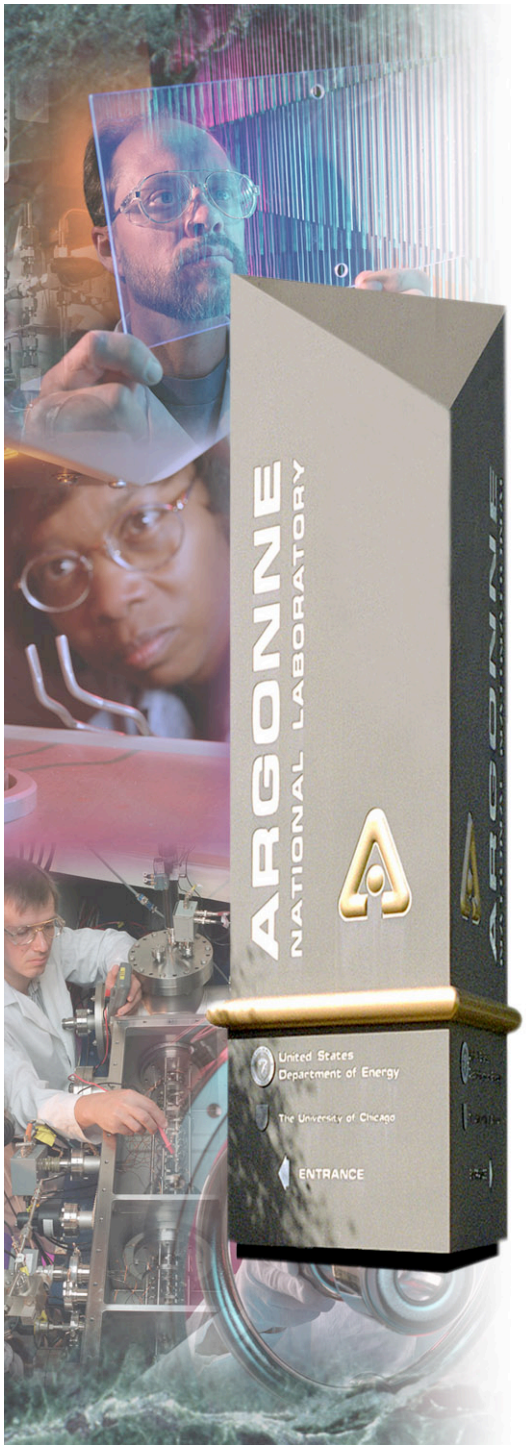


Tools and Toys

1. New Way Porous Media Air Bearings
2. Kappa/KBM μ-Diffraction "No Hammer" Alignment
3. Linkam THMSG600 Freezer/Furnace
4. Other Fun Stuff

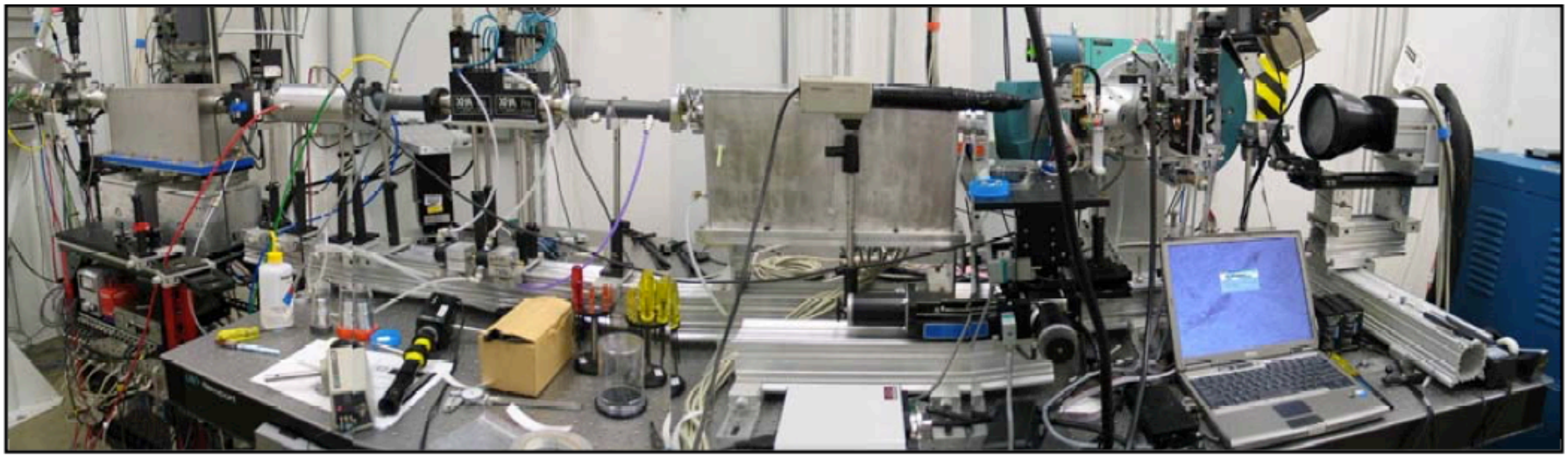
Argonne National Laboratory

Office of Science
U.S. Department of Energy

A U.S. Department of Energy
Office of Science Laboratory
Operated by The University of Chicago

Tabletop KBM-Based μ-Diffraction

Problem: Align a 4-circle Kappa goniometer relative to a 10 m KBM focused beam when the KBM and the goniometer are all on the same optical table



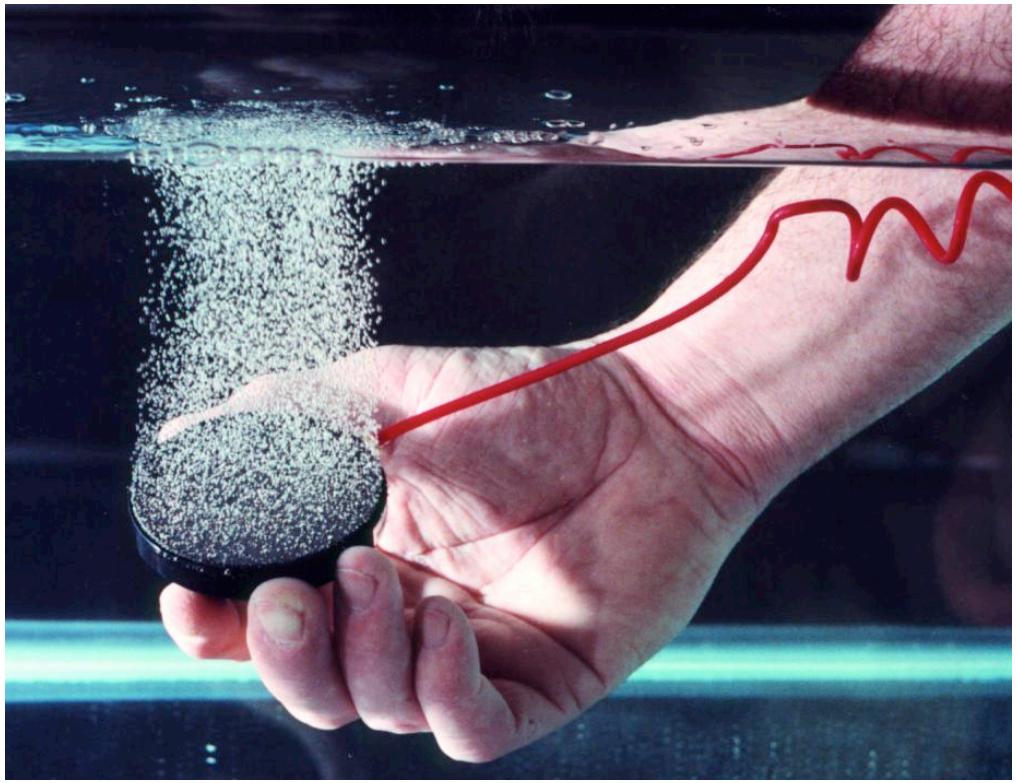
- Method 1: Focus the beam, then bring the goniometer into compliance
- Method 2: Use the Table Record, Luke

