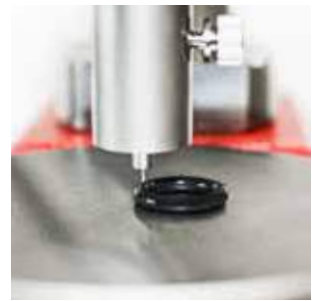
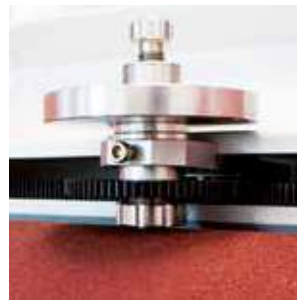
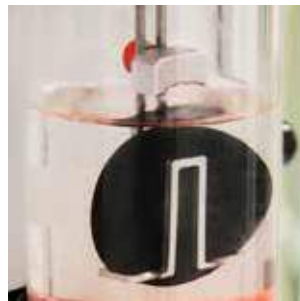


## *Rubber Testing Solutions*



***INNOVATIONS IN  
RUBBER TESTING***



***[www.rubber-testing.com](http://www.rubber-testing.com)***

# MonTech®

Rubber Testing Solutions

Carl - Benz - Straße 11

D - 74722 Buchen / Germany

**INNOVATIVE  
TESTING  
SOLUTIONS  
MADE IN  
GERMANY!**

**MonTech Werkstoffprüfmaschinen GmbH is the world's leading premium manufacturer of rubber testing instruments.**

Since 1998, we have been developing, producing, distributing and servicing high quality testing machines and their components as well as related software solutions for materials and component testing. Trust in MonTech's products and services are reflected in their long-term customer loyalty, and by being appointed "preferred supplier" by many of our OEMs.

*The secrets of our success are:*

- ✓ **Highest quality standards for all products**
- ✓ **Proximity to customers**
- ✓ **Highly qualified sales, support and service staff**
- ✓ **Continuous R&D programs**

MonTech's extensive product range spans from solutions for basic to high-end applications for both quality control and R&D. MonTech rubber testing instruments are available in standardized versions or can be built according to individual customer requests and requirements. With manufacturing and HQ located in Buchen, Germany, our state-of-the-art facility supports a 98% in-house fabrication rate and a team of experienced engineers form the foundation of capability for custom solutions.

MonTech is a global family business, wishing to bring the values of working with a family business to the laboratory. Therefore we have created extraordinarily broad global network of branch offices and subsidiaries along with representatives and partners, who guarantee both optimal 24/7 technical service on site and short delivery times.

MonTech group of companies is internationally certified according to ISO 9001 and holds accreditations accordance with DIN EN ISO 17025\* at various global sites.

The unique modular product design provides advantages of easy maintenance, interchangeable instrument configurations, and a high testing flexibility for all kinds of elastomeric materials. Due to MonTech's wide variety of products and their applications, we have customers in many industries, but most noticeably the automotive, tire, aerospace, rubber compounding, pharmaceutical, chemical, food, packaging, research centers, universities and institutes.

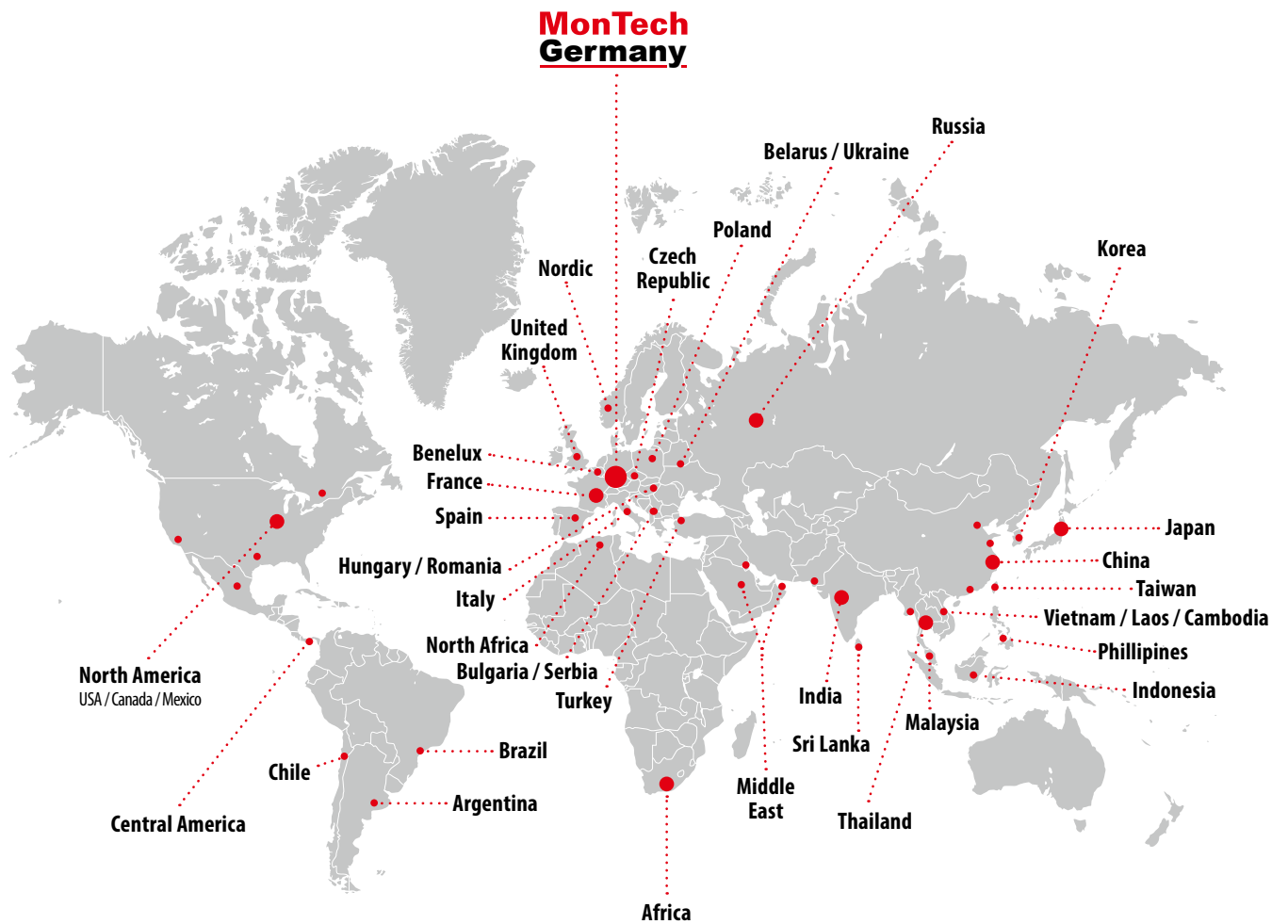
\* Please refer to individual certificates for scope of certification / accreditation and services offered



## MonTech - the global leader in rubber testing solutions...

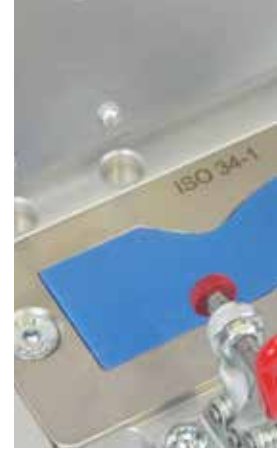


# MonTech World



## You can count on us!

We are represented in every continent and in over 63 countries, providing technical and commercial service through a network of highly-qualified local and international support staff.



## **Technology meets engineering - Industry 4.0** **MonTech Rubber Testing Solutions**

**MonTech rubber testing instruments feature the latest in German innovation, technology and industry 4.0 connectivity. With a product selection of over 70 instruments and software solutions, MonTech covers all major testing requirements for any rubber, silicone or elastomer laboratory. Through decades of R&D, MonTech's team is dedicated to continuous improvement of the product line and the next generation of smart laboratories.**

MonTech is the fastest growing testing instrument supplier in the market focusing on raw materials, rubber, elastomers, plastics, composite, food and other viscoelastic and curing materials

### **Industries and Applications served:**

- Tire
- Technical Rubber
- Polymers and Raw Materials
- Additives
- Fillers (Carbon Black, Silica, Clay, ...)
- Medical
- Aerospace
- Functional Composites
- Adhesives and Resins
- Solar
- Energy
- Cable and Wires
- Resins
- ...

The world is demanding smarter technologies, better accuracy and repeatability for their testing laboratories. We recognize the advancements required for the future of testing elastomeric materials and bring those technologies into our Moving Die Rheometers, Rubber Process Analyzer, Mooney Viscometers, physical testing instruments and the entire product line. Our systems therefore feature a variety of smart Industry 4.0 interfaces and possibilities for process integration and seamless workflows in individual customer infrastructures.



### **Core values**

MonTech's strong values and philosophy put customers first, working with dedication and commitment to develop the best technology and set new standards in material testing machines. Innovation is our culture. Finding technological solutions to meet customer needs is our common goal and challenges inspire our passion.

### **Durability, Support and Service**

Our systems are guaranteed for a minimum of 20 years from delivery, making your MonTech machine a highly secure investment.

MonTech branches and service organizations in over 63 countries ensure expert advice and OEM service available worldwide - Guaranteed.

### **Details that make the difference**

All custom machine components and assemblies are machined, manufactured and assembled in-house by highly qualified MonTech engineers.

Clean-rooms and climate-controlled environments allow us to have complete control and influence over every step of our manufacturing process, which is in compliance with ISO / ASTM / DIN / JIS / GB and many other standards. These integrated processes are the foundation for every testing system produced by MonTech.



## **Standard range and Tailor made testing solutions**

**Standard, adapted to your application or tailor developed and made?  
MonTech provides cost-effective solutions customized to your application  
and testing needs!**

Commercially available standard testing devices and machinery do not always fit the requirements of a specific laboratory process or testing setup. In that case, the solution comes from adapting an already available standard system or from developing a new, tailor-made machine.

**We provide customized solutions in all fields of testing applications**

Depending on the material or product to be tested, more or less individual approaches are required. In order to fulfill your specific testing demands, we apply our decades-lasting experience and know-how. Our superb engineering is a combination of machine development, electronics design, automation, software development and integration of the device in your laboratory and testing environment by linking it to your database and host systems. Of course, MonTech's tailor-made laboratory systems also include global delivery, installation, commissioning and customer services such as continuous support, after sales service, maintenance and calibration.

MonTech truly offers custom testing machinery starting from the client's idea and requirements to the final, most advanced and reliable testing system solution.



### **Precision in design**

We design and manufacture all components used in MonTech testing instruments in-house. This makes us really unique and allows us to have technological knowledge aimed for our users' benefit - the one-of-a-kind, patented cooling options are the best demonstration for how important this knowledge is.

### **A new standard made in Germany**

MonTech is the world's leading supplier in rubber testing systems, developed by our experts for use in demanding testing situations and in a wide range of applications.

All our machines are entirely engineered, manufactured and assembled in Germany by our own, skilled team of engineers and technicians. MonTech machines are truly made by MonTech as all production steps are performed in-house in Germany without external labour or subcontractors.

### **Precision and Reliability**

MonTech is not only building machines but also refining, or even engineering, major key components in order to supply our customers with exceptional features.

Our patented wearless direct drive solutions provide unique advantages. They are extremely robust and offer unbeatable dynamic testing performance. Even loadcells and transducers are manufactured by MonTech in order to guarantee excellent test signal quality, machine performance and highly reliable test results.



## ***In-house design, engineering, manufacturing, production technology and logistics***

**Our customers trust us because they know that we not only design and assemble instrumentation but also conduct all production steps in-house in our extensive workshop and facilities, equipped with the latest production machinery and manufacturing technologies.**

This includes machine design, development of control and operating software, machining in its highest precision, final assembly and functional testing. Our thorough German quality, together with a certified quality management system and accredited laboratory are convincing reasons for our customer to deploy MonTech materials testing machines worldwide.



### ***In-house manufacturing facilities include:***

- 3D CAD/CAM engineering workstation, FEM and load simulation, digital twin
- Automated material storage, handling and preparation with batch traceability
- Tactile, optical and surface measuring
- CNC Milling (3- and 5-Axis), CNC Turning / Turn-Milling
- CNC Cylindrical and flat grinding
- 3D printing and additive manufacturing
- Laser and EDM Cutting, shaping, texturing and engraving
- Sheet metal processing, bending welding (MIG, MAG, WIG, TIG)
- Surface Technologies e.g. anodizing, painting, powder coating, fine-finishing, polishing
- Electronics planning, assembly and wiring, electronic programming and test units
- Final assembly lines for small machines, heavy machine group assembly
- Clean-room for micro and optical assemblies
- Global shipping, handling and logistics



### **Precision , Performance and Reliability**

MonTech products are proving an excellent performance for reliable, repeatable and reproducible test results over decades.

For many fields across various industries and applications MonTech testing systems are considered the ultimate benchmark.

This has resulted in hundreds of publications and dozens of patents underlining the reliability, performance and precision of MonTech instruments.

### **Technology and Innovation**

Since MonTech developed its first products in 1998, we have maintained an up-to-date product range which we are continuously expanding and adapting to the demanding needs of our customers and new applications.

All our systems undergo - besides a very strict quality control process - continuous development to deliver even greater precision. During this process our experts work hand-in-hand with our customers, ensuring perfect solutions for every field of application.

### **Quality first**

We manufacture products with the greatest possible care and precision for customers from all sectors and provide state-of-the-art solutions for research and development.

Our testing machines are the embodiment of the proverbial "Made in Germany" quality. See for yourself - and visit one of our showrooms around the world.





# Global Technical Centers Application support and process development

Rubber applications and processes are becoming more and more complex, thereby raising the importance of testing. We address this trend and partner with our customers to design and implement latest testing technology adapted to the individual requirements of new materials and processes.

Our team of applications experts has a deep understanding of processes and requirements in the rubber industry - this has served as the basis for the design of the MonTech Technical Centers. They enable us to create a realistic laboratory environment and optimal conditions for presenting latest testing technology, developing testing process as well as conducting extensive trials for our customers. The Technical Centers - available at various locations throughout the world - are equipped with the our full instrument lineup including sample preparation, curing, ageing and testing facilities.

Of course our experts are also available for on-site process development, validation and troubleshooting, startup of laboratories and independent auditing.



## Training and education

We not only build testing instruments and machinery but provide you a holistic solution for your testing requirements, therefore MonTech applications experts continuously support and consult with our customers - before, during and after sale. Besides customer individual trainings

MonTech has a continuous schedule of Webinars, a variety of e-learning, remote and classroom trainings and additional education offerings, covering general rubber technology to specialized, application specific topics. All trainings are available also in customized versions at MonTech Technical Centers or customer locations.

### Resources and Learning

Rubber testing is both a science and an art. Whether you are new to the rubber industry or not, it is our goal to provide the most relevant resources for you to grow your expertise in laboratory testing, instrument usage, rubber compounding, quality control and more.

Stay in touch with us through our online channels, webinars or classroom sessions to get latest updates about rubber testing developments, standards and trends!



# MonTech

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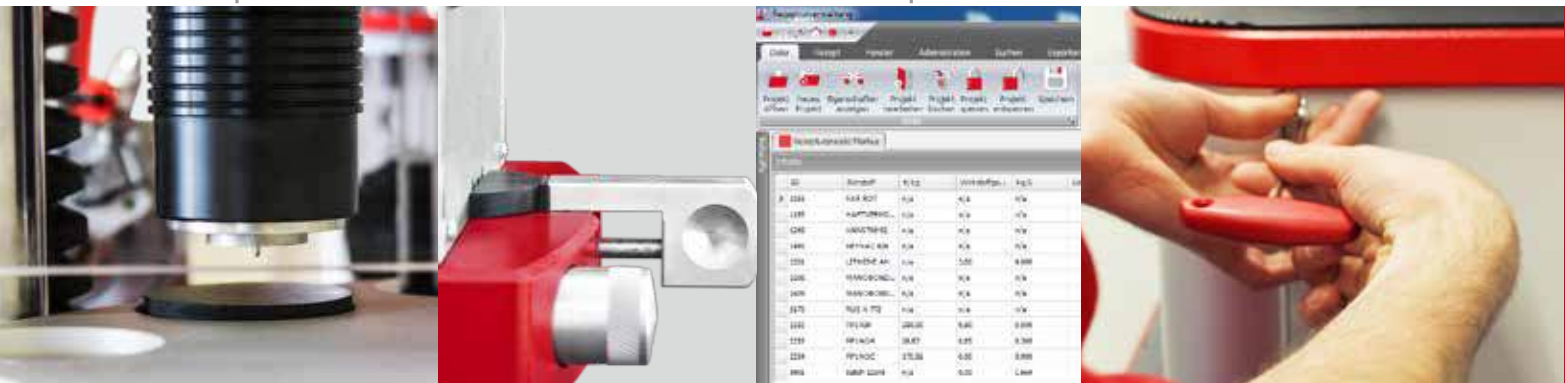
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For experiencing the quality, precision and performance of any MonTech product, contact us today to schedule your personal visit to one of our eight global demo laboratories and showrooms!

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## MonTech Technology: Moving Die Rheometer (MDR and RPA) Series

**Moving Die Rheometers are the standard testing method for characterisation of rubber curing in quality control as well as research and development.**

Therefore these rotorless curemeters are equipped with a closed, sealed, biconical die system according to all relevant ISO, ASTM and DIN standards. During the test the lower die performs a sinusoidal oscillation with a fixed oscillation amplitude and frequency, at either a fixed (isothermal) or variable temperature (non-isothermal).

MonTech Moving Die Rheometer systems are the backbone for reliable and repeatable quality control in the rubber industry - offering a unique design with an extremely rigid test frame and superior temperature control.

Depending on the instrument model, the instrument is either equipped with a mechanical or with a direct drive system. Every machine is supplied with the flexible and easy to operate MonControl Software for managing test specifications, acquiring data, and reporting results.

Furthermore, every instrument can be configured to exactly meet the customers specific needs - this includes a modular platform of automation solutions, cooling options and sample preparation systems.



### Rugged housing and ultra-stiff machine frame

The machine frame of every MonTech Rheometers is constructed from aerospace grade aluminum and stainless steel making MonTech Rheometers the most rugged and stable Rheometer systems in the market.

This design includes baseplates of up to 80 mm thickness, 50 mm stainless steel pullrods, massive 80 mm crossheads with integral stainless steel force crossbeam support for superb die symmetry and alignment as well as up to 20 mm thick side panels. This results in an overall superior instrument stiffness; significantly improving repeatability and result correlation, while reducing signal-to-noise ratio as well as guaranteeing the best damping abilities, especially for high frequency testing and unbeaten dynamic testing performance.

This ultra-rigid instrument design has even more advantages: The whole instrument frame is used as a heatsink for all major electronic components so that the instrument does not need any fans or air ventilation for cooling, allowing the complete electronic cabinet to be sealed against pollution and especially conductive carbon black dust.

As only high-strength aluminum and stainless steel are used for every single component in the instrument, corrosion is no issue at all, making MonTech instruments a secure investment.

**MonTech rubber testing instruments - truly built to last !**

## Test dies and die closing system

MonTech Moving Die Rheometers are equipped with a biconical die assembly with integrated direct heating, accurate sample temperature measurement, superior temperature control with unbeaten accuracy, highest heating and cooling rates, and minimized response times.

The specific die and crosshead design ensures a perfect alignment and uniform closing as well as parallelism of both test dies, significantly reducing result variations.

MonTech Rheometer test dies are entirely made from superior, lot-traceable stainless steel, hardened, precision ground and polished, making the dies built to last with an extreme stiffness and durability even against the most abrasive rubber compounds.

The test dies are sealed off with easily changeable long-life seals to provide superior lifetimes of up to 12 months, minimizing maintenance and instrument downtime.

Every MonTech Rheometer is equipped with a pneumatic die closing system for a reliable closing and sealing of the die cavity.

Optionally, instruments can be equipped with variable closing force, cavity pressure and variable die gap control.

In combination with the MonTech loadframe, this instrument design guarantees compliant testing results at the highest possible level of accuracy and precision paired with perfect reproducibility and reliability.



## Integrated calibration and diagnostics

MonTech Instruments feature internal diagnostic and condition monitoring routines for every critical process, enabling the instrument to detect, report and even solve problems before they occur.

Along with MonTech precision calibration tools, customers are guided through a software sequence, making the verification of the instrument really easy in order to always guarantee the highest instrument precision and most accurate test data.

Once the verification process is completed, a detailed PDF Report with all critical verification and calibration is generated, assuring traceability to any reference standard used.

Readings of most reference standards and performance parameters are taken by the software, minimizing operator involvement for providing objective results.

# MonTech Technology: Moving Die Rheometer (MDR and RPA) Series

## Precision torque measurements and transducer systems

Torque / force transducers and loadcells are the most critical part when it comes to precision of the instrument because raw torque and force signals, as well as derived modulus and viscosity signals are directly used for test result calculation. This is exactly the reason why MonTech designs and manufactures all transducers in-house. This guarantees the widest measurement ranges along with clean-room applied strain gauge technology paired together in ultra-rugged and stiff assemblies.

MonTech's intelligent transducer technology possesses various unique features such as variable amplifications, stiffness control and temperature compensation — proof again that MonTech systems are the most advanced testing systems available; guaranteeing the highest accuracy and precision from the smallest Milli-Newton torque readings to the highest dynamic loads over the complete torque range.

## Integrated data acquisition and processing

Programmable Logic Controllers form the backbone of every MonTech testing instrument, providing customers with proven technology and the highest system reliability.

The highly complex set of stress, strain and other raw data streams and results that are all time-critical to each other are analyzed in real-time with the most advanced 24-bit electronics and a 10 kHz high speed data sampling rate. This superior oversampling technology paired with the superior signal to noise ratio eliminates the need for data filtering or further data processing, providing the user with actual true measured data and results.

MonTech's advanced rubber testing machines support customers with as much valuable material information as possible, with features including measurement of higher harmonics, nonlinearities, and behavior at extreme processing conditions.

Every MonTech Rheometer and Mooney Viscometer is equipped with a rugged, well-proven and reliable Programmable Logic Controller (PLC) system as well as standard automation components.

Every instrument is directly equipped with an Ethernet interface, allowing direct integration of the machine into the customers network as well as linking host systems and computers by standard TCP/IP protocol with extremely high data rates and throughput.



## Powerful drive technology

MonTech Rheometer systems are equipped with the latest, closed-loop digital drive technology. The quality and performance of the instruments' rheological measurements are highly influenced by the precision of the applied deformation and thus the motor positioning. Therefore all MonTech Rheometer testing systems are equipped with the latest high-precision drive systems:

The MDR 3000 Basic instrument features a geared, brushless DC motor with integrated drive control systems, digitally connected to the instrument PLC unit, making this drive the ideal system for static testing at fixed frequencies.

All other MonTech Moving Die Rheometers and Rubber Process Analyzers feature the patented MonTech wearless direct torque drive system which ensures highly precise, stepless, and variable movement of strains, frequencies and other types of controlled sequences. This unique and powerful drive is the only motor system that has been specially designed for MDR and RPA applications. Unbeaten dynamic performance can be achieved as the drive is mounted directly underneath the lower die, minimizing the moving mass and eliminating the need of any clutches, drive shafts or couplings. Finally, this means that there are absolutely no start delays or backlashes, continuously assuring exact and repeatable movements for the most accurate rheological measurements. Ceramic and magnetic bearings form the backbone of the drive's high durability, stiffness, rigidity and reliability, resulting in superior precision for the smallest strains to the highest frequencies.

In-line to the main drive system, a specially designed high-precision angular displacement sensor with an accuracy of  $0.000001^\circ$  is mounted, measuring the slightest movements and forming a digital, closed-loop control circuit with a response time of less than 20 nanoseconds.



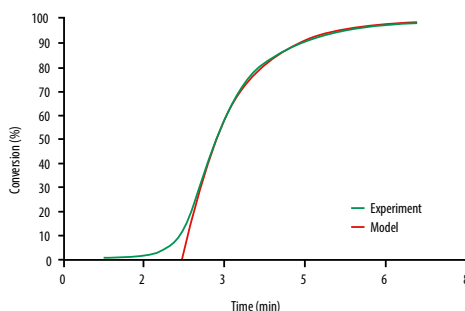
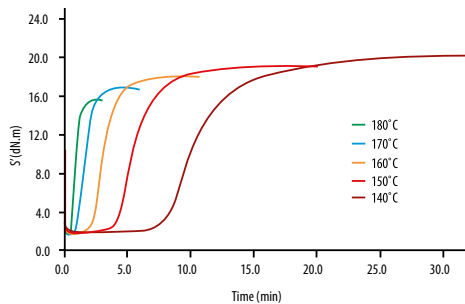
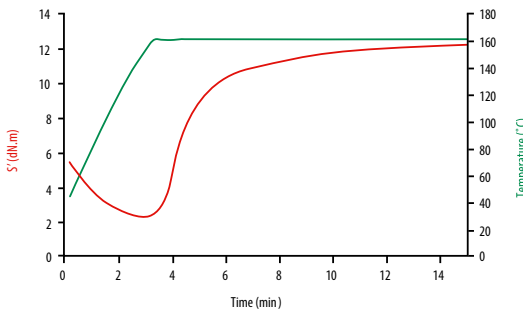
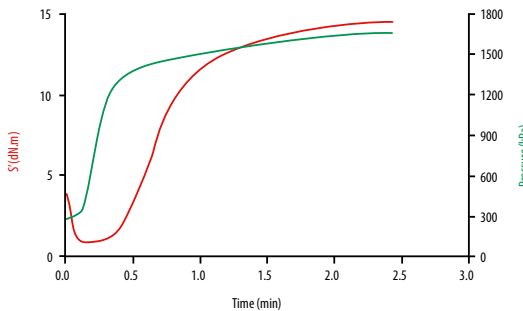
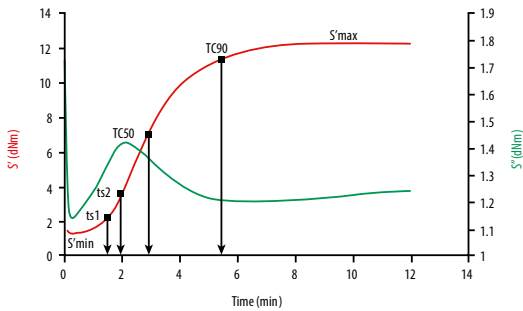
MonTech Moving Die Rheometers are the world-leading instrument series for reliable cure measurements in the rubber industry.

Due to the rugged design and superior design quality, MonTech instruments clearly offer superior accuracy and precision, proven by our certifications according to ISO 9001 and accreditations according to ISO 17025\*.

These calibrations services are offered throughout the world by our highly qualified team of MonTech field engineers in order to make sure that the calibrations of your instruments are fully traceable and comply to all local, company, and international standards.

\* Please refer to individual certificates for scope of certification / accreditation and services offered

# Moving Die Rheometer Application Examples



## Isothermal Cure

Isothermal cure experiments are the most common type of test for quality control in rubber and elastomer processing. MonTech Moving Die Rheometers provide high precision data as well as a simple operation of the instruments. All the important characteristics, such as minimum / maximum elastic torque, scorch times, cure times and reaction rates are precisely calculated, with over 3500 different datapoints. All data is available in numerical as well as graphical form; limits, control gates and tolerance graphs can easily be set, and Pass / Fail status is automatically evaluated after each test.

## Cure with simultaneous Sponging / Foaming / Blowing Reaction

Especially for sealing applications, blowing agents form a vital part of compound recipes in order to produce a cellular structure via a foaming process that runs in parallel to the cure reaction. The cellular matrix structure which is created during the foaming process reduces density, increases thermal and acoustic insulation, and affects the relative stiffness of the mix. Therefore, MonTech Rheometers can be fitted with a precision normal force measurement transducer in the die cavity in order to calculate cavity pressure simultaneously during the curing and reaction in a single test, and revealing interrelations between the two reactions.

