MOONEYCHECK-DRIVE

MOONEY VISCOMETER CONTROLLED BY PERSONAL COMPUTER.

gibitre
INSTRUMENTS

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Overview

The Mooney viscometer is a shearing-disc viscometer, which permits to measure the Mooney viscosity, Pre-curing (scorch) and Stress Relaxation Characteristics of uncompounded or compounded rubbers.

The test is carried out by measuring the torque, which has to be applied under specified temperature and pressure conditions, in order to rotate a metal disc at 2rpm speed in the cylindrical test chamber filled with rubber.

The resistance offered by the rubber to this rotation is expressed as the Mooney viscosity of the test compound.

Instrument Characteristics

• Easily accessible test chamber with transparent safety panel and safety lock.
• Test chamber and rotor in compliance with international standards.
• Touch-screen display for instrument control.
• Direct test chamber heating controlled by thermoregulators with PID microprocessor with 0.1 °C accuracy.
• Automatic rotor expulsion system.
• Automatic calibration with calibrated weight incorporated in the instrument.
• Designed for eventual application of a fume aspiration system.

Development and production

The instrument is totally developed and produced in the plant of Gibitre Instruments in Italy.

All the mechanical parts are produced in the company workshop using modern CNC machines.

Components and sensors from well-known brands are selected in order to ensure the maximum reliability in the measures.

Internal trained personnel takes care of all the production stages: assembly, start-up, calibration, packing, shipment and installation.

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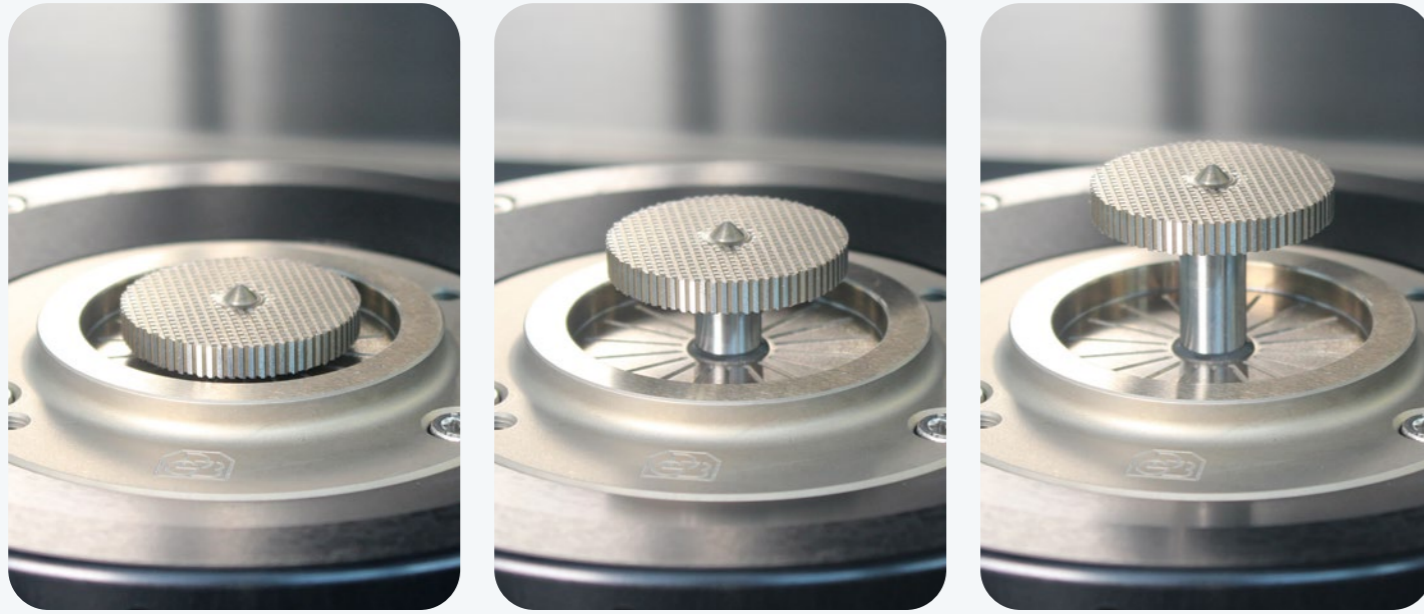
EJECT

Construction characteristics
Solid steel frame with epoxy powder coating.
Easily accessible test area with transparent safety panel and safety lock.
Die closure system with 4 columns structure to ensure long time stability.