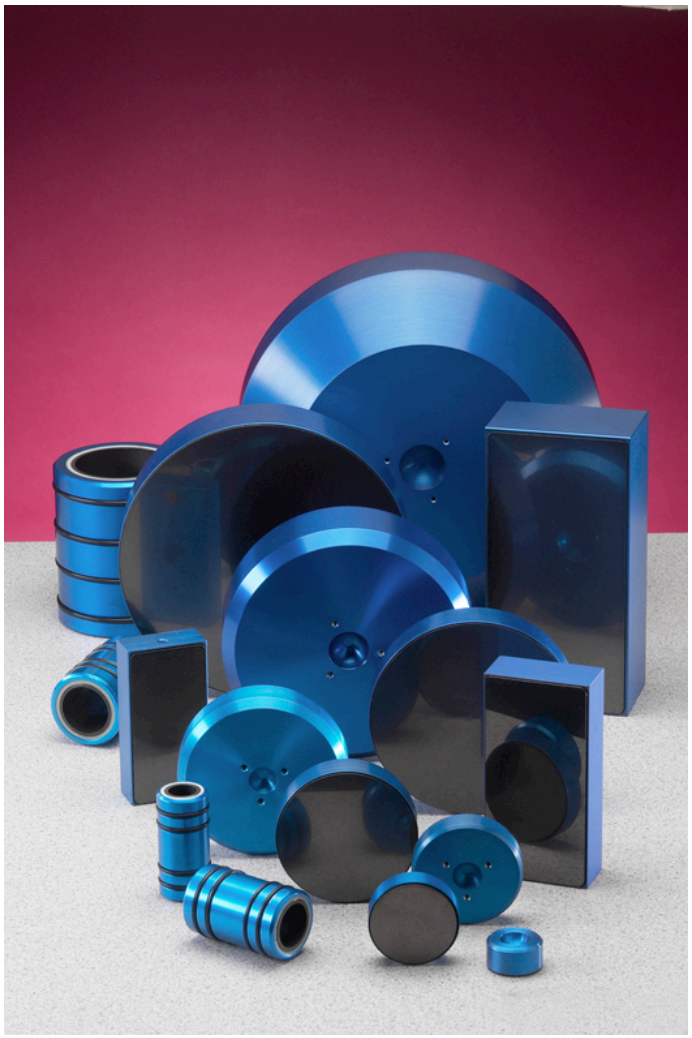
a.k.a.