Key datapoints such as PMin, PMax, PR, MPR, TP10, T50, TP90, P@ML, P@MH, ... are automatically calculated

## Non-isothermal Cure

In addition to isothermal static cure testing, MonTech MDRs and RPAs can perform tests at variable temperatures.

These non-isothermal sequences can be programmed in order to follow virtually any temperature profile, making them especially valuable for the simulation of manufacturing processes which are usually not isothermal. Typical processes that can be simulated are mixing, milling, extrusion, compression moulding, injection moulding, and storage conditions. Of course, non-isothermal test sequences can be executed in a single test with any other static or dynamic sequence, such as strain and frequency sweeps, providing the most accurate data of the material's behavior at any production stage and material state.

## Advanced cure kinetics modeling

Test data from similar static or dynamic test sequences executed at different temperatures can automatically be evaluated and modelled for an advanced cure kinetics analysis, providing information about:

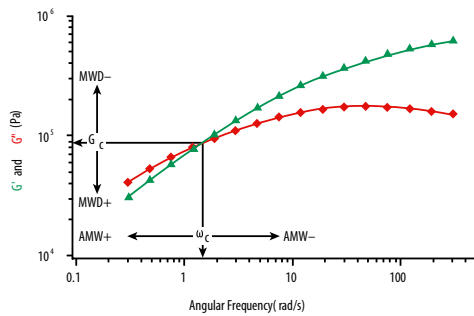
- Reaction Rate
- Order of Reaction,  $n$
- Rate Constant,  $k$
- Activation Energy,  $E$
- Incubation Time,  $t_i$

Check out our "MonKinetics Software" system on page 112 for more insights into cure kinetics modelling and simulation.



# Rubber Process Analyzer

## Raw Material Applications

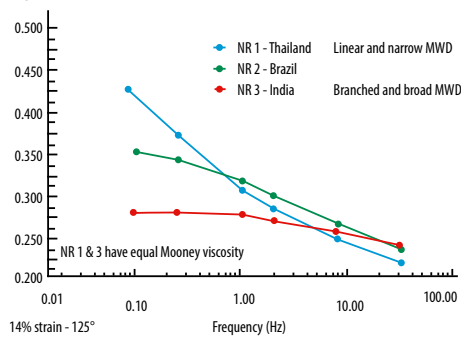


### Frequency sweep material analysis

In general, the mechanical properties of materials depend on frequency. A good understanding of the influence of frequency on a material is therefore very important for its practical use. For example, a material appears stiff under the action of a force at high frequency, but soft when the force is applied slowly. Isothermal frequency sweeps provide information about the weight distribution MWD (crossover modulus) as well as average molecular weight AWM (crossover frequency). But the behavior of viscoelastic materials like polymers not only depends on frequency, it also depends on temperature.

MonTech has incorporated further advanced testing capabilities such as the Time-Temperature Superposition principle (TTS), which is based on the equivalence between frequency and temperature behavior during transition processes, forming the basis of WLF master-curve modelling available on MonTech dynamic Rheometers, even for predicting material performance at frequencies outside the range that can be measured with a dynamic mechanical analyzer.

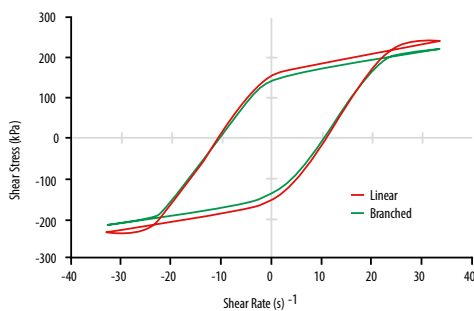
Natural rubbers from different sources - comparison  
Tangent Delta



### Structural characteristics and processability

The rheological properties of rubbers are related to their structural characteristics and will influence the behavior of the rubber during processing and the performance of the final product. While Mooney testing does not provide sufficient information to clearly differentiate branching and Molecular weight distribution the Rubber Process Analyzer can easily be used as a tool for solving production problems. Using frequency sweeps to scan the material over the whole shear rate range can reveal substantial material differences and variations e.g. causing a particular material to be very sticky and therefore difficult to process while others can be perfectly processed.

These test can be performed in the linear and also non-linear viscoelastic range to cover all different processing methods and material states. ISO 13145 suggests a simple and quick test procedure utilising a rotorless sealed shear rheometer (RPA) for rheological evaluations as an alternative to traditional Mooney Viscometer testing.



### Non-Linear material response at high strain (LAOS)

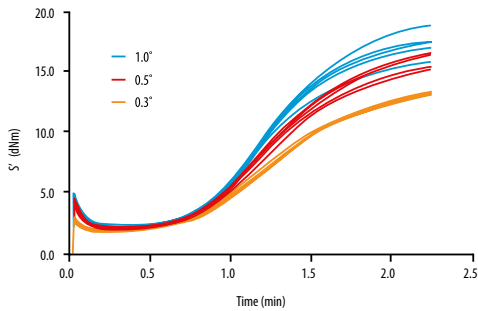
Dynamic oscillatory shear tests are common in rubber rheology - more specifically, small-amplitude oscillatory shear (SAOS) tests are the most common test method for measuring linear viscoelastic properties of rubber compounds and polymers.

But in processing operations, the shear rates can be large and rapid; non-linear material properties form an even more important part in understanding material response. Therefore, MonTech Rheometers provide Fourier transformation analysis capabilities of periodic data, along with full raw-data access, for in-depth analysis to investigate and quantify the nonlinear viscoelastic behavior by using large-amplitude oscillatory shear (LAOS) testing in order to characterize and quantify material stress response which is no longer purely sinusoidal (linear), allowing a better understanding of filler content and structure, as well as the polymer architecture.

More details on the analyses of non-linear material properties can be found on page 112 of this brochure "MonLAOS Software".

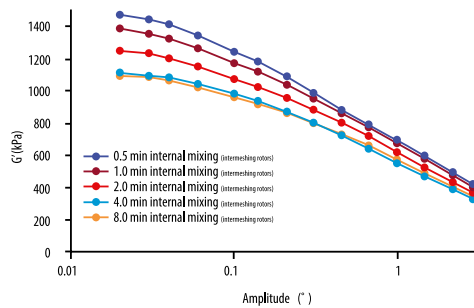
# Rubber Process Analyzer

## Advanced Cure and Processability Applications



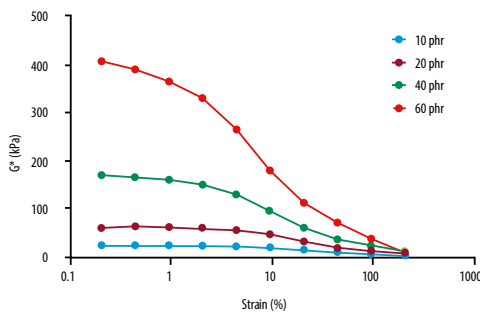
### Isothermal Curing at Variable Strain

Typically, cure experiments on rubber compounds - especially for quality control purposes - are performed with a fixed oscillation angle of  $\pm 0.5^\circ$  and a frequency of 1.67 Hz. However, for specific rubber compounds or challenging materials such as silicones or epoxy resins, this might not be ideal as either reaction torque readings are too low, providing only a limited ability to distinguish between different batches, or might be too high causing high result variability as the material is damaged as strain already exceeds the linear viscoelastic range. MonTech Rheometers provide the possibility of testing with variable oscillation angles to allow measurements within the ideal strain amplitude for optimal signal-to-noise ratio and the most precise test results, while avoiding any structural breakdown or slippage of the sample in the die cavity.



### Structural Breakdown of rubber compounds - process simulation

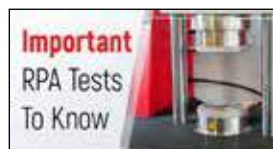
Rubber compounds are extremely sensitive to processing operations such as milling. Increasing strain causes the carbon black network - which is held together by Van der Waals-London attraction forces to break, causing a decrease in shear modulus of filled rubber vulcanizates. Therefore, MonTech Rheometers provide simulation capabilities for almost any possible production process, providing irreplaceable data for developing rubber compounds, as well as understanding and simulating manufacturing processes and environments.



### Strain Sweep for Filler Loading "Payne-effect"

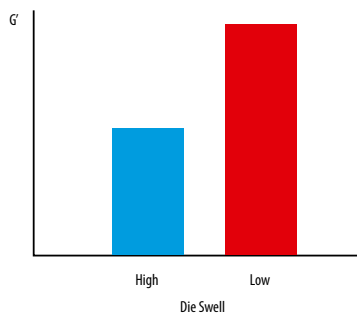
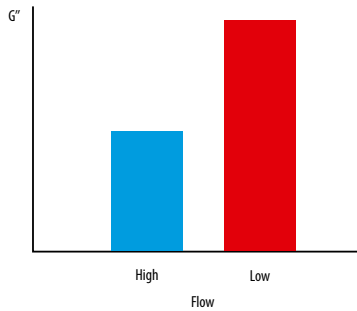
The Payne effect is a particular feature of the stress-strain behavior of rubber, especially rubber compounds containing fillers such as carbon black and silica. Physically, the Payne effect can be attributed to deformation-induced changes in the material's microstructure, i.e. to breakage and recovery of weak physical bonds linking adjacent filler clusters. Measurement of modulus vs. strain is therefore essential to understanding and quantifying filler loading, filler dispersion and filler-filler interaction in the low strain region, and polymer-filler interaction at higher strain. The resulting characterizations of material structure are essential as they directly impact dynamic stiffness and damping behavior of final products such as rubber bushings, automotive tires and all other rubber goods. Similar to the Payne effect under small deformations is the Mullins effect, which is observed under larger deformations in the non-linear viscoelastic range.

Stay updated about latest trends and topics in rubber testing and visit us online or subscribe to our channels!



# Rubber Process Analyzer

## Processability and post-cure Applications

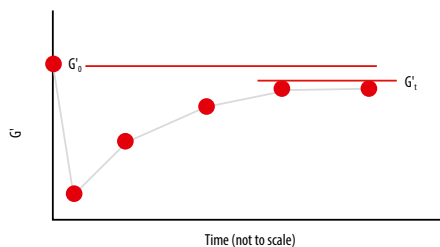
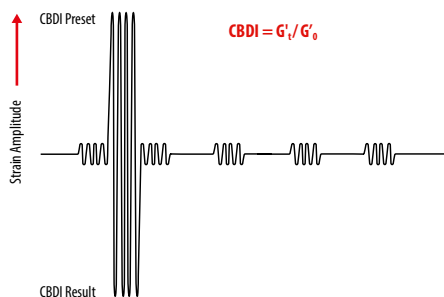


### Prediction of processability: Extrusion

Good processing performance is influenced by three main criteria: throughput flow, die swell and surface finish. The rubber is required to flow through the extruder. The flow will be controlled by the viscosity of the rubber. The shear rate from an extruder and extrusion die can easily be calculated and used as the specific test parameters in a Rubber Process Analyzer test setup. The shear rate in MonTech Rubber Process Analyzer is proportional to the frequency multiplied by the oscillation angle.

A low viscosity will mean that rubber will easily flow through the extruder with low die pressure. Once the rubber is extruded it is required to be in the correct size – however as the rubber is extruded through the die it is in compression across the direction of flow and extension in the direction of flow. When leaving the die, the elastic nature of the compound will cause the rubber to expand, resulting in die swell. MonTech Rubber Process Analyzers can obtain the Storage shear Modulus  $G'$  at high strains (typically 100%) allowing an excellent prediction of die swell.

The surface finish of the extrudate is required to be smooth, and not rough. Roughness tends to occur when a stick-slip resonance is set up between the speed of the extruder and the elastic response of the compound. Testing at variable shear rates using a frequency sweep allows the comparison of compounds that extrude with smooth and rough finishes revealing processing differences in the storage shear modulus  $G'$ .



### Mechanical properties: Carbon Black Dispersion

In filled rubber compounds carbon-black particles form a network of mutually interactive agglomerates. These effects can be measured and quantified using a simple D-RPA 3000 Matrix test. Storage shear modulus ( $G'$ ) results at low strains (e.g. +/- 1%) are typically high and get reduced after a larger strain amplitude (e.g. +/-50%) is applied for a short period of time. With lower strain amplitudes applied over time, the reduced Storage shear modulus ( $G'$ ) will partially recover. This effect relates to the Van der Waals forces linking the agglomerates, getting broken at higher strain amplitudes and the partially recovering over time.

The extent of recovery of the Storage shear modulus ( $G'$ ) directly relates to the Dispersion Rating (DR) of the rubber compound. If the carbon black is poorly dispersed, the recovery of the Storage shear modulus ( $G'$ ) will be much lower indicating a much weaker filler structure and therefore reduced mechanical performance properties.

A simple CDBI performed by a Rubber Process Analyzer allows consistent testing and quality control on the Carbon Black Dispersion rating:  $CDBI = \text{Initial storage shear modulus } G' (50^\circ\text{C}, 1\text{Hz}, 1\%) / \text{Final storage shear modulus } G' (50^\circ\text{C}, 1\text{Hz}, 1\%)$ .

The higher the CDBI value, the better the carbon black dispersion.

# MonTech Moving Die Rheometers and Rubber Process Analyzers

Static Curemeters are designed to test mixed rubber compounds under isothermal test conditions with fixed strain and frequency.

Dynamic Curemeters are Dynamic Mechanical Rheological Testers (DMRT) designed to measure material properties of raw elastomers or mixed rubber – before, during and after cure in a single test.



## STATIC TESTING

	MDR 3000 Basic	MDR 3000
<b>Instrument description</b>	Compact, entry model instrument for repetitive quality control testing as well as simple R&D applications	High-end instrument for QC and static R&D testing for a broad range of materials (from LSR, all kinds of elastomers to composite materials)
<b>International standards</b>	ISO 6502, ASTM D 5289, DIN 53529	ISO 6502, ASTM D 5289, DIN 53529
<b>Die configuration</b>	Biconical, closed die system, sealed	Biconical, closed die system, sealed
<b>Drive system</b>	Mechanical, brushless DC eccentric drive	Direct, wearless servo drive system
<b>Oscillation frequency</b>	1.667 Hz	1.667 Hz
<b>Oscillation strain</b>	+/- 0.1°, 0.2°, 0.5°, 1°, 3° or 7.17° Mechanically adjustable	+/- 0.01° to 5° Programmable via Software
<b>Temperature range</b>	Ambient to 232 °C	Ambient to 232 °C
<b>Measured Data</b>	Torque, temperature, frequency Optional: Normal force	Torque, temperature, frequency, strain Optional: Normal force
<b>Calculated Data</b>	S', S'', S', tan δ	S', S'', S', tan δ

Let us help you to determine  
the optimal instrument configuration  
for your testing needs.  
Contact us today!

All instruments are also available  
with various automation options:  
► Page 30



#### STATIC AND DYNAMIC TESTING

MDR 3000 Professional	D-MDR 3000	D-RPA 3000
Entry model instrument in the Rubber Process Analyzer (RPA) technology. The MDR 3000 Prof. can be operated either in static testing mode (MDR) or also in dynamic testing mode (RPA).	Top model for advanced dynamic testing of all kinds of rubber, rubber-like, curing or crosslinking materials. This includes TPE, TPV, LSR, Composite materials, Polyolefins, ...	High-end instrument for demanding static and dynamic testing in QC and R&D with a huge set of customizing options. This enables testing capabilities that have not been possible to measure in a Rheometer before, such as die gap regulation, High-speed data acquisition, FT-Rheology, low-temperature cooling, ...
ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, ASTM D 8059, DIN 53529	ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, ASTM D 8059, DIN 53529	ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, ASTM D 8059, DIN 53529
Biconical, closed die system, sealed	Biconical, closed die system, sealed	Biconical, closed die system, sealed
Direct, wearless servo drive system with ceramic bearings	Direct, wearless servo drive system with ceramic bearings	Advanced wearless servo drive system with ceramic bearings
0.001 Hz to 33 Hz (0.001 Hz to 50 Hz optional)	0.001 Hz to 100 Hz	0.001 Hz to 100 Hz
+/- 0.01° to 20° (+/- 0.01° to 90° optional)	+/- 0.001° to 180°	+/- 0.0001° to 360°
Ambient to 232 °C	Ambient to 232 °C	Ambient to 232 °C
Torque, temperature, frequency, strain Optional: Normal force	Torque, temperature, frequency, strain Optional: Normal force	Torque, temperature, frequency, strain Optional: Normal force, die gap, die pressure
$S'$ , $S''$ , $S'$ , $G'$ , $G''$ , $G''$ , $\tan \delta$ , $\eta'$ , $\eta''$ and $\eta^*$	$S'$ , $S''$ , $S'$ , $G'$ , $G''$ , $G''$ , $\tan \delta$ , $\eta'$ , $\eta''$ and $\eta^*$	$S'$ , $S''$ , $S'$ , $G'$ , $G''$ , $G''$ , $\tan \delta$ , $\eta'$ , $\eta''$ and $\eta^*$

# MonTech MDR 3000 Basic

## Entry level Moving Die Rheometer



### The MDR 3000 Basic

is the easiest to operate and most cost-effective way to determine viscoelastic properties of polymers and rubber compounds before, during and after cure.

The acquired data gives exact information about processability, cure characteristics, cure speed and the behavior of the compound after-cure, as well as optional pressure measurement for sponge rubber compounds.

The MDR 3000 Basic comes as a complete and ready-to-test set consisting of the Rheometer itself, an external Personal Computer with the latest Windows Operating System, TFT screen, keyboard and mouse, as well as a printer.

Like every MonTech Rheometer, the MDR 3000 Basic also features an Ethernet Interface and can therefore be directly integrated in any customer's factory network, guaranteeing the most stable data transfer and communication in any laboratory or factory environment, allowing data access at the instrument and from remote and office workstations, creating a digital process chain and integrated workflow based on a digital data repository, eliminating the need of result printing after each test series.

Designed as a table top instrument utilizing only minimal benchspace, the MonTech MDR 3000 Basic is synonymous with a reliable but easy and efficient testing operation. The instrument is equipped with the latest PLC-based control and data acquisition electronics, ensuring the highest data acquisition precision and reliability, along with superior temperature control - improving overall data significance and laboratory efficiency. The instrument comes with the MonControl Analysis software for test configuration management, data recording, automated Pass/Fail testing, processing of historical data as well as online statistical process control (SPC), having more than 3500 different datapoints available for selection. With an optional 5" instrument touch-control panel, the instrument can even be conveniently operated in stand-alone mode by directly displaying and printing the most essential datapoints - including the possibility to save and archive test data on a USB flashdrive.

### Completely closed, rotor-less, sealed, biconical test chamber system

entirely made from stainless steel, precision machined, hardened and ground to utmost precision for highest durability and testing accuracy. The lower die is directly connected to the central shaft and drive system. All these parts and components are also made from solid stainless steel, making the MDR 3000 Basic a cost-efficient, long-lasting and safe investment. The upper die is attached to the reaction torque measurement for immediate recording of the material feedback at the highest precision.

The MDR 3000 Basic features an extremely stiff, ultra-rugged loadframe paired with a unique, column-guide-free, accessible testing area along with the most simple single-button operation and integrated multi-color status bar making this instrument truly the most reliable testing system for quality control purposes not only in the laboratory, but also directly in the production area.

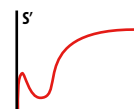
Of course various different automation options for increasing testing productivity are available and can be fitted to the instrument at any time.



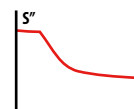
### Technical specification

<b>International standards</b>	ISO 6502, ASTM D 5289, DIN 53529, ...
<b>Die configuration</b>	Biconical, closed System, sealed
<b>Die gap</b>	0.45 mm nominal
<b>Sample volume</b>	approx. 4.5 cm <sup>3</sup>
<b>Drive system</b>	Mechanical, brushless DC eccentric drive
<b>Closing system</b>	Pneumatic with soft-close to prevent foil rips
<b>Oscillation frequency</b>	1.667 Hz (100 cpm)
<b>Oscillation strain</b>	+/- 0.1°, 0.2°, 0.5° (Std), 1°, 3°, 7.17°, Mechanically adjustable (+/- 1.4%, 2.8%, 7% (Std), 14%, 42%, 100%)
<b>Torque range</b>	0.01 to 250 dNm
<b>Normal force / Pressure (opt.)</b>	0 to 10.000 kPa (1.450 lbin), Auto tare
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, Max. heating rate: 85°C/min digital, microprocessor PID controlled,
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, microprocessor monitored
<b>Measured Data</b>	Torque (dNm, lbf.in, kgf.cm), Temperature (°C, °F), Pressure (bar, kg per cm <sup>2</sup> ), Time (min - min / min - sec / sec), Shear rate (1/s, rad/s), Cure rate (1/min, 1/sec)
<b>Calculated Data</b>	$S'$ , $S''$ , $S^*$ , $\tan \delta$ , phase angle, cure rate, ...
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	Over 3500 data points available for each test <i>Including: <math>S'</math> Min, <math>S'</math> Max, TS 1, TS 2, TC 10, TC 30, TC 50, TC 90</i>
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	100-120 V, 8 Amps or 200-240 V, 5 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	<ul style="list-style-type: none"> <li>- Instrument control panel with 5" touchscreen display and printer</li> <li>- Selectable oscillation frequency 1,67 / 0,83 Hz (100 / 50 cpm)</li> <li>- Adapted transducers for high or low-viscosity torque range</li> <li>- Normal force / Pressure measurement</li> <li>- Single channel forced air cooling system</li> <li>- Extended thermal range to +300°C</li> <li>- Autoloader 5 or 10 sample linear</li> <li>- Autoloader with 24 or 48 sample tray</li> <li>- R-VS 3000 constant volume sample cutter</li> <li>- Label Printer</li> <li>- Signal tower</li> <li>- Dustproof version / Safety package</li> <li>...</li> </ul>

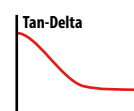
### Calculated results



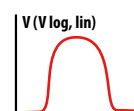
Elastic Modulus



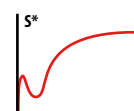
Viscous Modulus



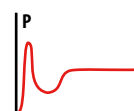
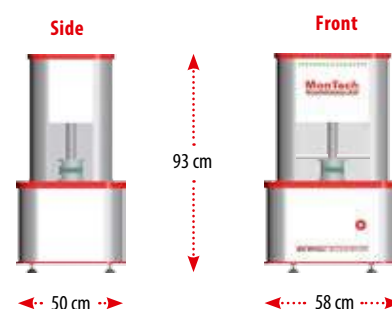
Tan - Delta



Vulcanization speed



Complex Modulus

Normal force / Pressure  
(optionally available)

# MonTech MDR 3000

## Advanced Moving Die Rheometer



### The MDR 3000

is the industry standard for measuring the viscoelastic properties of polymers and elastomeric compounds before, during and after cure.

The acquired data gives advanced information about processability, cure characteristics, cure rate as well as the behavior of the compound after-cure at fixed, user selectable strain rates.

The instrument comes in the unique MonTech Series 3000 loadframe - industrial proof, fanless and ultra-rugged even for toughest production environments.

The reaction torque is measured by a high resolution, digital strain gauge assembly with integrated temperature compensation, making the MDR 3000 the most accurate and precise Moving Die Rheometer for static testing.

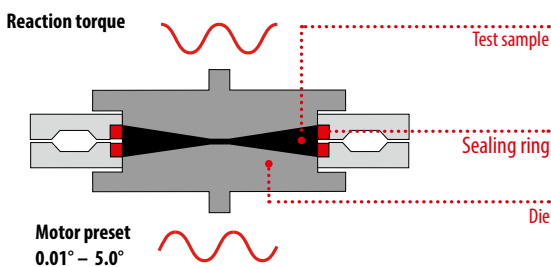
Optionally, the instrument can be equipped with a combined torque / normal force sensor to assess blowing or sponging reactions of the tested material. For increased productivity and throughput, various types of highly reliable automation systems are also available.

Of course the MDR 3000 can be easily upgraded at a later stage to an MDR 3000 Professional to not only be able to run static but also dynamic test sequences.

### Unique direct drive system

The instrument utilizes a direct, high-precision, gearless torque drive system mounted directly to the lower die assembly. Therefore, the oscillation angle can be directly changed in the MonControl software, making the instrument capable of always measuring materials in the optimal strain range. This feature significantly reduces signal noise, improving the accuracy of testing results. With this fully digital drive system, no mechanical strain adjustments are needed and the motor positioning is monitored and recorded throughout the test.

For less demanding applications the MDR 3000 is also available in a economy "M" version equipped with a mechanical stainless steel drive system with BLDC motor.



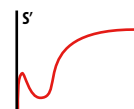
The heart of the instrument is the directly heated and precisely regulated biconical die assembly. The lower die oscillates with a predefined angle and frequency whereas the reaction torque is recorded on the upper die.



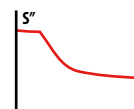
### Technical specification

<b>International standards</b>	ISO 6502, ASTM D 5289, DIN 53529, ...
<b>Die configuration</b>	Biconical, closed die system, sealed
<b>Die gap</b>	0.45 mm nominal
<b>Sample volume</b>	approx. 4.5 cm <sup>3</sup>
<b>Drive system</b>	Direct, wearless servo drive system
<b>Closing system</b>	Soft closing to prevent foil rips and damage of test sample
<b>Oscillation frequency</b>	1.667 Hz (100 cpm)
<b>Oscillation strain</b>	+/- 0.01° to 5° (+/- 0.14% to 70%), Programmable via Software Optional "M" version with mechanically fixed oscillation angle
<b>Torque range</b>	0.01 to 250 dNm
<b>Normal force / Pressure (opt.)</b>	0 to 10.000 kPa (1.450 lbin), Auto tare
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, Max. heating rate: 85°C/min digital, microprocessor controlled
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, microprocessor monitored
<b>Measured Data</b>	Torque (dNm, lbf.in, kgf.cm), Temperature (°C, °F), Pressure (bar, kg per cm <sup>2</sup> ), Time (min - min / min - sec / sec), Shear rate (1/s, rad/s), Cure rate (1/min, 1/sec)
<b>Calculated Data</b>	S', S'', S''', tan δ, phase angle, cure rate, ...
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	Over 3500 data points available for each test Including: S' Min, S' Max, TS 1, TS 2, TC 10, TC 30, TC 50, TC 90
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	200-240 V, 6 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	- "M" version with mechanical drive system - Instrument control panel with 5" touchscreen display and printer - Adapted transducers for high or low-viscosity torque range - Normal force / Pressure measurement - Double channel forced air cooling system - Extended thermal range to +300°C - Autoloader 5 or 10 sample linear - Autoloader with 24, 48 or 100 sample tray or tray changers - R-VS 3000 constant volume sample cutter - Label Printer - Signal tower ...

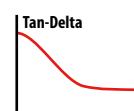
### Calculated results



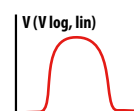
Elastic Modulus



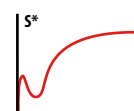
Viscous Modulus



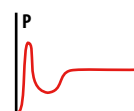
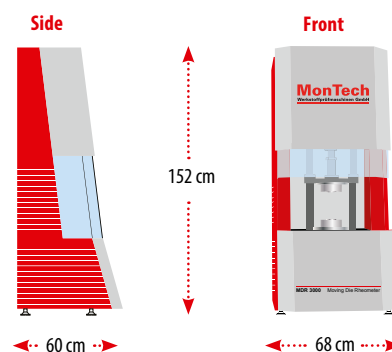
Tan - Delta



Vulcanization speed



Complex Modulus

Normal force / Pressure  
(optional available)

# MonTech MDR 3000 Professional Performance Moving Die Rheometer



## The MDR 3000 Professional

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 rate and the behavior of the compound at the after-cure as well as final compound dynamic mechanical properties.