Rotor ejection
The pneumatic rotor ejection permits easy sample replacement at the end of the test.

Automatic Torque Calibration
The Calibration weight integrated with the instrument permits the automatic Calibration of the torque sensor.
The Calibration is easily performed by pressing the Calibration button on the Control Display, which activates the pneumatic lifting of the weight.

CALIBRATION START
CALIBRATION STOP
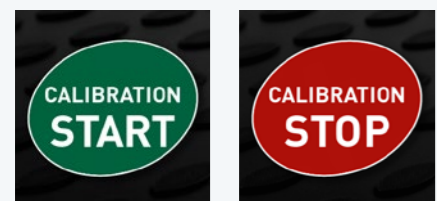
Temperature regulation
Test Temperature can be set between room temperature and 250 C. The regulation of the temperature is performed using thermo-regulators with PID micro-processor and with 0.1°C resolution.
Independent temperature control units ensure sophisticate temperature control and easy replacement in case of failure.
Electrical heating resistances have been specifically designed for this instrument to ensure quick and efficient heating.
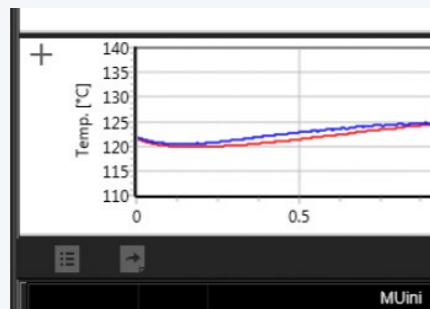
Air Cooling of the dies (optional)
Compressed air cooling circuit, controlled by the temperature control units, for rapid temperature set adjustment.

Instrument control devices
The instrument is equipped with a large touch-screen display with dimensions 10.2". The buttons on the display permit to start and stop the tests. The display provides complete information about the status of the instrument: connection to the software, temperature of the dies, diagnostic of the sensors installed.

Light panel
A light panel, installed in the front part of the instrument, changes the color and permits to check the status of the instrument from a distance. The indicator light identifies the following statuses: Instrument ready, instrument under test, instrument setting test temperature.

Easy cleaning of the instrument
The instrument has been specifically developed for easy cleaning of the test chamber. Technical improvements are:
• Seal design to prevent the flowing of rubber below the rotor
• Easy rotor removing by pneumatic ejection.
• The shaft housing hole is open from top to bottom to permit easy cleaning.
• The cleaning activity does not require regulation of rotor height.

Standard Calibration service for Mooney Viscometer
The calibration is performed with reference to the requirements of ISO 289-1 standard. The service includes:

• Ordinary maintenance of the instrument.
• Replacement of the sealing of the lower die.
• Calibration of the temperature of upper and lower dies of instrument (at 100°C and 125°C).
• Calibration of the time for temperature recovery at test start.
• Calibration of the torque reading (at 100 Mooney points).
• Calibration of the rotation speed of the rotor.
• Final check with Standard Gibitre Compound.
• Issue and e-mail shipment of the Calibration Certificate with traceability to primary standards.

Variable Rotor Rotation Speed (optional)
• The configuration allows to define the Rotation Speed as a configurable parameter of the Test Procedure.
• The speed can be set between 0.01 and 20 RPM (clockwise and anticlockwise)
• The execution of tests at different speeds allow to evaluate the behavior of your product according to the shear rate

Safety devices
The instrument is equipped with:
• Class 1 Safety switch, which prevents the closure of the dies if the safety panel is not closed.
• Safety Push-button.
• Safety lock of the maintenance access door, which ensures safe usage even in non-standard operation conditions.
The instrument is fully compliant with CE safety regulation.

Accessories
- Constant Volume Sample Cutter for the preparation of samples with standard volume and central hole.
- Polyamide or Polyester Film for the protection of the dies during the test.
- Certified Rubber Samples For Mooney Test obtained, from a bale coded as IRM (Industry Reference Material) prepared by the working group ASTM D11.20 in accordance with ASTM D 4678.

