thermo scientific

Dynamic Shear Rheometer (DSR) for asphalt binder and bitumen tests

Bitumen and its applications

Bitumen is a mixture of various hydrocarbons that occur naturally and is also a product of a crude oil refining process.

Bitumen is used in roofing, sealing, and insulation, however, the most common application is in road pavement. Bitumen serves as a binder for the mineral components (rocks) in the upper asphalt (concrete) layers of roads, parking lots, runways, etc.

Roads are exposed to heavy traffic and a wide range of weather conditions. This can lead to undesired effects such as the formation of grooves or cracks. The goal is therefore to develop new asphalt concrete formulations that are more durable and withstand increasing traffic loads as well as extreme weather conditions.

The rheological properties of bitumen binder play an important role in the development of new formulations. A set of rheological testing protocols have been defined over the past several decades to guarantee consistent quality control of bitumen binder materials.

Rheological Measurements with a Thermo Scientfic™ HAAKE™ MARS™ iQ Air Rheometer

- Master daily lab challenges with a robust, air-bearing rheometer
- Pre-programmed rheological testing according to industry standards (AASHTO, ASTM, DIN EN, and FGSV) with Thermo Scientific™ HAAKE™ RheoWin™ Software and ‘’Bitumen’’ module
- Ensures ease-of-use with step-by-step standard operating procedures (SOPs)
- Meets the highest bitumen standards temperature accuracy requirements
- Avoid user errors with intuitive ‘’Assist’’ functionalities such as auto-recognition of quick coupling geometries.

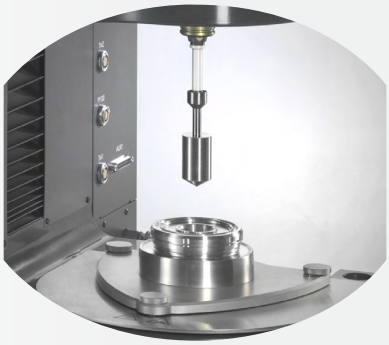
ThermoFisher SCIENTIFIC

A smart rheometer for bitumen measurements

A robust design, a modular concept that responds to new requirements, and “Assist” functionalities to simplify and prevent mistakes are distinguishing features of the **HAAKE MARS iQ Air Rheometer**. Discover two rheometer configurations that fulfill today’s bitumen standards:

Peltier Temperature Module with active cone heater for parallel plates

- For determination of viscoelastic properties according to SHRP, MSCR, or BYET methods
- Corresponding lower and upper plates with various diameters (4 mm, 8 mm, 25 mm)
- Silicon molds for easy sample preparation acc. to ASTM D7175



Peltier Temperature Module for coaxial cylinder measuring geometries

- For shear viscosity determination at elevated temperatures
- Easily interchangeable lower cups with a removable bottom for ease of clean or disposable version to minimize cleaning effort
- Coaxial cylinders in various sizes; with larger gap widths for measurements on recycled asphalt pavement (RAP)

Both configurations include:

- Measuring geometries with ‘‘Connect Assist’’ quick coupling and automatic recognition to avoid user errors
- Ceramic shaft rotors to minimize temperature gradient within the sample

General optional features:

- Fully automated temperature calibration tool available to ensure high-temperature accuracy
- Rheometer verification and calibration carried out by a certified service technician (various service products available on request)

Operate with a mouse click or a finger touch

HAAKE MARS iQ Air Rheometers are fully software controlled with HAAKE RheoWin PC Software which allows for operation via pre-defined protocols (SOPs) or with user-defined, custom measuring and evaluation procedures. All HAAKE RheoWin test methods can be launched remotely from the instrument touchscreen, while the software runs in the background.