The MDR 3000 Professional is a unique hybrid testing system; it can be operated in static testing (MDR) mode and with a single click in the MonControl Software, be switched over into dynamic testing (RPA) operation mode.

This provides the highest possible flexibility to the user as the MDR 3000 Professional can cover everyday routine QC tasks by working like a normal static Moving Die Rheometer at highest accuracy, repeatability and reproducibility while offering full Rubber Process Analyzer testing capabilities for even complex R&D testing, allowing the user to program, execute and evaluate arbitrary test sequences with the included MonControl Software.

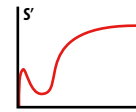
The instrument is equipped with MonTech's unique, patented direct precision drive system, offering variable oscillation amplitude and frequency along with precision temperature control, enabling testing according to almost every DIN / ISO and ASTM test standard in reference to Moving Die Rheometers and Rubber Process Analyzers.

Due to the rugged and flexible construction and various options such as cooling and automation, this device can be used for extended quality control and production monitoring purposes not only in the laboratory, but also directly on the shopfloor.

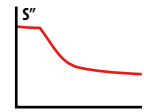
**Technical specification**

<b>International standards</b>	ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, ASTM D 8059, DIN 53529, ...
<b>Die configuration</b>	Biconical, closed die system, sealed
<b>Die gap</b>	0.45 mm nominal
<b>Sample volume</b>	approx. 4.5 cm <sup>3</sup>
<b>Drive system</b>	Direct, wearless servo drive system with ceramic bearings
<b>Closing system</b>	Soft closing to prevent foil rips and damage of test sample
<b>Oscillation frequency</b>	0.001 Hz to 33 Hz (0.001 Hz to 50 Hz optional) (0.05 to 2000 cpm (0.05 to 3000 cpm))
<b>Oscillation strain</b>	+/- 0.01° to 20° (+/- 0.01° to 90° optional) (+/- 0.14% to 280% (0.14% to 1260%))
<b>Torque range</b>	0.001 to 250 dNm
<b>Normal force / Pressure (opt.)</b>	0 to 10.000 kPa (1.450 lbin), Auto tare
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, Max. heating and cooling rate: 85°C/min, digital, microprocessor controlled (Pneumatic double channel cooling system optional)
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, microprocessor monitored
<b>Measured Data</b>	Torque (dNm, lbf.in, kgf.cm), Shear modulus (Pa, dynes/cm <sup>2</sup> , psi), Dynamic viscosity (Pa s), Temperature (°C, °F), Pressure (bar, kg per cm <sup>2</sup> ), Time (min - min / min - sec / sec), Frequency (Hz, cpm), Shear rate (1/s, rad/s), Strain (deg, %), Cure rate (1/min, 1/sec)
<b>Subroutines</b>	Isothermal, Non-Isothermal, Timed, Temperature Sweep, Strain Sweep, Frequency Sweep, Shear rate Sweep, Relaxation, Retardation, Hysteresis, Tension tests, LAOS, ...
<b>Calculated Data</b>	S', S'', S', G', G'', G', tan δ, phase angle, cure rate, η', η'', η*, ...
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	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
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	200-240 V, 6 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	- Instrument control panel with 5" touchscreen display and printer - Adapted transducers for high or low-viscosity torque range - Normal force / Pressure measurement - Double channel forced air cooling system - Low-temperature cooling system M Cool 10 / M Cool -40 - Extended thermal range to +300°C - Autoloader 5 or 10 sample linear - Autoloader with 24, 48 or 100 sample tray or tray changers - R-VS 3000 constant volume sample cutter

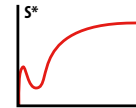
**Calculated results**



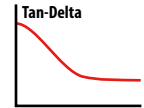
Elastic Torque



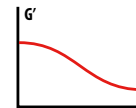
Viscous Torque



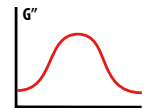
Complex Torque



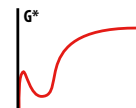
Tan-Delta



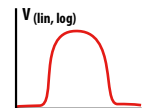
Storage Shear Modulus



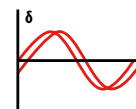
Loss Shear Modulus



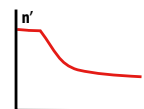
Complex Shear Modulus



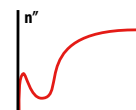
Vulcanization speed



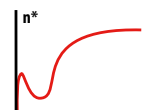
Loss Angle



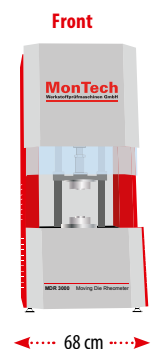
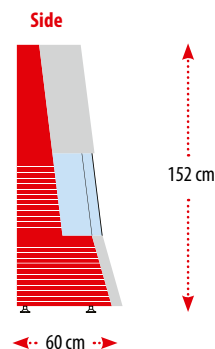
Real Dynamic Viscosity



Imaginary Dynamic Viscosity



Dynamic Complex Viscosity



# 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 rate, 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<sup>-1</sup>. 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.

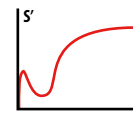
Based on this fundamental measurement data, modulus (G), dynamic viscosity ( $\eta$ ), Compliance (J), Tensile Modulus (E), Compliance under extension/compression (D), Spring rate (K) and Damping coefficient (C) are calculated.



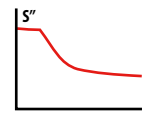
**Technical specification**

<b>International standards</b>	ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, ASTM D 8059, DIN 53529, ...
<b>Die configuration</b>	Biconical, closed die system, sealed
<b>Die gap</b>	0.45 mm nominal, variable die gap and closing force optional
<b>Sample volume</b>	approx. 4.5 cm <sup>3</sup>
<b>Drive system</b>	Direct, wearless servo drive system with ceramic bearings
<b>Closing system</b>	Soft closing to prevent foil rips and damage of test sample
<b>Oscillation frequency</b>	0.001 Hz to 100 Hz (0.05 to 6000 cpm)
<b>Oscillation strain</b>	+/- 0.001° to 180° (+/- 0.014% to 2516%)
<b>Torque range</b>	0.001 to 250 dNm
<b>Normal force / Pressure (opt.)</b>	0 to 10.000 kPa (1.450 lbin), Auto tare
<b>Temperature control system</b>	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)
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, microprocessor monitored
<b>Measured Data</b>	Torque (dNm, lbf.in, kgf.cm), Shear modulus (Pa, dynes/cm <sup>2</sup> , psi), Dynamic viscosity (Pa s), Temperature (°C, °F), Pressure (bar, kg per cm <sup>2</sup> ), Time (min - min / min - sec / sec), Frequency (Hz, cpm), Shear rate (1/s, rad/s), Strain (deg, %), Cure rate (1/min, 1/sec)
<b>Subroutines</b>	Isothermal, Non-Isothermal, Timed, Temperature Sweep, Strain Sweep, Frequency Sweep, Shear rate Sweep, Multi Sweep, Relaxation, Retardation, Hysteresis, Tension tests, LAOS, ...
<b>Calculated Data</b>	S', S'', S*, G', G'', tan δ, phase angle, cure rate, η', η'', ...
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	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
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	200-240 V, 6 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	<ul style="list-style-type: none"> <li>- Instrument control panel with 5" touchscreen display and printer</li> <li>- Adapted transducers for high or low-viscosity torque range</li> <li>- Normal force / Pressure measurement</li> <li>- Cavity pressure control system</li> <li>- High speed data acquisition</li> <li>- Low-temperature cooling system MCool 10 / MCool -40</li> <li>- Extended thermal range to +300°C</li> <li>- Autoloader 5 or 10 sample linear</li> <li>- Autoloader with 24, 48 or 100 sample tray or tray changers</li> <li>- R-VS 3000 constant volume sample cutter</li> </ul>

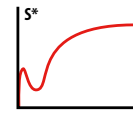
**Calculated results**



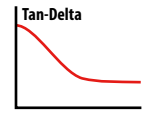
Elastic Torque



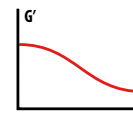
Viscous Torque



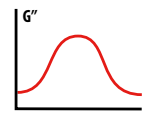
Complex Torque



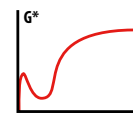
Tan-Delta



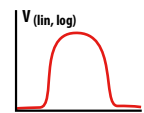
Storage Shear Modulus



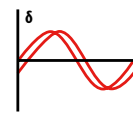
Loss Shear Modulus



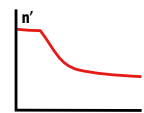
Complex Shear Modulus



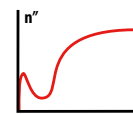
Vulcanization speed



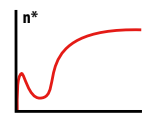
Loss Angle



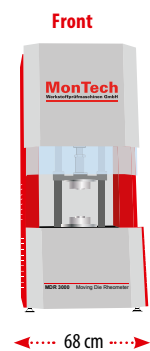
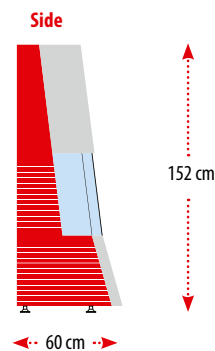
Real Dynamic Viscosity



Imaginary Dynamic Viscosity



Dynamic Complex Viscosity



# MonTech D-RPA 3000

## Flagship Dynamic Rubber Process Analyzer

### The D-RPA 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 the processability, cure characteristics, cure rate and behavior of the compound at the after-cure.

The D-RPA 3000 fulfills the complete range of all test requirements; Polymers, raw materials, basic, finished and cured compounds can all be characterized. Besides the cure properties, cure characteristics and processability can all be determined and evaluated.

The D-RPA 3000 is the state-of-the-art machine for dynamic testing purposes. The machine can be fitted with several unique options such as variable die gap, low-temperature cooling, and high speed data acquisition - providing the highest frequency-strain combination available on the market.

The high flexibility of the D-RPA 3000 allows the user to program and execute arbitrary test sequences with the MonControl Analyses Software. Each dynamic test sequence can include an unlimited number of the following substeps: timed tests, isothermal tests, non-isothermal tests, amplitude sweeps, frequency sweeps, temperature sweeps, shear rate sweeps, matrix tests, relaxations, retardations, hysteresis and tension tests. Of course, any combination of these sub-tests are possible - with or without an initial strain offset, as well as strain or stress controlled.

Equipped with single test - multi subtest test procedure programming with up to 1000 sub-programs as well as an unbeaten shear rate range of up to  $100 \text{ sec}^{-1}$  in oscillation and up to  $750 \text{ sec}^{-1}$  in steady shear - the D-RPA 3000 is truly the most flexible and dynamic multi function Rheometer in the market.



### Completely closed, directly heated, biconical test chamber system

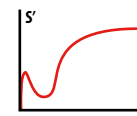
entirely made of high-strength stainless steel, precision ground and hardened, significantly reducing sample slippage for highest dynamic test ranges and most accurate torque, modulus and viscosity readings.



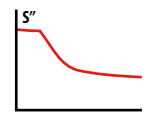
## Technical specification

<b>International standards</b>	ISO 13145, ISO 6502, ASTM D 5289, ASTM D 6204, ASTM D 6601, ASTM D 6048, ASTM D 7050, ASTM D 7605, ASTM D 8059, DIN 53529, ...
<b>Die configuration</b>	Biconical, closed die system, sealed
<b>Die gap</b>	0.45 mm nominal, variable die gap and closing force optional
<b>Sample volume</b>	approx. 4.5 cm <sup>3</sup>
<b>Drive system</b>	Advanced wearless servo drive system with ceramic bearings
<b>Closing system</b>	Soft closing to prevent foil rips and damage of test samples, optionally variable closing force and die gap
<b>Oscillation frequency</b>	0.001 Hz to 100 Hz (0.05 to 6000 cpm)
<b>Oscillation strain</b>	+/- 0.0001° to 360° (+/- 0.0014% to 5032%) Optionally infinitely for large strains and continuous rotation
<b>Torque range</b>	0.0001 to 250 dNm
<b>Normal force / Pressure (opt.)</b>	0 to 10.000 kPa (1.450 lbin), Auto tare
<b>Temperature control system</b>	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)
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, microprocessor monitored
<b>Measured Data</b>	Torque (dNm, lbf.in, kgf.cm), Shear modulus (Pa, dynes/cm <sup>2</sup> , psi), Dynamic viscosity (Pa s), Temperature (°C, °F), Pressure (bar, kg per cm <sup>2</sup> ), Time (min - min / min - sec / sec), Frequency (Hz, cpm), Shear rate (1/s, rad/s), Strain (deg, %), Cure rate (1/min, 1/sec)
<b>Subroutines</b>	Isothermal, Non-Isothermal, Timed, Temperature Sweep, Strain Sweep, Frequency Sweep, Shear rate Sweep, Multi Sweep, Relaxation, Retardation, Hysteresis, Tension tests, LAOS, ...
<b>Calculated Data</b>	S', S'', S*, G', G'', G*, tan δ, phase angle, cure rate, η', η'', η*, ...
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	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
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	200-240 V, 6 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	<ul style="list-style-type: none"> <li>- Instrument control panel with 5" touchscreen display and printer</li> <li>- Adapted transducers for high or low-viscosity torque range</li> <li>- Normal force / Pressure measurement</li> <li>- Cavity pressure control system</li> <li>- High speed data acquisition</li> <li>- Low-temperature cooling system MCool 10 / MCool -40</li> <li>- Extended thermal range to +300°C</li> <li>- Autoloader 5 or 10 sample linear</li> <li>- Autoloader with 24, 48 or 100 sample tray or tray changers</li> <li>- R-VS 3000 constant volume sample cutter</li> </ul>

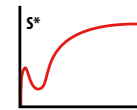
## Calculated results



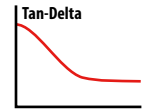
Elastic Torque



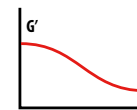
Viscous Torque



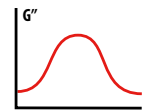
Complex Torque



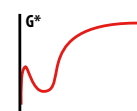
Tan-Delta



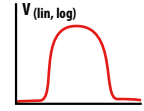
Storage Shear Modulus



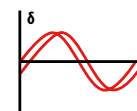
Loss Shear Modulus



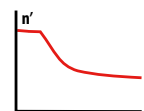
Complex Shear Modulus



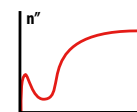
Vulcanization speed



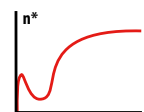
Loss Angle



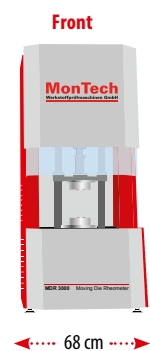
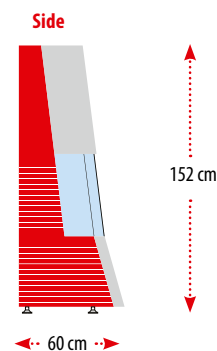
Real Dynamic Viscosity



Imaginary Dynamic Viscosity



Dynamic Complex Viscosity



# MonTech D-RPA 3000 Advanced Applications Package

*...also available as a retrofit to your D-RPA 3000*

The D-RPA 3000 Advanced Applications Package features most advanced measurement technologies boosting RPA testing to new levels - allowing to understand and characterize materials better providing essential data for key manufacturing processes.

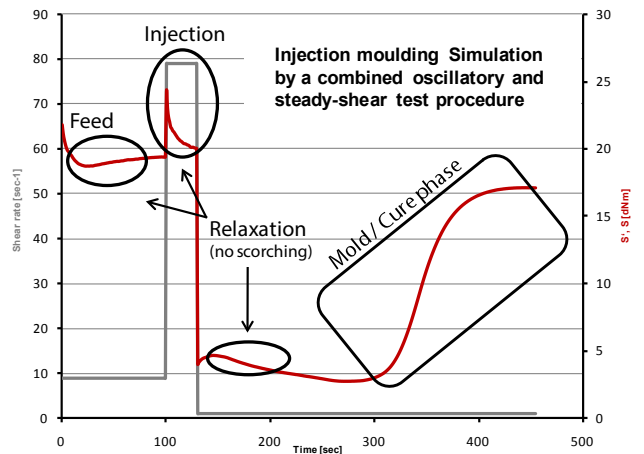
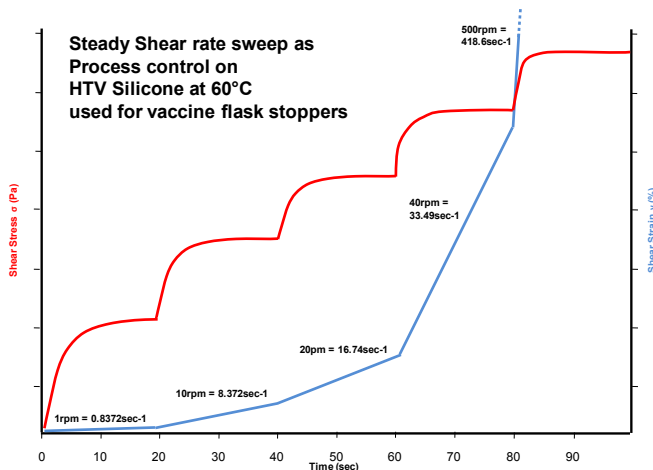
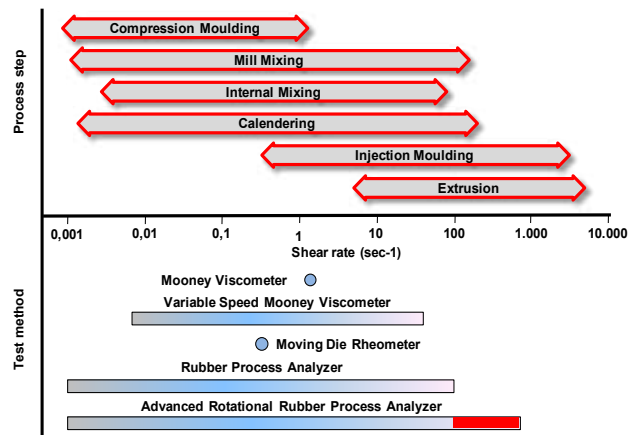
**Key features include:**

- New generation **DIRECT TORQUE DRIVE SYSTEM** for testing in oscillatory and rotational mode
  - ✓ Shear rates from  $10^{-4} \text{ s}^{-1}$  to  $100 \text{ sec}^{-1}$  in oscillatory and  $750 \text{ sec}^{-1}$  in rotational mode
  - ✓ New, dedicated MonControl Subtest routines for Steady Shear, Shear rate Sweeps, ...
  - ✓ Variable drive offset, adjustable pre-strain for every subtest
  - ✓ Infinite strain for high shear LAOS measurements
  - ✓ Normal force controlled wall slip measurements
- **Revolutionary new seal technology for lower die**
  - ✓ High-Tech seal from advanced materials for longer seal life
  - ✓ Minimized friction and reduced heat-build up around lower die
  - ✓ Durable & designed to withstand highest shear rates

**With the new ADVANCED APPLICATIONS PACKAGE the D-RPA 3000 is ready for your processability challenges!**

The new, revolutionary combination of technologies - oscillatory & steady shear paired with die cooling and new seal / friction heat compensation - allow to exactly relevant processing conditions during testing.

The excellent correlation achieved to high shear manufacturing processes - such as calendering, injection moulding, extrusion-... - boosts the versatility of the MonTech D-RPA 3000 to a hole new level making it the most advanced RPA! With a proven correlation between oscillatory (SAOS & LAOS) and rotational steady shear tests and also to other typical tests like DMA, extrusion rheology and viscometry any process relevant condition in the rubber industry can now be covered in one single device. Simple tests with pre-programmed procedures generate process relevant results in minutes - eliminating the need for traditional methods such as Capillary Rheometer tests on filled rubber compounds.





# MonTech Test Die Geometries for ultimate testing flexibility

## MonTech quick change test dies for Rheometers - *are waiting your testing challenge!*

Offering the largest test dies selection in the market available test die geometries include 8 types according to different international and industry standards as well as over 30 application specific die designs. This allows the combination of dies in many different test setups such as double cone, plate-cone and plate-plate configurations with traditional closed or semi-open boundary.

Along with the automatic test die identification and quick change system the system provides users with highest testing flexibility for almost any kind of viscoelastic materials and applications.

### Readily available die types cover:

- Cruciform designs with 4 or 5 sectional grooves
- Cruciformless types
- Ungrooved, polished dies
- Flat dies

Each die type is additionally available in recessed and shallow designs, with specially coated surfaces, with defined surface roughness. Furthermore die types can be customized to user specific application, material and test requirements - even for the most aggressive test materials or highest temperature ranges.

All MonTech test dies have however on thing in common: Their **PRECISION** - ensuring superior and always reliable test results.

Every part of our test die assemblies is meticulously manufactured, inspected and assembled for highest **PERFORMANCE**.

Specific design advantages such as the corrosion free materials, specially shaped die notches and grooves without corner radius and a seamless transition from the die surface into the groove facilitate easy cleaning and long term **DURABILITY**.

### MonTech testing technology shapes the world - application examples:

- **Test dies with reduced slippage for LAOS testing**  
Specially grooved test dies minimize slippage during LAOS measurements so that testing can truly be considered slippage free. The dies - in conjunction with MonTechs' unique cavity pressure measurement and control ensure consistent processability and after ure data as measurement error from traditional RPA system are eliminated - essential for modern tire development!
- **Wall-Slip measurements**  
With special polished, ungrooved dies the typically considered slip free RPA measurement can be converted into a pressurized rotational Rheometer to measure surface slippage, transient and steady shear at process relevant shear rates (up to 750sec<sup>-1</sup>) closely correlating to extrusion and other critical high shear manufacturing processes.
  - **Heat build up and thermal conductivity**  
Test dies with recessed grooves allow to determine heat build up on final compound after cure. Special subroutines with heating and cooling turned off, utilizing Large Oscillatory Strains or constant shear rates at a defined rotation speed allows generates a heat build up which can be measure d with the lower die temperature sensor. Heat dissipation to the upper die in addition allows to correlate to the thermal conductivity.
- **Composite materials, Resins and Prepregs**  
Modern aircraft and electric car manufacturing would not be possible without them. Manufacturing integrated testing ensures process consistency and component safety.
  - **Thermoplastic elastomers (TPEs)**  
The handle of your bike, the pen in your fingers, the mat in your car, the toy of your kid - all of them only feel so nice because these materials have been precisely engineered - with the help of MonTech testing technology.
  - **Characterisation of gel time of thermosets**  
FMC, SMC, BMC, Bakelite, phenolic or epoxy resins - we have the right solution for your materials and processes!
- **Thermoplastics**  
Our testing technology speeds up the digital transformation: Closed loop process rheological control of XLPE materials accelerates manufacturing of e.g. sub-sea fiberoptic cables.
  - **Superfoods**  
Chewy or Yummy? Our test routines and setups adapted to the food industry will tell you!



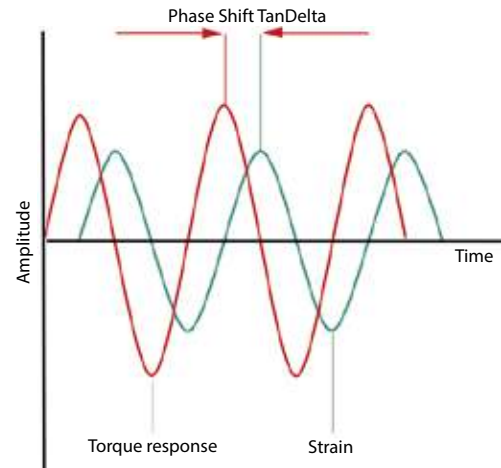
# MonTech D-RPA 3000

## MCool-40 Low-Temperature cooling system

From viscous to elastic, from latex to composites, the MonTech Rubber Process Analyzer D-RPA 3000 can analyze the dynamic mechanical properties for a wide range of rubber, elastomers and other viscoelastic materials.

The sample is compressed in a closed die cavity between two biconical heated dies - a high-force direct drive torque motor mounted to the lower die generates a dynamic load - and optional a static load, while the material response is measured by a reaction torque transducer mounted to the upper die.

While conventional Rubber Rheometers operate at temperature above ambient, MonTech has developed the MCoool-40 system for sub-ambient and sub-zero testing. This unique system with closed refrigeration circuit and heat exchanger directly integrated in the test die assembly reaches temperatures as low as  $-40^{\circ}\text{C}$  using an external refrigeration unit which eliminates the need of liquid nitrogen or any auxiliary gases. To account for material shrinkage, MonTech uses its proprietary cavity pressure control technology ensuring the any material change due to thermal shrinkage is automatically compensated.



### Curemeter and in-situ dynamic mechanical thermal analyzer (DMA & DMTA)

Combining low temperature testing technology with a rubber curemeter to perform traditional Rubber Rheology and Dynamic Mechanical tests (DMA) tests has greatly expanded testing possibilities and eliminates the need for performing other auxiliary tests which may need additional samples preparation and test devices. For the first time Rubber Process Analyzers can now be used as Dynamic Mechanical and Thermal Analyzer covering the entire temperature and shear rate range relevant to elastomers and rubber compounds.

This ultimately allows users to save precious development time and cost to get new materials quicker developed and new products quicker to the market. Tire industry customers have found low-temperature testing capabilities as the quickest and most efficient testing method for assessing key performance parameters of newly developed compounds and formulations - not only winter tires!

MonTech's MCoool-40 cooling unit is easy and convenient to operate as it is directly integrated in the control of the test machine allowing low temperature tests to be performed in less than 20 minutes allowing to use the system also in quality control and to create instant fingerprints of materials.

Excellent correlations to e.g. tire traction, wet/skid performance and rolling resistance are used to ultimately ensure that tire labeling requirements are consistently met under high volume production conditions.

Low temperature testing has further evolved from tire industry and raw material applications also into technical rubber and demanding specialty applications - e.g. to assess the low and high temperature fatigue performance of seals for rocket booster tanks.

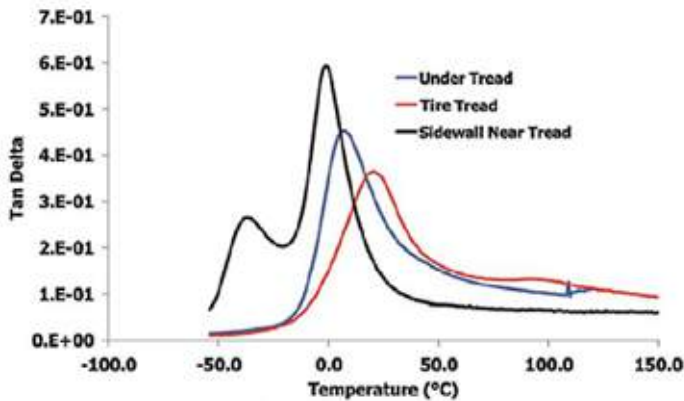
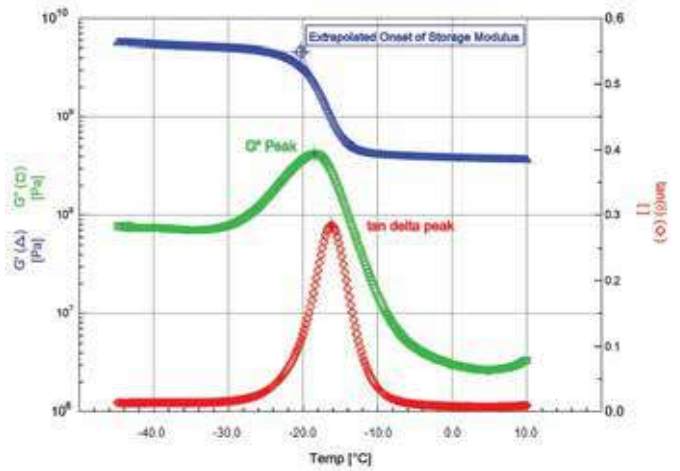


For more information and application tips visit us at:  
[www.rubber-testing.com](http://www.rubber-testing.com)

### Glass-transition temperature (Tg)

The typical test procedure to determine the glass transition temperature with a Rubber Process Analyzer includes a temperature ramp with typical ramps of -1 to -5°K/min. The glass transition (Tg) is seen as a large drop (a decade or more) in the loss shear modulus when viewed on a log scale against a linear temperature scale. Subsequently a Peak in Tan δ can also be seen.