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Gibitre-Mooney-Interactive software

The software is connected to the standard SQL Gibitre Database to ensure safe and solid storage of test results and curves.
The program permits quick and easy identification of the tests to be performed and is optimized for the use of bar code reader (or similar identification device).
Before the test start, the program activa-

tes the test procedure set for the product, automatically adjusts the instrument and sets the tolerance limits for the verification of the results.
During the test you can plot the Viscosity curve and Stress Relaxation Curve (in linear an logharithmic axes)and the temperatures of the dies.
At the end of each test, the Viscosity and

Stress Relaxation curves are overlapped to the ones of the previous tests for immediate comparison. The curves are plot with different colors for easy identification.
At the end of the tests the program saves the results, verifies the conformity with the tolerance limits and processes the statistical analysis (X-Chart, Gaussian, Media, St. Dev., Max, Min, Cp, Cpk).

Test report

Can be printed or saved to pdf in one of the available languages. The format of the Test Report can be customized by the user.

Datagest Program

The Datagest program is the database management tool always installed in combination with all Gibitre instrument-control programs.
The program permits to:
- Select, filter, print, export and analyse the test results stored with all the instruments connected.

- Prepare test procedures by defining the test conditions and the results to be produced.
- Set tolerance limits for each product by manual insertion or using the statistical analysis (mean and standard deviation) of saved results.
- Prepare multi-instrument test reports.

In any phase of operation of the instrument, the program is ready to receive the input of data related to the next samples to be tested.
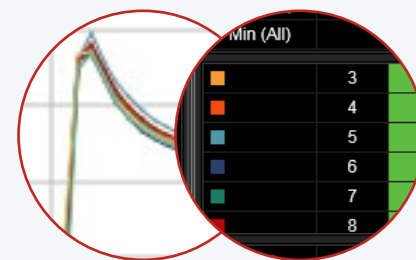
If a barcode reader (or other automatic identification device) is used, the complete identification is performed by a single 'click'.

Depending on the selected product, the program automatically selects the test procedure to be used for the specimen.
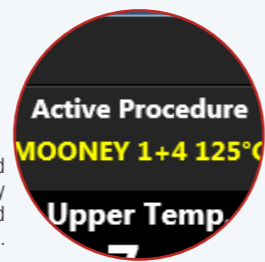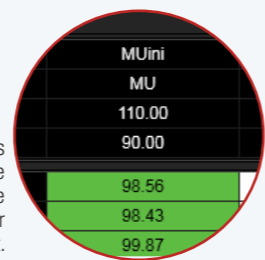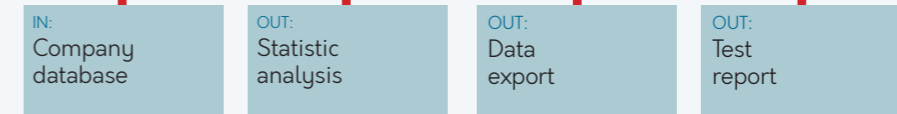

Programma Mooney-Interactive

| IN: Company database | OUT: Statistic analysis | OUT: Data export | OUT: Test report |

The curves of the tests performed with the same product are automatically overlapped with different colours for immediate identifications of the corresponding results.

The program checks the conformity of the results with respect to the tolerance limits set for the product.

Industry 4.0 integration

The instrument and the software have been specifically developed to optimize integration with other environments.
The database in SQL format and the Gi-

bitre_Company_Connect program allows you synchronize your company management software with Gibitre database and to speed up the identification of the tests and to use bar-code readers or similar devices.

The automatic logging service permits to send alarm information to the cloud-service platform of Gibitre Instruments in order to optimize the reaction times of the Service Support.

