

SMaRT – MCR501 (Anton Paar)

The air bearing supported synchronous motor is a specific aspect of the Physica Modular Compact Rheometer. Rapid, linear response, coupled with advanced electronics results in an accurate speed and strain control. The instrument allows for a fast response for step tests and to perform strain-controlled oscillatory tests at the smallest torques.



Device specifications

The synchronous motor of the MCR501 rheometer is supported by a very rigid air bearing which contains a normal force transducer. The transducer detects the natural movement of the air bearing due to the applied normal forces.

These technologies allow to accurately apply torques from 0.01 $\mu\text{N.m}$ to 300 mN.m with a resolution of 0.1 nN.m , and normal forces from 0.01 N to 50 N with a resolution of 0.002 N.

Frequencies from 10^{-5} to 628 rad/s and speeds up to 3000 1/min can be applied with a displacement resolution of 0.01 μrad .

Geometries

A wide range of cone and plate tools ($\varnothing 25$ and 50 mm and angles 1, 2 and 4°) is available. A roughened cone and several (homemade) disposable geometries are also present.

A Couette cell holder is available to be used with (double gap) cups and bobs or vanes.

A solvent trap bottom plate and hood with evaporation blocker is present to guarantee sample stability.

A special interfacial rheology setup with a bicone geometry in a cup is available to measure the interfacial viscosity of liquid-liquid or liquid-air interfaces.

A commercial ball-on-three-plates tribology setup is available to measure friction and lubrication phenomena.

A dielectric cell to measure dielectric properties of samples under flow can be coupled to the CTD oven.

A pressure cell setup allows measurements under pressure up to 150 bar. It is equipped with a bob/cup or plate/cup system.

Environmental control

Temperature control can be achieved using a Peltier plate, a solvent plate with hood, a Couette Peltier, or a CTD convection oven. This allows accurate temperatures from -40° C to 1000° C.

The instrument has a fully automatic tool recognition and a TruGap™ system to monitor and control the real gap, eliminating errors from thermal expansion and normal force during measurements.

Typical measurements

The wide variety of geometries and add-ons makes this instrument suited for a broad range of materials such as food applications, emulsions, polymers,... The instrument also allows monitoring the transient first normal stress difference which is a sensitive fingerprint of the morphology of a material. Measurements are controlled and analyzed with RheoPlus software.

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