Peter Eng's "No-Hammer" Alignment Method

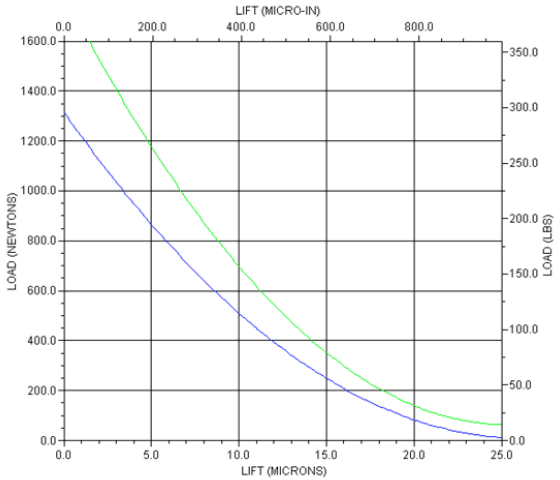
New Way Porous Media Air Bearings

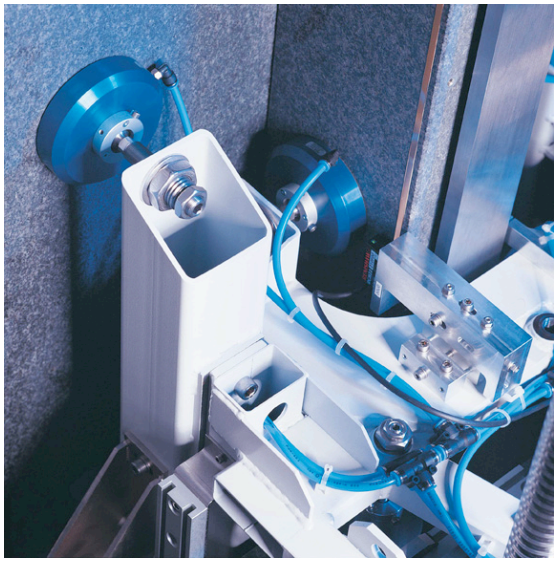
http://www.newwayairbearings.com

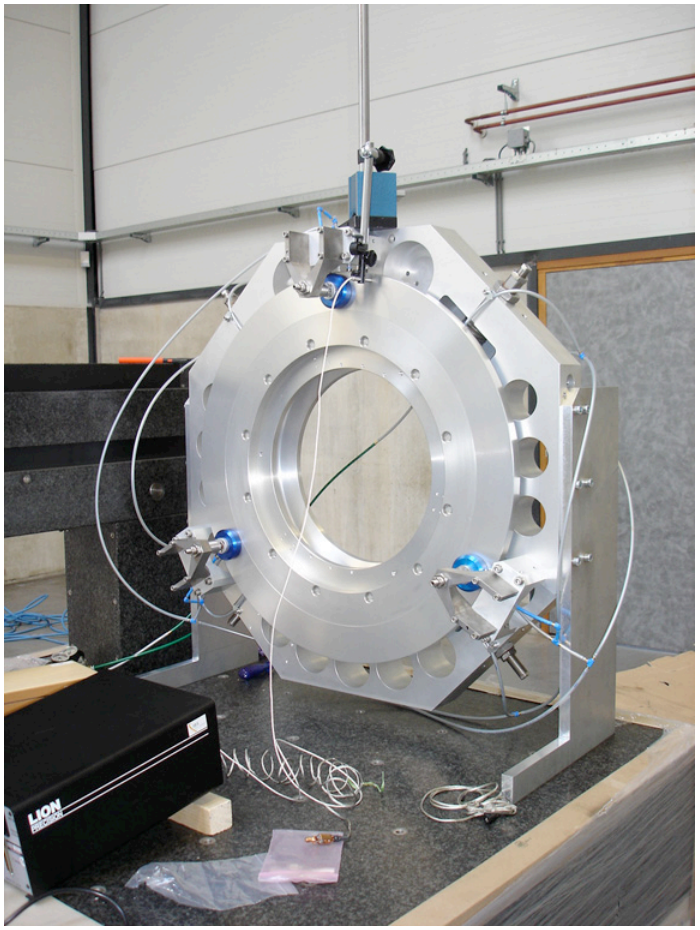




New Way Porous Media Air Bearings



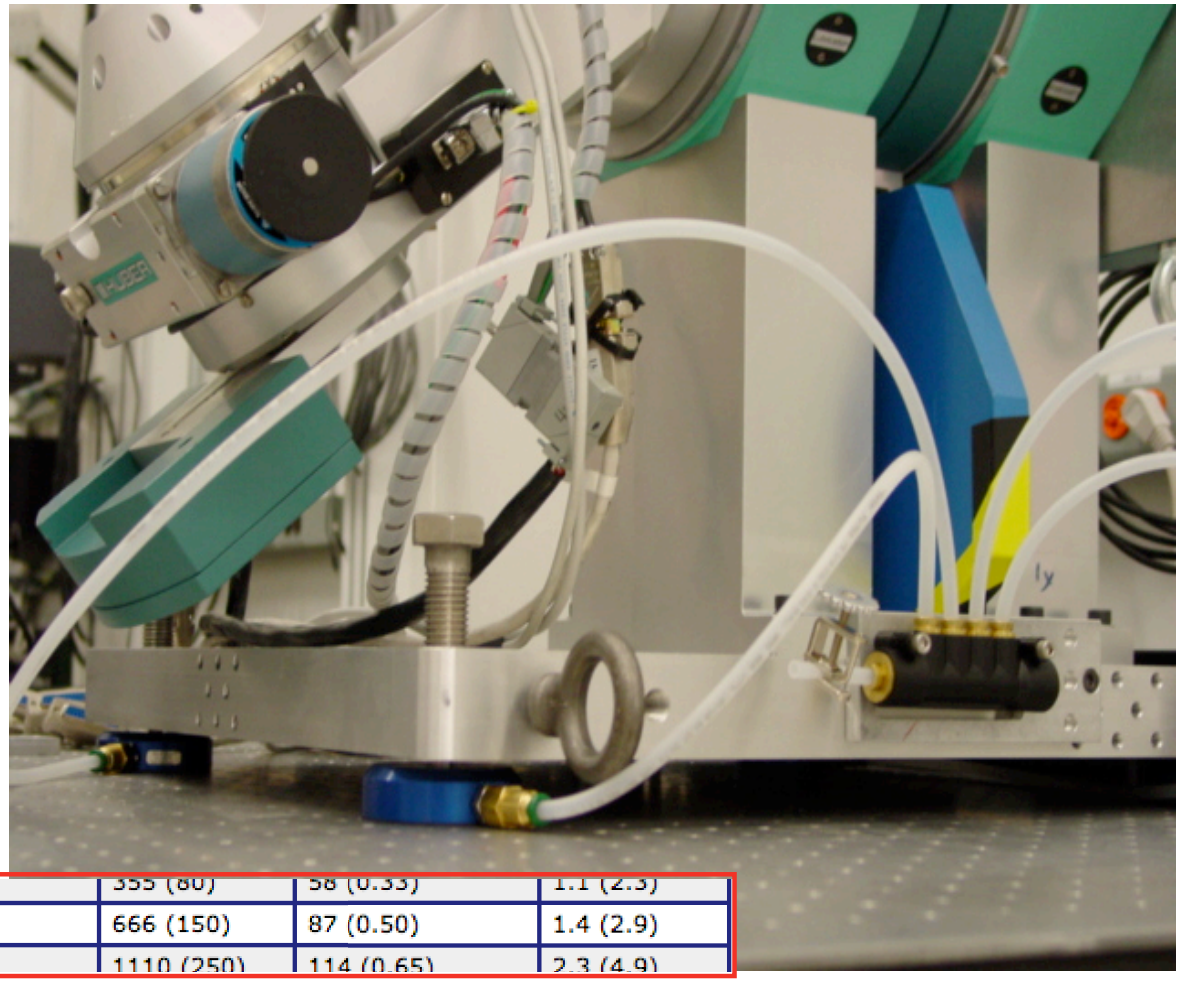




New Way Porous Media Air Bearings

Directly on top of a stock Newport Optical table using APS in-house compressed air

- 4 x 65mm ∅ bearings @ $195.00 each
- $70 worth of gas fittings
- APS in-house compressed air (dry, 120 psi)
- 150 kg instrument easily manipulated with a Newport CMA-25PP actuator

