

## FTIR600 - Systems for IR Microscopy and Spectroscopy

FT-IR is an increasingly popular method of sample analysis. With today's highly sophisticated instruments combining research quality optical features such as DIC and Phase contrast with IR micro analysis, the FT-IR microscopes are some of the most powerful research tools available. The research possibilities are dramatically increased, by adding a precision heating and freezing stage.

### Features and Benefits

The FTIR600 stage can be mounted horizontally for IR microscopy applications and vertically for cabinet type IR spectroscopy.

The silver block has a tapered hole to allow maximum transmittance of IR without interference. The angle of admittance from the condenser is 85° and that of the objective is 116°.

Temperature range is -196°C to 600°C with heating rates up to 150°C per minute.

A wide variety of window materials are available (see Windows section on Page 4), covering far IR down through visible to the UV region of the spectrum if required.

### System Options

#### FTIR600 Horizontal

This stage can be used with either the standalone T95-LinkPad system controller with ergonomic LCD touch screen control or the T95-LinkSys computer interface controller which includes the Linksys 32X system control software. (T95 LinkPad also has RS232 connectivity for LinkSys 32 Software) See T95 controller brochure for more details.

#### FTIR600 Vertical

This stage can also be used with either T95 controller. This stage is designed for horizontal IR beam spectrometers and incorporates a vertical sample holder and detachable base-plate for either free-standing, or attachment to a bracket, in the spectrometer chamber. The central aperture through the heating block can be supplied in the range 1.3 to 5mm to optimise intensity without compromising thermal performance.

#### Cooling

The LNP95 cooling pump communicates with the T95 system controller and varies the pump speeds to give a precise flow of liquid nitrogen from the 2L Dewar (supplied), to enable linear cooling speeds from 0.01 to 100°C/min. The exhaust dry nitrogen is then recycled through the pumps and used to keep the tubing flexible and purge the sample chamber to eradicate condensation. (All fittings and Dewar are supplied with the pump).

#### Water Cooling

For working at temperatures above 300°C for prolonged periods then use the ECP water circulator pump to keep the stage body cool.



The FTIR600 heating and freezing stage

Temperature Range -196 to 600°C



FTIR600 System with LNP95 cooling system



FTIR600 Vertical System for cabinet spectrometers

## Specifications

- Temperature range -196°C to 600°C
- Fast heating rates up to 150°C/min
- Fast cooling rates up to 100°C/min
- Temperature stability <0.1°C
- 16mm XY sample manipulation
- Sample area 22mm diameter
- Gas tight chamber for atmospheric control
- Compatible with most IR systems.
- 100 Ohm platinum resistor sensor
- Light aperture: 3mm diameter for high accuracy control (\* apertures up to 5mm diameter available)
- Silver heating block for high thermal conductivity
- Direct injection of the coolant into the silver block
- Range of IR transparent windows available (see Page 4)
- Objective lens working distance: 4.5mm
- Can also be used with all optical microscope techniques
- Water cooled stage body for high temperature work (>300°C)
- Suitable for Confocal, Laser Raman and X-Ray
- Stage body size: 137x92x22mm

\* Please note that larger aperture sizes may increase temperature gradients across the sample



## Optical Specifications

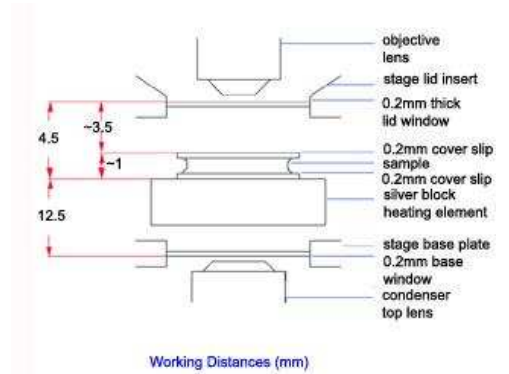
The **FTIR600 Horizontal** is designed to be used with an upright microscope, where the objective lens is above the sample.

When working with heating and freezing stages, it is necessary to use long working distance objective lenses. If viewing the sample using transmitted light you also require a long working distance condenser lens.

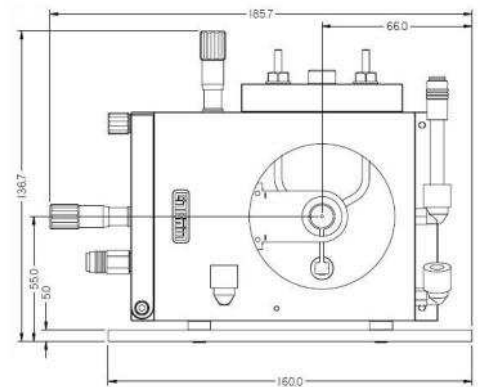
The objective lens is isolated from the sample by the stage lid window which is a fixed distance from the heating/cooling element. In the FTIR600 this distance is 4.5mm, as seen in the diagram opposite. We recommend that you use an objective lens with at least 4.5mm working distance.

The condenser lens is isolated from the sample by the stage base plate window and the thickness of the heating/cooling element. In the FTIR600 this distance is 12.5mm.