The Tg value reported as the varies as per the method and measurement principle - usually Tg is defined as the onset of the drop of G' drop, the peak of the tan delta or the peak of the G'' curve being the most commonly used.



### Tire tread performance assessment

Tan δ obtained at 0°C of a tire tread compound correlates to improved wet traction. Conversely, lowering Tan δ at 60°C correlates to improved rolling resistance. Generally, conventional tread rubber compounds that optimize Tan δ at one temperature negatively impact Tan δ at the other temperature.

While the compounding of tire treads are typically tailored to their intended application (high performance, snow, etc.), most common treads fit a linear trade-off between better predicted wet traction (higher Tan δ at 0°C) and better predicted rolling resistance (lower Tan δ at 60°C).

### Simplified formulation development, reduced time to market

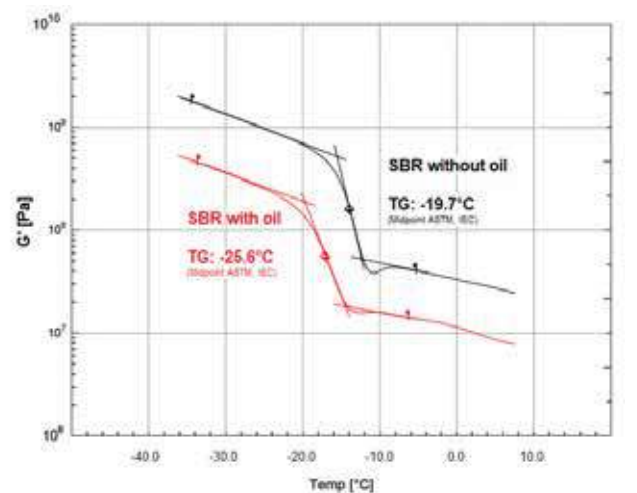
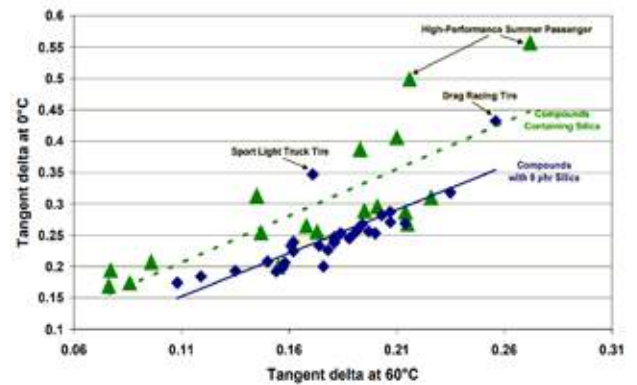
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Advanced formulations which minimize this trade-off are typically containing advanced raw materials (e.g. use of precipitated silica) and compounding techniques including varying filler level, polymer type and grade, ...

Low temperature testing with a closed cavity rotational shear Rheometer allows assessment of viscosity before cure, sampling curing, cooling and assessment of the performance at 60°C, 0°C and even lower temperatures covering the entire application temperature range of typical rubber materials.

This enables tire, automotive, sealing, anti-vibration and auxiliary product manufacturers to assess all critical compound performance parameters effortlessly in minutes instead of time consuming sample preparation and multiple tests in various devices.



# MonTech Moving Die Rheometer

## Automation options

**All MonTech Moving Die Rheometers as well as Rubber Process Analyzers can be easily automated, allowing customers to increase productivity and release operators for other important tasks.**

MonTech offers the worlds largest Rheometer Automation portfolio designed for our customers to rely on - in the lab or on the shopfloor, in multiple shifts, 365 days, every year.

Depending on the selected type of automation system, samples are loaded and unloaded automatically from linear or rotary trays, film is fed and tested samples are removed automatically.

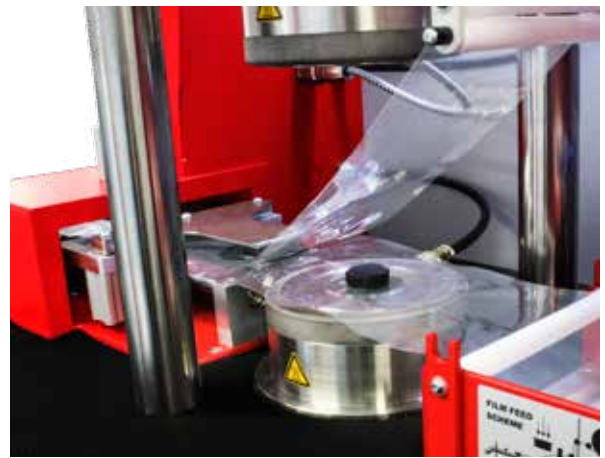
Of course, every automated machine can - within a single click - also be switched into manual operation mode.

### Semi Automation

#### Testing made easy:

The semi-automated loader consists of an automatic film feeding system, eliminating the need to manually handle testing film.

This semi-automatic system is especially popular for online testing requirements where workers are cutting warm samples directly from the mill and feeding them into the Rheometer. This means that no delay for queuing or handling the sample can be accepted. However, handling testing film is not easy for workers wearing protective gloves, and can cause variations in test results if film is not placed correctly, or if more than one layer of testing film is used on either the lower or upper die. Therefore, the semi automation automatically provides film transportation and removal of the tested sample so that the operator just has to place the test sample and hit the start button.



### Linear Automation

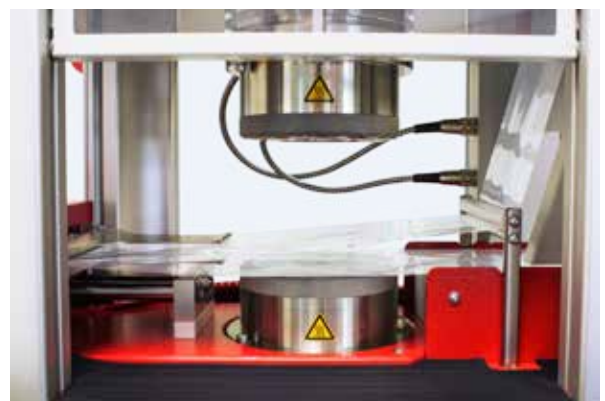
#### Easily increasing productivity:

Linear Automation systems are mainly used for online testing, utilizing a fast and reliable direct conveyor feeder with the lower film as transportation carrier.

**5 Samples:** This system features automated sample loading and unloading with a linear queue of 5 test samples. This is ideally suitable for online testing purposes.

**10 Samples:** This system is equipped with the same features as, the 5 Sample linear loader but can queue up to 10 test samples, making this system ideally suitable for online testing purposes and for laboratory testing.

Linear automation systems are always the preferred choice for very sticky materials such as silicones or glue that sample loading arm systems might not be able to handle.



## Tray Automation

### Maximum efficiency:

Tray automation systems allow users to queue larger amounts of samples and leave the testing system running totally unattended over long periods. With MonTech's patented direct sample handling system, sample placement accuracy and test result repeatability is significantly increased. Samples are handled and monitored by a high-volume vacuum system, ensuring perfect sample pickup, transportation and drop-off - even for less than ideal test samples.

### 24, 48 or 100 samples tray

This system features automated sample loading and unloading with a direct tray-to-chamber handling system. A interlocking rotary tray with a capacity of 24, 48 or 100 samples is integrated into the right side of the instrument, minimizing the overall footprint of the testing system.

Test samples are queued in the software with their individual identification and test specifications, picked up from the tray and directly placed into the test chamber. Of course, the test queue can be altered at any time, samples can be skipped, planned stops can be inserted and immediate tests can be performed. Film is fed and monitored automatically and tested samples are immediately removed once tests are finished.

Tray automation systems are especially suitable for operator-less testing over long testing times, significantly increasing instrument and lab productivity.



Automation option		MDR 3000 Basic	MDR 3000	MDR 3000 Prof.	D-MDR 3000	D-RPA 3000
	Semi	-	x	x	x	x
Linear	5 Samples linear	x	x	x	x	x
	10 Samples linear	x	x	x	x	x
Tray	24 Samples tray	x	x	x	x	x
	48 Samples tray	x	x	x	x	x
	100 Samples tray	-	x	x	x	x
Tray changer	10x24 tray changer	-	x	x	x	x
	10x48 tray changer	-	x	x	x	x

x = available - = not possible

## Tray change Automation

Tray change systems feature similar sample handling like the tray automation but additionally offer an automated 10-slot tray changer system. This results in a 10 times higher sample queuing capacity, allowing the machine to run continuously for multiple days or even weeks.

### 10 x 24 and 10 x 48 samples tray changer

The fully enclosed tray change system features automated sample loading and unloading with a direct tray-to-chamber handling system and a separate tray handling mechanism.

Up to 10 rotary tables with a stock of 24 or 48 samples each can be stored at the instrument and automatically processed. Trays are automatically moved into loading and unloading positions, where the samples are picked from the trays and directly placed into the test chamber.

For all automation systems various options such as film-out sensors, alignment systems, ... are available.

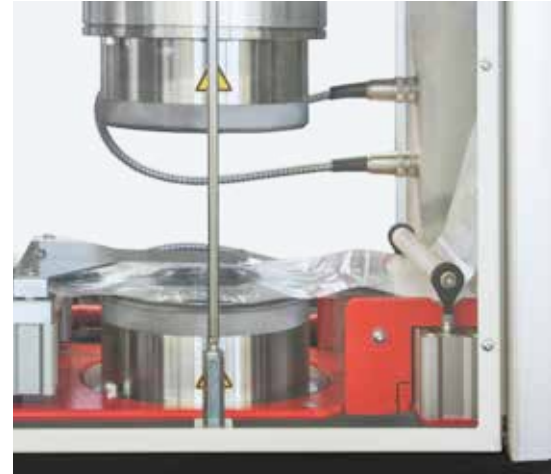
# MonTech Automation options in detail



Sample queueing and sample detection sensors for fully monitored sample handling.



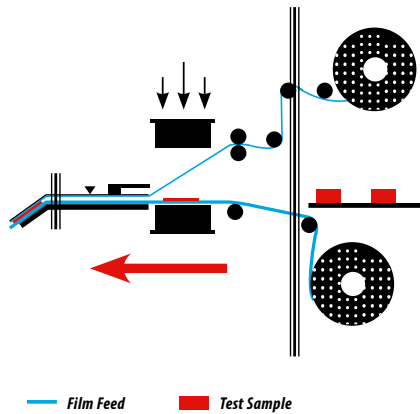
Every step in the sample handling process is closely monitored to have full sample traceability.



Integrated sample scrapers and film guides prevent film breakage and ensure proper sample removal.



High volume vacuum handling of samples guarantee proper sample handling and placement.



Reliable feeding and transportation of testing films from 2 or optionally 4 rolls.



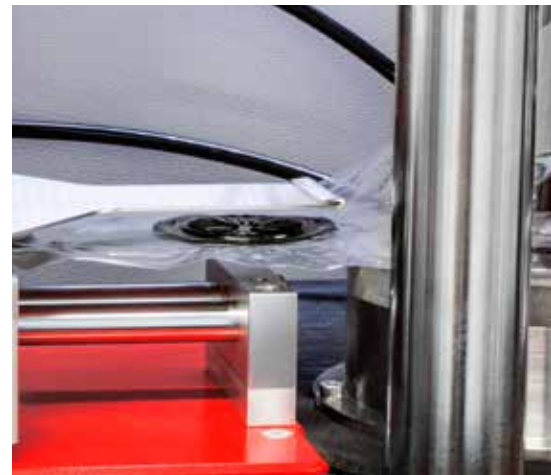
Precise film guiding to avoid any crinkles or folding of the testing film.



With direct tray-to-chamber handling, the sample arm picks samples from the tray. The testing area of 3000 Series is completely protected by a supervised safety door.



Monitored sample placement directly into the center of the die.



Haul-off mechanism: Sample removal, film guide and feeding



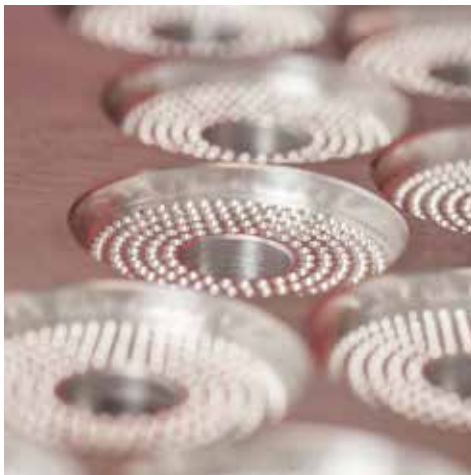
All sample movements are closely monitored by special proximity sensors, light barriers, vacuum or camera. This standard feature on all linear and tray systems ensures full sample traceability and prevents any loss of samples. Optionally, barcode or RFID readers can be directly integrated into the instrument or sample tray.



Samples can be grouped together for easy operator recognition, with room for running immediate tests between scheduled sequences.



Safe, reliable and automated sample removal and film advancement.



Special anti-tack machined sample tray provides high reliability for sample detection, pick-up and handling.

# MonTech

## Advanced instrument options for MDRs and RPAs

### Cooling systems

#### Pneumatic cooling system

Both chambers are cooled separately by a PID-controlled forced air cooling system.

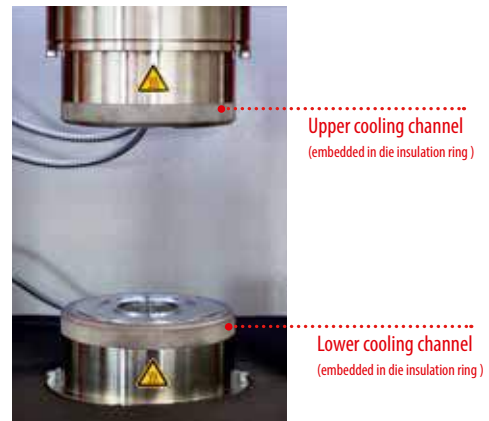
In MDR mode this system can be used to rapidly cool the instrument from a higher to any lower testing temperature and therefore significantly reduce non-productive time of the instrument as well as shorten stabilization and operator waiting times.

Forced air cooling systems enable cooling at any point during test sequences in non-Isothermal and RPA operation modes, allowing test definitions to follow precise cooling ramps and steps. Cooling can also be used to conduct heat from the sample when friction heat is a concern, such as testing with high shear rates.

	MDR 3000 Basic	MDR 3000	MDR 3000 Professional	D-MDR 3000	D-RPA 3000
<b>Pneumatic</b>	0	0	0	S	S
<b>MCool 10</b>	-	-	0	0	0
<b>MCool -40</b>	-	-	-	-	0

- = not available   S = Standard   0 = Option

#### Forced air cooling operation principle:



#### MCool 10

Integrated cartridge cooling system that separates the provided air streams into cold (-45°C) and hot (+110°C) fractions to enhance the performance of the machine compared to the standard pneumatic cooling system.

This system is especially suitable for testing at or below room temperature in order to provide the most accurate test results as well as correlations with final product application environments. This system is highly recommended for dynamic testing on very soft rubbers, polymers and silicones.

The operation principle of the MCool 10 cooling system is extremely simple and fully integrated into the machines control system:

Air is accelerated and separated in cartridge centrifuges.

Afterwards the cold fraction of the air is used for separate cooling of both test dies down to +8°C.

Only a forced air supply with at least 4 Bars is required - there are no additional chillers or cooling liquids needed.

(Performance of the cooling systems depends on supplied air).

#### MCool -40 Sub-ambient cooling system

The advanced MCool -40 cooling system features a liquid cooling system with external chiller unit directly connected to the test dies of the instrument.

This system adds revolutionary features to Static and Dynamic rubber testing allowing the characterization test of cure characteristics, damping / rolling resistance and tire labelling predictors such as wet/ice traction in a single test.

The MCool-40 system with specially adapted die seals allows to cool the dies to as low as -40° Celsius this allows to even reach Glass transition temperature for many polymers and rubber formulations.

This makes the instrument equipped with this cooling system the ideal Dynamic Mechanical Rheological Testing System: The total heating system of the dies remains unchanged so that instruments equipped with this device are absolutely comparable with any other Moving Die Rheometer or Rubber Process Analyzer.





## Advanced technology options

### Axial force transducer system for normal force measurement

Features a combined torque / force transducer to measure torque as well as die cavity pressure (derived from the normal force) directly in the test chamber. Before each test, the transducer and amplifier is balanced automatically.

The system also includes a second channel amplifier system for realtime simultaneous measurements of torque and normal force with a data acquisition rate of 10 kHz.

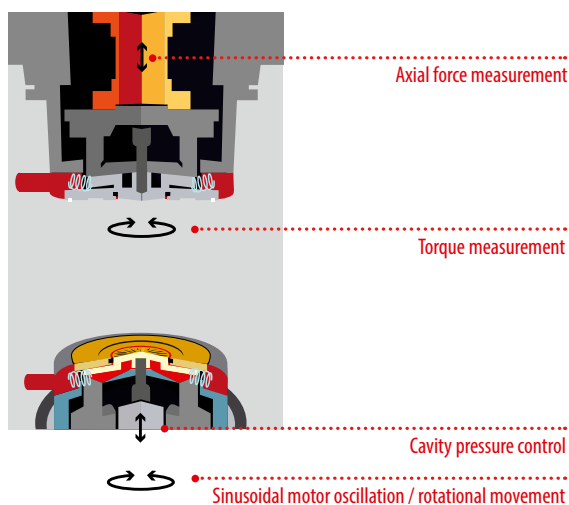
### Cavity pressure controller system

With this option, cavity pressure can also be controlled either to a pre-programmed or to an online calculated pressure level.

The closing force and die gap are designed as a variable, independent axis, so that the cavity pressure can be precisely controlled.

This system is especially suitable for test sequences that include curing as well as a cool-down of the sample for a dynamic mechanical analysis, and can be utilized to compensate for material shrinkage as well as to avoid any slippage in the test chamber.

This technology is worldwide patented by MonTech.



### High speed data acquisition system

The high speed DAQ option offers unique result stream resolution as well as an ultimate level of precision for the torque signal and motor position.

Both channels are sampled and processed simultaneously with 24-bit resolution at a data rate of 180 kHz.

All data streams are provided on the PC and calculated online in a realtime kernel.

It is also possible to save the raw data streams to the PC's memory.

This makes the system especially suitable for FT-Rheology purposes as well as applications that require precise analysis of material responses in any harmonic such as the characterisation of long-chain branching. The high speed data acquisition system is especially suitable for analyzing the non-linear material response by LAOS (Large Amplitude Oscillatory Shear) measurements.

The scope of supply includes the MonLAOS software system (see page 112 for details) with full FT - Rheology capability to analyze the frequency spectrum of the materials response, higher harmonics, for calculating Chebyshev coefficients and the Long Chain Branching Index (LCBI)

# MonTech Rheometer

## Data and productivity options

Increase productivity and efficiency of your testing system with MonTech's unique data and productivity options:

### Data / IT options

#### Integrated Industrial computer

From harsh mixing plants to cleanrooms, special environments demand special encapsulation and protection of the computer system for controlling and managing the instrument.

MonTech therefore offers machine integrated and machine mounted computer systems in various protection ratings, guaranteeing the highest reliability under even the toughest environmental conditions.

#### Instrument Control Panel

Allows the machine to be operated from a remote computer or completely standalone for simple quality control and printing results.

#### RS 232 Logic Interface

Compatibility to older host or software systems as well as interfacing with proprietary third party software systems is no problem for MonTech testing instruments.

Every machine can be equipped with a serial RS232 bi-directional interface to program the instrument as well as retrieve test data and results by a simple, standardized ASCII protocol.

#### Result and Label Printer

All test results can be directly printed from the instrument through an optional printer. Of course reports for single test results, test series reports and even Pass/Fail labels with or without barcodes are available for printing.

#### Additional Instrument Outputs

Additional, programmable output signals for switching auxiliary units and devices attached to the instrument or its environment such as: chillers, Ventilation systems, ...

#### Signal tower

For direct Pass / Fail operator feedback

### Productivity options

#### Enhanced instrument protection

Explosive, corrosive, cleanroom or other critical environments are no problem for MonTech rubber testing machinery.

All instruments can be tailored to meet any International Protection Rating that our customer's environment requires.

#### Instrument table or cart

For flexible instrument setup and utilization, MonTech offers movable instrument carts, fixed workbench carts and movable closed-instrument carts.

Please contact us to discuss your individual instrument setup and space requirements to identify your ideal workplace scenario.

#### Forced air aspiration system

For a safe workplace free from smells and fumes, even when testing aggressive or hazardous materials, a forced ventilation and aspiration system can be fitted to every MonTech Rheometer.

Optionally activated carbon filtration systems can directly be integrated into the instrument.



5" Color Touchscreen Instrument control panel

## Traceable Calibration Torque Standards

MonTech offers a full range of high precision, internationally traceable reference calibration standards for instrument calibration and verification purposes.

### Torque calibration standard

MonTech's advanced, fully elastic torsion torque standards have been specially developed for the highest calibration precision of Moving Die Rheometers. Compression as well as clamping types are available. Torque standards allow users, in combination with the MonTech easy calibration system, to verify as well as calibrate the instrument directly, significantly increasing data confidence and instrument uptime.

All MonTech torque standards are fully traceable to national and international standards with overall uncertainties of less than 0.35%.

Torsion springs and torque standards can be calibrated under static and dynamic conditions at single or multiple deflection angles providing additional information on linearity as well as continuous stress-strain profiles by linear regression calculations.

MonTech calibrates torque standards and offers preventive maintenance programs that include accredited calibration.



Compression Torque Standard



Clamping Torque Standard

## Reference Materials

Besides reference standards, MonTech offers reference materials for instrument verification purposes.



### Reference compound for Rheometer

SBR or EPDM reference compound for Rheometer cure and dynamic testing, allowing customer to easily verify and perform consistency checks on MDRs and RPAs. Material is supplied as slabs or pre-cut samples with film. Each lot comes with a test certificate and round-robin / interlab validation. Compound stability is typically good for up to 3 months. Various standard and customer specific delivery plans are available.

## MonTech Mooney Viscometer Series

Mooney Viscometers are the backbone for testing the viscous flow of raw materials such as polymers and intermediates such as masterbatches for maintaining stable and consistent manufacturing processes. Furthermore, all MonTech Mooney Viscometers also allow Scorch as well as Stress Relaxation testing.



PERFORMANCE

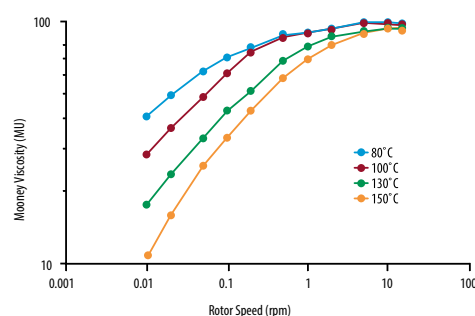
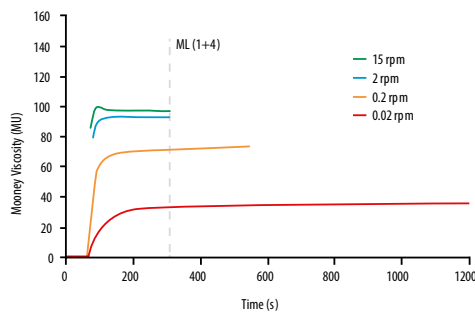
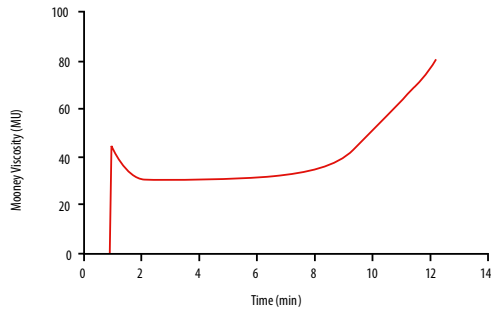
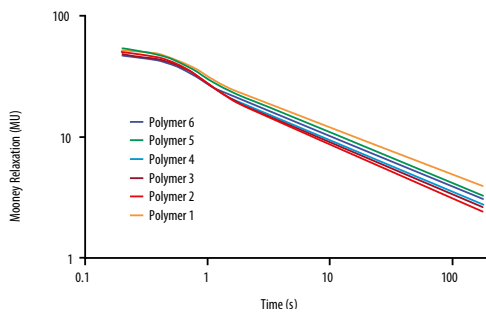
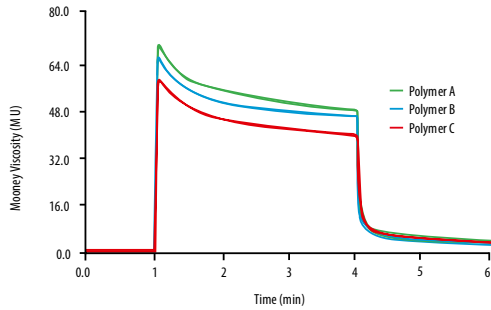
### STATIC TESTING

### DYNAMIC TESTING

	MV 3000 Basic	MV 3000	V-MV 3000
<b>Instrument description</b>	Entry model instrument for repetitive Quality control testing as well as simple R&D applications	Standard instrument for QC and R&D testing according to international standards.	High-end instrument for QC as well as dynamic R&D testing with maximum flexibility featuring variable rotor speed and temperature sweeps as well as block programming with multi-step stress relaxation.
<b>International standards</b>	ISO 289:2018, ASTM D 1646, ASTM D 3346 DIN 53523, BS 903: Part 58, AFNOR T43-00/005, BS 1673, GOST 10722-76, JIS K6300, TGL 25-689	ISO 289:2018, ASTM D 1646, ASTM D 3346 DIN 53523, BS 903: Part 58, AFNOR T43-00/005, BS 1673, GOST 10722-76, JIS K6300, TGL 25-689	ISO 289:2018, ASTM D 1646, ASTM D 3346 DIN 53523, BS 903: Part 58, AFNOR T43-00/005, BS 1673, GOST 10722-76, JIS K6300, TGL 25-689
<b>Test modes</b>	Mooney Viscosity, Mooney Scorch, Stress Relaxation, Mould release, Delta Mooney	Mooney Viscosity, Mooney Scorch, Stress Relaxation, Mould release, Delta Mooney	Mooney Viscosity, Mooney Scorch, Stress Relaxation, Mould release, Delta Mooney Mooney Variable Viscosity, Variable test sequence block programming Multi-step stress relaxation
<b>Rotor</b>	Large (38.10 mm) and Small (30.48 mm) Sealed, with longlife seals	Large (38.10 mm) and Small (30.48 mm) Sealed, with longlife seals	Large (38.10 mm) and Small (30.48 mm) Sealed, with longlife seals
<b>Rotor speed</b>	2.00 turns per minute	2.00 turns per minute	0.00 to 50.00 turns per minute, 0.01 steps
<b>Stress Relaxation</b>	According to ISO 289:2018, DIN 53523 Part 4	According to ISO 289:2018, DIN 53523 Part 4	According to ISO 289:2018, DIN 53523 Part 4
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, digital, microprocessor controlled	Ambient to 232 °C, precision +/- 0.03 °C, digital, microprocessor controlled	Ambient to 232 °C, precision +/- 0.03 °C, digital, microprocessor controlled
<b>Units</b>	Mooney - units (MU), Temperature (°C, °F), Time (min - min / min - sec)	Mooney - units (MU), Temperature (°C, °F), Time (min - min / min - sec)	Mooney - units (MU), Temperature (°C, °F), Time (min - min / min - sec)

# MonTech Mooney Viscometer Application Examples

Contact us today for a demonstration with your compounds and materials!