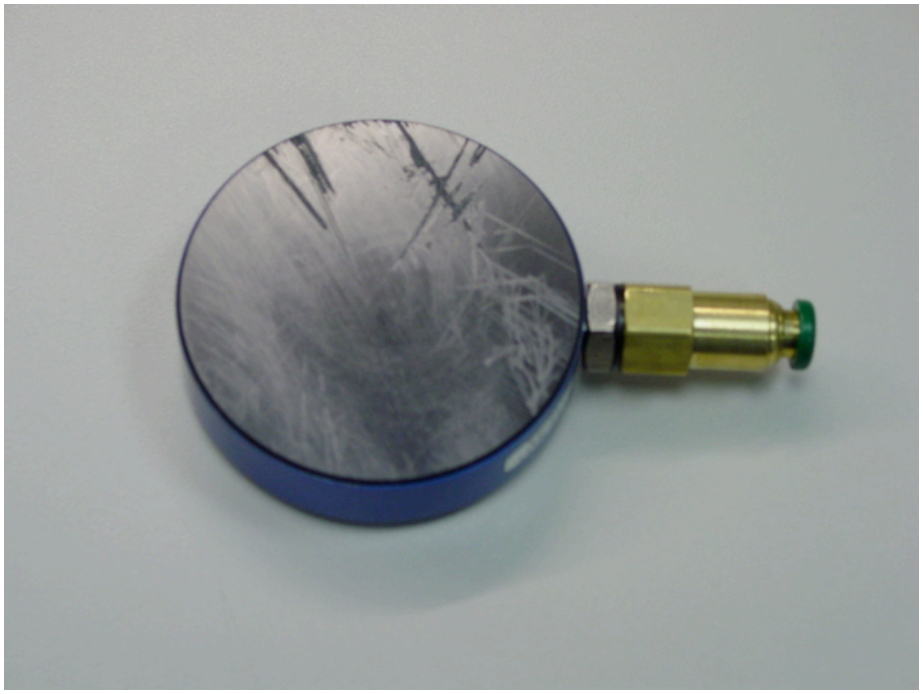


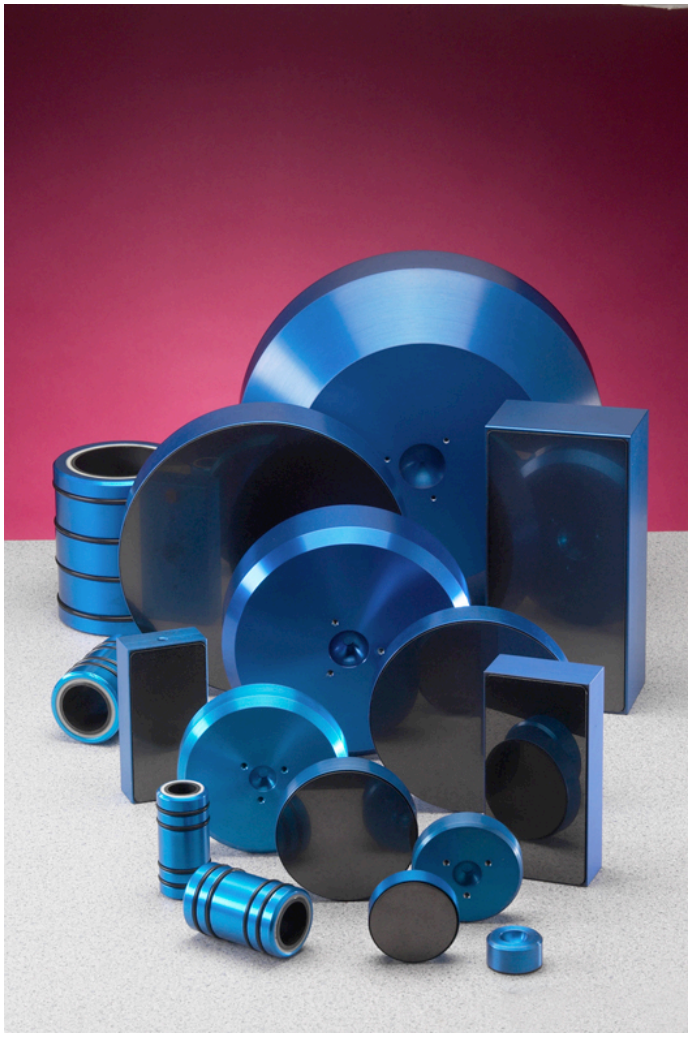
Size	Part # (select for load/lift curve & drawing)	Ideal Load N (lbs) @ .41 MPa (60psi)	Stiffness N/micron (lbs/u in) @ 0.41 MPa (60psi)	Flow NLPM (SCFH) @ .41 MPa(60psi)
25mm Dia.	S102501	80 (18)	18 (0.10)	0.53 (1.2)
40mm Dia.	S104001	222 (50)	28 (0.16)	0.74 (1.6)
50mm Dia.	S105001	355 (80)	58 (0.33)	1.1 (2.3)
65mm Dia.	S106501	666 (150)	87 (0.50)	1.4 (2.9)
80mm Dia.	S108001	1110 (250)	114 (0.65)	2.3 (4.9)
100mm Dia.	S1010001	1776 (400)	175 (1.0)	2.6 (5.6)
125mm Dia.	S1012501	2775 (625)	254 (1.5)	2.6 (5.6)
150mm Dia.	S1015001	4444 (1000)	350 (2.0)	2.9 (6.1)
200mm Dia.	S1020001	7770 (1750)	700 (4.0)	3.8 (8.1)
40mm x 50mm	S124001	355 (80)	35 (0.20)	1.3 (2.7)
40mm x 80mm	S124002	622 (140)	58 (0.33)	2.1 (4.5)
50mm x 100mm	S125001	1110 (250)	110 (0.63)	2.5 (5.4)
75mm x 150mm	S127501	2220 (500)	150 (0.85)	2.4 (5.2)

50mm Dia.	S105001	355 (80)	58 (0.33)	1.1 (2.3)
65mm Dia.	S106501	666 (150)	87 (0.50)	1.4 (2.9)
80mm Dia.	S108001	1110 (250)	114 (0.65)	2.3 (4.9)

New Way Porous Media Air Bearings

The surface loses its "new bearing shine" up after two weeks of cutting edge user science, but it still works perfectly.

