PolyVISC® Automatic Viscometer

Instruments for Automated Viscosity Determination

CANNON INSTRUMENT COMPANY®

CANNON

CANNON® PolyVISC® Automatic Viscometer

ASTM D 2857/D 1628/D 4603 (PET), ASTM D 789, ISO 307 (Nylon), ASTM D 1243/D 3591, D 4603 (PVC), ASTM D 871/D 1795 (Cellulose), ASTM D 1601 (Ethylene Polymers)

- Automatic glass capillary polymer viscosity analysis between 0.3 to 20,000 cSt*
- Compatible with most solvents used for polymer work
- Unique AIRBATH® technology – ultrastable thermostatic air chamber
- Temperatures from 20 to 100°C (135°C with High Temperature Option)
- VISCPRO® Windows® software calculates relative viscosity, inherent viscosity, reduced viscosity, and intrinsic viscosity
- May also be used for other viscosity applications

* Special viscosity ranges available upon request

CANNON PolyVISC® Automatic Viscometer

Features:

The CANNON® PolyVISC® Automatic Glass Capillary Viscometer combines automatic sampling, viscosity measurement, viscometer washing, and polymer solvent compatibility to provide a convenient benchtop unit ideal for dilute solution polymer viscosity analysis. Both transparent and opaque samples can be measured with the accuracy required by ASTM D 2857. Infrared optical sensors are used for all transparent samples and some opaque samples. Thermal sensors are available upon request for heavily opaque samples.

The PolyVISC utilizes a unique "air bath" technology to maintain excellent temperature control. Analyses are made in an ultra-stable thermostatic air chamber (the AIRBATH®). The AIRBATH consists of an outer insulated chamber enclosing a second, inner chamber, where the viscometer and sample are continuously bathed in a thermally stabilized stream of air. Temperature is controlled within 0.01°C with advanced measuring electronics, thermoelectric cooling, and controlling software. Because both the sample carousel and the viscometer are completely contained in the AIRBATH, only the first sample requires a delay for thermal equilibrium. The AIRBATH also allows rapid temperature and viscometer changes. Built-in thermoelectric cooling enables testing below 40°C without the need for an external chiller.

Overview of Automatic Sample Loading and Analysis

Samples are placed in disposable vials which are then loaded into a carousel and inserted into the AIRBATH for analysis. The carousel accepts eleven vials, each containing 10 to 15 mL of sample. The extended-range viscometer used in the PolyVISC is similar to that in the CANNON Automatic Viscometer (CAV). The viscometer contains a lower and an upper timing bulb. First the sample is pulled into the lower chamber of the viscometer. The time required to fill the lower bulb is measured. If the time is short, the sample is pulled into the upper bulb. If the time is long, the lower bulb is used. A PolyVISC viscometer covers a range of approximately 100-fold viscosity range. This means that a single size 1-100 PolyVISC viscometer can analyze a range of samples that would require five manual viscometers. Viscometers can be easily changed in less than 60 seconds without the inconvenience of messy bath liquids.

After each analysis is completed, the sample flows back into the sample vial. Residual sample is cleaned from the inside, outside, and tip of the viscometer by automatic rinsing with a wash solvent, followed by a drying solvent. The viscometer is then dried. A typical wash requires only 10 to 20 mL of washing solvent and 10 mL of drying solvent. Wash parameters are adjustable by the user.

Software Features

The operating system is designed to be user friendly. Powerful VISCPRO® software for Windows automatically calculates relative, inherent, reduced, and two types of intrinsic viscosity (limiting viscosity number), Solomon-Ciuta and Billmeyer relationships, and the K-value relationship after Fickentscher. In addition, it provides flexible and sophisticated control and database management features. Data can be printed, displayed on the computer screen, or automatically routed to an existing LIMS data-processing network. Data storage is in a Microsoft® Access database.

Solvent Compatibility*

The PolyVISC is compatible with most solvents commonly used for the dilute solution viscosity determination of polymers. Polymer solutions routinely analyzed in the standard PolyVISC include polyacrylonitrile in DMF, nylon in formic acid, nylon in sulfuric acid, polyester in HFIP, polyester in phenol-TCE, epoxy resins in methanol, vinyl resins in MIBK, cellulose acetate in acetone and methylene chloride, and polycarbonate in methylene chloride, and others. We will be happy to answer any questions concerning the compatibility of the PolyVISC with other solvents.

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CANNON® PolyVISC® Accessories & Options

ASTM D 2857

Kynar® interior with Teflon® carousel

Ubbelohde

Kynar®/Teflon® component upgrades

A Kynar® coating upgrade is available for the PolyVISC instrument. The AIRBATH interior is coated with this durable polyvinylidene fluoride (PVDF) compound. The upgrade permits testing with highly aggressive solvents, including concentrated sulfuric acid. The Kynar coating upgrade also includes a Kynar® wash platform and solid Teflon sample carrier and wash station.

PolyVISC Low Volume Testing Option

Offers low-volume testing with only 5 mL of sample.The PolyVISC Low Volume Testing Option consists of a specially-designed spring-loaded glass vial adapter insert with a 5 mL capacity—approximately ¼ the volume of the standard 20 mL sample vial. Ideal for use with a limited volume of sample, the adapters and springs come in packs of 12 each. The option also includes a modified capillary viscometer tube. Replacement vials (P65.0035) and springs (P65.0029) can also be ordered separately.

PolyVISC Volatile Sample Testing Option

Provides protection from solvent evaporation. The topless plastic screw cap for standard PolyVISC sample vials can be modified by the addition of a scored Mylar® film and rubber seat.