## Mooney Viscosity

The Mooney Viscosity test is the most popular test method for characterizing polymers and uncured rubber materials. As defined by international standards, the sample material is preheated for a defined period in a closed die cavity, then sheared by the embedded rotor at a constant rate. The Mooney Viscosity is recorded and data is automatically calculated at predefined time and viscosity points. MonTech Mooney Viscometers offer superior precision and repeatability, providing the user with reliable data and making it easy to differentiate between different types and grades of polymers in order to ensure a high processing consistency.

## Mooney Stress Relaxation (Single or Multi-zone)

As Mooney Viscosity testing only provides information about the flow = viscosity of polymers and rubber compounds, stress relaxation testing can be used to assess elastic material behavior. This does not even require additional samples or testing efforts. Once the Mooney Viscosity test is completed, the rotor is stopped within 5 milliseconds and the torque decay is observed and recorded. Once the stress relaxation is completed, the slope-intercept and regression coefficient are calculated in multiple zones, providing excellent correlations in reference to polymer branching and processing.

## Mooney Scorch

Mooney Scorch is one of the most useful tests to determine starting of cure - so called scorching behavior - of rubber compounds, providing essential data for designing and controlling production processes as well as checking material consistency. Of course, every MonTech Mooney Viscometer offers full Mooney Scorch and Delta Mooney testing capabilities featuring a selection of over 3500 datapoints which include initial Mooney viscosity, minimum viscosity, scorch times and scorch viscosities.

## Mooney Viscosity at Shear Rates and Temperatures

Besides only static testing, MonTech Variable Mooney Viscometers such as the V-MV 3000 offer full dynamic testing capabilities, allowing measurement of viscosity at variable shear rates (by stepless changes of the rotor speed) and temperatures. Furthermore, even non-isothermal sequences, variable rotor speed profiles as well as step-relaxations can easily be programmed and executed. Overall, this allows a detailed and complete understanding of the polymer behavior. Along with this, low rotor speed rates in Mooney Viscosity testing even provide the ability to test highly elastic and shear sensitive materials that could not be properly tested and characterized on Mooney Viscometers before.

# MonTech MV 3000 Basic

## Entry level Mooney Viscometer

### The MV 3000 Basic

is a rotational shear viscometer according to Mooney for performing

- Viscosity tests (ML / MS 1+X)
- Stress Relaxation testing
- Mooney Scorch
- Delta Mooney testing

on polymers as well as rubber compounds for quality control, research and development applications.

The MV 3000 Basic is supplied as a complete, ready-to-test instrument set including a personal computer, MonControl Software, cables, connectors and regulators as well as a standard set of tools and consumables.

**Easy to use:** All test parameters are pre-programmed through the MonControl Software - the instrument is equipped with a single button for starting the test sequence.

**Direct feedback:** An integrated multi-color LED status bar clearly displays the current machine state.

**Rugged:** The compact and highly rigid frame is made from high strength aluminum. Along with direct-drive technology, this guarantees stable and accurate test results in every environment.



### Rotor, die assembly and drive system

The most fundamental and important parts on a Mooney Viscometer are the rotor, die assembly and in-line drive shaft. The test sample is placed below and above the rotor with optional test film. Then the upper die is lowered onto the lower die with a force of 11.5 kN.

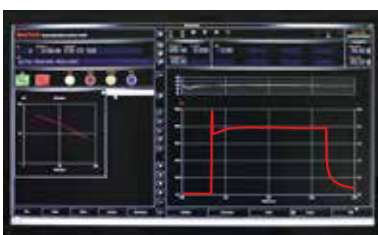
After a pre-heat time, the rotor - which is now totally embedded in the test material in the closed die cavity - rotates at a fixed speed of 2 turns per minute, powered by an in-line drive system.

During the whole test sequence, the temperatures of both dies are measured by a separate precision probe on each die and the heaters are accordingly controlled and regulated to precisely maintain the temperature at its setpoint.

The torque needed to turn the rotor in the test material is precisely measured by an in-line torque transducer. Torque in Mooney Units (MU), die temperatures and rotor speed are recorded. Data is automatically calculated and displayed once the test is completed.



### MonControl Software for test configuration, data acquisition, result calculation and reporting



Mooney Viscosity test with stress relaxation and log-log graph



Test results with automatic Pass / Fail calculation

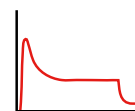


Mooney Scorch test

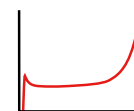
### Technical specification

<b>International standards</b>	ISO 289:2018, ASTM D 1646, ASTM D 3346, DIN 53523, BS 903: Part 58, AFNOR T43-00/005, BS 1673, GOST 10722-76, JIS K6300, TGL 25-689, ...
<b>Die configuration Rotor</b>	According to international standards large ( $\varnothing$ 38.1 mm) and small ( $\varnothing$ 30.48 mm) Rotor
<b>Force measurement</b>	In-line torque transducer
<b>Closing force</b>	11.5 kN
<b>Rotor speed</b>	2.00 turns per minute (0.209 Radians / second)
<b>Rotor shaft seal</b>	Standard or longlife seals available
<b>Stress Relaxation</b>	According to ISO 289:2018, DIN 53523 Part 4
<b>Torque range</b>	0.01 to 230 MU
<b>Sample volume</b>	Two specimens having a combined volume of 25 cm <sup>3</sup>
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, digital, microprocessor controlled
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, PID microprocessor monitored
<b>Calibration</b>	Fully automatic by built in calibration weights, Software guided
<b>Measured data</b>	Mooney - value (MU) Temperature (°C, °F) Time (min - min / min - sec / sec)
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	Over 3500 data points available <i>Including:</i> Initial viscosity, ML / ML 1+X, Y+X+Z, Scorch viscosities and cure times, Stress Relaxation (log-log), Slope, Intercept, Regression coefficient, Multi-zone Stress Relaxation
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	100-120 V, 8 Amps or 200-240 V, 5 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	- Instrument control panel with 5" touchscreen display and printer - Variable Rotor speed from 0.50 to 10.00rpm - Variable Rotor speed from 0.10 to 20.00rpm - Rotor detection - Double channel forced air cooling system - Low-temperature cooling system M-Cool 10 - M-VS 3000 constant volume sample cutter - Label Printer - Signal tower ...

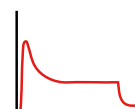
### Calculated results



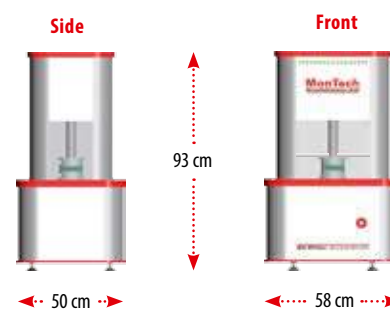
Mooney Viscosity



Mooney Scorch



Stress Relaxation



## **MonTech MV 3000**

### **Industry standard Mooney Viscometer**



#### **The Mooney Viscometer MV 3000**

is the leading test instrument for measurement of viscosity, scorching and stress relaxation on polymers and rubber compounds.

The MV 3000 is suitable for quality control as well as research and development purposes with excellent repeatability and reproducibility due to its low-mass die design, direct heating and a unique direct drive design with snap-in mechanics.

The massive aluminum frame of the MV 3000 with its 270° accessible die area allows easy sample loading while integrated rotor ejection simplifies rotor handling. Operation is made easy by 4 illuminated pushbuttons providing clear information about the machine state. A motorized safety shield separates the die area before the test sequence is started.

Die temperatures are accurately and precisely measured by calibrated probes and controlled with a precision of  $\pm 0.03$  °C by heaters, dies and rotors with an extremely fast thermal response

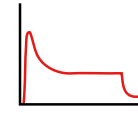
The MV 3000 is fitted with built-in software-controlled systems for automatic balancing and calibration, including a double dead-weight system to apply a defined torque of 100 Mooney units, ensuring the utmost data accuracy and eliminating the needs of any external tools or fixtures.



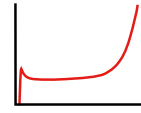
### Technical specification

<b>International standards</b>	ISO 289:2018, ASTM D 1646, ASTM D 3346, DIN 53523, BS 903: Part 58, AFNOR T43-00/005, BS 1673, GOST 10722-76, JIS K6300, TGL 25-689, ...
<b>Die configuration / Rotor</b>	According to international standards large ( $\varnothing$ 38.1 mm) and small ( $\varnothing$ 30.48 mm) Rotor
<b>Force measurement</b>	In-line torque transducer
<b>Closing force</b>	11.5 kN
<b>Rotor speed</b>	2.00 turns per minute (0.209 Radians / second)
<b>Rotor shaft seal</b>	Standard or longlife seals available
<b>Stress Relaxation</b>	According to ISO 289:2018, DIN 53523 Part 4
<b>Torque range</b>	0.01 to 230 MU
<b>Sample volume</b>	Two specimens having a combined volume of 25 cm <sup>3</sup>
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, digital, microprocessor controlled
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, PID microprocessor monitored
<b>Calibration</b>	Fully automatic by built in calibration weights, Software guided
<b>Measured data</b>	Mooney - value (MU) Temperature (°C, °F) Time (min - min / min - sec / sec)
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	Over 3500 data points available <i>Including:</i> Initial viscosity, ML / ML 1+X, Y+X+Z, Scorch viscosities and cure times, Stress Relaxation (log-log), Slope, Intercept, Regression coefficient, Multi-zone Stress Relaxation
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	200-240 V, 6 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	<ul style="list-style-type: none"> <li>- Instrument control panel with 5" touchscreen display and printer</li> <li>- Easy access and encapsulated electronic system</li> <li>- Rotor detection</li> <li>- Reinforced drive shaft and rotor to 300MU</li> <li>- Variable Rotor speed from 0.50 to 10.00rpm</li> <li>- Variable Rotor speed from 0.10 to 20.00rpm</li> <li>- Double channel forced air cooling system</li> <li>- Low-temperature cooling system MCool 10</li> <li>- M-VS 3000 constant volume sample cutter</li> </ul>

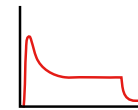
### Calculated results



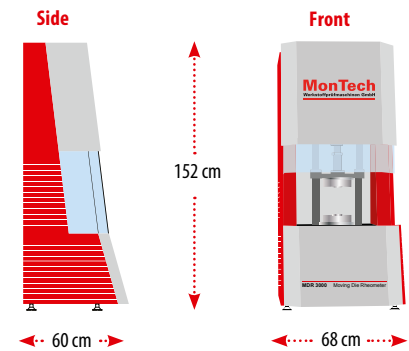
Mooney Viscosity



Mooney Scorch



Stress Relaxation



# MonTech V-MV 3000

## High-end Mooney Viscometer

### The Variable Mooney Viscometer V-MV 3000

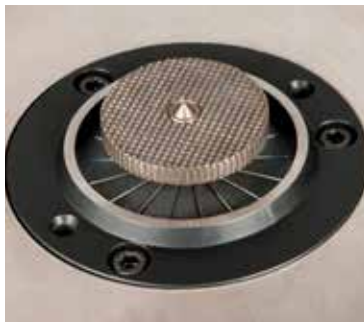
brings traditional Mooney Viscosity, Scorch and Stress Relaxation testing to the next level. Besides the ultra-rigid test frame, the instrument incorporates the latest direct servo drive technology and superior design for unbeaten data accuracy and test result precision.

In addition to static Mooney Viscometer testing at fixed rotor speeds under isothermal conditions according to international standards, the Variable speed Mooney Viscometer V-MV 3000 is further capable of running test sequences at variable rotor speeds as well as fully dynamic tests including speed steps, ramps and multi-step relaxation, all this with simultaneous temperature profiles and optional cooling of the sample in the die cavity to as low as  $+10^{\circ}\text{C}$ , making the V-MV 3000 not only ideal for polymers and rubber compounds, but also silicone, latex and epoxy resin testing.

This functionality efficiently provides very useful additional information on the test material at the highest accuracy. For example, materials showing similar static viscosities at 2rpm can now be tested at variable shear rates and temperatures.

From these results, polymer specialists can gain a much better understanding of polymer and rubber behavior regarding branching, molecular weight distribution, average molecular weight as well as shear thinning.

The instrument is equipped with MonControl Software and special block programming features to allow an unlimited number of rotor speeds and test temperatures per test - of course in any combination.



Lower radial v-groove die with large, serrated rotor. The low-mass rotor design ensures homogenous temperature distribution, and in conjunction with MonTech longlife seals, offers the highest accuracy in Mooney readings.



Rubber sample after Mooney scorch testing. Mooney Scorch testing is made simple with the V-MV 3000. Test can be automatically stopped once the maximum desired Scorch time or Scorch viscosity reading is reached, maximizing instrument availability and sample throughput.

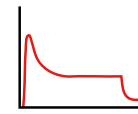


SBR Polymer sample after Mooney viscosity testing. Various types of testing film are available for easy sample handling, reduced cleaning needs, less die contamination and therefore improved repeatability.

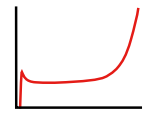
## Technical specification

<b>International standards</b>	ISO 289:2018, ASTM D 1646, ASTM D 3346, DIN 53523, BS 903: Part 58, AFNOR T43-00/005, BS 1673, GOST 10722-76, JIS K6300, TGL 25-689, ...
<b>Die configuration / Rotor</b>	According to international standards large ( $\varnothing$ 38.1 mm) and small ( $\varnothing$ 30.48 mm) Rotor
<b>Force measurement</b>	High precision in-line torque transducer
<b>Closing force</b>	11.5 kN
<b>Rotor speed</b>	0.00 to 50.00 turns per minute, 0.01 steps (0 to 5.25 rad / sec)
<b>Stress Relaxation</b>	According to ISO 289:2018, DIN 53523 Part 4
<b>Torque range</b>	0.01 to 230 MU
<b>Sample volume</b>	Two specimens having a combined volume of 25 cm <sup>3</sup>
<b>Temperature control system</b>	Ambient to 232 °C, precision +/- 0.03 °C, digital, microprocessor controlled
<b>Temperature check system</b>	Recordings of the temperature gradient on the screen, PID microprocessor monitored
<b>Calibration</b>	Fully automatic by built-in calibration weights, Software guided
<b>Measured data</b>	Mooney - value (MU) Temperature (°C, °F) Time (min - min / min - sec / sec)
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Data points</b>	Over 3500 data points available <i>Including:</i> Initial viscosity, ML / ML 1+X, Y+X+Z, Scorch viscosities and cure times, Stress Relaxation (log-log), Slope, Intercept, Regression coefficient, Multi-zone Stress Relaxation
<b>Pneumatics</b>	min. 4.5 Bar / 60 psi
<b>Electrical</b>	200 -240 V, 6 Amps, 47-63 Hz, Single phase
<b>Instrument options</b>	<ul style="list-style-type: none"> <li>- Instrument control panel with 5" touchscreen display and printer</li> <li>- Easy access and encapsulated electronic system</li> <li>- Rotor detection</li> <li>- Reinforced drive shaft and rotor to 300MU</li> <li>- Double channel forced air cooling system</li> <li>- Low-temperature cooling system M-Cool 10</li> <li>- M-VS 3000 constant volume sample cutter</li> </ul>

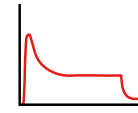
## Calculated results



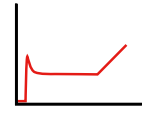
Mooney Viscosity



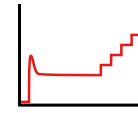
Mooney Scorch



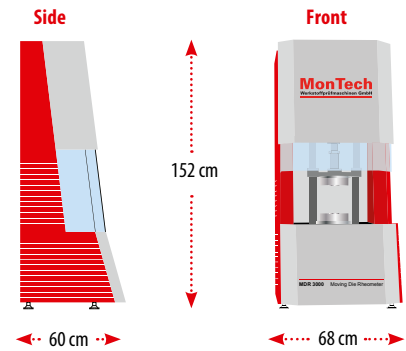
Stress Relaxation



Rotor Speed Variation Linear



Rotor Speed Variation Steps



# MonTech Mooney Viscometer

## Cooling, data and productivity options

Expand measurement capabilities and increase instrument flexibility with MonTech's unique instrument options:

### Cooling options

#### Pneumatic cooling system

Both test dies are cooled separately by a PID-controlled forced air cooling system.

This system can be used to rapidly cool the Viscometer from a higher testing temperature (e.g. testing Mooney Scorch at 160°C) to a lower testing temperature (e.g. Mooney Viscosity testing at 100°C), significantly reducing operator waiting and non-productive times of the instrument.

On the V-MV 3000, this option can further be used for running Non-Isothermal testing sequences as well as actively cooling friction heat.



#### MCool 10

Integrated cartridge cooling system that allows cooling of the test dies and rotor below room temperature down to +10°C, adding additional test capabilities especially for low viscosity materials such as silicones, latex and epoxy resins.

This technology is worldwide patented by MonTech.



### Data / IT options

#### Integrated Industrial Computer

From harsh mixing plants to cleanrooms, special environments demand special encapsulation and protection of the computer system for controlling and managing the instrument.

MonTech therefore offers machine-integrated and machine-mounted computer systems in various protection ratings, guaranteeing the highest reliability under even toughest environmental conditions.

#### Instrument Control Panel

The 5" Color-Touchscreen allows the machine to be operated from a remote computer or completely standalone for simple quality control testing.

#### RS-232 Logic Interface

Compatibility to older host or software systems as well as interfacing with proprietary third party software systems are no problem for MonTech testing instruments.

Every machine can be equipped with a serial RS-232 bidirectional interface to program the instrument as well as retrieve test data and results by a simple, standardized ASCII protocol.

#### Result and Label Printer

All test results can be directly printed from the instrument through an optional printer.

Of course, reports for single test results, test series reports and even Pass/Fail labels, with or without barcodes, are available for printing.

## Productivity options

### Enhanced instrument protection

Explosive, corrosive or other critical environments are no problem for MonTech rubber testing machinery.

All instruments can be tailored to meet any international protection rating depending on what the customer environment requires.

### Instrument table or cart

For a flexible instrument setup and utilization, MonTech offers movable instrument carts, fixed workbench carts and movable closed-instrument carts.

Please contact us to discuss your individual instrument setup and space requirements to identify your ideal workplace scenario.

### Forced air aspiration system

For a safe workplace free from smells and fumes, even when testing aggressive or hazardous materials, a forced ventilation and aspiration system can be fitted to every MonTech Mooney Viscometer.

Optionally activated carbon filtration systems can directly be integrated into the instrument.



## Reference Standards and Materials

MonTech offers a full range of precise reference standards and materials for Mooney Viscometers.

### Calibration weights

High precision calibration weight sets manufactured by MonTech are built into the instrument and controlled using a software guided calibration sequence, guaranteeing the highest accuracy and traceability for Mooney Viscometers.



### Reference polymers for Mooney Viscosity

Precut reference butyle rubber for Mooney viscosity and stress relaxation testing allows easy verification and consistency checks on Mooney viscometers. Each supply includes a test certificate and interlab validation. Compound stability is typically good for up to 10 months.

# MonTech Sample cutters for specimen preparation

MonTech offers a wide range of sample cutters and specimen preparation equipment for every need.

## MonTech Sample Cutters

### Cutting of uncured specimens and preforms

- **R-VS 3000**  
Rheometer Volume sample cutter
- **M-VS 3000**  
Mooney Volume sample cutter
- **VS 3000**  
Universal sample cutter for preforms



R-VS 3000 constant volume sample cutter

### Cutting of Polymers and rubber sheets / bales:

- **CP 3000**  
Laboratory guillotine shear cutter
- **CP 3000 Auto**  
Fully automatic bale cutter
- **CP 3000 compact**  
Small size guillotine shear cutter



CP 3000 laboratory tabletop bale cutter

### Die and universal cutting of cured rubber specimens and sheets

- **P-VS 3000 M**  
Manual die cutter
- **P-VS 3000**  
Universal clicker press
- **P-VS 3000 plus 15 kN / 40kN**  
High force universal clicker presses
- **Cutting dies and knives**
- **NC 3000**  
Nick cutter



P-VS 3000 Universal dumbbell sample cutting press

# MonTech R-VS 3000

## Rheometer - constant volume sample cutter



### The R-VS 3000 Rheometer volumetric sample cutter

With an all new C-frame design accessibility to the cutting area along with the overall stability of the cutter has been improved. The completely new design allows loading of long rubber sheets and strips without the need for making any pre-cuts. Endless rubber strips and can be simply fed through the cutter.

The reinforced C-frame consists of a single cast iron part making the R-VS 3000 the most stable and reliable volumetric sample cutter in the market.

The cutting mechanism consists of a double-acting pneumatic system, ensuring a constant, user-defined specimen volume - even on toughest materials.

The cutting sequence is simply started by simultaneously pressing the two operation buttons. Initially the material is compressed to a constant volume and in a second step after the compression time is elapsed the sample is cut automatically by a knife sliding upwards from the bottom onto the upper compression piston.



### Key features and advantages of the R-VS 3000 sample cutter:

- Integral C-frame design for easy accessibility and highest rigidity
- Longer lifetime of the knife due to compression piston / sliding knife design
- 30% higher cutting force to other models in the market > ideal for tough materials
- No consumables / cutting plates needed > eliminating the possibility of any material contamination
- Safe, easy and simple to operate > just keep the 2 pushbuttons pressed for the duration of the cutting sequence

### Technical specification

<b>Cutting diameter</b>	35 mm (others optional)
<b>Max. thickness</b>	18 mm
<b>Reproducibility</b>	0.1 %
<b>Sample volume</b>	2 cm <sup>3</sup> to 12 cm <sup>3</sup> (adjustable)
<b>Compression - time</b>	1 sec to 15 sec (adjustable)
<b>Dimensions (H x W x D)</b>	600 mm x 430 mm x 380 mm
<b>Weight</b>	approx. 90 kg net
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz
<b>Pneumatics</b>	min. 5.0 Bar



# MonTech M-VS 3000

## Mooney - constant volume sample cutter



### The M-VS 3000 Mooney volumetric sample cutter

enables higher accuracy, repeatability and optimized testing results in Mooney Scorch and Viscosity testing by preparing constant volume test samples. The M-VS 3000 features an automatic cut of a center hole for the rotor shaft along with a time delay for compressing the material before cutting. This guarantees the highest sample preparation reproducibility.

Therefore the M-VS 3000 volume cutter is fitted with a double acting pneumatic system which is controlled by a two-hand safety control system with anti-tiedown.

The M-VS 3000 sample cutter increases operator safety, reduces operational variability, and totally eliminates the need for manual sample cutting.

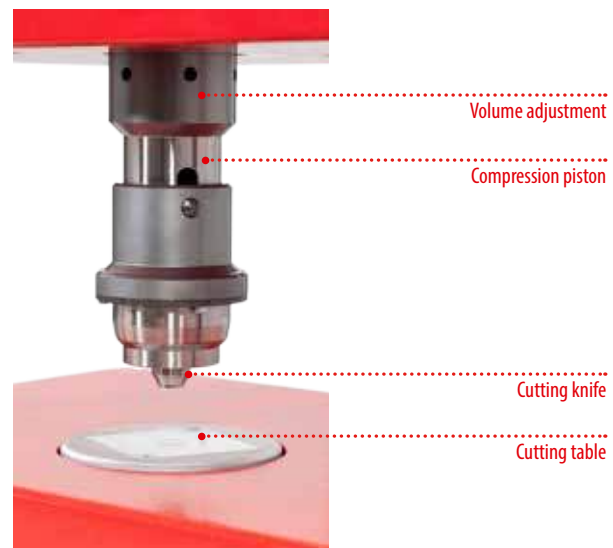


### The cutting process is a controlled 2 step sequence:

- Compression of the material to a constant volume and cutting of an inner borehole for the rotor shaft
- After a set time delay the test sample is cut to the die diameter

### Technical specification

<b>Cutting diameter</b>	45 mm
<b>Max. thickness</b>	20 mm
<b>Reproducibility</b>	0.1 %
<b>Sample volume</b>	about 15 cm <sup>3</sup>
<b>Compression time</b>	1 sec to 15 sec (adjustable)
<b>Dimensions (H x W x D)</b>	600 mm x 430 mm x 380 mm
<b>Weight</b>	approx. 50 kg net
<b>Pneumatics</b>	min. 5.0 Bar





# MonTech VS 3000

## The most universal sample cutter for preforms



### The VS 3000 universal constant volume cutter

is the ideal and reliable sample preparation tool for applications that require constant volume samples such as preforms for moulding operations.

The VS 3000 cutter works with a two stage pneumatic cylinder assembly which first compresses the material with an upper piston until a specific volume is reached, then cutting out the specimen in a second step.

This whole sequence is monitored and controlled to ensure precisely cut samples. The cutter is equipped with a pneumatic two-hand anti-tie down control, guaranteeing operator safety and simple operation.

The VS 3000 sample cutter can be fitted with knives of any diameter between 20 and 60 mm per customers requirements, making the cutter an ideal tool for easy preform preparation in lab or production environments.

### Technical specification

<b>Cutting diameter</b>	per customer requirement 20 to 60 mm
<b>Max. thickness</b>	18 mm
<b>Reproducibility</b>	0.1 %
<b>Sample volume</b>	2 cm <sup>3</sup> to 80 cm <sup>3</sup> (adjustable) (depending on knife)
<b>Compression time</b>	1 sec to 30 sec (adjustable)
<b>Dimensions (H x W x D)</b>	1120 mm x 400 mm x 390 mm
<b>Weight</b>	approx. 90 kg net
<b>Pneumatics</b>	min. 5.0 Bar



Volume adjustment

High force compression piston

Cutting table

Upward motion cutting knife

# MonTech P-VS 3000 M Manual sample cutter

## The P-VS 3000 M Lever Press

assures constant accuracy and precise cutting results. The cutter can conveniently be used for all types of ASTM, ISO, DIN, JIS cutting dies for all kind of samples made from rubber, leather and paper.

It allows easy, quick and convenient sampling with simplified operation.

The base as well as head of the P-VS 3000M cutter is made from precisely machined cast steel ensuring highest rigidity and best cutting results. An integrated height adjustment spindle allows a quick set-up and adjustment of the cutter to any height of cutting dies. Once a specific cutting height is the cutting head can easily be clamped and fixed in the particular position.

Cutting dies can easily be inserted in the precisely guided piston rod and simply clamped by a central locking screw.

The cutting table is built from durable PTFE material and fixed to a T-slot groove in the machine base. This design preserves the cutting dies from excessive wear as well as provides a solid work area.

Selection of various optionally available cutting dies for P-VS 3000 cutters:



### Technical specification

<b>Cutting force</b>	3.8 kN
<b>Cutting stroke</b>	30 mm
<b>Die height</b>	20 - 150 mm
<b>Throat depth</b>	70 mm
<b>Cutting area</b>	120 x 80 mm
<b>Max. material thickness / hardness</b>	6 mm / 95 Shore A
<b>Compatible cutting knives</b>	Any ISO, DIN, ASTM and other standard die types
<b>Dimensions (H x W x D)</b>	380 mm x 120 mm x 180 mm
<b>Weight</b>	approx. 14 kg net

# MonTech P-VS 3000

## Universal sample cutter



### Universal sample cutter

for fast and precise preparation of sample test specimens for tensile tests and all other DIN, ISO and ASTM standard sample shapes from rubber, elastomers, foam rubber, plastic films, foils and paper.