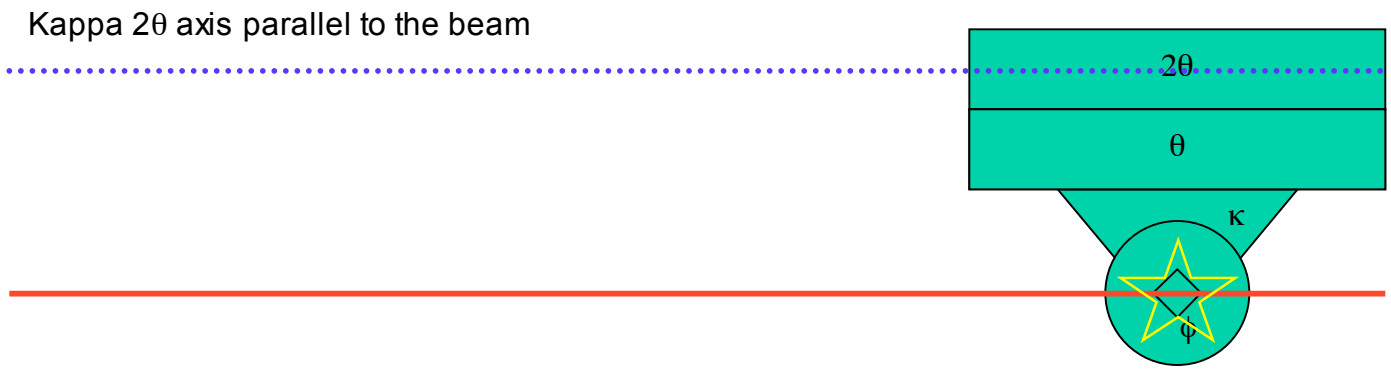




Kappa/KBM μ-Diffraction

Peter Eng's "No-Hammer" Alignment Method

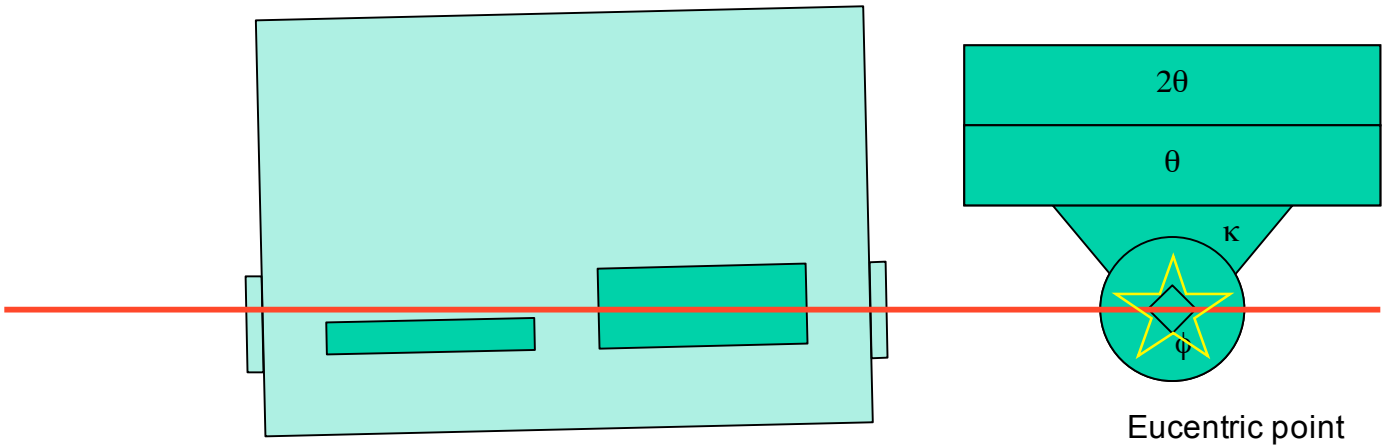
Step 1: Bring the Kappa into alignment with the beam



Kappa/KBM μ-Diffraction

Step 2: Coarse alignment–KB Mirrors on table, roughly parallel to beam

Position KBM assembly so the beam passes close to the surfaces of both mirrors (where "close" means within the range of motion of the KB Mirror H and V translation motors).



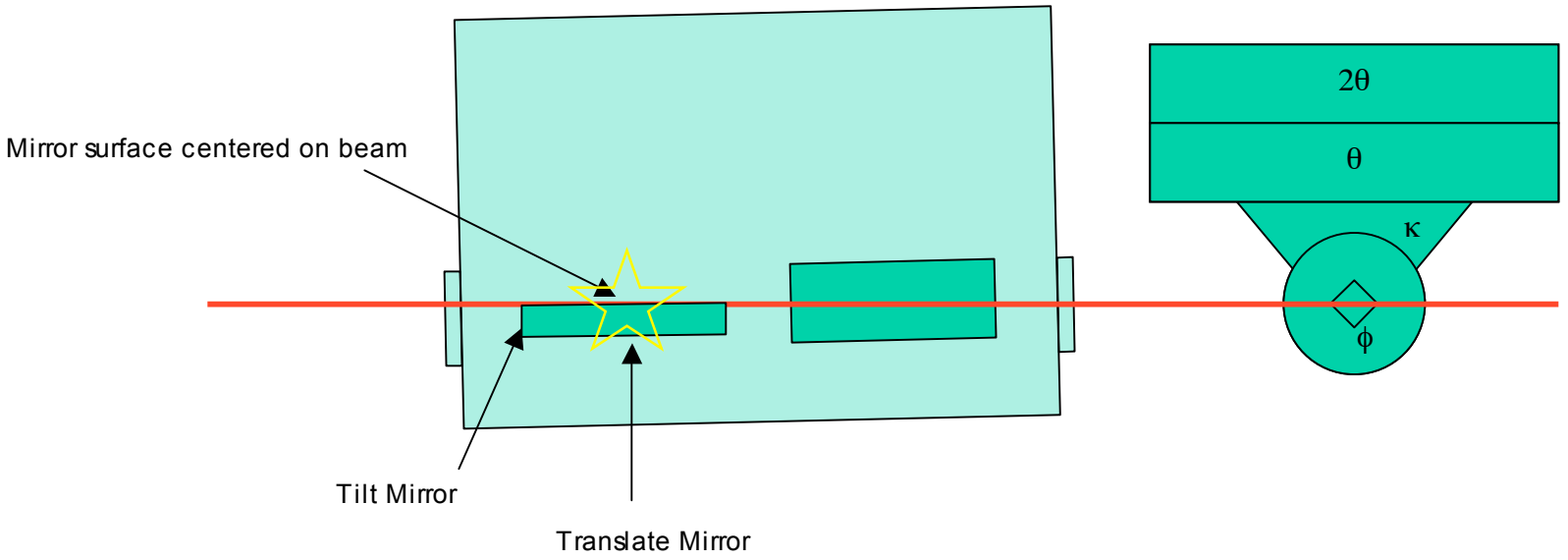
Eucentric point centered on beam

For all subsequent steps, the KB Mirror Box and the Kappa are **fixed** on the table.

Kappa/KBM μ-Diffraction

Step 3: Horizontal Focus

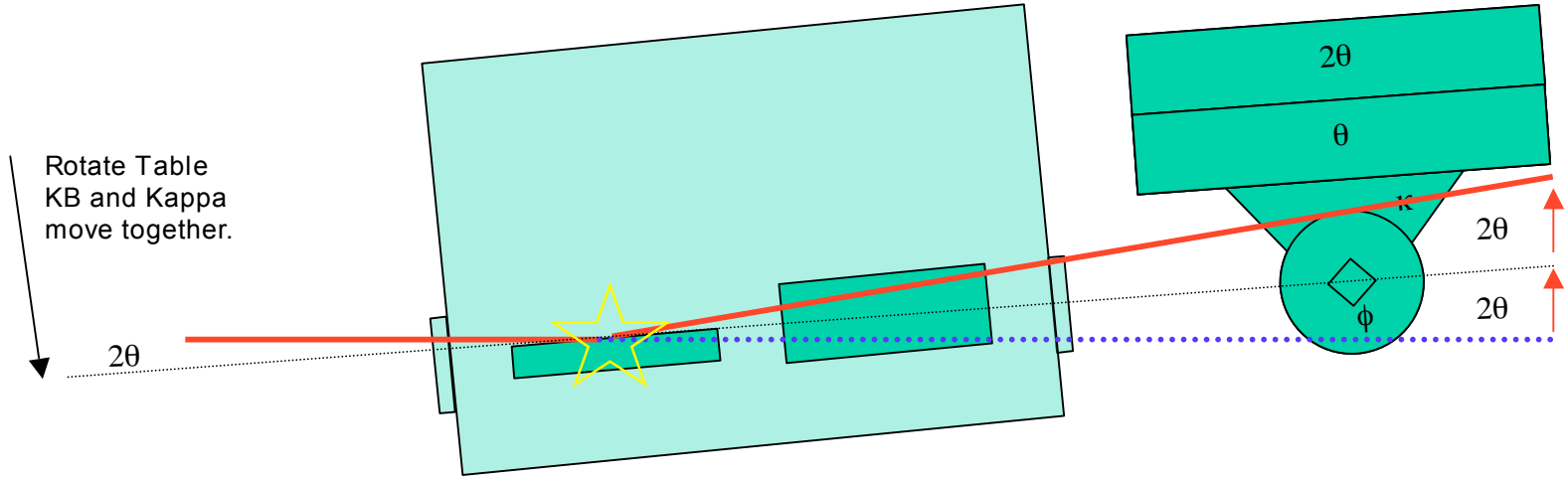
Use the internal H-Translate and H-Tilt to make the H focusing mirror parallel and centered on the beam



