Annealing & Strain Points
Log 14.0 to Log 9.0 Poises

(Beam Bending Viscometer – ASTM C-598 and ASTM C-1350M and others)

Automatic Annealing & Strain Points
Automatic Viscosity - Temperature Table
Eliminate Operator Errors !!
Improved Accuracy & Reproducibility !!

It's simple:

Insert the sample (bar or rod) and apply the weight. Enter the dimensions and start the test. Return to read the Annealing & Strain Point Temperatures, or print the Viscosity versus Temperature tables.

It's that easy!!

Orton Model BBV Series

(required computer system not shown)

The Orton beam bending viscometer Model BBV-1000 system is well suited for glasses that are not adaptable for flame working, glasses that the operator does not want to expose to flame working, or for applications where thermal expansion or effective length corrections (common to the fiber elongation method) are eliminated. The Model BBV-1000 has been designed to automatically determine the **Annealing** and **Strain Point Temperatures** of a solid glass sample (precision cut beam, rod, or tube) according to the **ASTM C-598** test procedure, or measure the viscosities (between **Log 14.0 and log 9.0** poises) of the glass sample according to the **ASTM C-1350M** test procedure (dynamic and isothermal). Changes in the annealing and strain point temperatures, or changes in viscosity for a given temperature can be used as an indication of changes in batch chemistry from raw material changes or batching errors.

EASY: The operator requires little training. After the sample beam (rod or bar) is prepared and the appropriate information is entered into the software, the operator lifts the furnace, places the beam on the sample support fixture, applies the weight, lowers the furnace, and clicks the START button on the computer monitor. The system does the rest. At the conclusion of the test, the Annealing and Strain Point Temperatures, or other viscosity data are displayed on the computer monitor.

ACCURATE, RELIABLE, and **REPRODUCIBLE:** The LVDT system automatically monitors the deflection, the computer calculates the rate of deflection, and the computer determines the annealing and strain point temperatures, or the viscosity/ temperature data. **Operator differences, errors, and biases are eliminated.**

FLEXIBLE: The user can select the ASTM C-598 or ASTM C-1350M (dynamic or isothermal) procedures, or modify the testing procedures and parameters 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 temperature points, or tabulates viscosity / temperature data.

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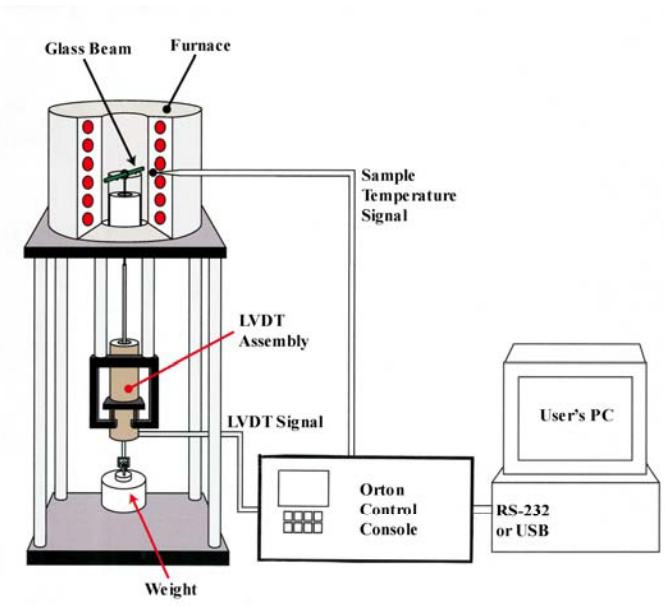
Description: The Model BBV Series System is comprised of a manually raised and lowered furnace for easy sample loading and unloading, a 2-point sample support system, a midpoint sample load rod hook, a set of weights, an LVDT system to monitor continuously the sample deflection, the Orton BBV Controller Console, Orton BBV Software, and a dedicated personal computer system.

The heart of the Model BBV Series is the special Orton BBV Software. The software prompts the operator to select the mode of operation and enter 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: After the beam is positioned, the weight applied, and the appropriate data entered, the test is begun. The Orton software sends information to the BBV Control Console, and the furnace is heated according to the predetermined thermal cycle. As the temperature increases and decreases and the sample beam deflects, the LVDT system monitors the beam deflection and continuously sends its signal to the computer. The software calculates the deflection rate as a function of time, and concludes the test once the deflection rate exceeds a predetermined value. Depending upon the mode of operation, the software selects the temperature at the target deflection rate, displays it as the annealing point, performs the extrapolation, and displays the strain point, or displays the viscosity / temperature data. The furnace cools to the next beginning temperature, and the system waits for the next test beam.