The machine cuts the exact shape of the test samples using a powerful, direct pneumatic piston ram system.

For safe and easy operation, the universal P-VS 3000 sample cutter is equipped with a two-hand safety operation system.

Any type of cutting knife can be used with the P-VS 3000 sample cutter. Knives can be changed in seconds and cutting height can easily be adjusted on the upper piston ram.

### Technical specification

<b>Cutting force</b>	8 kN
<b>Cutting stroke</b>	30 mm
<b>Max. material thickness / hardness</b>	8 mm / 95 Shore A
<b>Reproducibility</b>	0.1 %
<b>Compatible cutting knives</b>	Any ISO, DIN, ASTM and other standard die types
<b>Dimensions (H x W x D)</b>	440 mm x 300 mm x 380 mm
<b>P-VS Sliding Dimensions (H x W x D)</b>	460 mm x 300 mm x 1050 mm
<b>Weight</b>	approx. 50 kg net
<b>Pneumatics</b>	min. 5.0 Bar



### P-VS Options: Sliding table and multiple knife stations

Designed to simultaneously cut multiple samples from the same rubber sheet for increased productivity.



# MonTech P-VS 3000 Plus

## High force sample cutting press



### Direct actuated sample cutter

for multiple-blade cutting station knives or tough materials requiring high cutting forces.

Whenever there is a need to save time and increase productivity by cutting multiple samples at the same time, P-VS 3000 is the ideal sample cutter.

Equipped with 2-hand anti-tie down control and completely pneumatic operation, sample cutting is made easy and safe.

The cutting force can be preset on the regulator unit, allowing enough cutting force to ensure precise and repeatable results while maintaining a long lifetime for the cutting knife.

By eliminating any need for electric or hydraulic supplies, the cutter can easily be hooked up almost anywhere, and can even be used in cleanroom environments because of the fully enclosed design.

### Multi-station cutting knife - Three samples ISO 37 Type 2 in one cut



*For more details on cutting dies and knives in various configurations, please have a look at our dedicated sample preparation brochure!*

### Technical specification

<b>Cutting force</b>	15 kN or 40kN
<b>Cutting stroke</b>	30 mm
<b>Max. material thickness / hardness</b>	10 mm / 98 Shore A (15kN) 10 mm / 70 Shore D (40kN)
<b>Reproducibility</b>	0.1 %
<b>Compatible cutting knives</b>	Any ISO, DIN, ASTM and other standard die types
<b>Dimensions (H x W x D)</b>	690 mm x 300 mm x 380 mm
<b>Weight</b>	approx. 72 kg / 86 kg net
<b>Pneumatics</b>	min. 5.0 Bar



Multi-station cutting knife

Machine table

# MonTech Cutting knives, dies and moulds

## Universal sample cutting knives and dies

MonTech's range of cutting knives and dies are durable and built to last, machined from a solid piece of steel, precision ground and hardened.

MonTech cutting knives guarantee optimal dimensional stability, form accuracy and a long lifetime. All are available with automatic ejectors.



Standard	Type	Application	$l_3$ mm	$l_1$ mm	$b_2$ mm	$b_1$ mm	h mm	$L_0$ mm	L mm	Shape	Part - No
ISO 37	1	Preferred size	>115	33±2	25±1	6+0.4	2±0.2	25±0.5	-		MC 1.1010
ISO 37	1A	Smaller size	100	20+2	25±1	5±0.1	2±0.2	20±0.5	-		MC 1.1011
ISO 37	2	Smaller preferred size	>75	25±1	12.5±1	4±0.1	2±0.2	20±0.5	-		MC 1.1012
ISO 37	3	Smaller size	>50	16±1	8.5±0.5	4±0.1	2±0.2	10±0.5	-		MC 1.1013
ISO 37	4	Very small size	>35	12±0.5	6±0.5	2±0.1	1±0.1	10±0.5	-		MC 1.1014
DIN 53504	S1	Larger size	115	33±2	25±1	6+0.4	2±0.2	25	-		MC 1.1020
DIN 53504	S2	Preferred size	75	25±1	12.5±1	4±0.1	2±0.2	20	-		MC 1.1021
DIN 53504	S3a	Smaller size	50	16	8.5	4	2±0.2	10	-		MC 1.1022
DIN 53504	S3	Very small size	35	12±0.5	6±0.5	2±0.05	1±0.1	10	-		MC 1.1023
ASTM D 412	C	Preferred size	>115	33	25±1	6+0.05	1.3...3.3	25±0.25	-		MC 1.1030
ASTM D 412	A	Possible size	>140	59±2	25±1	12+0.05	1.3...3.3	50±0.5	-		MC 1.1031
ASTM D 412	B	Possible size	>40	59±2	25±1	6+0.05	1.3...3.3	50±0.5	-		MC 1.1032
ASTM D 412	D	Possible size	>100	33±2	16±1	3+0.05	1.3...3.3	25±0.25	-		MC 1.1033
ASTM D 412	E	Possible size	>125	59±2	16±1	3+0.05	1.3...3.3	50±0.5	-		MC 1.1034
ASTM D 412	F	Possible size	>125	59±2	16±1	6+0.05	1.3...3.3	50±0.5	-		MC 1.1035
ISO 37	A	Normal size	52.6	44.6±0.2	-	-	4±0.2	152.7	-		MC 1.1016
ISO 37	B	Small size	10	8±0.1	-	-	1±0.1	28.26	-		MC 1.1017
DIN 53504	R1	Preferred size	52.6	44.6	-	-	4±0.2	152.7	-		MC 1.1025
DIN 53504	R2	Small size	44.6	36.6	-	-	4±0.2	127.5	-		MC 1.1026
ASTM D 412	1	Preferred size	17.9	15.9	-	-	1...3.3	50	-		MC 1.1037
ASTM D 412	2	Larger size	35.8	31.8	-	-	1...3.3	100	-		MC 1.1038
ISO 34-1	A	Tear test, trouser preferred size	>100	-	15±1	-	2±0.2	-	-		MC 1.1050
ISO 34-1 and ASTM D 624	B	Tear test, angle with/ without nick	>100	-	19±0.05	12.7±0.05	2±0.2	-	-		MC 1.1055(.N) MC 1.1056(.N)
ISO 34-1 and ASTM D 624	C	Tear test, crescent with/ without nick	>110	-	25±0.5	10.5±0.05	2±0.2	-	-		MC 1.1057(.N) MC 1.1058(.N)
ASTM D 624		cutting die A	42	-	-	10.2	-	-	-		MC 1.1060

1) Cutting is only possible for specimen showing a hardness less than 85 Shore A. Harder materials shall be machined by use of milling machines or other convenient machinery acc. to ISO 2818.

2) This specimen shape is specially designed for moulding. Cut specimens do not correspond to any standard.

3) Value indicates the upper and lower tolerances.

# MonTech CP 3000

## The innovative tabletop laboratory bale cutter



### The laboratory bale cutter CP 3000

is the ideal tool for sample preparation in the laboratory environment, particularly for cutting polymer bales, blocks and rubber sheets.

Operation made easy, safe and reliable:

The bale is placed on the conveyor at the rear of the machine, and the desired portion / cut size is pushed into the bale cutter onto the lower striker plate. The cutting blade is guided by hardened, precision-ground ball bearing guides. This ensures a smooth movement of the blade and precise cuts.

The CP 3000 is quiet, pneumatically operated, requires minimal maintenance, and does not require any electrical connection.

All MonTech bale cutters feature the unprecedented monoblock cutting knife which is machined from a solid block of high-strength, corrosion proof tool steel and entirely hardened.

This means to you: Frequent re-grinding or re-sharpening of the cutting knife - that's a thing of the past!

The CP 3000 is available in two different sizes: Standard and Compact.

In addition smaller and larger bale cutters as well as various semi or fully automatic material feeding options are available upon request.



### CP 3000 Compact

The CP 3000 compact is the most compact and versatile bale cutter available.

The machine is designed for small scale laboratory applications and is ideally suited to prepare pre-cut blocks and slices of polymers for further sample preparation, such as cutting Mooney test samples with an M-VS 3000 volumetric sample cutter

The CP 3000 compact is the ideal tool for small scale and trial mixing applications where the bale cutter is typically located in close proximity to the mixer feeding - to always have to right amount of polymer available when needed.

Safety two-hand control with anti-tiedown, transparent windows at all sides and a fully enclosed top-section of the CP 3000 make it also the safest laboratory bale cutter in the market.

Like all other MonTech cutters the CP 3000 series operates free from hydraulics, meaning that operation is extremely ergonomic and bale contamination is simply impossible.

Contact us today for  
a demonstration of the  
CP 3000 bale cutter!

Technical specification	CP 3000 Standard	CP 3000 Compact
International Standards	BE EN 242 Part 2, ASTM D 7050	
Operation	Up to 12 cuts / minute	
Bale width / cutting width	max. 520 mm	max. 285 mm
Bale height / cutting height	max. 240 mm	max. 148 mm
Cutting force (adjustable)	Min: 0.6 tons @ 2.0 bar Max: 4.6 tons @ 10.0 bar	Min: 0.3 tons @ 2.0 bar Max: 2.5 tons @ 10.0 bar
Cutting knife	hardened and precision ground	
Cutting block	Teflon, exchangeable	
Material supply	roller conveyor, total length 750 mm	roller conveyor, total length 400 mm
Safety equipment	pneumatic safety 2-hand operation (anti-tiedown), transparent safety shields at both sides as well as front and backside of the machine	
Required supplies	Compressed air with min. 2 bars (5 bars recommended), No electrical connection required!	
Dimensions (H x W x D)	1085 x 900 x 700 mm	940 x 480 x 560 mm
Weight	approx. 225 kg net	approx. 120 kg net
Optional items	<ul style="list-style-type: none"> <li>- High speed version with increased cutting speed</li> <li>- Various cutting block designs</li> <li>- Increased cutting width and/or height</li> <li>- Safety lid for knife edge</li> <li>- Stainless steel / hygienic / medical / food version</li> <li>- Frontside conveyor</li> <li>- Frontside safety shield with / without conveyor</li> <li>- Backside feeding tunnel</li> <li>- Backside safety shield</li> <li>- Pneumatic downholder</li> <li>- Heated cutting knife (ambient to + 80°C)</li> <li>- Cutting line laser</li> <li>- Setup table or cart</li> <li>- Rubber bale lifting and handling systems</li> </ul>	



# MonTech CP 3000 Auto Automated bale cutting system

## Highly efficient automatic cutting system for polymer and rubber bales

The CP 3000 Auto is the most efficient way to get your sample preparation and cutting done!

Whether for synthetic or natural rubber bales this cutting system is the most efficient solution for sample feeding and preparation.

The system features a long infeed conveyor line on which bales can be buffered and fed into the machine. A PLC controlled sequence allows definition of the exact required cutting length and number of cuts.

The automatic feeding paired with a specific downholder systems ensures accurate cuts at high speed. Quick and automatic cycles ensure an optimum cutting efficiency allowing to cut a full rubber bale in less than 3 minutes. All cut material is buffered in a discharge conveyor which can be linked to storage bins or further conveying systems. For operator safety the unit is equipped with tunnels in the loading and discharge area, with a supervised maintenance door and safety light guards. Optionally ergonomic vacuum bale handling systems are available and for an increased productivity the CP 3000 Auto system can be directly linked to mixing line feeding and control, equipped with automatic bale and cut measurement sensors as well as robotic depalletizers.







### Technical specification

### CP 3000 Auto

*please refer to CP 3000 for technical details on the bale cutter itself*

#### Bale dimensions (LxWxH)

max. 800 x 520 x 240 mm

#### Conveyor lines

Loading: total length 1750 mm (940mm open)  
Discharge: total length 1550 mm (1000mm open)

#### Safety equipment

front- and backside feeding tunnel with light guards,  
supervised safety maintenance door

#### Pneumatics

Compressed air with min. 5 bars (65 psi)

#### Dimensions (H x W x D)

1920 x 3280 x 700 mm (incl. support table and conveyors)

#### Weight

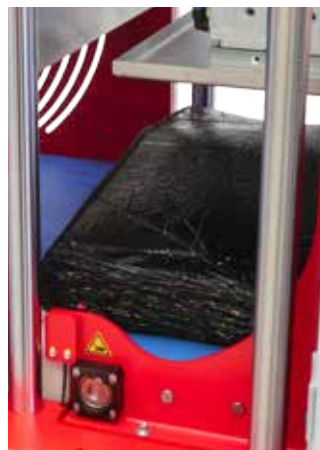
approx. 560 kg net

#### Electrical

90-250 V, 3 Amps, 47-63 Hz, Single phase

#### Optional items

- Heated cutting knife (ambient to + 80°C)
- Rubber bale lifting and handling systems



# MonTech VP 3000

## Pneumatic low force laboratory press

### The small and compact pneumatic laboratory press VP 3000

is used for fast and easy moulding, curing and preparation of rubber samples.

The VP 3000 tabletop press is equipped with a 5.7" Color Touchscreen Display for setting Cure times, Temperatures, Degassing cycles and more, making the press with its single button control the ideal tool for small scale laboratory sample production in various shapes and thicknesses.



**VP 3000**  
Small tabletop laboratory press

The VP 3000 lab press features a pneumatic closing unit, electric PID-controlled heating systems, a pneumatic safety front shield and a full protection around the press frame.

Various standards and customer specific press moulds are optionally available.

The VP 3000 can be tailored to specific sample and trial moulding needs as per specific customer and applications requirements.

### Online sample preparation

The MonTech VP and LP 3000 laboratory press series, along with optional sample moulds, are the ideal tools for online sample preparation in the production environment. The precise temperature control and homogenous temperature distribution ensure perfect samples for hardness, tensile, density, filler dispersion and abrasion testing.



# MonTech LP 3000

## High-precision hydraulic laboratory press series

The MonTech LP 3000 laboratory press series is specifically designed for rubber applications and have evolved into the international standard in precision laboratory presses in the rubber industry.

As sample preparation plays a key role in the testing process and - proven by ISO initiated interlab tests - sample preparation provides a significant influence to tests performed on cured rubber samples the ISO committee as well as the ASTM task group have defined strict standard for sample preparation processes in the laboratory. This especially covers the moulding processes in laboratory presses along with moulds and tools to be utilized:

**ISO 2393** "Rubber test mixes- Preparation, mixing and vulcanization- Equipment and procedures" and

**ASTM D 3182** "Standard Practice for Rubber - Materials, Equipment and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets"

have formulated strict specifications for the laboratory curing presses - which specifically include the following requirements:

- An evenly distributed closing force of at least 3.5 MPa ( $=N/mm^2$ ), automated degassing cycles and precision timing
- Superior platen parallelism better than 0.25mm/meter
- Extremely high thermal uniformity within +/- 0.5°C on the press platen surface and between adjacent platens

Based on these standards MonTech has developed the hydraulic laboratory press series LP 3000 presses to fulfill these rubber industry specific press requirements. MonTech presses stand for quality, reliability, high performance and easy operation with over 2500 installation all over the world.

All LP 3000 press models fully comply to the stringent requirements of ISO 2393 as well as ASTM D 3182 in all points, including press force, thermal stability and platen parallelism as well as of course CE and EN 289 requirements.

### Key features of the LP 3000 laboratory press series:

- Enclosed 4-column press frame for high rigidity
- Stainless steel press platens and tension bars
- Electric heating with superior temperature distribution and digital PID temperature control
- Pneumatic front shield with 2-hand safety control
- Integrated 5.7" color touchscreen press control
- High efficiency low-noise hydraulics



**LP 3000 - 1500kN**

Large hydraulic laboratory press with single daylight and 596 x 596mm press platens.

Here shown with optional fixed press table.

## Hydraulic laboratory press series LP 3000

With 6 different models available which compromise dimensions ranging from 196 x 196 mm to 596 x 596 mm and maximum press forces of 20 to 150 tons (200 to 1500kN) a matching system is available for almost any application and capacity requirement.

All LP 3000 presses are equipped with the latest, high energy efficient hydraulic drive and control technology, featuring rigid 4-column press frames, precision electric heating, stainless steel press platens, a full color touchscreen interface (with optional program step sequencing and data acquisition), software proximity switches as well as digital PID temperature control.

The core of each press is a closed circuit, low-noise integrated hydraulic system requiring as low as 8 to 20 Liters of oil in the whole press, operating at a pressure of up to 400 Bars, making the press very durable and energy efficient at the same time.

In combination with precision electric PID controlled heating systems, pneumatic safety front shield, and 5.7" Color Touchscreen Display for setting Cure times, Temperatures, Degassing / lifting cycles, closing speeds and switching points, these LP series presses are simple to use, reliable and rugged at the same time.

Each press can additionally be equipped with integrated data acquisition systems with up to 12 additional temperature channels, Ethernet, USB interfaces or the MonPress Computer Software, allowing users to record full press cycles including press times, forces, control temperatures, mould temperatures, degassing and more for mould-flow and cure simulation purposes or even small-scale trial production.



**LP 3000 - 200kN**

Medium size benchtop hydraulic laboratory press



**LP 3000 - 400kN**

Floorstanding hydraulic laboratory press with single daylight



**LP 3000 - 600kN**

Hydraulic laboratory press

Here shown in single layer configuration with optional frontmounted mould handling table.



**LP 3000 - 1000kN**

Hydraulic laboratory press

Here shown with optional second daylight with a total of 4 heated plates and height-adjustable press table.

## Lab Press Series / Model type

	VP 3000	LP 3000 - 200kN	LP 3000 - 400kN	LP 3000 - 600kN	LP 3000 - 1000kN	LP 3000 - 1000kN L	LP 3000 - 1500kN
<b>Type</b>	Pneumatic tabletop	Hydraulic tabletop	Hydraulic floorstanding	Hydraulic floorstanding	Hydraulic floorstanding	Hydraulic floorstanding	Hydraulic floorstanding
<b>Closing Force</b> <b>kN</b>	40	200	400	600	1000	1000	1500
<b>Press platen size</b> <b>mm</b>	ø 180	196 x 196	296 x 296	446 x 446	446 x 446	596 x 596	596 x 596
<b>Cylinder stroke</b> <b>mm</b>	100	100	300	200	300	300	300
<b>Specific platen pressure N/mm<sup>2</sup></b>	1.05	5.21	4.57	3.02	5.03	2.82	4.22
<b>Heating type</b>	electrical	electrical	electrical	electrical	electrical	electrical	electrical
<b>Capacity per platen</b> <b>kW</b>	1.6	2.8	4.0	6.0	6.0	10.0	10.0
<b>Max. temperature</b> <b>°C</b>	200	250	250	250	250	250	250
<b>Temperature accuracy</b> <b>°C</b>	+/- 0.5	+/- 0.5	+/- 0.5	+/- 0.5	+/- 0.5	+/- 0.5	+/- 0.5

## Options &amp; accessories

<b>2-Hand safety control with user modes</b>	X	X	X	X	X	X	X
<b>Pneumatic safety front shield</b>	X	X	X	X	X	X	X
<b>PLC Control with 5.7" color Touchscreen</b> <small>Program storage is standard (up to 100), Cycle programs optional</small>	X	X	X	X	X	X	X
<b>LED Status Signal tower with buzzer</b>	-	0	0	0	0	0	0
<b>LED interior worklight for press platens</b>	-	-	-	0	0	0	0
<b>Fully enclosed work area with ventilation</b>	-	0	0	0	0	0	0
<b>Data acquisition system</b> <small>offline / Ethernet or USB or online with MonPress software with 4, 8 or 12 additional PT 100 temperature channels</small>	-	0	0	0	0	0	0
<b>Proportional high precision force control</b>	-	-	X	X	X	X	X
<b>Cooling systems</b> (air / water open or closed loop)	0	0	0	0	0	0	0
<b>Enlarged ram strokes and platens</b>	-	0	0	0	0	0	0
<b>High-temperature version</b> (300°C / 400°C)	-	0	0	0	0	0	0
<b>Second daylight - totally 4 heated platens</b>	-	-	0	0	0	0	0
<b>Third daylight - totally 6 heated platens</b>	-	-	-	0	0	0	0
<b>Press table</b> (fixed / height adjustable)	-	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
<b>Mould cart</b> (movable) / <b>Mould rack</b> (stationary)	-	-	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
<b>Dimensions (HxWxD)</b> <b>mm</b> <small>(net, single layer machine without options)</small>	930 x 560 x 480	970 x 790 x 550	1695 x 800 x 590	1750 x 1250 x 800	1750 x 1250 x 800	1950 x 1450 x 900	1950 x 1450 x 900
<b>Weight</b> (approx. net, single layer machine without options)	105 kg	450 kg	800 kg	1.100 kg	1.400 kg	2.350 kg	2.500 kg

- = not available    X = Standard    0 = Option

# MonTech Laboratory curing moulds for rubber, plastics, foam, wires and trial moulding

## MonTech Precision Curing moulds - General Overview and Introduction

In our inhouse mould-making shop MonTech manufactures a comprehensive range of precise and durable sample curing moulds according to ISO, DIN, ASTM and GB standards in various different versions. MonTech curing moulds guarantee easy handling and accurate moulding results.

The molds are available with single or multiple cavities, hardened or polished stainless steel. Every type of sample preparation for any kind of material can be covered with more than 500 different types of standard curing mould designs, over 20 different material types, and more than 20 different surface finishings and coatings. Of course moulds can also be engineered, designed and machined per customer individual requirements and specifications.

## Advanced curing mould design

Every MonTech curing mould system is a precise toolset to ensure the highest sample preparation precision and optimal results.

All MonTech mould and cover plates are exclusively made from high strength stainless steel, withstanding even highly aggressive compounds and materials. The fabrication of every mould plate includes tempering to relieve all strains from the material, coplanar grinding for highest parallelism, machining with a dimensional precision of up to 0.002 mm, polishing, final inspection and quality control.

In addition to this, moulds can optionally be fitted with sensors for force, flow and temperature distribution measurement, allowing simple sample preparation, production trials and simultaneous data acquisition for tests like cure simulation.

## MonTech moulds are

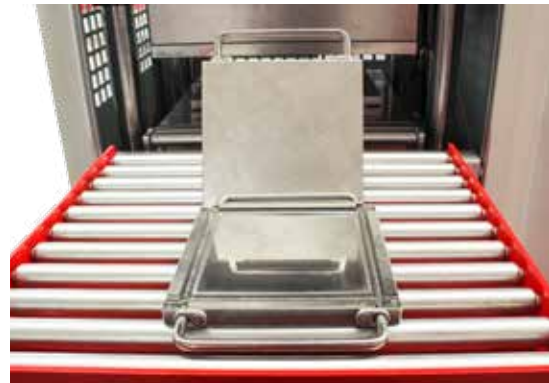
- Precisely FEM engineered and modelled
- Designed with advanced 3D solid modeling;
- CNC 5axis machined
- Precision ground
- Expertly honed
- Finely polished
- Made from High carbon content A2 mold steel
- thick, tempered mould plates resist warping, distribute heat and pressure evenly
- machined with deep overflow recesses (flash pockets) reduce overflow problems
- feature precision locator pins & receivers that assure precise mould plate alignment
- equipped with High strength fasteners which resist the effects of strain and stress and thermal fatigue

## Standard surface finishes:

- Precision ground and fine-finished ( $<Ra\ 0,4$ ) [STANDARD]
- Nitriding and black oxidizing
- Precision ground and mirror polished
- Tack reducing PTFE (Teflon) coating
- Wear-resistant TiN (Titanium Nitride) coating
- Chrome plating
- ...



Tire / Fabric cord adhesion mould "H-Test"  
according ASTM D 4776 Type 2a  
Supplied including weight set  
Part no.: MT 218-18009



ISO 2393 / ASTM D 3182 Single cavity sheet mould (150x150x2mm) Part no.: MT 218-02000



Six cavity sheet mould (6x 150x80x2mm)

Part no.: MT 218-01000



Two cavity sheet mould (2x 200x95x2mm)

Part no.: MT 218-05004

# MonTech standard laboratory curing moulds

MonTech stocks standard curing moulds for immediate delivery as well as - due to extensive in-house machining capabilities as well as a own mould making shop - can produce required curing moulds within a few days after technical clarification and drawing approval.

With over 800 moulds - solely for rubber lab applications - produced annually and wether moulds according to standards, customer adapted or individually designed moulds, MonTech is your competent partner for any sort of curing mould and mould fixture requirement.