Kappa/KBM μ-Diffraction

Step 3: Horizontal Focus

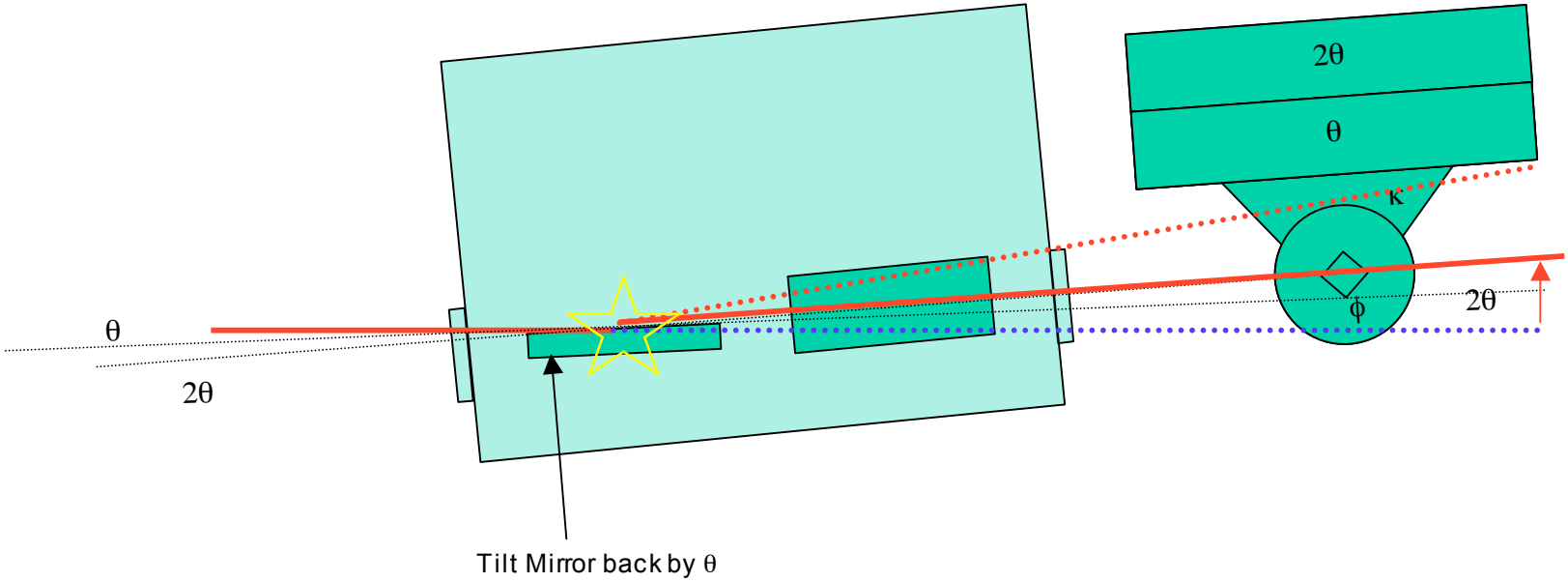
Use the EPICS Table Record to rotate the table about the H Mirror Surface to **TWICE** the desired KB mirror angle



Kappa/KBM μ-Diffraction

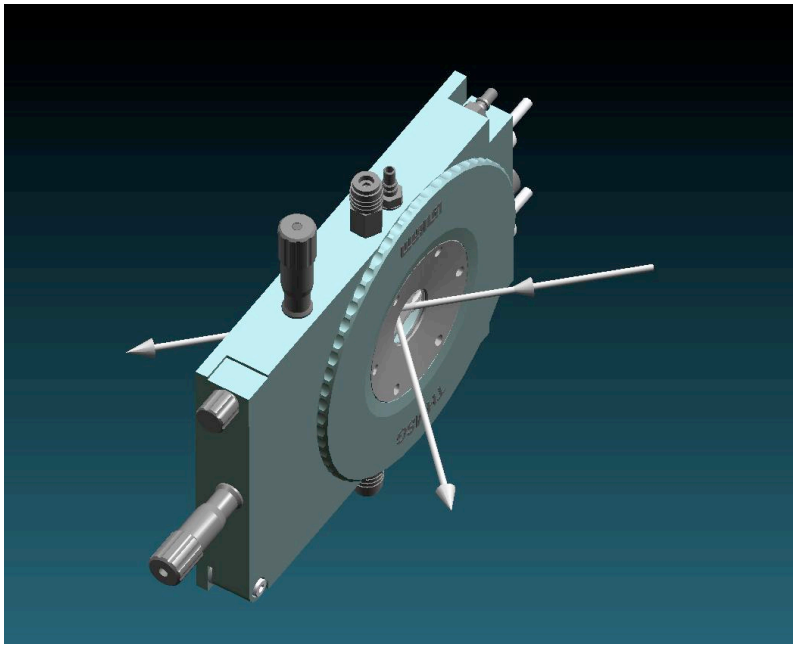
Step 3: Horizontal Focus

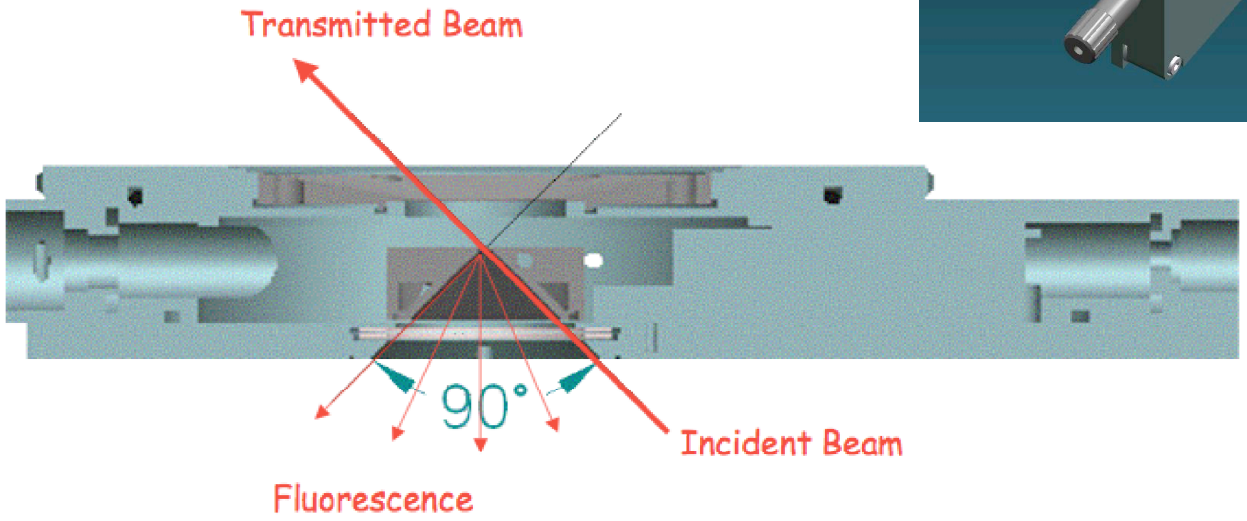
Use the KB Mirror Tilt to move the mirror surface **BACKWARD** to the correct angle with respect to the beam



