

Rheo-Line Multi Function Rheometer

Utilising a new generation In-line Servo Motor coupled with digital servo drive technology, the Rheoline Multi function Rheometer has great flexibility and can offer a wide range of test conditions. The instrument can be used firstly at lower temperatures and frequencies to study the processability of polymers, secondly as a standard MDR and thirdly as a dynamic mechanical analyser to evaluate the cured properties of materials.

The temperature control of the dies is better than its rivals, giving an impressive variation of +/- 0.03 degrees from the set point.

The instrument comes with a set of pre-programmed tests and allows full flexibility giving the user complete control of the test stages. Tests can be in the form of standard MDR mode, frequency sweep, strain sweep, or temperature sweep, or indeed any combination of these parameters.

The dynamic properties of an elastomer can best be exhibited by examination of the response of a specimen under a sinusoidal oscillation. The elastic component of the elastomer is responsible for the in-phase stress, while the viscous component is responsible for the out-of-phase stress. The amount by which the strain response lags the resultant of the two stresses (in-phase and out-of-phase) is known as the phase or loss angle, δ . The more viscous an elastomer, the greater the phase or loss angle. The tangent of this angle "tan δ ," in the simplest terms, is the ratio of the viscous modulus to the elastic modulus.



Parameters Calculated

- Elastic Torque, S'**
 The peak amplitude torque component which is in phase with a sinusoidally applied strain.
- Viscous Torque, S''**
 The peak amplitude torque component which is 90° out of phase with a sinusoidally applied strain.
- Complex Torque, S***
 The peak amplitude torque response measured by a reaction torque transducer for a sinusoidally applied strain.
 Mathematically, $S^* = (S'^2 + S''^2)^{1/2}$
- Pressure P**
 The axial load exerted on the die during the test
- Loss Angle, delta**
 The phase angle by which the complex torque (S*) leads a sinusoidally applied strain.
- Storage Shear Modulus, G'**
 The ratio of (elastic) peak amplitude shear stress to peak amplitude shear strain for the torque component in phase with a sinusoidally applied strain.
 Mathematically, $G' = [(S'/Area)/Peak Strain]$
- Loss Shear Modulus, G''**
 The ratio of (viscous) peak amplitude shear stress to peak amplitude shear strain for the torque component 90° out of phase with a sinusoidally applied strain.
 Mathematically, $G'' = [(S''/Area)/Peak Strain]$
- Complex Shear Modulus, G***
 The ratio of peak amplitude shear stress to peak amplitude shear strain.
 Mathematically, $G^* = [(S^*/Area)/Peak Strain] = (G'^2 + G''^2)^{1/2}$
- Loss Factor, Tan delta**
 The ratio of loss modulus to storage modulus, or the ratio of viscous torque to elastic torque.
 Mathematically, $\tan \delta = G''/G' = S''/S'$
- Dynamic Complex Viscosity, n***
 The ratio of the complex shear modulus, G*, to the oscillation frequency in rads/sec.
- Real Dynamic Viscosity, n'**
 The ratio of the loss shear modulus, G'', to the oscillation

The Rheoline Multi Function Rheometer is available as a stand alone instrument, or it can be supplied with Autoloader facilities, please contact us for further information.

TECHNICAL SPECIFICATIONS

Standards	Conforms to: <ul style="list-style-type: none"> • ASTM D5289 - Moving Die Rheometer • ASTM D6204 - Processability of uncured rubber • ASTM D6601 - Cure and after cure dynamic properties
Die System	Bi-conical, fully sealed
Die Gap	0.45mm nominal
Torque Device	Reaction transducer in upper platen
Closing System	Soft closing to reduce breakage of film and distortion of sample
Temperature Control	3 term PID, control accuracy to 0.03°C
Temperature Range	Room temperature to 250°C
Drive System	In line servo-motor and Aerotech digital controller
Frequency Range	0.01Hz to 30 Hz
Strain Range	1% to 200%
Calibration Device	Torsion spring
Electrical	Single Phase, 220 / 240v 50Hz, or 110v 60Hz
Pneumatics	Filtered Air 4.2 Kg/cm (60PSI).
Torque Units	In/Lbs or DNm
Temperature Units	Celsius or Fahrenheit
Pressure Units	Lb/sq.in or Kg/sq.cm
Time Units	Min/Seconds or Minutes/Decimal.
PC Specification	Pentium processor, Fully Networkable.
Data Format	All data stored in accessible format allowing easy export to all other packages.
Optional Extras Available:	<ul style="list-style-type: none"> • Auto loading module (see Automated Rheo-Line Moving Dir Rheometer) • MDR Sample Cutter



It is strongly recommended that samples are prepared with an automatic volumetric cutter which is available from Prescott Instruments Ltd. Please see MDR Sample Cutter for more details.

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