Mould type / class	Application	No. of cavities	Cavity dimensions mm	Overall dimensions mm + cover	Remark	Part - No
Sheet mould 6 Cav	Flat sheet moulding according ISO 2393 / ASTM D 3182	6	120x80x2	346x300x17 + 12	Hinged	MT 218-01000
Sheet mould 4 Cav		4	150x150x2	396x396x17 + 12		MT 218-03000
Sheet mould 4 Cav		4	150x150x2	396x396x17 + 10		MT 218-13000
Sheet mould 2 Cav		2	95x180x2	246x246x17 + 12		MT 218-05000
Sheet mould 2 Cav		2	95x200x2	246x246x17 + 12		MT 218-05004
Sheet mould 2 Cav		2	150x150x2	346x196x17 + 12		MT 218-05005
Sheet mould 2 Cav		2	105x105x2	158x296x17 + 12		MT 218-05007
Sheet mould 1 Cav		1	150x150x2	196x196x17 + 12		MT 218-02000
Sheet mould 1 Cav		1	150x150x6	196x196x17 + 12		MT 218-02009
Sheet mould 1 Cav		1	250x250x2	296x296x17 + 12		MT 218-02005
Sheet mould 1 Cav		1	200x200x2	246x246x17 + 12		MT 218-02008
Sheet mould 80x40+40x20		4+3	80x30x2, 40x40x2	196x196x17 + 12		MT 218-24001
Multi cavity mould Small 1		various e.g.	6 / 6 / 8 / 1	Ø29x12.5 / Ø16x8 / Ø13x6.3 / 25x70x6		246x246x22 + 12
Multi cavity mould Small 2	Hardness,	6 / 6 / 8 / 1	Ø40x6 / Ø29x12.5 / Ø13x6.3 / 96x82x6	246x246x22 + 12		MT 218-06003
Multi cavity mould 3	Density,	12 / 24 / 14 / 24	Ø44x6 / Ø29x12 / Ø16x8 / Ø13x6.3	396x396x22 + 12		MT 218-06007
Multi cavity mould 4	Abrasion,	24 / 16 / 1	Ø40x4 / Ø8x4 / 72x208x4	396x396x17 + 12		MT 218-06010
Multi cavity mould 5	Rebound,	24 / 16 / 1	Ø40x6 / Ø8x6 / 72x208x6	396x396x17 + 12		MT 218-06011
Multi cavity mould 6	Compr. set,	11 / 18 / 18	Ø42x6 / Ø16x6 / Ø13x6	296x296x17 + 12		MT 218-06012
Multi cavity mould 7	Dispersion,	5 / 2	Ø43x6 / 150x150x2	346x260x17 + 12		MT 218-06017
Multi cavity mould 8	...	4 / 8	150x150x2 / Ø43x6	446x446x17 + 12		MT 218-06019
Circular button mould 2 plate	Rebound	9	Ø29x12.7	196x196x17 + 12		MT 218-06008
Circular button mould 2 plate	Rebound	16	Ø29x12.7	246x246x22 + 12		MT 218-10004
Circular button mould 2 plate	Hardness / SG	16	Ø40x6	246x246x17 + 12		MT 218-11000
Circular button mould 2 plate	Hardness / SG	9	Ø42x6	196x196x17 + 12		MT 218-11003
Circular button mould 2 plate	Ring cutting	9	Ø60x6	246x246x17 + 12		MT 218-11002
Circular button mould 2 plate	Ring cutting	20	Ø65x4	396x396x17 + 12		MT 218-06015
Circular button mould 3 plate	Compr. set	16	Ø10x10	230x160x10 + 2x10		MT 218-14004
Circular button mould 3 plate	Abrasion	16	Ø16x10	230x160x10 + 2x10		MT 218-14001
Circular button mould 3 plate	Flexometry	9	Ø18x25.4	156x156x25.4 + 2x12		MT 218-15013
Circular button mould 3 plate	Rebound small	16	Ø29x12.7	246x246x12.7 + 2x12		MT 218-10000
Circular button mould 3 plate	Hardness / SG	1	Ø39x6	Ø108x6 + 2x10		MT 218-07001
Circular button mould 3 plate	Hardness / SG	33	Ø42x6	396x396x6 + 2x10		MT 218-15003
Circular button mould 3 plate	Hardness / SG	36	Ø43x6	396x396x8 + 2x12		MT 218-15000
Circular button mould 3 plate	Hardness / SG	12	Ø50x6	346x296x6 + 2x12	fixed handles	MT 218-15015
Circular button mould 3 plate	Rebound large	9	Ø50x20	246x246x20 + 2x12		MT 218-09000
Circular button mould 3 plate	Rebound large	9	Ø50x12	246x246x12 + 2x12		MT 218-15011
Square button mould 2 plate	Hard / SG / Abr	20 / 18	51x51x6 / Ø16x6	396x296x17 + 12		MT 218-24003
Square button mould 2 plate		4	120x60x6.5	346x196x17 + 12		MT 218-03014
Square button mould 2 plate	DMA	9	70x70x0.85	310x310x21 + 11	Grid mould	MT 218-25000
Square button mould 2 plate		6 / 3	130x175x2x6 / 130x30x8	446x446x17 + 17	Mould rail	MT 218-16001
Square button mould 3 plate	Dispersion	24	30x8x6	296x296x6 + 2x10	fixed handles	MT 218-22015
Square button mould 3 plate	Dispersion	24	50x12x6	296x296x6 + 2x10		MT 218-22000
Square button mould 3 plate	Plastics sheets	4	100x100x0.5-4.5	296x296x0.5-4.5 + 2x17		MT 218-22011
Square button mould 3 plate	Foam / Sponge	1	130x130x20 conical	196x196x20 + 2x12	conical cavity	MT 218-22017
De-Mattia Fatigue	ISO 132	5	25x150x6.3 with kink	346x206x17 + 17		MT 218-04000
Fatigue to failure FTFT	ASTM D 4482	2	Strips with flanges and marks	296x346x17 + 17		MT 218-08000
Positive mould Ø50	Plastics	1	Ø200x2 / 4 / 10	246x246x27 + 17-27		MT 218-23005
Positive mould 150x150	Fabric adhesion	1	150x150x4	196x196x15 + 15		MT 218-17015
Cord adhesion H-Test 2B	ASTM D 4776 2B	10	177.8x6.4x9.52 Slot width 1.17	~450x196.8x25.4 + 12	incl. weights	MT 218-18006
Cord adhesion H-Test 2A	ASTM D 4776 2A	10	177.8x6.4x6.35 Slot width 1.17	~430x196.8x25.4 + 12	incl. weights	MT 218-18009
Cord and wire adhesion 25	ASTM D 1871	1	200x25x12.5 with 12 slots 1.15	246x146x12.5 + 12+10		MT 218-21001
Cord and wire adhesion 12.5	ASTM D 1871	1	200x12.5x12.5 with 12 slots 1.15	246x146x12.5 + 12+10		MT 218-21002
Cord and wire adhesion 50	ASTM D 1871	1	200x50x12.5 with 12 slots 1.15	246x146x12.5 + 12+10		MT 218-21003
Beadwire adhesion 50	ASTM D 1871	1	200x50x12.5 with 12 slots 1.20	246x146x12.5 + 12+10		MT 218-21004
Steel cord adhesion	ASTM D 2229	4	200x12.5x12.5 with 15 slots 1.80	300x300x12.5 +2x10		MT 218-21020
Cord adhesion H-Test ISO	ISO 4647	8	100x6.4x3.2 with 4 slots 1.2x3 (opt. 0.8x3)	~400x145x15 + 12	incl. weights	MT 218-21061

All moulds are supplied with handles and cover platen unless otherwise noted. Stated overall dimensions do not include handles (~120mm add.), hinges or rails. Hinges or rails are optionally available for each mould type. Mould calibration and certification is optionally available. Detailed specification and approval drawings for standard moulds available upon request.

# MonTech HT 3000

## Hardness testers Series

Want your samples testing?  
Contact us today

### Portable and stationary Hardness testing according to Shore

in accordance with DIN ISO 7619, DIN EN ISO 868, ASTM D 2240, JIS K7312, SRIS 0101, ...

The rugged HT 3000 hardness testers are equipped with a constant contact force by a specially designed handle, with configurable test times according to standards and simplified three button operation.

A backlit graphical display, optical and acoustical signals, display of test series average as well as direct Pass / Fail indication provide direct user feedback. A RS232 and USB interface onboard and integrated rechargeable lithium battery along with the data storage for up to 1000 test results with date and timestamp allows flexible use of the HT 3000 as a handheld unit directly in the field or stationary in the laboratory in combination with one of the available test stands types.

Optional HT 3000 hardness testers can be calibrated and certified according to ISO 17025\*.

#### Testing heads:

##### → HT 3000

Digital Handheld Shore precision hardness tester

Delivered in a rugged transport case, with cable, instruction manual and works calibration

Available in the following configurations:

- Shore A                   MH 1.1000
- Shore A0                 MH 1.1050
- Shore B                 MH 1.3000
- Shore C                 MH 1.4000
- Shore D                 MH 1.2000
- Shore D0                MH 1.2050
- Shore E                 MH 1.7000
- Shore O                 MH 1.5000
- Shore 00                MH 1.6000
- ASKER C                MH 1.9000

#### Accessories:

- Temperature and humidity measurement
- Additional centering and positioning devices
- Positioning masks and aids for laboratory or product samples
- Verification and control rings, Reference rubber blocks
- Additional loadweights
- MonLink Software System for specification and test configuration management, data acquisition and reporting.
- MonScan Software System for simple data import into any kind of software
- ...



HT 3000  
SHORE A



HT 3000 package: Hardness Tester, Test stand, Verification blocks and Control rings

#### Hardness Tester Packages:

Readily pre-configured standard hardness tester packages:

- **HT 3000 Shore A Manual package**   Part No.: MH 1.1080  
HT 3000 Shore A, Manual test stand, Charger, MonScan Software, Certificate, Set of control rings (4pcs), set of rubber reference block (7pcs)
- **HT 3000 Shore A Auto package**    Part No.: MH 1.1085  
HT 3000 Shore A, Automatic test stand, Cable, MonScan Software, Certificate, Set of control rings (4pcs), set of rubber reference block (7pcs)
- **HT 3000 Shore D Manual package**   Part No.: MH 1.2080  
HT 3000 Shore D, Manual test stand, Charger, MonScan Software, Certificate, Shore D loadweight, set of rubber reference block (3pcs)

\* Please refer to individual certificates for scope of certification / accreditation and services offered at each of our locations



# MonTech HT 3000

## Manual and Automatic test stands

A selection of test stands allow a comfortable stationary use of HT 3000 Hardness testers

Test stands vary in their level of automation to further simplify the hardness testing process and eliminate operational influence:



### HT 3000 MANUAL

Part No.: MH 8.1000

Manual test stand with simplified lever operation  
Integrated height adjustment and adjustable test surface

### HT 3000 AUTO

Part No.: MH 8.2000

Automatic test stand with motorized hardness head movement  
Single button operation and integrated power supply, controlled indentation speed acc. standards  
Optional: variable indentation speed, Pass/Fail indicator light



### HT 3000 AUTO ROTATION FIVE

Part No.: MH 8.2020

Automatic test stand with motorized hardness head movement and continuous multi sample automation by integrated rotary tray.  
Multiple readings per sample with average or median calculation.  
Simplified single button operation, different centering masks for various sample and product shapes are optionally available.



### HT 3000 AUTO ROTATION ONE

Part No.: MH 8.2010

Automatic test stand with motorized hardness head movement and single sample automation by rotating sample platform.  
Multiple readings per sample with average or median calculation.  
Simplified single button operation and optional centering masks.



# MonTech HT 3000 Modular Precision Hardness testing for Rubber, Plastics, ...

## Adaptable stationary Shore and IRHD Hardness testing

in accordance with international standards featuring a flexible changeover of testing heads and measurement applications making the HT 3000 Modular the most versatile hardness testing unit available for laboratory samples, parts and product testing.

The system features an integrated multi-axis stepper motor control to raise and lower the testing head as well as dead-load weights in accordance with the specific testing standard, type of head installed and the selected test method. This guarantees user-independent test results and an extremely good repeatability. Immediate feedback on testing results is provided by the display integrated into the testing head as well as by the optionally available MonLink computer software system or tablet computer attached to the test stand.

### The HT 3000 Modular system is a flexibly platform consisting of:

- A test stand with either integral or height adjustable table
- The pickup unit with integrated drive system and connection flange
- One or multiple testing heads according to various standards
- Optional application specific positioning and centering devices
- Optional software systems for data acquisition

All control electronics and interfaces are directly integrated into the solid base of the test stand eliminating the majority of cables, simplifying installation as well as providing a good and solid base for a high stability of the entire structure.

## HT 3000 Modular precision testing heads

The HT 3000 Modular testing heads are available in various configurations according to different standards and hardness scales so that virtually any hardness testing application can flexibly be covered. The quick connect design allows a changeover of testing heads within seconds - without the needs for tools or re-calibration.

Every testing head is equipped with a integrated precision measurement and electronic system as well as a graphical, back-lit display and control buttons.

All critical data such as head type, calibration information as well as system and measurement software is directly stored in this electronic system.

This allows easy interchangeability as well as in case of re-calibration only requires the head to be sent for calibration and not the entire measuring device.

**Please find on the following page an overview with most popular system configurations and testing heads available!**

## Application examples



IRHD Micro measurement on O-Rings



Precision centering of O-Rings



IRHD Normal measurement on parts



Laser centering and thickness measurement



HT 3000 Modular system with height adjustable test stand, Shore A measuring head

## Options and accessories for simplified handling and increased productivity

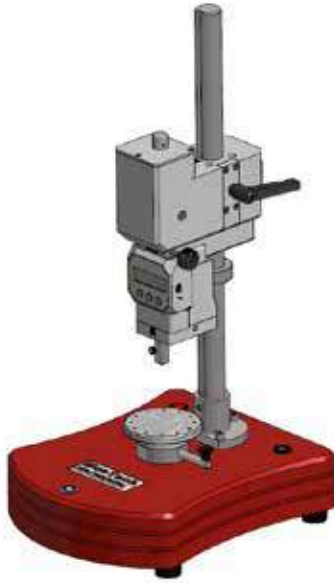
An essential part of the HT 3000 Modular product range are application specific accessories to simplify testing for any kind of rubber part or geometry.

Available accessories include manual or automated fixing, holding, centering and alignment devices for oil-seals, O-rings, sealing profiles, ...

Additional options include integrated laser thickness gauges, automated sample handling, temperature control units, verification control rings and rubber blocks, accredited calibrations as well as a variety of software systems for specification management, data acquisition with graphical display as well as reporting.

# MonTech HT 3000 Modular System Overview

The main part of a HT 3000 Modular System is the test stand - with integrated electronics system and height adjustable pickup bracket:



Modular test stand with tilting table and integrated electronics unit



Modular test stand with height adjustable table and integrated electronics unit

Test stands can be combined with over 40 available types of testing heads according to different measurement scales and methods:



Shore A / B / C / D  
for flat sheets and buttons



Shore D / C / DO  
for specialty parts testing



Shore A / B / O  
for parts testing / uneven surfaces



Shore O / AO / DO  
for parts and materials



Shore 00  
for very soft materials



Shore 000 / 000-S  
for extremely soft materials



Shore M / AM  
for soft miniature parts testing



Micro Shore A  
Shore hardness testing for thin parts



VLRH  
Very low rubber hardness



IRHD N / H / L  
for soft to medium rubber parts



IRHD M  
Micro hardness testing for small parts

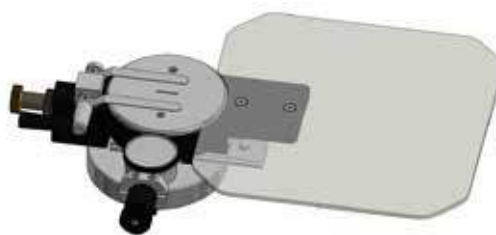


Universal Force / Load Testing  
with 10N or 50N loadcell

In addition the HT 3000 Modular system can further be expanded with accessories for sample handling and data processing such as:



Rubber reference blocks available in sets provide quick and simple verification possibilities



Mechanical centering system with / without table extension available in different configurations for O-Rings, hoses, parts, ...

- Stationary table extensions
- Parts and sample fixtures
- Rotating sample holders
- Stands for production integration
- Certified reference rubber block sets
- Indenters and Control rings
- External display units
- MonScan data import software
- MonLink data management system
- LIMS, CAE and CAQ integration

## MonTech HT 3000 Modular Sample and part holding for your needs!

### Hardness testing can be tricky - MonTech has the perfect fixture for every challenge!

Even if your part is extremely delicate, tiny or hard to handle - with MonTech test fixture you will always be able to find a perfect and reliable way to position and locate your sample. This guarantees highest reliability and reproducibility of every single test result.

All fixture feature a quick change system for shortest setup times as well as adjustable measurement position and sliding table for safe any easy changeover of the test sample. Automated test stands are plug and play with digital identification and setup / calibration data stored directly in the individual fixture.

#### Our selection of test fixtures - readily available from stock - covers:

- Laser centering device with thickness measurement for buttons and O-rings
- Mechanical centering device for O-rings
- Clamp and extension tables
- Diaphragm quick centering device for circular parts
- Holder for rubber tube and hoses
- Centering prisms
- Support prism for small rubber rollers
- Three- or Four-jaw chuck
- Clamping vise with 20 or 50mm opening
- Manual interlocking rotation table
- Auto-Rotation table for single samples
- Auto-Rotation table for multiple samples
- Tack and sheet testing table
- Centering tool for granules and pellets
- Fixture for cables and wires
- Positioning device for capsules and tablets
- Holding frame for Printed Circuit Boards
- Portable fixtures for encapsulations, solar cell and composites
- ...



**Haven't yet found the right fixture for your testing challenge? No Problem!**

**MonTech can tailor one of our many standard fixtures exactly to your need or purpose design a special solution for you!**



# MonTech Physical testing Automation solutions From compact to smart - from tabletop to robotic

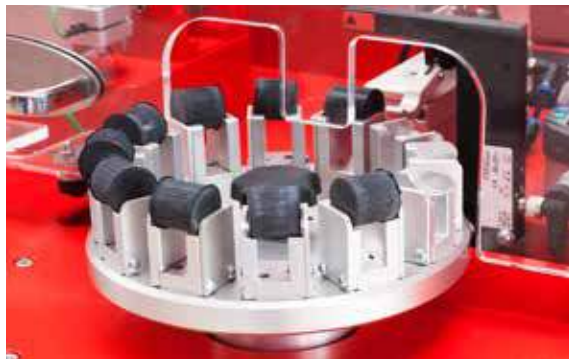
**Can keep up with testing? Samples everywhere? We've got you covered with our intelligent solutions!**

Besides a complete range of standalone or production integrated automation solution MonTech can tailor automated testing for your parts and laboratory space. Utilizing latest industrial automation technology our system provide a solid testing platform generating reliable results with a short return on invest.

**We partner with you to create the ideal automation solution for your budget - for example:**



MonTech collaborative Testing Cells that integrate many different tasks in one, modular unit integrating sample preparation, handling and testing in one unit. Preparation tasks that can be covered include sample identification, sorting and preparation, moulding, cutting, conditioning and ageing. Integrated testing system for performing - besides rheological tests - all physical and mechanical tests required - e.g. Viscosity, Hardness, Density, Rebound, Tensile, Elongation, Compression set and many more. After test completion samples are collected, if required labelled and automatically stacked and stored.



Blow-Out and Heat-Build-Up testing

All our automation solutions come with a whole range of interfaces as standard allowing customers to integrate MonTech devices into their Industry 4.0 and IoT environment. This includes Serial RS232, USB, Ethernet, ASCII and CSV, OPC UA, Open Database Connectivity (ODBC) as well as configurable SQL Im- and Export interfaces utilizing predefined and also configurable formats. Our systems directly integrate with many industry standard solutions such as SAP, EDI, Minitab, QDAS, ...

***Be smart and ask us how we can automate your lab!***



Smart Production Hardness testing with HT 3000 Sort



Traceable Samples and Results? Any time. Guaranteed!  
With MonTech AutoID technology based on RFID, QR and Barcode systems

# MonTech HT 3000 Modular Universal Autohesion and Tackiness testing

## The revolutionary HT 3000 Modular Tack testing system

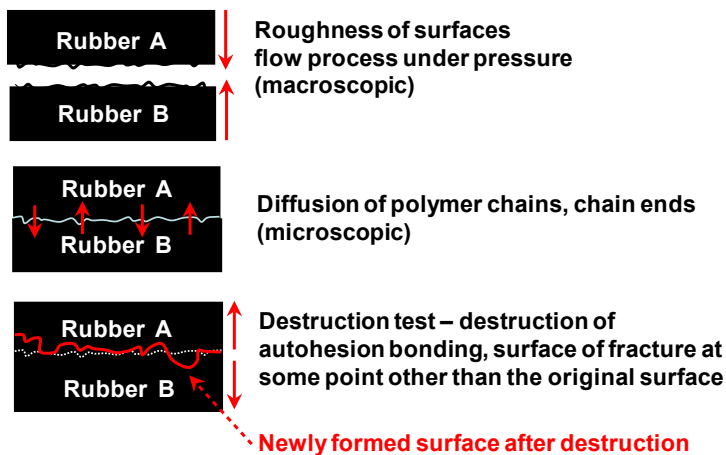
is a new, highly efficient and reliable procedure for the determination of the tackiness of rubber materials.

Designed for a variety of applications – not only for the tire industry – the system is capable of determining the tackiness / autohesion (static friction force) of rubber and polymer materials. Tack testing allows to precisely distinguish between different polymers, tackifiers or fillers provided from different sources and between different batches.

The Tack testing head has simply been designed as an additional testing head for the HT 3000 Modular system - intuitively increasing the testing capabilities of this system which is traditionally used for flexible hardness testing applications - minimizing total investment costs and saving precious space in the laboratory.

### Typical tack testing applications include:

- Determination of the tackiness (autohesion) of „Green Tires“
- Stickiness and Tackiness of epoxy resins (adhesion and autohesion)
- Adhesion testing of components such as calendered materials against each other or against fabrics
- Tackiness of varnish/paint work
- Pull and attraction forces of magnets



### The modular sample holder and test support design provides a flexible changeover for different test setups:

- ✓ Cured rubber samples vs. standard surfaces (polished steel, tar, abrasives, glass...)
- ✓ Green samples vs. standard surfaces (films, papers, talcum, fabrics, ...)
- ✓ Tackiness of epoxy resins (autohesion)
- ✓ Adhesion testing of component segments such as calendered materials against each other or against fabrics
- ✓ Tackiness of varnish/paint work
- ✓ Pull and attraction forces of any materials against other materials or surfaces

The unique sample holder design of the MonTech Tack testing system eliminates traditional challenges like imperfect contact areas due to trapped air and allows for a simple repetitive or multi reading procedure by a rotating specimen holder. The fully automated test process guarantees higher throughput, simplified sample preparation and higher accuracy compared to traditional tack testing methods such as a T-Peel and rolling ball tests.

### Test procedure definition and data acquisition:

Tack testing procedure are simple to setup as the entire testing process is controlled by the MonLink software allowing to easily create multi step and multi stage test procedures allowing highest flexibility and test parameters and measurement setups:

- Absolute values of deformation, force, initial sample length  $L_0$ , time and speed can be defined for each measurement step
- Variation of the following parameters: pressing force, pressing time, pressing speed, separation speed with closed loop control
- Determination of the peel force („tack“ force) to the separation
- Storage of the raw data curves and calculated value, graphical presentation and reporting
- Integrated clamping quick clamping mechanism for samples - additional or customer specific sample holder are optionally available.

## **Force, Displacement & Load testing head**

### **A new level of modularity beyond Hardness tests**

**Have you ever ...**

- ... wondered why you favorite gummy bears always chew the same?**
- ... asked yourself why your mattress is just right to have a perfect sleep?**
- ... thought why the dashboard of your car feels so nice?**

**The answer is pretty simple:**

**All these products and the materials they consist of were developed and thoroughly tested with the universal HT 3000 Modular Force testing system!**

The miniature force and displacement measurement system has been integrated into the Force testing head which seamlessly integrates with the HT 3000 Modular base units. The versatile testing head is equipped with:

- ✓ Precision displacement transducer with 0,0001 mm resolution.  
The height adjustable testing head as well as measurement table simplify test setups and sample mounting
- ✓ Calibrated Load cell for the measure of the force (Available loadcells include +/-2N, +/- 10N, +/-20N and +/- 50N)  
The integrated dead-weight calibration system allows easy verification and recalibration by the user. (available for transducers  $\geq 10N$ )
- ✓ Interchangeable indenter probes for force application  
70 standard probes are readily available covering e.g. flat, ball, cones, truncated cones, knife die and slit shapes in various diameters

The variable test procedure programming for Force / Load, Displacement or Time controlled operation in compression and tension paired with multi-subtest routines allow user to cover highly complex test procedures such as hysteresis, creep and slow cycle fatigue testing.



# MonTech HT 3000 Chamber

## Environmentally controlled Hardness testing

### High-end, application based hardness testing under thermal influence

Understanding product performance at the specific applications conditions is a key criteria to design and produce high performance parts and components. In the tire, automotive, aerospace as well as general technical rubber industry parts and products are subjected to a huge thermal spectrum – in order to understand the material behavior and especially the change of the material hardness under those extreme conditions, the HT 3000 chamber has been developed.

The HT 3000 Chamber consists of an all-stainless 240 Liter measuring chamber available in two temperature ranges from  $-40^{\circ}\text{C}$  to  $+180^{\circ}\text{C}$  or optionally  $-70^{\circ}\text{C}$  to  $+180^{\circ}\text{C}$ .

Optionally the chamber can also be equipped with controlled humidity or de-humidification. High air circulation rates inside the test area guarantee uniform temperature and humidity distribution in the test space.

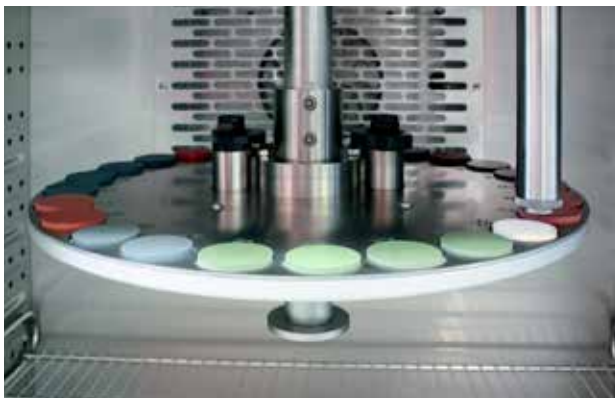
An outstanding spatial temperature distribution is achieved through aerodynamic air flow not only from the backside but also from the sides of the chamber. The HT 3000 chamber is fitted with a highly energy efficient, triple stage compressor unit with a closed refrigeration system. This completely eliminates the need for external gases or cooling media, allowing continuous operation at lowest operational cost.

On top of the chamber a specifically adapted HT 3000 Modular testing unit is mounted with a specially adapted Shore A or IRHD testing head reaching all the way into the chamber. All tests are in full compliance with DIN 53505, ISO 868, ISO 7619, ASTM D 2240, JISK 6253 (Shore A) or DIN ISO 48, NFT 46-003, ASTM D 1415, BS 903, Part. A26 (IRHD N) . This design guarantees that the precision measuring mechanism with all critical components remain outside the chamber while the test specimens are precisely subjected to the thermal profile required by the specific application.

#### **Fully automatic or manual operation - available test configurations in the chamber:**

- Rotary tray with up to 25 sample position for automated sequential sample testing at multiple points on multiple samples or sample groups
- Stable platform for products and parts testing, complete with a special specimen holder and porthole access to the holder from the right side of the chamber.

All test processes of the HT 3000 Chamber are precisely controlled by the MonLink software where test series can be configured, samples can be identified and grouped as well as thermal sequences can be configured. In automatic mode the chamber follows an exact temperature profile testing samples at multiple points in set intervals whereas thermal stability is closely monitored. This allows even longtime ageing test as well as creep testing sequences to be programmed and executed fully automatic. In manual mode product or part samples can be tested quickly by simply placing the specimen in the test area, setting the desired temperature and conditioning time.



The entire testing process can be monitored through the large, heated viewing window at the front of the chamber.

Integrated in the 5 layer insulated and heated window is a LED light bar for a clear visibility inside the test area.

All testing sequences are fully software guided sequences provide the operator with all necessary information to execute and monitor single or series tests.

All data during the testing process is stored automatically in a database as well as a report format and available for a detailed analysis later.

This includes data and plots on Hardness vs. Temperature, Hardness vs. Time, ... Customized configurations of the chamber and automation unit are available upon request.





# MonTech DM 3000

## Semi-Automatic Densimeter

### Densimeter for testing of individual samples with automatically guided test sequence and precision weighing system

The MonTech DM 3000 is a semi automated Densimeter. The compact instruments is designed for rapid and accurate determination of specific gravity - with a simplified, software guided operation up to 4 tests per minute can be performed.

The Densimeter utilizes the hydro-static method by comparing the weight of the sample in air as well as in an immersion liquid. For optimum test results for different types and shapes of samples a wide variety of sample holders are available (e.g. basket, needle, wire, pellet, clip, ...).

The operator simply hangs the sample from the balance and pushes the start button.

A intergrated precision scale then weighs the sample in air, automatically raises a beaker with the immersion liquid, takes the weight of the sample in the immersion liquid and lowers the beaker.

This whole process is software guided and once the procedure is completed the density is displayed. Additionally the sample weight in air, weight in water, and the weight difference are also recorded and reported.

#### Technical specification

<b>Measurement method</b>	Hydro-static weighing method
<b>Measured data</b>	Density, Mass change, Volume change
<b>Weighing range</b>	0.000 to 420 grams (0.0 to 160.0 grams with optional 0.1mg resolution)
<b>Sample weight (typ.)</b>	1.000 to 50.000 grams
<b>Density range</b>	0.50 – 10.00 g/cm <sup>3</sup> (lower density range possible with anti-float or needle holder)
<b>International standards</b>	Rubber: ISO 1817, ISO 2781, ISO 4649, BS 903, EN 681-1 ASTM D 297, ASTM D 471, ASTM D 5963 Plastics: ISO 1183-1, ASTM D 792 Hoses: ISO 7840 Cellular foams ISO 6916-1, ISO 6916-2, ASTM D 1056, ASTM D 3574
<b>Resolution</b>	1 Milligram (optional 0.1mg) / 0.00001 g/cm <sup>3</sup>
<b>Repeatability</b>	Better than ± 0.020%
<b>Output interfaces</b>	Serial (RS232), USB 2.0 optional
<b>Dimensions (H x W x D)</b>	565 (765) mm x 250 mm x 480 mm
<b>Weight</b>	approx. 23 kg net
<b>Electrical</b>	90-250 V, 2 Amps, 47-63 Hz, Single phase
<b>Options</b>	- Various sample holders (Basket, Needle, Wire Pellet, Clip, ...) - Anti-float bracket - Variable dipping speed - Auto correction of water density (temperature sensor installed in beaker) - Spare standard or double wall beaker - Digital clip-on thermometer - Temperature control kit (+5 to +80°C) according ISO 1183-1 (includes double wall beaker, silicone hoses, external chiller system with fluid)



LED Workroom lights

#### Features:

##### Ease of Maintenance

- Snap-in Components
- Simple and rugged mechanics

##### Ease of Use

- Single Button Operation
- Guided operation sequence
- Fully automated calibration
- LED workroom lights

##### Applicable Data Measurement

- Density
- Volume change

#### Scope of delivery:

- DM 3000 Densimeter main unit
- Standard glass beaker
- Integrated electronic lift device
- Basket sample holder for solid samples
- Glass safety shields and sliding doors
- MonLink Software for Density measurement
- Instruction Manual and calibration certificate
- Standard accessories, cables

## MonTech H&D 3000 Automated Hardness & Density Testing Instrument

**2 INSTRUMENTS IN 1:** With the MonTech H&D 3000, hardness AND density testing of cured rubber samples is made simple, fast and reliable. Arbitrary test sequences are easily pre-programmed, samples are sequentially processed and test data is automatically collected, without the need for operator involvement. Due to the unique rotary tray design, no manual magazine handling is needed; the instrument can be continuously loaded and operated.