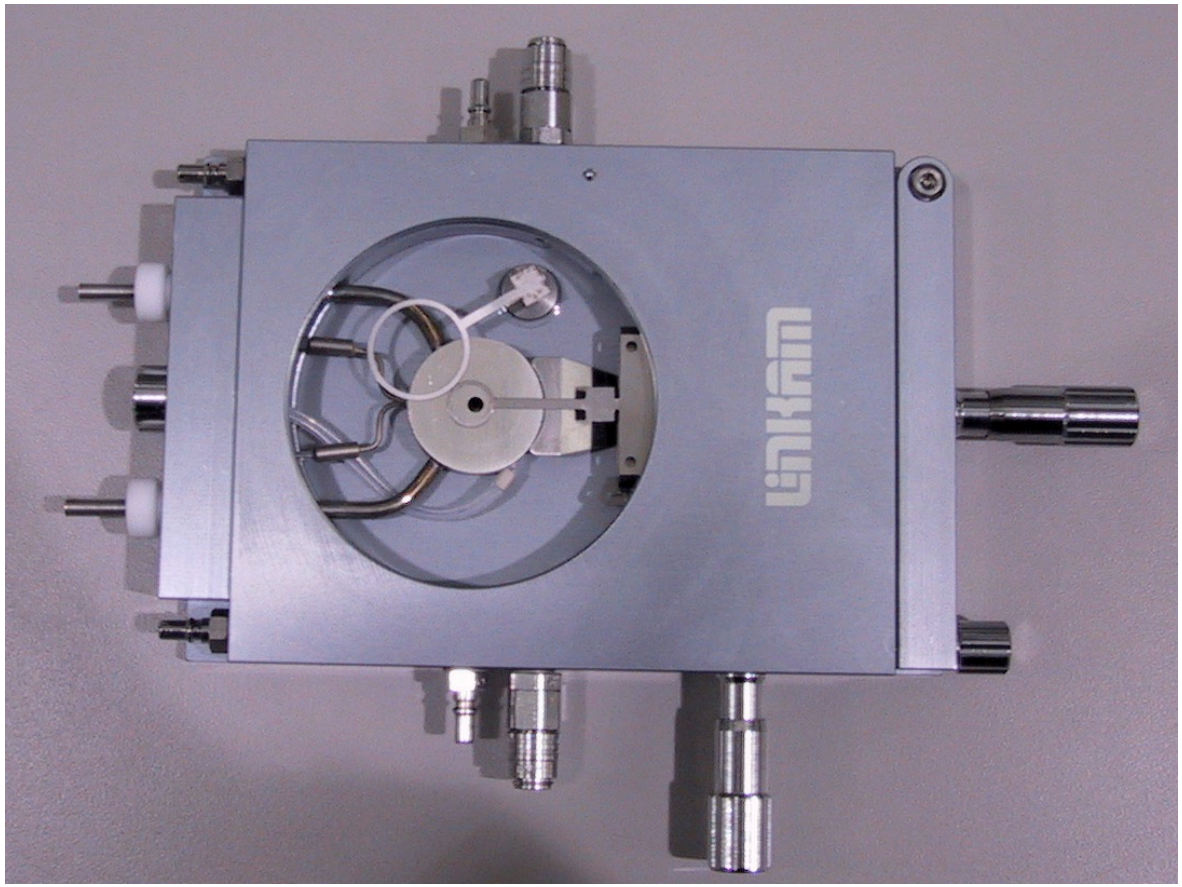
Linkam THMSG600 Freezer/Furnace

THMSG600 w/modification (shown)	$8,820
TMS94 Temperature programmer	$5,560
LNP94/2B Liquid nitrogen pump	$2,520