The **FTIR600 Vertical** is designed for horizontal beam instruments, cabinet spectrometers, and it is critical that the position of the central aperture in the heating block is aligned with the beam. See diagram opposite for the position of the aperture.



FTIR600 Horizontal — the diagram illustrates objective lens and condenser lens working distances.



FTIR 600 Vertical — the diagram illustrates the aperture centre for beam alignment

## Attaching the FTIR600 to a Microscope

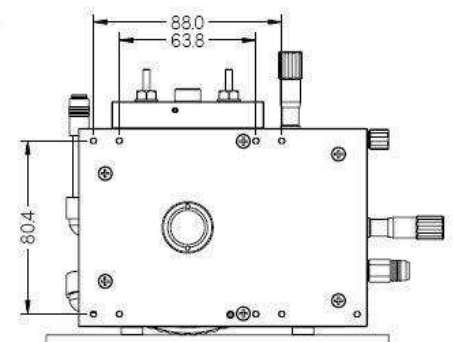
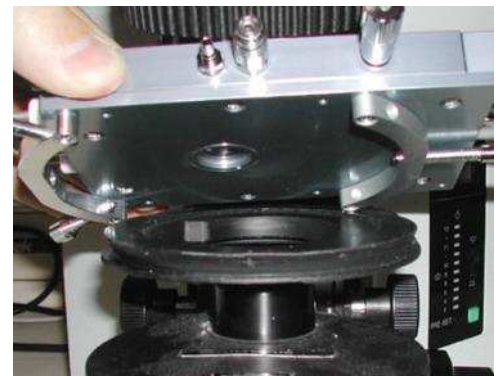
FTIR microscopes incorporate either a mechanical XY sample stage, or a motorized XY(Z) sample stage.

For mechanical XY stages Linkam manufactures a range of stage clamps to attach the FTIR600 stage to many different brands of microscope. The stage clamps are required to adjust the position of the hot-stage relative to the light path of the objective lens. Select the stage clamps you require from the Stage Clamps section on our website.

For motorized XY(Z) stages Linkam has a number of designs where the FTIR600 can fit directly in to the recess of the top plate of the stage. Please check with Linkam for compatibility ([info@linkam.co.uk](mailto:info@linkam.co.uk)).

## Attaching the FTIR600 to a bracket

The FTIR600 Vertical is supplied as standard with 8xM3 tapped holes for attachment to customise brackets.



## Windows

The FTIR 600 stages are supplied with zinc selenide windows as standard. However we can supply other windows on request.

Window Material	Transmission Range (Microns)	Properties
Zinc Selenide (ZnSe)	0.5 to 20	Soluble in strong acids. Insoluble in water and most organic solvents. Good resistance to thermal and mechanical shock. Suitable for work in the temperature range $-200$ to $250^{\circ}\text{C}$
Barium Fluoride ( $\text{BaF}_2$ )	0.2 to 11	Low water solubility. Soluble in acids and $\text{NH}_4\text{Cl}$
Sapphire ( $\text{Al}_2\text{O}_3$ )	0.15 to 5	Very slightly soluble in acids and bases. High strength and hardness. IR use limited but extends well into UV range.
Potassium Bromide (KBr)	0.3 to 25	Soluble in water and alcohol. Hygroscopic.
Calcium Fluoride ( $\text{CaF}_2$ )	0.15 to 8	Insoluble in water and resists most acids and bases. Soluble in $\text{NH}_4$ salts.

### BARIUM FLUORIDE

2682	W10B0.5	Barium Fluoride Sample Window 10mm diameter 0.5mm thick
2684	W16B0.5	Barium Fluoride Sample Window 16mm diameter 0.5mm thick
2686	W22B0.5	Barium Fluoride Lid/base Window 22 diameter 0.5mm thick

### ZINC SELENIDE

3833	W10Z 0.5	Zinc Selenide Sample Window 10mm diameter 0.5mm thick
3834	W10Z 1.0	Zinc Selenide Sample Window 10mm diameter 1mm thick
3828	W16Z 0.5	Zinc Selenide Sample Window 16mm diameter 0.5mm thick
3832	W16Z 1.0	Zinc Selenide Sample Window 16mm diameter 1mm thick
3827	W22Z 0.5	Zinc Selenide Lid/base Window 22mm diameter 0.5mm thick
3820	W22Z 1.0	Zinc Selenide Lid/base Window 22mm diameter 1mm thick

### POTASSIUM BROMIDE

2678	W10K0.5	Potassium Bromide Sample Window 10mm diameter 0.5mm thick
2672	W16K0.5	Potassium Bromide Sample Window 16mm diameter 0.5mm thick
2674	W22K1.0	Potassium Bromide Lid/base Window 22mm diameter 1mm thick

### SAPPHIRE

9570	THMS/S	Stainless Steel Ring with 15mm diameter Floating Sapphire Window
2691	W15TS	15mm diameter Sapphire Window for THMS/S
2697	W22S0.3	22mm diameter sapphire window (0.3mm thick)