MOONEY VISCOSITY TEST
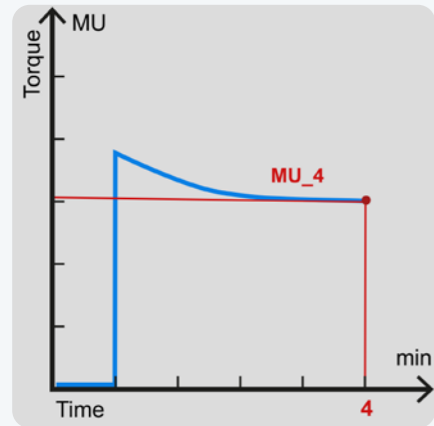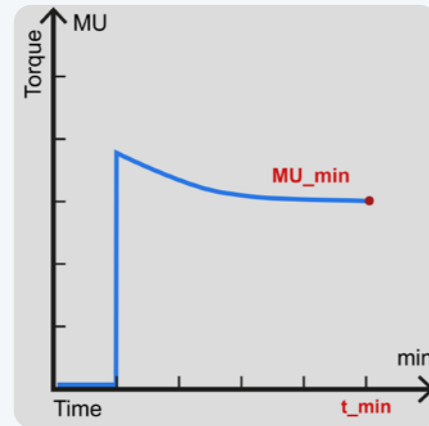

Mooney Viscosity at set time

Calculation:
The calculation returns the Mooney Viscosity after the set test time. Standard test time includes 1 minute pre-heating time and 4 minutes test time.
Reference standard:
ISO 289-1 / ASTM D 1646
Unit:
MU (Mooney units)
Parameters:
Test Time: t
Expression:
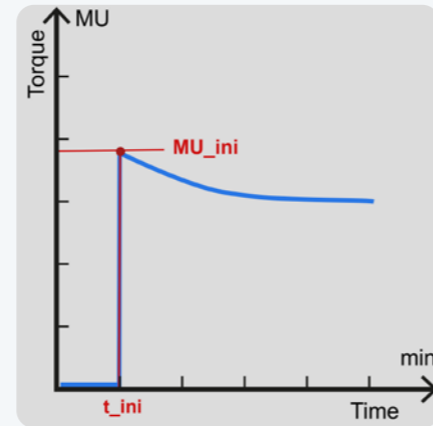ML (1+t) - Example ML (1+4)

Minimum Mooney Viscosity

Calculation:
The calculation returns the minimum value of Mooney Viscosity over the complete test time.
Unit:
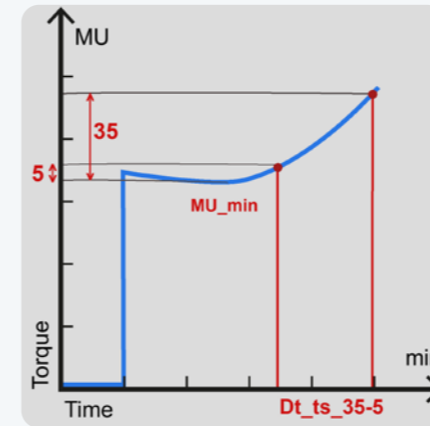MU (Mooney units)
Expression:
MU_min

Initial Mooney Viscosity

Calculation:
The calculation returns the Maximum Mooney viscosity at the beginning of test time.
Unit:
MU (Mooney units)
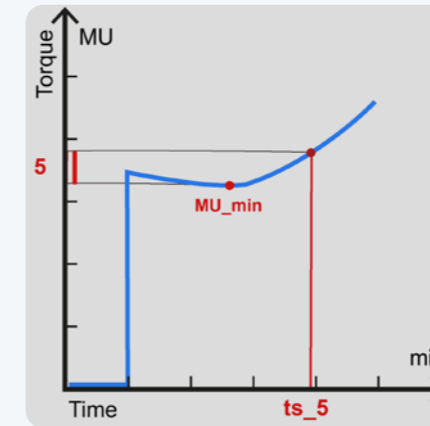**Expression:**
MU_ini

MOONEY SCORCH TEST

Scorch Index

Calculation:
The calculation returns the time needed for the viscosity to increase from the first to the second set values.
Reference standard:
ASTM D 1646
Unit:
mm:cc (minutes, minutes/100) or mm:ss (minutes, seconds).
Parameters:
Start Torque Value: ts1
Final Torque Value: ts2
Expression:
Dt_ts_(ts2-ts1) (example: Dt_ts(35-5))