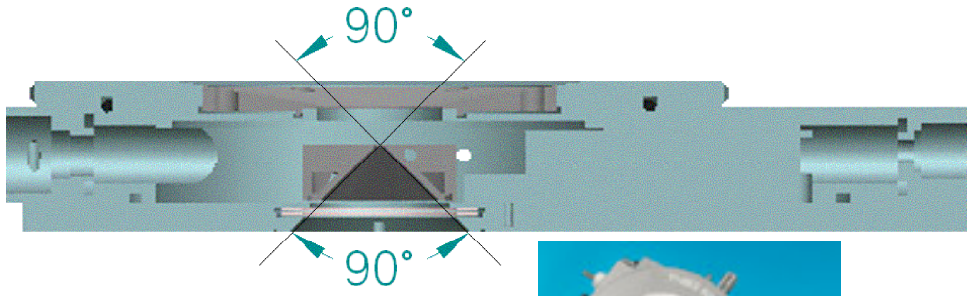




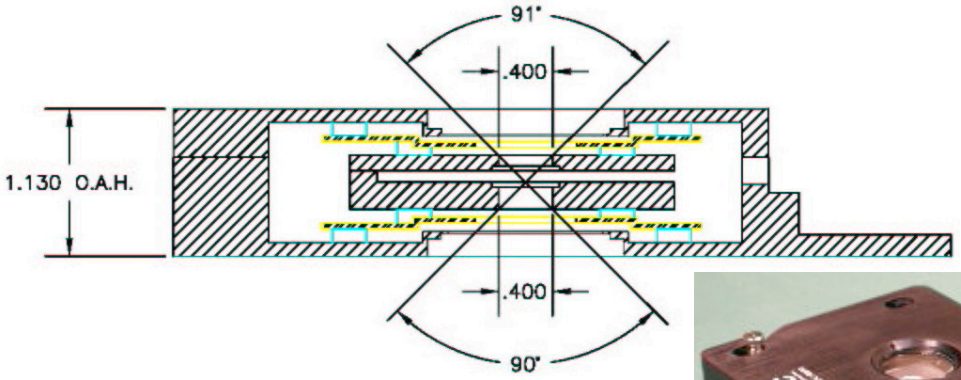
Linkam THMSG600 Freezer/Furnace



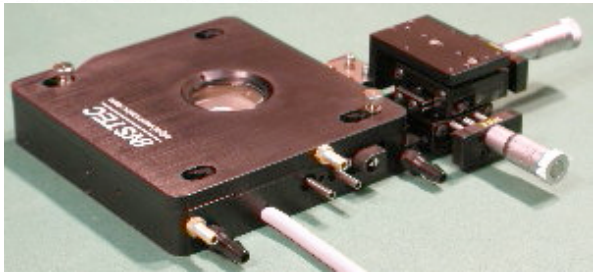
Linkam THMSG600 Freezer/Furnace



www.linkam.co.uk

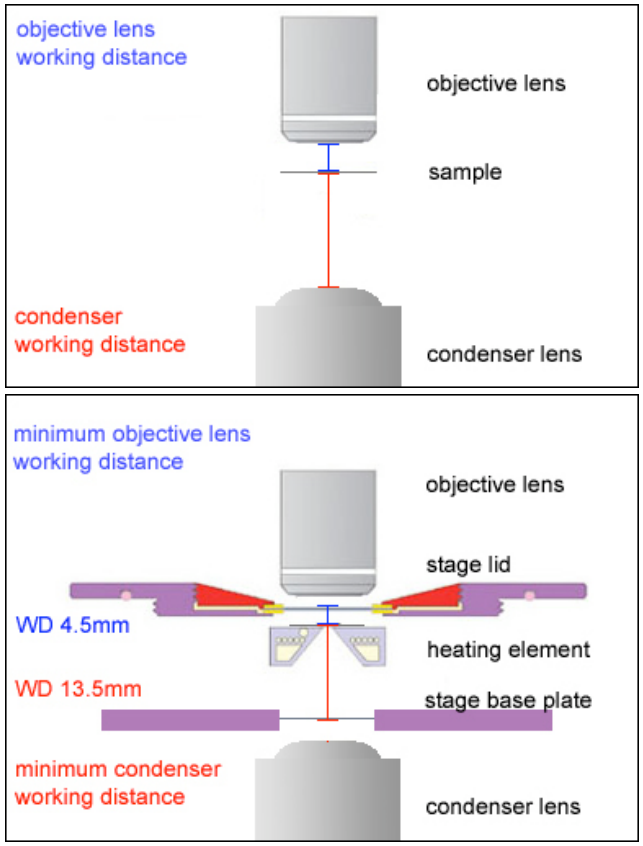


www.instec.com



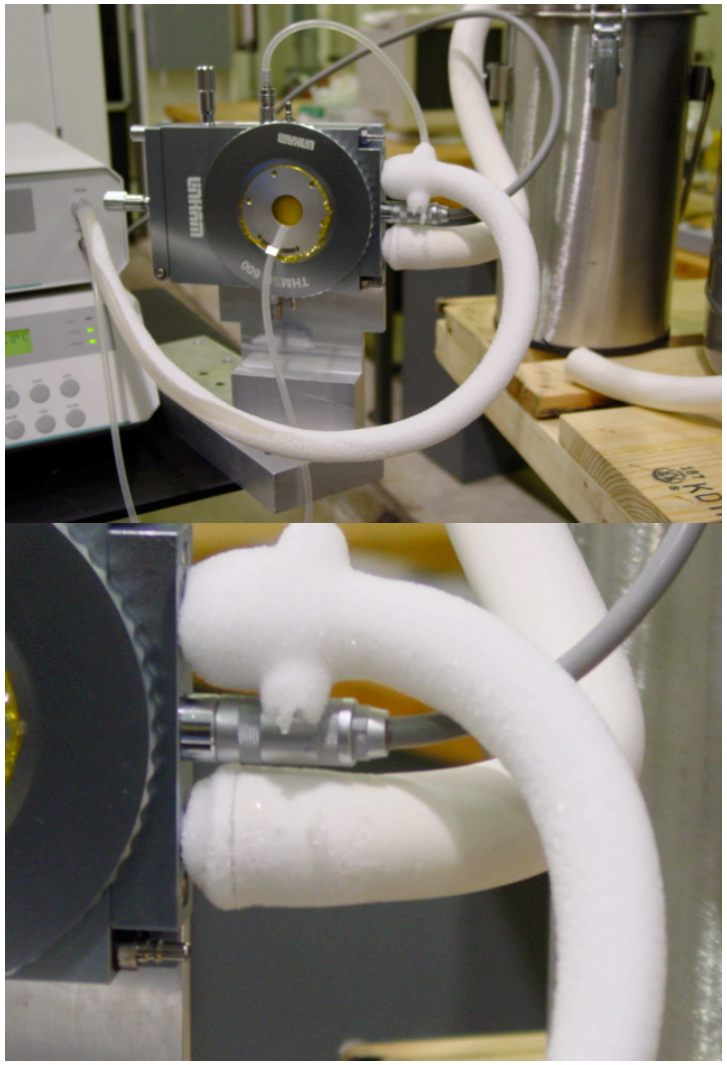
Linkam THMSG600 Freezer/Furnace

- Temperature range -196° to 600°C
- Up to 130°C/min heating
- Temperature stability < 0.1°C
- 16 mm X,Y sample manipulation
- Sample area 22 mm diameter
- Gas tight chamber for atmospheric control
- Clamps directly to the microscope substage for stability
- 100ohm platinum resistor sensor. 1/10th Din
- Light aperture - 1.3 mmØ
- Silver heating block for high thermal conductivity
- Direct injection of the coolant into the silver block
- Single ultra thin lid window - 0.17 mm
- Objective lens working distance - 0.1 mm to 4.5 mm
- Condenser lens minimum working distance 12.5 mm
- Range of condenser extension lenses available
- Can be used with all microscope techniques
- Water cooled stage body for high temperature work (>300°C)
- Suitable for Confocal, Laser Raman and X-Ray
- Sample side loading without removing the stage lid
- Stage body size - 137 x 92 x 22 mm



Linkam THMSG600 Freezer/Furnace

- Frost formation on the LN2 transfer lines
- Refilling the 25 liter Dewar
- User (as in General User) friendly sample holders
- Motorized internal XY for maximum automation
- Longer LN2 transfer lines
- Computer control of the temperature controller



User Support: Single-Serve Coffee Technology

$200 for the coffee pot

NEGATIVES

- Locked in to buying proprietary coffee packets at ca. $0.45/cup

POSITIVES

- NO CLEAN-UP!!
- Low maintenance
- Internal charcoal filter, so just fill w/tap water. Holds 1 gallon.
- Very easy to train new users
- Decent selection of coffees, teas and hot chocolate
- Drip brewed into the cup, with no cross-contamination between cups.
- Graduate students and post docs love having hot, fresh coffee on-demand 24/7 at 1/2 the price of 401 Grill and Cart coffee
- Professors love pushing the buttons and trying all the different flavors.