

Furnaces

for the Primary Laboratory

Apparatus to melt and freeze the fixed points of ITS-90.

To get the best performance from the cells requires the best quality apparatus. We have, over the years, produced many models to satisfy particular customer requirements, each has its own benefits and temperature range.

Considering first our very best apparatus, these are a range of 3 products we call dual furnaces. Based on a concept by Dr. Piero Marcarino of IMGIC, Italy. The dual furnace is designed to have two independently controllable furnaces. One, a simple furnace to pre-warm and anneal the thermometers being calibrated. The second, a heat-pipe to perfectly melt and freeze the cell into which the thermometers will be immersed.

These are the apparatus in my own Primary Laboratory and once you use them nothing else will do, because they handle both the fixed point, and the thermometer's ideal thermal path.

For those laboratories who already have furnaces for pre-warming and annealing thermometers we offer a range of 3 heat-pipe furnaces. The dual furnaces and heat-pipe furnaces all meet the requirements of "Optimal Realizations".

A more economic solution to melting and freezing cells is by using three zones of heating. We offer two three zone furnaces. These will also meet the requirements of "Optimal Realizations".

Lastly, we have two single zone furnaces offering economic solutions to annealing and lower temperature fixed points, the following pages detail these options.

Other products, originally designed for comparison calibration can be adapted to freeze and melt fixed point cells, these are described fully in Databook 2.

Plateau lengths

CCT/96-8 says that a plateau length of 10 or more hours is suitable for optimal realizations.

NIST in America like to work with long plateaus whereas according to our UKAS procedure we should calibrate an SPRT 2 or 3 times using a new plateau each time.

If our apparatus is good, which it is then the length of plateau is dictated mainly by how close the set point of the apparatus is to the fixed point we are realizing.

Plateau lengths at the silver point of over 70 hours (3 days) have been achieved using our furnaces. From a practical point we normally work with one working day long plateaus, remelting the cell overnight ready for a new freeze the next day.

Note:

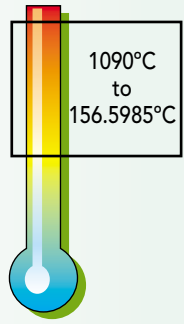
For increased safety our High Temperature Furnaces operate from 110VAC. To maintain low earth leakage currents, 230VAC and 110VAC - 110VAC Isolating Transformers are available



www.isotech.co.uk/primary



Dual Furnaces



Using standard platinum resistance thermometers presents many problems due to strain and contamination, which can too easily be introduced into the thermometer during thermal cycling.

Because such problems have been only partially understood, little published information or apparatus is available for the safe-handling of these sophisticated devices.

At Isotech, we feel that enough information exists for us to propose a new apparatus specifically designed, not only to create and maintain the Fixed Points of ITS-90, but also to pre- and post-condition the thermometers to be calibrated. Thus we have incorporated a second furnace which, because of its unique design, will safely (and without contamination) pre- and post-condition the thermometers.

To complete the apparatus, a further pre-warming tube (with a temperature approximately equal to that of the heat-pipe) made of a unique and gas-tight material, is provided, together with a storage rack for 4 thermometers.

Method of operation

The cell is melted in an essentially gradient-free heat-pipe. When melting is complete, the heat-pipe temperature is readjusted to be 0.5°C below the freeze temperature of the cell. A cold rod introduced into the cell's re-entrant tube initiates the freeze, to give a plateau that will last for between 12 and 24 hours.

The thermometers are removed from their storage rack and placed in the pre-conditioning furnace. The furnace is slowly heated to the Cell temperature.

The thermometers are protected from contamination by a slow air flux around them.

One by one the thermometers are transferred into the cell for 20 to 30 minutes for calibration and thence back to the conditioning furnace.

When all the thermometers have been calibrated, the conditioning furnace is slowly cooled back to 400°C whence the thermometers can safely be removed into room temperature.

And our thanks to Dr P. Marcarino of IMGCI Italy for his permission to develop the idea.

Performance Essentially gradient-free heat-pipes provide the ideal apparatus for fixed point calibration and give the perfect profile within the fixed point cell. The addition of the second furnace with its air-flow enables thermometers to be easily and safely calibrated. A comprehensive handbook accompanies each delivery.

Comparison calibration A temperature-equalising block is available for comparison calibration purpose.

Options

420-02-15 Inconel Equalizing block (17705 + 17706)

425-02-07 Aluminium Equalizing block (17707)

824-01-00 Fan Assembly (to cool the thermometer handle)

425-06-01 Gantry (holder for thermometer)

935-19-43 230v/110v Transformer

935-19-48 110v/110v Transformer

How to order

ITL-M-17707 Low Temperature Dual Furnace

ITL-M-17706 High Temperature Dual Furnace

ITL-M-17705 Very High Temperature Dual Furnace

Model	17707 for Indium and Tin Fixed Point Cells 17706 for Zinc, Aluminium and Silver Fixed Point Cells 17705 for Aluminium, Silver and Copper Fixed Point Cells
Dimensions	Height 960mm (excluding holding rack) Width 600mm Depth 560mm
Control	The heat-pipe and the thermometer conditioning furnaces are controlled independently to a resolution of 0.1°C
Communications	Included as standard, see page 42 for details
Over-temperature Protection	Provided on each furnace with independent sensor
Supply	110VAC, 3kw, 50/60Hz CTE (230VAC and 110VAC to 110VAC Isolating Transformers are available) (Model 17707 available 108 - 115 or 208 - 240 VAC)