## What do you need for a complete Temperature Control Solution?

### Select FTIR600 Stage Type

Either: FTIR600 Horizontal

Or: FTIR600 Vertical

### Select Heating/Freezing block aperture size

3 to 5mm diameter

### Select Stage Windows (lid, sample and base) for optimum IR transmission

(ZnSe, BaF<sub>2</sub>, KBr, Sapphire, CaF<sub>2</sub>). See Page 4

### Select T95 controller

Either: T95 LinkPad (standalone, includes touch screen data input module)

Or.: T95 LinkSys (PC interface controller, includes LinkSys 32 Software)

### Add Cooling Option to extend temperature range from Ambient to -196°C

LNP95 (includes 2L Dewar and siphon)

### Add Stage Clamp to mount to microscope sub-stage

See website 'Optical Accessories'



## Suggested Spare Parts

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

*The FTIR 600 heating element is extremely durable if used carefully. However, it is made from pure silver which is a soft metal. 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.*

*The Precision Temperature Kit, is used to get extremely accurate temperatures. A highly conductive sapphire window is used with a special sample holder and covered with a pure silver lid to create a micro oven around the sample. This technique ensures the sample is heated on all sides and will yield the most accurate temperature control available.*

Part No.	Part Name	Part Description
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<b>7518</b>	<b>FTIR600 Kit</b>	<b>Full Replacement Spares Kit</b>
	WGI	Water/Gas Valve Insert <b>x2</b>
	WVC	Water/Gas Valve Connector <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)
	RI17	Stainless Steel Ring Set
	TCH	Tube Clip Holder (for Nitrogen de-fogging stage lid tube)
	ORTHMS	Set of O-Rings for FTIR600 Stage Body and Lid
	TUBE	3x6x150mm Clear PVC Tube
	WT	Window Tool (for unlocking lid insert and base locking ring)
	ACCE	Box of Glass for Windows / Sample: 22x0.17mm (x50); 16x0.17mm (x50); 22x0.3mm (x10)
	FTIR/CC	Crucible Carrier for Sample Loading
	W16Z0.5	Zinc Selenide Sample Window 16mm diameter 0.5mm thick <b>x2</b>
	W16B0.5	Barium Fluoride Sample Window 16mm diameter 0.5mm thick <b>x2</b>
	W22B0.5	Barium Fluoride Lid/base Window 22 diameter 0.5mm thick <b>x2</b>
	W22Z0.5	Zinc Selenide Lid/base Window 22mm diameter 0.5mm thick <b>x2</b>

## Suggested Spare Parts

Part No.	Part Name	Part Description
<b>7519</b>	<b>FTIR600 ZnSe Kit (0.5mm)</b>	<b>Full Replacement ZnSe Spares Kit (0.5mm)</b>
	W16Z 0.5	Zinc Selenide Sample Window 16mm diameter 0.5mm thick <b>x4</b>
	W22Z 0.5	Zinc Selenide Lid/base Window 22mm diameter 0.5mm thick <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)

Part No.	Part Name	Part Description
<b>7520</b>	<b>FTIR600 ZnSe Kit (1.0mm)</b>	<b>Full Replacement ZnSe Spares Kit (1.0mm)</b>
	W16Z 1.0	Zinc Selenide Sample Window 16mm diameter 1mm thick <b>x4</b>
	W22Z 1.0	Zinc Selenide Lid/base Window 22mm diameter 1mm thick <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)

Part No.	Part Name	Part Description
<b>7521</b>	<b>FTIR600 BaF<sub>2</sub> Kit</b>	<b>Full Replacement BaF<sub>2</sub> Spares Kit</b>
	W16B	Barium Fluoride Sample Window 16mm diameter 0.5mm thick <b>x4</b>
	W22B	Barium Fluoride Lid/base Window 22 diameter 0.5mm thick <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)



## Suggested Spare Parts

### Part No. Part Name Part Description

<b>22222</b>	<b>FTIR600 KBr Kit</b>	<b>Full Replacement KBr Spares Kit</b>
	W16K	Potassium Bromide Sample Window 16mm diameter 0.5mm thick <b>x4</b>
	W22K	Potassium Bromide Lid/base Window 22mm diameter 1mm thick <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)

### Part No. Part Name Part Description

<b>22222</b>	<b>FTIR600 Sapphire Kit</b>	<b>Full Replacement Sapphire Spares Kit</b>
	W15TS	Sapphire Sample Window 15mm diameter 0.3mm thick <b>x4</b>
	W22S0.3	Sapphire Lid/Base Window 22mm diameter 0.3mm thick <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)

### Part No. Part Name Part Description

<b>22222</b>	<b>FTIR600 CaF<sub>2</sub> Kit</b>	<b>Full Replacement CaF<sub>2</sub> Spares Kit</b>
	W16C	Calcium Fluoride Sample Window 16mm diameter 0.5mm thick <b>x4</b>
	W22C	Calcium Fluoride Lid/base Window 22mm diameter 0.5mm thick <b>x2</b>
	SRR	Silicon Rings for Lid and Base (Set of 4)

### Part No. Part Name Part Description

<b>22222</b>	<b>FTIR600 Glass Windows Kit</b>	<b>Spare Windows for Lid, Base and samples</b>
	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)