Operating Modes: The Orton ANS Software prompts the operator to select one of several modes of operation: the ASTM C-598 Mode, the ASTM C-1350M Mode (dynamic and isothermal), or the User Defined Mode. The User Defined Mode follows the guidelines of the ASTM C-598 and C-1350M modes, but allows the operator to change the test parameters (the starting temperature for each test, the heating rate, the turnover temperature or deflection rate, the cooling rate for the data collection period, and the target deflection rate) to suit individual testing requirements.

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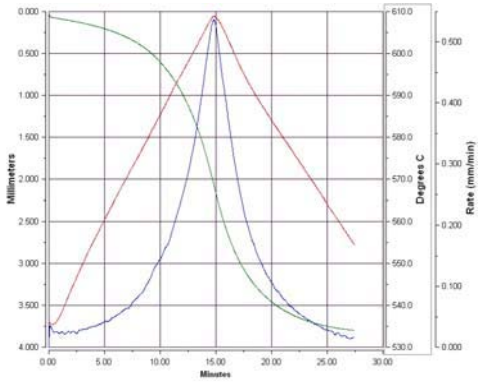
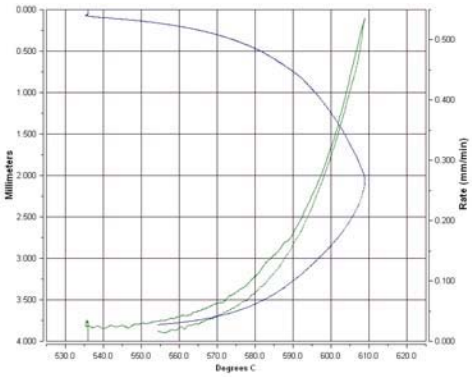


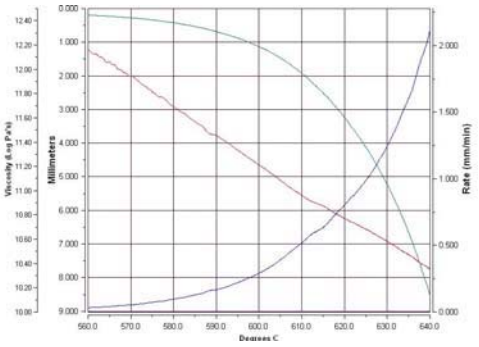
Data Acquisition: The graph at the left is the real time display of the test procedure. The computer continuously monitors and displays the LVDT and thermocouple outputs, and calculates and displays the rate of deflection:

- Beam deflection (green curve)
- Temperature (red curve)
- Rate of deflection (blue curve)

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



Data Analysis – ASTM C-598: At the end of the test, the computer software plots the log deflection rate versus temperature during cooling, curve fits the data, selects the annealing point temperature, and extrapolates the strain point temperature. This analysis is performed automatically WITHOUT the operator, so OPERATOR ERRORS and BIAS in data analysis are ELIMINATED !!



Data Analysis – ASTM C-1350M: At the end of the test, the computer software plots the deflection and deflection rate versus temperature, and calculates the viscosities at various temperatures according to the equations in C-1350M. This analysis is performed automatically WITHOUT the operator, so OPERATOR ERRORS and BIAS in data analysis are ELIMINATED !!

Data Review: The Orton software will display and store the beam deflection, deflection 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, or the temperature / viscosity data for that series of tests.

Model BBV-1000 Series Specifications

	Model BBV-1000	Model BBV-1200	Model BBV-1600
Maximum Temperature	1,000°C	1,200°C	1,600°C
Heating Element	Kanthal A-1	Kanthal A-1	Molybdenum Disilicide
Thermocouple	Type “S”		
Temperature Control System	PID – Automatic		
Sample Span	50 mm (other spans are available)		
Sample Cross Section (50 mm span)	2.53 to 3.78 mm diameter rod or 2.21 to 3.31 mm square		
Sample Support & Load Device	Fused Quartz / Fused Quartz	High Alumina / High Alumina	High Alumina / Single Crystal Sapphire
Deflection Tracking System	LVDT (± 2.5 mm linear range)		
Data Acquisition & Display	Automatic		
Power Requirements	120 VAC, 10 amp, 50/60 Hz (240 VAC as an option)	120 VAC, 10 amp, 50/60 Hz (240 VAC as an option)	240 VAC, 20 amp, 50/60 Hz
Computer Requirements	Provided by the Orton - PC system with English language version of Windows XP		

Measuring Unit Dimensions	12” Wide x 14” Deep x 33” Tall (305 x 355 x 840 mm)
BBV Controller Dimensions:	18” W x 12” D x 5” T (460 x 305 x 130 mm)

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