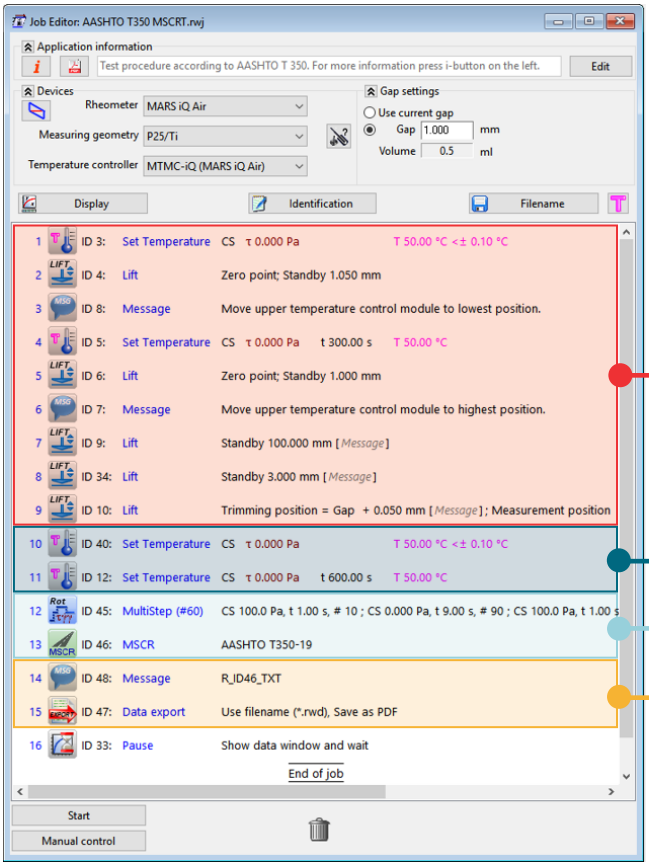
Top 5 highlights of the HAAKE RheoWin PC Software measuring flexibility

- Single touch, multilingual user interface (17 languages)
- Bitumen procedure library with predefined test protocols according to current standards
- Creation of automated routines including data analysis, pass/fail evaluation, and results documentation
- User guidance via text, picture, or video messages
- Free configurable data export (ASCII, Microsoft® Excel®, XML, etc.) and save results in multiple formats (pdf, jpg, etc.)

Run a complete SOP directly from the instrument touchscreen

- Large 7” color multilingual touchscreen for convenient operation
- Access to 15 procedures
- Visual interactions
- Online display of measurement values
- Display basic data analysis results for clear pass/fail assessment

Detailed view of a selected measurement: Multiple stress creep recovery (MSCR) test according to AASHTO T350, ASTM D7405, DIN EN 16659 or FGSV AL 723

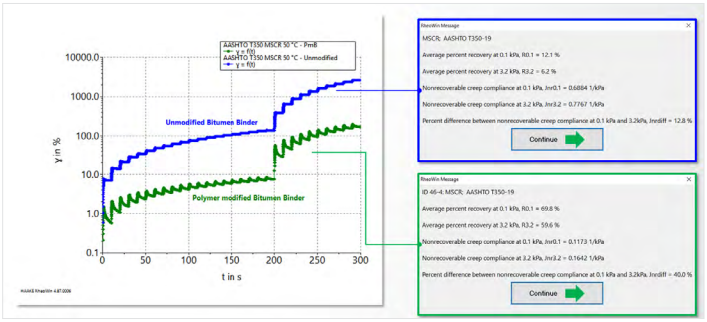


Sample loading and trimming

Temperature equilibration and sample relaxation

Standard-compliant measurement and data evaluation

Presentation of results and data storage



Measuring the percent recovery and non-recovery creep compliance of modified asphalt binder to determine performance

For standard-compliant measurements with reliable and user-independent results

Compliant with the following standards:

AASHTO and ASTM	
AASHTO TP123	BYET
AASHTO T315	SHRP-Test
AASHTO T316	Rotational viscosity with cylinder
AASHTO T350	MSCR-Test
ASTM D4402	Rotational viscosity with cylinder up to 200 °C
ASTM D7175	SHRP-Test
ASTM D7405	MSCR-Test

Other standards available on request

DIN EN and FGSV	
DIN EN 13302	Rotational viscosity with cylinder
DIN EN 13702	Rotational viscosity with cone & plate
DIN EN 14770	Complex modulus and phase angle
DIN EN 16659	MSCR-Test
FGSV AL 720	BTSV-Test
FGSV AL 721	Constant Shear Rate
FGSV AL 722	Temperature Sweep
FGSV AL 723	MSCR-Test

Watch the Dynamic Shear Rheometer in action »

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Measurements beyond the standards

Watch the Rheonaut in action »

Thermo Scientific™ HAAKE™ MARS™ 60 Rheometer platform with the unique Thermo Scientific™ Rheonaut™ Module and Thermo Scientific™ Nicolet™ iS™20 FTIR Spectrometer

Understand the rheological behavior of bitumen at the molecular level with:

- Simultaneous rheological and FTIR spectra measurements
- ATR (attenuated total reflection) principle
- Analysis of structural changes on the molecular level under shear/deformation and temperature
- All standard-compliant bitumen measurement routines are also available

Benefit from our global support

Global service and support

Experience the instrument and software virtually or in-person. Discuss your needs with an expert including individually designed customer support and service packages.

Learn more at **thermofisher.com/mc-services**.

Learn with us

Find comprehensive training programs online & in-house around the world.

More information is available at **thermofisher.com/learnwithus**.

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