MonTech D-MDR 3000 Advanced Dynamic Moving Die Rheometer

The D-MDR 3000

is designed for measuring the viscoelastic properties of polymers and elastomeric compounds before, during and after cure. The acquired data gives exact information about advanced material properties, processability, cure characteristics, cure speed, behavior of the compound at the after-cure and final compound dynamic mechanical properties, with an unlimited amount of testing steps and subroutines.

The D-MDR 3000 is the universal dynamic Moving Die Rheometer, providing the highest testing flexibility for static as well as dynamic testing applications for all kinds of rubber, rubber-like, curing or crosslinking materials.
This includes, of course, all kinds of rubber materials filled with carbon black, silica or any other type of organic or inorganic filler, as well as TPE, TPV, LSR, and Composite Materials such as Prepregs, Polyolefins, Glues, Gelatine, ...

Utilizing a unique, patented, wearless direct drive design with digital drive and control technology, the D-MDR 3000 can cover almost every possible test condition in any combination, with shear rates up to 500 sec-1.
Temperature in the dies is precisely controlled and the unique direct double channel forced air cooling system not only enables rapid cooling to the setpoint but also allows non-isothermal testing and integrated friction heat compensation essential to high-strain testing.

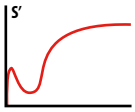
High precision torque and force measurements, in conjunction with the high resolution motor feedback, guarantee the most precise and accurate torque readings to derive elastic modulus, measured as in-phase stress (S‘), and viscosity, measured as out-of-phase stress (S“),
as well as loss angle and tan-delta.

Based on this fundamental measurement data, modulus (G), dynamic viscosity (η), Compliance (J), Tensile Modulus (E), Compliance under extension/compression (D), Spring rate (K) and Damping coefficient (C) are calculated.

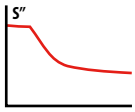
Technical specification

International standards	ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, DIN 53529
Die configuration	Biconical, closed die system, sealed
Die gap	0.45 mm nominal, variable die gap and closing force optional
Sample volume	approx. 4.5 cm^3
Drive system	Direct, wearless servo drive system with ceramic bearings
Closing system	Soft closing to prevent foil rips and damage of test sample
Oscillation frequency	0.001 Hz to 100 Hz (0.05 to 6000 cpm)
Oscillation strain	+/- 0.001° to 180° (+/- 0.14% to 2500%)
Torque range	0.001 to 235 dNm
Temperature control system	Ambient to 232 °C, precision +/- 0.03 °C, Max. heating and cooling rate: 85°C/min, digital microprocessor controlled (Pneumatic double channel cooling system standard, low-temperature cooling systems (+10 / -40°C) optional)
Temperature check system	Recordings of the temperature gradient on the screen, microprocessor monitored
Measured Data	Torque (dNm, lbf.in, kgf.cm), Shear modulus (Pa, dynes/cm^2, psi), Dynamic viscosity (Pa s), Temperature (°C, °F), Pressure (bar, kg per cm^2), Time (min - min / min - sec / sec), Frequency (Hz, cpm), Shear rate (1/s, rad/s), Strain (deg, %), Cure rate (1/min, 1/sec)
Subroutines	Isothermal, Non-Isothermal, Timed, Temperature Sweep, Strain Sweep, Frequency Sweep, Shear rate Sweep, Relaxation, Retardation, Hysteresis, Tension tests, LAOS, ...
Calculated Data	S′, S″, S*, G′, G″, G*, tan δ, phase angle, cure speed, η′, η″, η*, ...
Data Interface	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
Data points	Over 3500 data points available for each static subtest Including S' Min, S' Max, TS 1, TS 2, TC 10, TC 30, TC 50, TC 90 Integrated, automatic reporting features for dynamic tests
Pneumatics	min. 4.5 Bar / 60 psi
Electrical	200 V - 240 V, 6 Amps, 50/60 Hz
Instrument options	- Instrument control panel with 5" touchscreen display and printer - Torque transducer for low-viscosity torque range - Normal force / Pressure measurement - Cavity pressure control system - High speed data acquisition - Low-temperature cooling system MCool 10 / MCool -40 - Autoloader 5 or 10 sample linear - Autoloader with 24, 48 or 100 sample tray or tray changers - R-VS 3000 constant volume sample cutter

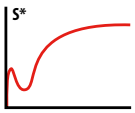
Calculated results



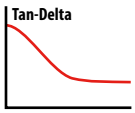
Elastic Torque



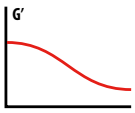
Viscous Torque



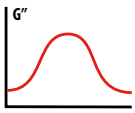
Complex Torque



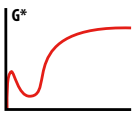
Tan-Delta



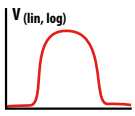
Storage Shear Modulus



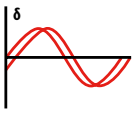
Loss Shear Modulus



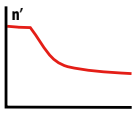
Complex Shear Modulus



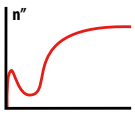
Vulcanization speed



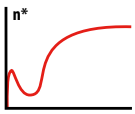
Loss Angle



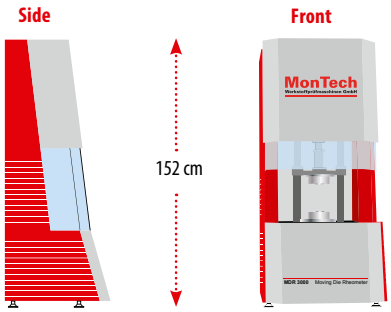
Real Dynamic Viscosity



Imaginary Dynamic Viscosity



Dynamic Complex Viscosity



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