In conjuction with an aluminum foil seal, the Mylar® and rubber inserts enhance test precision for highly volatile samples by preventing evaporation that can affect the concentration of the polymer solution. The design also helps to reduce toxic and/or corrosive vapors in the AIRBATH® by resealing the cap aperture following the test, and the Mylar® and rubber inserts wipe the exterior of the viscometer tube as it is withdrawn from the vial, further reducing the risk of cross-contamination when performing multiple sample tests.

The solvent-resistant Mylar®/rubber inserts are sold in packages of one dozen each, and can be re-used multiple times with appropriate cleaning and drying procedures.

Atlantic

PolyVISC viscometer tubes

Two tube types are available for the PolyVISC instrument. The modified Atlantic compound viscometer tube is suitable for most samples. The modified Ubbelohde tube is particularly suited for more volatile samples, and may significantly enhance determinability and repeatability. Contact CANNON Technical Services for order information.

* Some solvents and solvent vapors may be corrosive to AIRBATH components. The user is responsible for determining chemical compatibility with PolyVISC components. Contact CANNON for consultation and special maintenance guidelines when using potentially incompatible chemicals.

Extended-Range Viscometers Size/Range (cSt)

0.14 – 14	16 – 1600
0.3 – 30	25 – 2500
0.5 – 50	75 – 7500
1 – 100	300 – 30000
3 – 300	600 – 60000
8 – 800	

PolyVISC Specifications

Dimensions:	515 mm wide x 756 mm high x 520 mm deep (20.3 x 29.8 x 20.5")
Viscosity Range:	0.3 to 20,000 cSt (special ranges available on request)
Solvent Volume:	10 mL for each wash and rinse (application dependent)
Temperature Range:	20 to 100°C (135°C High-Temperature Option available)
Temperature Stability:	± 0.01°C at calibrated temperature
Drop Time Resolution	± 0.01 second
Electrical:	115/230V, 50/60 Hz, 1750/1850 watts (please specify voltage when ordering)
Compliance:	CE Mark; EMC directive (89/336/EEC); Low voltage directive (73/2/EEC); HI-POT (1900 VDC, 60 sec.)

Computer Requirements

Please contact CANNON for Computer Specifications.

Order Information

Catalog #	*Item Description*
9724-Z18	PolyVISC Automatic Viscosity Measuring System 115V, 50/60 Hz, 1750 watts
9724-Z20	PolyVISC Automatic Viscosity Measuring System 230V, 50/60 Hz, 1850 watts
P65.7500	Kynar®/Teflon® Component Upgrades
P65.3284	PolyVISC Low Volume Testing Option
P65.3283	PolyVISC Volatile Sample Testing Option
	PolyVISC Viscometer Tubes

CANNON® PolyVISC® SPS Solution Preparation System

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- Prepares polymer solutions for relative viscosity measurements using weight-to-weight methodology
- Eliminates errors due to variations in solvent density and cumbersome manual weight and volume measurements
- Provides concentration accuracy often better than ±0.02%

The PolyVISC® SPS Solution Preparation System from CANNON Instrument Company is a semi-automated solution preparation system that uses gravimetric rather than volumetric methodology. The SPS can be used with the CANNON PolyVISC® Automatic Viscometer to provide a complete polymer analysis system.

Why Gravimetric Measurement?

When manual volumetric methods of preparing solutions are employed, variations of solvent density with temperature can lead to errors larger than the error inherent in the subsequent analytical procedure. In the PolyVISC SPS Solution Preparation System, the solvent is weighed rather than measured volumetrically, eliminating errors due to variations in solvent density. For samples over 100 mL, concentration accuracy is often better than ± 0.02 percent.

When solutions are prepared using the gravimetric method, the solution concentration can be expressed in units of volume when the density of the solvent is known. Thus, it is possible for the PolyVISC SPS Solution Preparation System to prepare solutions for procedures written for the volumetric method.

PolyVISC® SPS components

A computer-controlled burette pump and proprietary PolyVISC SPS software are at the heart of the Solvent Preparation System. The software permits convenient user configuration of multiple sample/solvent recipes. Other required system components (ordered separately) include a Windows-compatible computer and an electronic balance. A number of digital electronic balances having an RS-232 (COM) output are compatible with the SPS software package.

Solution Preparation

SPS software for Windows® makes solution preparation rapid and simple. No volumetric glassware is used. After the sample ID information is entered, and the user-configured recipe is selected, the operator places an empty container on the balance pan. The container is weighed and the operator adds the amount of solute specified by the computer to the sample container. The precise solute weight is obtained; then the computer calculates the appropriate amount of solvent and adds the solvent to the sample container on the balance. Solution concentration is calculated by the software, and all sample information is stored on the computer hard disk drive. A sample label can be printed.

Specifications for the PolyVISC® SPS Solution Preparation System

Pump Module

Number of Pumps:	One
Type of Pumps:	Syringe
Flow Rate:	0 to 400 mL/min
Solution Types:	Weight-to-Weight, Weight-to-Volume, Dilution-to-Volume
Solution Preparation Accuracy:	± 0.02% or better for samples over 100 mL
Solution Preparation Time:	2 minutes (50 mL of solvent)
Compatible Balances:	Contact CANNON for updated list
Computer Operating System:	Windows® 95/98/XP®/NT®

Order Information

Catalog #	*Item Description*
9724-Z61	PolyVISC® SPS Solution Preparation System, 115V, 50/60HZ
9724-Z62	PolyVISC® SPS Solution Preparation System, 230V, 50/60HZ

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