



## Annealing and Strain Points

**Automatic Annealing & Strain Points in <25 minutes !!**  
**Eliminate Operator Errors !!**  
**Improved Accuracy & Reproducibility !!**

### It's simple:

Load the fiber, start the test, and return in about 25 minutes to read the Annealing & Strain Point Temperatures. *It's that easy!!*

### Orton Model ANS Series

(required computer system not shown)



The annealing and strain points of a glass are widely used production control parameters. Changes in the annealing and strain point temperatures are indications of chemistry changes. According to ASTM C-336 the annealing point temperature is the temperature at which a uniform fiber of glass (0.65 mm in diameter) elongates under an applied weight at a rate of 0.14 millimeters per minute while cooling in a special furnace at the rate of 4°C per minute. The strain point temperature is determined by extrapolation of the annealing point data and is the temperature at which the elongation rate is 0.0316 times the elongation rate observed at the annealing point. The Orton Model ANS-800 Series has been designed to automatically monitor the elongation of the sample fiber and calculate the annealing and strain points according to the ASTM C-336 method. In addition the operator can modify the thermal cycle to suit other testing procedures such as rapid sample testing to meet high volume production QC demands.

**EASY:** The operator requires little training. After the test fiber is pulled to meet the ASTM specified dimensions, the operator simply places the fiber into the furnace, applies the weight, aligns the LVDT, clicks the START button on the computer monitor, and walks away. The operator is free to perform other tasks.

**FAST:** In less than twenty five minutes the Annealing and Strain Point Temperatures are displayed on the computer monitor.

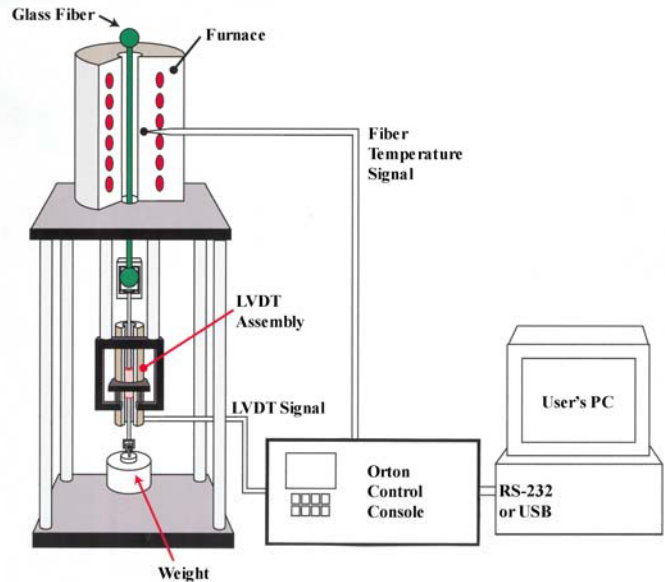
**ACCURATE, RELIABLE, and REPRODUCIBLE:** The LVDT system automatically monitors the elongation, the computer calculates the rate of elongation, and the computer determines the annealing and strain point temperatures. **Operator differences, errors, and biases are eliminated.** With good fibers,  $\pm 1^\circ\text{C}$  is routine.

**FLEXIBLE:** The user can select the ASTM C-336 procedure, or modify the thermal cycle for individual testing requirements, such as high volume QC testing.

**POWERFUL:** The data acquisition software displays the test and conditions while the test is underway. The data review software shows the test results, and generates a report that automatically calculates the average temperature for a series of fibers.

**Description:** The Model ANS-800 Series System is comprised of a special furnace to heat the glass fiber; sample support system with sample load rod and weight, an LVDT system to monitor continuously the fiber elongation, the Orton ANS Controller Console, an A/D card, and Orton ANS Software. The system requires a personal computer system that is provided by the purchaser.

The heart of the Model ANS-800 Series is the special Orton ANS Software. The software prompts the operator to select the mode of operation, to insert the desired thermal cycle parameters, and to insert the appropriate test parameters. The software directs the PID controller to follow the thermal cycle, collects the data signals from the sample thermocouple and LVDT, displays the data on the computer monitor in real time, performs the appropriate calculations on the data, stores the data and calculations in a text file on the hard drive, and waits for the operator to begin the next test. The software also opens past data files for post testing review, analysis, and report generation.

