

VTM Rheometer

Automated Rheometer for Plastics



Features

- n Rapid analysis of samples with typical test times at 10 to 12 minutes
- n Employs an industry unique closed cavity technology for analysis
- n Minimal clean up between tests minimizes operator interaction
- n Easy to use software suite for quick data analysis
- n Automated sampler increases lab throughput
- n Capable of measuring Long Chain Branching of polymers

Description

A unique technology, the VTM Rheometer (Viscosity-Transition Modulus), is a more robust, versatile and automated alternative to the traditional DMRT (Dynamic Mechanical Rheologic Tester or DMA (Dynamic Mechanical Analyzer). Measurements of melt to solid dynamic properties are provided as well as a wide range of the most meaningful parameters for plastics, including Tangent δ melt viscosity (η^*), shear modulus (G' & G'') and Modulus cross-over point (G_c and δ_c). The VTM can also replace or eliminate the need for testing on traditional laboratory equipment such as capillary rheometers, melt flow indexers, and gel permeation chromatography.

The VTM will increase throughput with an optional, fully automated sampler. Up to 100 samples may be tested under pre-programmed conditions, varying from test to test if desired, with no need for operator interaction once testing is commenced. The VTM's automation system allows for operation outside normal laboratory hours, as well as the elimination of time-consuming clean-up between samples. This system also helps with eliminating operator influence on data. Optional sample preparation equipment is available from Dynisco to aid with sample automation.



<http://www.aptus-hmi.com/>

Ctra.de Ribes,195 - 08520 LES FRANQUESES DEL VALLES (Barcelona – Spain)

Analysis

The VTM Rheometer enables detailed characterization of polymers in a single test. The VTM has the ability to measure the following:

- **Viscosity**
Measures viscosity with excellent repeatability and reproducibility at a wide range of oscillation frequencies
With the VTM's closed cavity and grooved dies, there is no wall slip or melt fracture
Calculation of different viscosity models (i.e., Cross-Carreau, Polynomial, etc., using appropriate data analysis software i.e., IRIS®)
- **Melt Tangent** □
- **New TAPPI specification for the rheological properties of LDPE, T-702 pm-06**
 $G' @ G''_{500Pa}$
- **Transitions – temperature and modulus**
Measurement of dynamic properties during and after crystallization
Transition temperature and transition modulus are directly measured using a temperature ramp from melt to solid phase.
- **Modulus**
Correlates to density (i.e., crystallinity)
- **Cross-over point G_c and ω_c**
Provides rapid measurement of molecular weight and molecular weight distribution

Applications

The VTM is capable of testing a wide variety of polymers. A few examples of applications for the VTM include:

- **Polyolefin resins: Polypropylene, Polyethylene's including: Linear Low-Density Polyethylene, Low Density Polyethylene, and Ultra High Molecular Weight Polyethylene**
- **Compounding of polymers**
- **Cross-linked Polyethylene, PEX-b**
Rapid analysis – each sample is measured in less than 10 minutes
- **Polyvinylchloride (PVC), including rigid and soft PVC compounds and high viscosity PVCs**
- **Large Amplitude Oscillatory Shear (LAOS) testing**
The VTM Rheometer applies strains up to 1200% to the sample. This test enables the degree of long chain branching present in the polymer to be measured. In addition it enables verification of polymer linearity (10 times more sensitive than nuclear magnetic resonance).

Specifications

Performance characteristics

Die configuration:	Sealed test cavity with bi-conical and / or parallel plate dies.
temperature range:	86° to 446°F (30° to 230°C)
temperature rates:	Cooling: 0.9°F/s (0.5°C/s) maximum with 77°F (25°C) air Heating: 90°F/minute (50°C/minute) maximum
strain:	0.0007 to 12.56 (0.07% to 1256%)
frequency:	0.0015 to 50Hz (0.1 to 3000CPM) Limited to a maximum shear rate of 44 s ⁻¹
torque range:	10 ⁻⁵ to 5.6Nm
sub-test types:	Ready, Matrix, Controlled Stress, Controlled Strain, Timed, Delay, and LAOS
Dimension:	27 (W) x 52 (H) x 20 (D) inches (68 x 132 x 76 cm)

sample requirements

for automation:	Molded Disc of 32mm diameter and 4mm thickness
sample Volume:	Biconical dies: 3.8 cm ³ Standard Parallel Plate Dies: 4.4 cm ³ Limited Slip Parallel Plate Dies: 4.8 cm ³
electrical:	115/230Vac, 50/60Hz
air Pressure:	80 PSI (5.6kg/cm ²) minimum, for cooling and cross-head operation

optional

automation	Automation system for increased throughput and decreased labor costs. Available in 10 and 100 sample configurations
sample mold	Mold device for use with the Dynisco Laboratory Mixing Molder to create sample discs for automation.
laos option	Enables the degree of long chain branching present in polymer to be measured as well as verification of polymer linearity

All dimensions are in inches (millimeters).

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Refer to www.Dynisco.com for access to Instruction Manual and other support documentation.

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