

## THERMAL CONDUCTIVITY INSTRUMENT

- Conforms to ASTM C 518 & ISO 8301
- Specimen size 300 mm sq. (12")
- Thickness Range from 0 to 102 mm (4")
- Linear Gradient Guard for thick samples
- Accuracy better than 1%
- Easy to use, rapid operation
- Microprocessor based
- Stand alone operation
- Solid state cooling\heating
- Operation from -20°C to 95°C (plate)
- Digital Thickness readout to 0.001"
- Powerful 24 Bit A/D Converter
- Two Thin-Film Heat Flux Transducers
- Temperature Control to 0.01°C
- Interfaces to a computer
- Ideal for slices of Cellular Plastics
- No need to calibrate for years
- Full One Year Parts and Labor Warranty
- Suitable for R&D and QC testing
- Win\_Therm Software extends flexibility
- Extremely energy efficient



### Simplicity of use:

Place the specimen in the test chamber, close the door and answer several prompts displayed on a clear 4 line alphanumeric LCD display. The Instrument does the rest.

The plate spacing is adjusted automatically to the desired specimen thickness (accurate to 0.001").

The FOX304 is equipped with a Linear Gradient Guard. This provides an active thermal guarding system on all four sides of the sample, precluding distortions in results due to edge heat loss when testing thick samples at temperatures other than room temperature. This minimizes dependence of calibration on thickness.

## Instrument Description and Procedure

The FOX304 instrument consists of two basic sections: the top section and the base. All the electronics are housed in the base section. The top section of the instrument is the actual test chamber. Once the door is opened, the sample can be placed between the two plates in the test stack. The upper plate is stationary. The lower plate can move up and down. It is powered by four independently controlled motors. The position of each corner of the bottom plate is monitored and controlled by a sophisticated digital thickness readout system with 0.025 mm (0.001") precision. Two options for thickness are available. Auto Thickness will cause the lower plate to raise and close on the sample, displaying thickness. User Defined Thickness will allow the user to enter the desired sample test thickness. This mode is used for compressible samples. The instrument will attain the specified sample thickness, specimen permitting. In either case the displayed results will be accurate to within 0.025mm (0.001"). Pressing ENT will initiate the test at the first setpoint. The instrument automatically advances to the next setpoints if more than one were entered. The results are displayed at the end of the test.

## Transducers and Thermocouples

A high output Thin Film Heat Flux Transducer, developed by LaserComp, is permanently bonded to the surface of each plate. The transducers are of the integrating type with a 4" by 4" active area in the center. Overall thickness is only 0.040", precluding heat flow distortion. A type E thermocouple is bonded in the center of each transducer and both are sealed to insure consistent precision over time. Because each is within 0.005" of the sample's surface they provide accurate readings of the sample's surface temperature and heat flux. The same thermocouple is used for control of the plate temperature.

## Electronic Power and Control

At the heart of the FOX304 instrument is a very powerful Digital Signal Processor and a 24 Bit Analog to Digital Converter. The A/D Converter converts the signals from the thermocouples and heat flow transducers to the digital domain. The resolution on the conversion is 0.6  $\mu$ V. This translates to a resolution of 0.01°C for temperature. For typical samples the resolution of transducer readings is 0.05%.

The DSP controls all aspects of the instrument's operation, from the user interface to sending data to the host computer and calculating the results. The DSP's most important task is to monitor the

## *fox304*

<b>Specimen Size:</b>	305mm (12") square 0 to 102mm (4") thick
<b>Temperature range:</b>	-20°C to 95°C ( -4°F to 203°F )
<b>Absolute accuracy:</b>	+/- 1%
<b>Reproducibility:</b>	+/-0.5%
<b>Conductivity range:</b>	0.005 to 0.35 W/mK ( 0.035 to 2.4 BTU in/hr ft <sup>2</sup> °F )
<b>Conductance:</b>	should not exceed:12W/m <sup>2</sup> C ( 2.0 BTU/h ft <sup>2</sup> °F )
<b>Utility requirements:</b>	110/220V 50/60 Hz switchable at 600VA cooling water at 18°C or less

temperatures of the plates and to perform a multistage PID algorithm to control the plates at +/- 0.01°C of the test setpoint temperature. Based on the outcome of the algorithm, new control signals are sent to the Power Output Board in each acquisition cycle (every 0.5 sec.). The Power Output Board provides the power to the solid state heating/cooling system in each plate. Both plates can be heated and cooled allowing for testing with heat flow up or down. The low thermal mass design of the plates combined with the power of the DSP and Power Output Board enable extremely fast attainment of setpoints.

## Win\_Therm Software

WIN\_THERM Software package operating under Microsoft Win95/98/NT/XP allows for connection of FOX instruments to an IBM compatible computer through a standard RS 232 interface. Through a series of windows all the test parameters and format of outputs can be setup and changed at any time during the test. The software provides complete control of the instrument at all times. All selected data is automatically stored on a hard disk. Once the test conditions have been set and the test started, the computer can be used to display any desired outputs in a series of windows. Two FOX (and as many as 8 with modest additional hardware) instruments can be run simultaneously on one host computer.