Scorch Time

The pre-vulcanization characteristics provide a means of estimating how long compounded rubber can be maintained at high temperatures and remain processable.
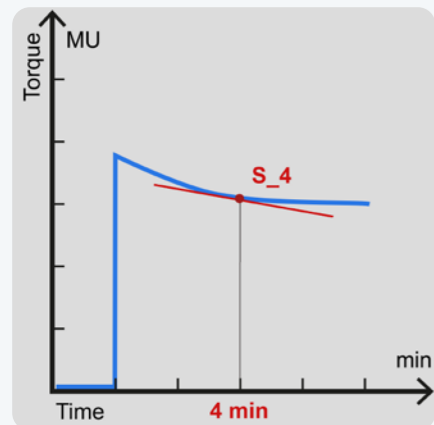**Calculation:**
The calculation returns the time in minutes including warm-up time, for the viscosity to increase by a specified amount from the minimum value.
Reference standard:
ISO 289-1 / ASTM D 1646

Unit:
mm:cc (minutes, minutes/100) or mm:ss (minutes, seconds).
Parameters:
Torque Increase: MU
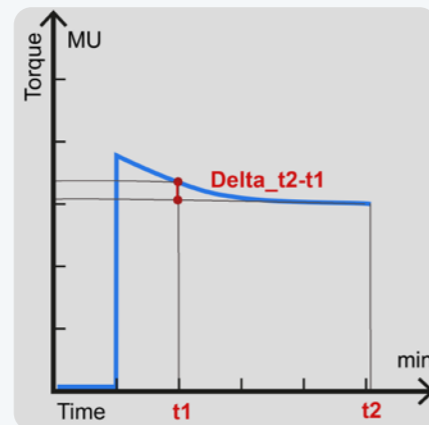**Expression:**
ts_MU (example ts_35)

Viscosity reduction Rate

Calculation:
The calculation returns the Slope of curve of the Viscosity vs Time at the set test time.
Unit:
MU (Mooney units)
Parameters:
Test Time: t
Expression:
S (1+t) - Example ML (1+12)

Delta Mooney Viscosity

Calculation:
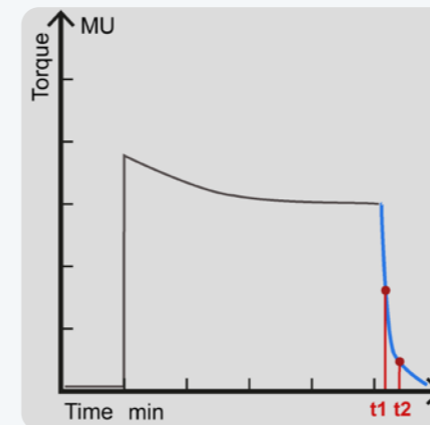The calculation returns the difference between the Mooney viscosities recorded at running time t1 and t2.
Reference standard:
ISO 289-3
Unit:
MU (mooney units)
Parameters:
Test Time t1
Test Time t2
Expression:
Dt_MU_(t2-t1)

MOONEY STRESS RELAXATION

Mooney Stress-Relaxation Rate

Stress Relaxation test consists of determining the decay of the Mooney torque immediately after the determination of the Mooney viscosity. After abruptly stopping the rotor at the end of the Mooney viscosity measurement, the decrease in torque is recorded as a function of time. The rate of change of the torque is evaluated over a short time interval.
Calculation
The calculation returns the slope of the linear regression line of the log(torque) versus log(time) plot over a specified time interval after stopping the rotor at the end of a
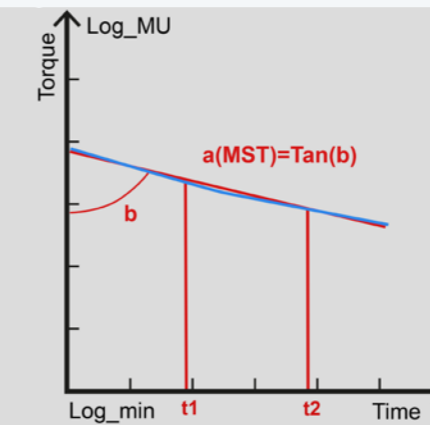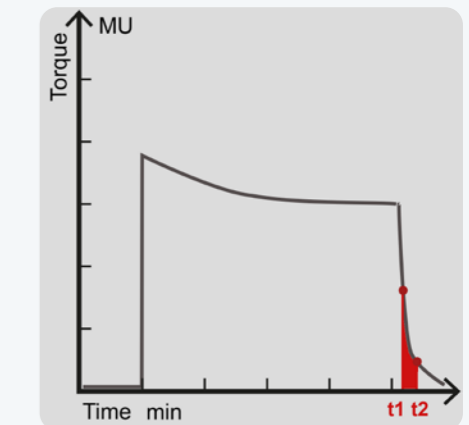
Mooney viscosity measurement. According to ISO Standard the regression is calculated between 1.6 and 5 seconds from rotor stop.
Reference standard:
ISO 289-4
Unit:
Mu/min
Parameters:
Time for Start of Regression Calculation: t1
Time for Stop of Regression Calculation: t2
Expression:
a (MSR) t1_t2 (example: a (MSR) 1.6-5.0)