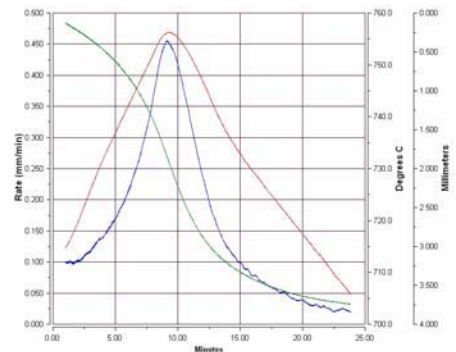


**Operation:** The furnace is initially heated to an equilibrium soak temperature, and waits for the test fiber. After the fiber is inserted and the weight applied, the test is begun. The Orton software sends information to the ANS Control Console, and the furnace is heated according to the predetermined thermal cycle. As the temperature increases and decreases and the fiber elongates, the LVDT system monitors the elongating fiber and continuously sends its signal to the computer. The software calculates the elongation rate as a function of time, and concludes the test once the elongation rate exceeds a predetermined value. The software selects the temperature at the target elongation rate, displays it as the annealing point, performs the extrapolation, and displays the strain point. The furnace cools to the next beginning temperature, and the system waits for the next test fiber.

**Data Acquisition:** The graph at the right is the real time display of the test procedure. The computer continuously monitors and displays the LVDT and thermocouple outputs, and calculates and displays the rate of elongation:

- Fiber elongation (green curve)
- Temperature (red curve)
- Rate of elongation (blue curve)

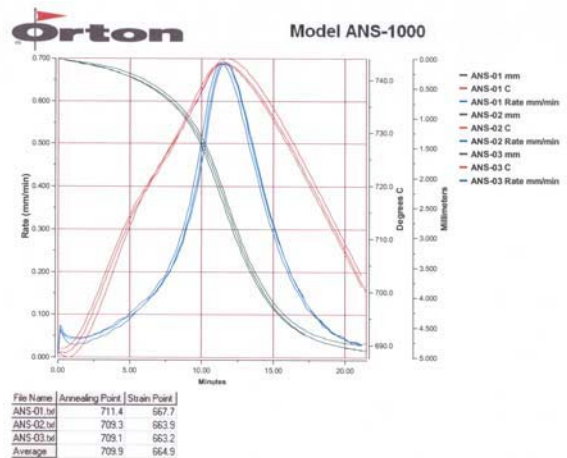
This process is performed **WITHOUT** the operator, so **OPERATOR ERRORS** in data acquisition are **ELIMINATED** !!



**Data Analysis:** At the end of the test, the computer software plots the log elongation rate versus temperature, performs a curve fitting routine to linearize the log rate versus temperature data, selects the temperature at the annealing point rate, extrapolates the linear data, and selects the temperature at the strain point rate. This analysis is performed immediately upon conclusion of the test and **WITHOUT** the operator, so **OPERATOR ERRORS** and **BIASES** in data analysis are **ELIMINATED !!**

**Data Review:** The Orton software will display and store the fiber elongation, elongation rate, time, and temperature. The data is saved in a text file on the hard drive, and is available for post testing review, analysis, and permanent storage. The user can select a series of test files and generate a report that automatically averages the annealing and strain point temperatures for that series of tests.

The figure to the right is a report showing the results from three tests, and automatically averages the results from the tests.



**Operating Modes:** The Orton ANS Software prompts the operator to select one of two modes of operation: the ASTM C-336 Mode, or the User Defined Mode. The User Defined Mode follows the guidelines of the ASTM C-336 Mode, but allows the operator to change the test parameters (the starting temperature for each test, the heating rate, the turnover temperature or elongation rate, the cooling rate for the data collection period, and the target elongation rate) to suit individual testing requirements.

### Model ANS-800 Series Specifications

	<u>Model ANS-800</u>	<u>Model ANS-1000</u>
Maximum Operating Temperature	800°C	1,000°C
Heating Element	AerOcoax Heating Cable on SS core	Kanthal wound ceramic tube and Inconel core
Thermocouple	Type "S"	Type "S"
Temperature Control System	PID – Automatic	PID – Automatic
Elongation Tracking System	LVDT (± 2.5 mm linear range)	LVDT (± 2.5 mm linear range)
Data Acquisition & Display	Automatic	Automatic
Power Requirements	120 VAC, 10 amp, 50/60 Hz (240 VAC available as an option)	
Computer Requirements	Provided by the Purchaser - PC system with English language version of Windows 2000/XP, with available slot for the A/D card, and RS-232 or USB port (must specify)	
Measuring Unit Dimensions	12" Wide x 12" Deep x 33" Tall (305 x 305 x 840 mm)	
ANS Control Console Dimensions	18" Wide x 12" Deep x 5" Tall (460 x 305 x 130 mm)	

The Model ANS-800 Series system is designed to test glass fibers according to the dimensions specified in ASTM C336 (508 millimeters long by 0.65 millimeters diameter).