Mooney Stress-Relaxation Area

Calculation:
The calculation returns the area under the stress relaxation curve over a specified time interval after stopping the rotor at the end of a Mooney viscosity measurement.
Reference standard:
ASTM D 1646
Unit:
Mu*sec
Parameters:
Time for Start of the Calculation: t1
Time for Stop of the Calculation: t2
Expression:
A (t1_t2) - Example: A 1.6_5.0)

MOONEYCHECK - DRIVE - TECHNICAL DETAILS

STANDARDS

Standards the instrument complies with	ASTM D1646; ISO 289-1; ISO 289-2; ISO 289-4;

SOFTWARE

Numerical test data

Viscosity test	MU_ini, t_ini, MU_min, t_min, Dt_MU, MU_4, MU_X, Dt(X-Y), S4, SX (X,Y=customer def.)
Scorch test	ts5, ts35, Dt_35-5, ts3, ts18, Dt_18-3, tsX, Dt_X-Y
Stress relaxation test	a, k, r, A, TX%
Test Curves	Torque versus time curve, Log Mooney versus Log time of Stress Relaxation test, Upper and Lower Test Chamber
Selectable Languages	Italian, English, French, Spanish, German, Portuguese, Russian, Chinese, Japanese, Turkish, Polish, Czech

Units

Torque	Mooney point
Time	Minutes and seconds, minutes and minutes/100, seconds
Temperature	°C, °F

CONTROL PANEL

Characteristics	Dimensions 10.2"
Type of device	Capacitive display (permits the use with gloves)
Data displayed	Active connection to the software, motor on-off, temperatures of the dies, heating status

LIGHT PANEL

	Permits to check from a distance the following statuses Instrument ready, instrument under test, instrument setting test temperature

CONSTRUCTION CHARACTERISTICS

Electronic card	Electronic card with STN 32F 429 micro-processor

Torque Sensor

Capacity	230 MU
Resolution	0.01 MU
Linearity Error (%FS)	+-0.25
Rotation frequency	2 RPM
Temperature	2 RPM (With variable speed option: adjustable between 0.01 to 20 RPM)
Power supply	220 VAC ± 10%, 50-60 Hz ± 3, 4 A, single phase
	110 VAC ± 10%, 60 Hz ± 3 on request
Power	1100 Watt
Compressed air	6 bar. Complessed air regulation unit integrated into the instrument

Dimensions and weight

Dimensions	684 x 671 x 1419 mm
Weight	180 Kg

SAFETY DEVICES

	Class 1 Safety switch for main piston (Idem)
	Safety Pushbutton
	Safety lock of the maintenance access door
	CE labelling

OPTIONS

Constant Volume Sample Cutter	For the preparation of samples with constant volume

CALIBRATION

Automatic calibration	Calibration weight integrated with the instrument with pneumatic lifting system for automatic torque calibration.
Calibration Report	Calibration Report with traceability to primary standards

PERSONAL COMPUTER (optional)

Minimum configuration	Intel Core i5 4 GB RAM
Compatible Operating Systems	Windows 10 or 11
Connection to the instrument	USB port

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