- Hardness and Density testing is combined together into a single tabletop machine requiring minimal bench space in the lab. The system is designed for unattended operation with a fully automated test sequence, totally eliminating any operator influence.
- Test samples can be continuously loaded into an endless rotary tray at the front of the machine and are identified directly on the computer by a host system or by a barcode.
- Fully synchronized parallel operation of hardness and density measurement permits total cycle times about 50 Seconds!  
(3 points Shore A + Density)
- During each test, the environmental and immersion fluid temperatures are accurately measured and recorded for a fully automated compensation of the specific gravity test results.
- All test results are recorded online by the MonDevice software system featuring extensive test specification management, more than 60 different datapoints specially for the H&D 3000, automated Pass / Fail evaluation and data export to host systems and databases.
- A standard analytical balance with integrated calibration is used for density testing, providing the most accurate results and full traceability. The scale is digitally connected to the main instrument controller for automatic data transmission





### Hardness measuring head

The motorized and weight loaded hardness measuring unit featuring an integrated alignment and a digital measurement of the indenter displacement guarantees

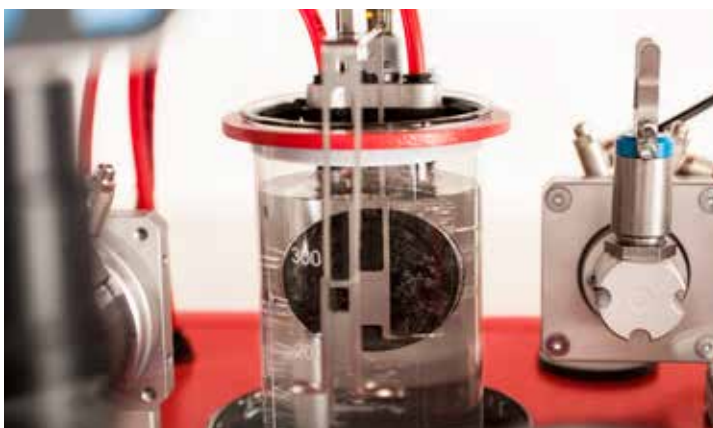
the highest precision hardness readings on up to 5 different test points per sample.

Various types of hardness heads from the HT 3000 and HT 3000 Modular series - in accordance to international standards such as Shore A, Shore D and IRHD are available. (multiple or interchangeable configurations available)

### Precise sample handling

Stainless steel linear, rotational and multiposition electronic / pneumatic actuators provide safe and reliable handling of test samples.

Actuators are mechanically separated into two groups: one for dry and one for wet samples to avoid any cross-contamination of the samples prior to weighing in the immersion liquid.



### Integrated pump circuits

ensure that the level of the density liquid in the dip tank is carefully controlled. After each density test, an adjustable amount of liquid is automatically renewed, keeping the density liquid fresh and in good condition.

Also the pumps can be used to automatically fill, empty and change the density liquid in less than 30 seconds.



### Endless rotary tray magazine

The rotary sample tray allows continuous operation of the machine, totally avoiding any unproductive time.

The testing area is separated by a supervised transparent safety door and covers all around the machine.



### Hydrostatic weighing

Density / Specific gravity is determined by using the "weight in air" and "weight in water" methods.

The H&D 3000 features two integrated weighing stations.

After weighing the sample in air on the first weighing station, and placing the sample on the second weighing station, a user-defined number of wetting cycles can be programmed to remove any air bubbles around the sample. Afterwards the weight is taken.

Simultaneously, the temperature of the density liquid is measured and used as a correction for density calculation.

All readings are rapidly taken by a precise weighing system based on a standard analytical precision scale, minimizing the possibility of water absorption by the sample.



### Sample removal

All test samples are automatically removed after being tested and put into a separate container on the lower left side of the instrument.

This guarantees that rotary tray for fresh samples never gets contaminated with the liquid used for density testing- for continuously highest accuracy and precision. Optionally, samples can be automatically sorted in separate containers for passed and failed specimens.

**Technical specification - General**

<b>Samples</b>	Cured rubber discs
<b>Sample diameter</b>	Circular discs with 30 - 45 mm diameter, 5 - 8mm thickness (other dimensions and shapes available on request)
<b>Sample capacity</b>	Continuous rotary sample tray with 20 sample capacity (Optional sample trays up to 2000 samples are available)
<b>Data Interface</b>	Ethernet (10/100 MBit), USB (int.), CF card (int.), RS232 (opt.)
<b>Dimensions (H x W x D)</b>	600 mm x 650 mm x 680 mm
<b>Weight</b>	approx. 80 kg net
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz, Single phase
<b>Instrument options</b>	<ul style="list-style-type: none"> <li>- Rotary and stacking sample magazines for up to 2000 samples</li> <li>- Barcode scanner for Compound and Batch identification</li> <li>- Additional Hardness testing heads: Shore B, C, D, DO, O, OO, OOO, Micro A, Micro D, IRHD N, M, H, L, VLRH</li> <li>- Sample separation in different containers or stacks (Pass / Fail)</li> <li>- Rebound testing integration</li> <li>- ...</li> </ul>

**Technical specification - Density**

<b>Test method</b>	Hydrostatic weighing according ISO 2781, ASTM D1817
<b>Measurement range</b>	< 1.0 g/cm <sup>3</sup> to 2.8 g/cm <sup>3</sup> (lower density range possible with anti-float holder)
<b>Temperature Measurement</b>	Standard for immersion fluid and ambient temperature

**Technical specification - Hardness**

	<b>Shore A</b>	<b>IRHD N</b>
<b>Test method</b>	Shore A in accordance with: ISO 868, DIN 53505, ASTM D2240, ISO 7619, NFT 51-174, BS 903-A26	IRHD N in accordance with: DIN ISO 48, ASTM D1415, NFT 46-003, BS 903-A26
<b>Indenter</b>	Hardened steel rod Truncated 35° cone 0.79 mm diameter	Spherical Ball 2.50 mm diameter
<b>Measurement range</b>	0 - 100 Shore A	0 - 100 IRHD
<b>Pressing force / load</b>	Contact pressure: 12.5 N Spring Force: 8.065 N	Preload: 0.29 N for 2 Seconds Main load: 5.4 N for 1-99 Seconds
<b>Resolution</b>	0.1 Shore	0.1 IRHD

# MonTech RD 3000

## Density Tester for uncured rubber compounds

Automatic compression density tester for uncured rubber compounds and polymers



### The RD 3000

is the simplest way to measure density and specific gravity of raw polymers, masterbatches and uncured rubber compound specimens of any geometry. Due to the extremely rugged instrument design, the RD 3000 is suited for laboratory and production environments.

The true innovation of the RD 3000 is the way it measures density. Typically, a strip of rubber is cut directly from the mill, identified at the control panel of the instrument and weighed. All air is compressed out of the sample in a compression cylinder and the volume of the material is taken. Once the density is automatically calculated, it is checked against tolerance limits and displayed along with Pass / Fail status.

For automatic acquisition and processing of all test related data, the RD 3000 is equipped with:

- a fully integrated precision scale
- an electronic piston measurement device
- a PLC color 5.7" touchscreen control panel system
- MonDevice PC-Software for data acquisition and storage (optional)
- an integrated printer (optional)
- a barcode scanner (optional)

### A single test only takes about 20 seconds comprising the following steps:

#### ① Weighing

The sample is placed on the electronic balance which is integrated into the machine table. Therefore only stable weight readings will be accepted.

#### ② Compression of the sample

The sample material is filled into the compression cylinder barrel and the compression of the material is started. Once the piston finally reaches a stable position in the compression process, all air is removed from the sample which means that the test sample is compressed to its specific volume.

#### ③ Volume determination

The sample volume is determined by calculating the difference between the piston stroke at an empty cylinder, and the piston position with the specific test material.

#### ④ Density calculation

The density of the sample is calculated automatically from the weight and the determined volume.

#### ⑤ Displaying of test results

The calculated sample density is displayed on the control panel or in the MonDevice software along with all other results in the test sequence.

Single tests and test series results can also be directly printed by an optional built in printer.

### Technical specification

<b>Density</b>	Density range: 0.8 - 5.0 g/cm <sup>3</sup> Accuracy: 0.1 % Reproducibility: 0.03 %
<b>Sample volume</b>	Required sample volume: 40 - 120 cm <sup>3</sup> Recommended sample volume: approx. 100 cm <sup>3</sup>
<b>Integrated scale</b>	Sample weight range: 0 - 420 g Resolution: 1 mg
<b>Compression cylinder</b>	Diameter: 60 mm max. stroke: 80 mm
<b>Pneumatics</b>	Supply: 5.5 - 10 bar Pressure range for compression: 4.5 - 5.5 bar Compression force: 40.0 kN (at 5 bar) Volume of air / cycle: 64 L (= 64 dm <sup>3</sup> )
<b>Data Interface</b>	Ethernet Network (10/100 MBit), Serial RS232 (optional)
<b>Dimensions (H x W x D)</b>	1085 mm x 525 mm x 720 mm
<b>Weight</b>	approx. 190 kg net
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz, Single phase
<b>Environmental conditions</b>	<b>Storage:</b> Temperature - 25°C - + 55°C relative humidity 5 - 95 %  <b>Operation:</b> Temperature + 5°C - + 45°C relative humidity 5 - 95 %
<b>Instrument options</b>	- Barcode scanner for Compound and Batch identification - Integrated test result and test series result printer - Serial (RS232) Output Interface - MonDevice control and data acquisition software



**RD 3000 Operating workspace**

Panel, Barcode Scanner (Opt.), Weighing and Compression cylinder



**Fully Integrated weighing system**

with automatic, guided calibration sequence



**Compression cylinder**

made from stainless steel, precision ground



**Stainless steel crosshead**

with integrated safety and limit switches for safe operation

# MonTech RB 3000

## Rebound Resilience Tester

### Automatic Schob pendulum impact elasticity tester for elastomers and foams

#### The RB 3000 automatic Rebound Resilience tester

allows the determination of the resilience properties of rubber and elastomeric materials according to DIN 53512, ISO 4662, ASTM D 1054 and ASTM D 7121.

Rebound resilience is defined as the relation between the returned and the impact energy between the hammer with its fin, the specimen and the instrument.

The samples used for testing are typically rubber and elastomeric materials as buttons or strips in a hardness range of 25 to 95 Shore A / IRHD N.

MonTechs RB 3000 resilience tester features a rigid design with all main components integrated into the machine frame - the electronics with 5" touchscreen display, data interfaces as well as the entire mechanical system which is precisely manufactured from high strength and aluminum. The pendulum mechanism features a 15mm diameter hammer fin and is connected via the pendulum arm to a virtually frictionless air bearing system connected to a high resolution non-contact encoder system guaranteeing highest precision in pendulum angle measurement.

A fully integrated spindle with adjustment gauge and clamping allows a quick and easy setup of the test specimen thickness so that testing can start right away.

The RB 3000 is equipped with a motorized pendulum release and return allowing a fully automated test sequence without any user interference.

Once the operator presses the start button on the multi-language touch-control panel, the instrument executes the selected test sequence automatically - including up to three pre-hits and three test hits according to standards. Once the test sequence is completed the test results are automatically displayed on the built in 5" touchscreen as well as also the median is calculated.

#### ***The RB 3000 Rebound Resilience tester has been designed keeping safety, comfort but also ease of use in mind:***

- ✓ Simplified touchscreen operation, menu guided with various comfort functions such as different test modes, parking and service functions
- ✓ Safety integrated Starting a test sequence is only possible once a sample has been placed on the anvil protecting hammer and anvil against any kind of damage
- ✓ Automatic detection of incorrect placed or shifted specimens
- ✓ Fully automated test sequence with motorized pendulum release and return eliminating almost any operator influence
- ✓ Integrated calibration routines allow the user to measure, calibrate and compensate the pendulum friction and release angle
- ✓ Interchangeable hammers, fins and anvil plates for various applications and sample types
- ✓ Easy setup with levelling feet and integrated spirit level and completely maintenance free mechanical system
- ✓ Optional temperature control with stability monitoring allows a test only to be started once the set temperature is reached



*Increase the testing capabilities and productivity of the instrument by adding some of the various options available:*

- Test results are only as reliable as the samples and their preparation: MonTech curing moulds and lab presses allow highly accurate sample preparation
- The RB 3000 is ready to connect through the integrated USB and RS232 Interface to the MonLink PC software adding full data acquisition and SPC capability
- One of the three available temperature control systems will allow testing at elevated or even sub-ambient temperatures
- Automated sample handling systems can highly increase throughput and efficiency and allow operator to focus on other activities



### Technical specification

<b>Measurement method</b>	Pendulum rebound resilience measurement (Schob type)
<b>Test modes</b>	Single, Median of 3 tests (with 3 or 4 conditioning hits)
<b>International standards</b>	DIN 53512, ISO 4662, ASTM D 1054, ASTM D 7121, JIS K 6255, DIN 13014 (Foam)
<b>Operation</b>	Fully automated with automatic pendulum lift and release
<b>User interface</b>	Integrated 5" color - Touchscreen
<b>Sample dimensions</b>	Cured rubber buttons or sheets with 0 to 30 mm thickness 28 to 65 mm in diameter or 50 x 50 mm in size
<b>Anvil distance</b>	0 to 60 mm (steplessly adjustable)
<b>Release angle</b>	90°
<b>Resolution / Accuracy</b>	0.001° arc / 0.1% Rebound Resilience
<b>Hammer fin</b>	hemispherical, 15 mm in diameter
<b>Impact velocity</b> <b>Impact energy</b>	1.98m/s 426.5 kJ/m <sup>3</sup>
<b>Pendulum capacity</b> <b>Pendulum length</b> <b>Pendulum mass</b>	0.5 Joule 200 mm 255 g
<b>Output languages</b>	English, French, German, Spanish, Russian (others on request)
<b>Output interfaces</b>	Serial (RS232) and USB 2.0
<b>Data acquisition</b>	MonLink software (optional) for test configuration management, data acquisition and statistical evaluation
<b>Dimensions (H x W x D)</b>	370 mm x 580 mm x 180 mm
<b>Weight</b>	approx. 50 kg net
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz, Single phase
<b>Options</b>	<ul style="list-style-type: none"> <li>- Reference rubber samples</li> <li>- Specimen curing moulds in various configurations</li> <li>- Pendulum for foam tests: Hammer with 0.196J / dia.=30mm</li> <li>- Pendulum for foam tests: Ball with 0.2J / Cyl. dia.=40mm</li> <li>- Heating system, ambient to +100°C</li> <li>- Heating / cooling system, -20°C to +100°C</li> <li>- Advanced heating / cooling system, -40°C to +100°C</li> <li>- Vacuum sample holder system</li> <li>- Multi sample automation</li> </ul>



Anvil plate with integrated sample sensor and sample height adjustment



Hammer 0.5 Joule with 15mm fin



Sample holder



Heating system, ambient to +100°C

A second version of the RB 3000 rebound tester has been configured specifically for foam testing according to DIN 13014 (Polyether foam hospital mattresses) featuring two different types of interchangeable pendulum inserts with either a ball radius configuration of R=40mm and a 40mm cylinder diameter or alternatively a hemispherical hammer fin of 30mm diameter.

# MonTech Disper Tester 3000

## Carbon black dispersion tester

Computer aided, advanced digital reflected light microscopy brought to the next level

### The DisperTester 3000

is the most easy to use instrument for filler dispersion analysis; providing superior compliance, reproducibility and repeatability. The DisperTester provides accurate, repeatable results in seconds for both vulcanized and uncured rubber compounds that are applicable to the process, allowing quick and easy testing of dispersion compared to other optical techniques which often take hours to perform (less than 2 minutes with sample preparation).

The DisperTester 3000 is equipped with cutting edge digital image processing to automatically determine dispersion ratings, filler distributions and agglomerate sizes. Up to 5 individual readings can be taken in order to precisely evaluate the dispersion and detect possible variations along the surface of the sample.

To increase testing possibilities even further, the MonDispersion software features variable brightness, contrast and exposure, as well as focus control for every type of test material, allowing colored or even white samples to be tested.

The DisperTester 3000 system includes built-in reference scales and can be used for all filler types including Carbon Black, Silica and natural inorganic materials with fully automatic calculation of X value, Y value, Z %, Dispersion %, White area %, ... in accordance with international standards. All data is processed automatically by the MonDispersion software. Agglomerates are automatically highlighted and can even be manually measured by their diameter and normalized area. Test results are stored in an SQL database. PDF reports along with distribution spreadsheets and histograms are created and images are stored into an image database in a high-resolution JPEG format. Of course custom reference scales can be easily added by the user at any time.

The determination of filler dispersion in technical rubber goods and tire compounds is of great importance to the industry.

Dispersion quality has a direct impact on final product properties and is therefore widely used as a quality control parameter.

Many important properties of the cured compound are directly affected by filler dispersion including:

- Tensile strength
- Tear strength
- Fatigue resistance
- Abrasion resistance

The DisperTester 3000 is the only instrument that gives a direct measurement of dispersion in a fast and simple test, without requiring subjective assessment. The instrument is available in three models with different magnification levels:

- **30x** with an optical range of **10 to 191 µm** (up to 2mm possible)
- **100x** for particles from **1 to 58 µm** (up to 250µm possible)
- **1000x** is specially designed for micro agglomeration measurement of silica compounds for particles from **100nm to 3µm**

### Sample Preparation

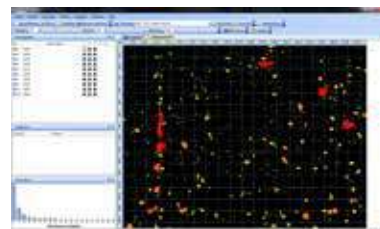
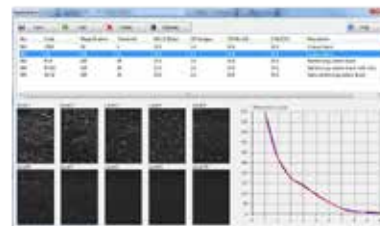
Sample preparation simply involves cutting the sample to generate a "fresh face / gloss cut" for analysis. A simple cutter utilizing ultra-sharp razor blades is supplied to optimize sample preparation for cured samples. For further simplifying sample preparation, the DisperCut automatic sample cutter is optionally available.



### Technical specification

<b>International standards</b>	ISO 11345, ASTM D 7723
<b>Magnification</b>	DisperTester 3000 - 1000x = 1000 times magnification DisperTester 3000 - 100x = 100 times magnification DisperTester 3000 - 30x = 30 times magnification
<b>Aperture Size</b>	DisperTester 3000 - 1000x = 4 mm x 3.5 mm DisperTester 3000 - 100x = 4 mm x 3.5 mm DisperTester 3000 - 30x = 9 mm x 5 mm
<b>Focus</b>	Manual
<b>Image resolution</b>	5 Megapixel with Carl Zeiss telecentric optics
<b>Data Interface</b>	USB 2.0
<b>Data format</b>	PDF, JPEG, ASCII
<b>Sample preparation</b>	Manual sample cutter with 100 Spare blades included
<b>Dimensions (H x W x D)</b>	190 mm x 160 mm x 460 mm
<b>Weight</b>	approx. 17.5 kg net
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz, Single phase
<b>Optional</b>	- DisperCool 3000 - DisperCut 3000

### MonDispersion software



# MonTech DisperTester 3000 Plus

## Carbon black and filler dispersion tester

### The MonTech DisperTester 3000 Plus

is the newest model of carbon black dispersion tester – computer aided, advanced digital reflected light microscopy brought to the next level. The DisperTester 3000 Plus is the most advanced instrument for reliable filler dispersion analysis based on the superior compliance, reproducibility and repeatability well known from the DisperTester 3000 series.

In addition, the DisperTester 3000 Plus has been upgraded with a set of extensive new features for reliable, subjective and operator independent analysis of the mix quality of your rubber compounds:

- Rugged housing machined from a single block of high-strength aluminium
- 10 Megapixel camera with USB 3.0 connectivity
- Multi-direction variably controlled LED light sources
- Precisely guided, horizontally moving camera system to obtain multiple test points from a single sample placement
- Fully automated or manual focusing, scanning and evaluation
- Black and White and Color camera systems available for black, white and colored rubber compounds
- Integrated data acquisition and analysis featuring PDF reports, histograms and high resolution result images
- Optional autosampling system for 50 samples

The DisperTester 3000 Plus features a totally new precision optical system paired with latest digital image processing technology. These enhanced capabilities now allow Dispersion analyses for particles from 1  $\mu\text{m}$  to 250  $\mu\text{m}$  - in full compliance with latest ISO 11345 and ASTM D 7725. Imaging capabilities are further extended with variable image thresholds and settings for advanced image and particle analyses.

The DisperTester 3000 plus features a precision double stage linear drive system to precisely evaluate variations along the surface of the sample. This totally eliminates the need for manual sample placement by allowing up to 5 individual readings for each sample placement.

To increase testing possibilities even further, the MonDispersion software now features additional imaging techniques such as variable focus control, freely definable shutters and image filters. This ensures an even clearer, superior quality sample image; providing higher test result precision and improved reproducibility.

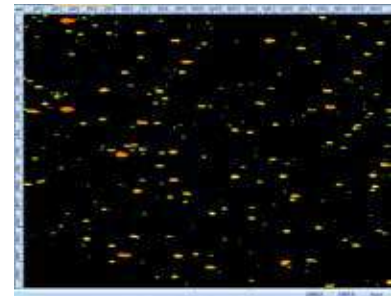
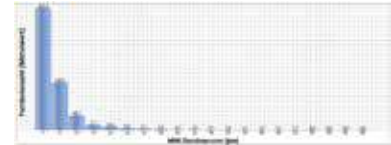
The DisperTester 3000 plus system includes additional built-in reference scales and can of course be used for all filler types including Carbon Black, Silica and natural inorganic materials with fully automatic calculation of X value, Y value, Z %, Dispersion %, White area %, ... for the most precise filler dispersion analysis.



### Technical specification

<b>International standards</b>	ISO 11345 : 2006, ASTM D 7723
<b>Magnification</b>	100 times magnification
<b>Aperture Size</b>	12 mm x 3.5 mm
<b>Agglomerate range</b>	1 $\mu$ m to 250 $\mu$ m
<b>Focus</b>	Fully automatic or manual
<b>Image resolution</b>	10 Megapixel with Carl Zeiss telecentric optics
<b>Data Interface</b>	USB 3.0
<b>Data format</b>	PDF, JPEG, ASCII
<b>Sample preparation</b>	Manual sample cutter with 100 Spare blades included
<b>Dimensions (H x W x D)</b>	180 mm x 220 mm x 375 mm
<b>Weight</b>	approx. 24 kg net
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz, Single phase
<b>Optional</b>	<ul style="list-style-type: none"> <li>- Automated sample holder</li> <li>- DisperCool 3000</li> <li>- DisperCut 3000</li> <li>- Automation system</li> </ul>

### MonDispersion software



DisperTester 3000 Plus with optional 50 sample automation system

# MonTech DisperCut 3000

## Stretched sample cutter for Dispersion testing



### DisperCut 3000

The DisperCut 3000 is a small and easy to use tabletop sample cutter that produces fine cuts of cured and uncured rubber samples especially for Dispersion testing samples.

The cutter is equipped with a high-speed close and cut system with simultaneous sample pre-stretching to avoid smearing of the sample and guaranteeing the best straight and clean cutting results.

Test samples can be cut and prepared within a single second! This makes the patented DisperCut 3000 sample cutter the most reliable tool for producing repeatable samples for Dispersion testing by excluding all kinds of operator influences.

Integrated endstops make sample positioning fast, reliable and easy, ensuring similar test sample dimensions.

The precision-ground blade guides, combined with ultra sharp, heavy-duty single edge blades, ensure straight and precise cuts.

In combination with the DisperCool 3000 chiller unit, the DisperCut 3000 cannot only be used for cured rubber samples, but is also the ideal combination for preparing uncured rubber samples by first cooling them down to glass transition temperature in the DisperCool 3000 and then cutting the samples with the DisperCut 3000.

The cutter is equipped with a two-hand safety control system for simple operation and the highest possible operator safety, eliminating the risks associated with manually operated sample cutters. The cutting knife is always covered and protected to avoid any accidental cutting or touching of the blade.

### Technical specification

<b>International standards</b>	ISO 11345 : 2006, ASTM D 7723
<b>Cutting blades</b>	Ultra-sharp heavy duty single edge blades, easily replaceable
<b>Sample dimensions</b>	Max. Ø 45 mm or 40 x 40 mm
<b>Pre-stretching</b>	adjustable by different cutting plates from 5 to 10%
<b>Operation</b>	2-hand safety control with anti-tiedown
<b>Cutting speed</b>	Up to 20 cuts per minute
<b>Dimensions (H x W x D)</b>	430 mm x 295 mm x 205 mm
<b>Weight</b>	approx. 12.0 kg net
<b>Pneumatics</b>	min. 5 Bar

### DisperCut - Step by Step



1 - Empty cutting area



2 - Place sample



3 - Active cutting by pressing the 2 control buttons



4 - Release control buttons - blade will return



5 - Cut sample

# MonTech DisperCool 3000

## Test sample deep freezing unit

### The DisperCool 3000

is used for the preparation and sample conditioning of uncured as well as cured rubber samples prior to the cutting process - especially designed for Dispersion Testing.

The sample preparation process is very simple and convenient:

First the sample is pre-cut (if needed) and then easily placed in the quick-open sample holder and then inserted into the tabletop DisperCool unit. Inside the DisperCool chamber, silicon oil is pre-chilled to a low temperature from minus 20 to minus 40°C. The sample holder is placed into the chamber which can hold up to two sample holders. Once the safety lid of the chamber is closed, the cooling process and integrated timer are immediately started.

During the cooling process, the sample is cooled to glass transition temperature. This means that a totally solid sample is produced.



The cooling / preparation time - usually between 5 and 12 minutes depending on the sample type and shape - can easily be set by the operator and can be monitored during the process on a count-down timer display. Once the cooling time is over, the operator is notified by an acoustic signal allowing the operator to open the chamber lid and take out the sample holder along with the sample.

Now the sample at glass transition temperature can be cut and processed like a normal solid hard rubber sample without smearing, distortion or modification of the sample surface. The DisperCool 3000 provides perfect samples for conventional cutters or automatic cutters like the DisperCut 3000.

The whole DisperCool 3000 process is closed, sustainable and environmentally friendly as no consumables like liquid nitrogen or other cooling gases are required.



### Technical specification

<b>Temperature range</b>	-40 to 200°C (depending on cooling / heating liquid)
<b>Cooling liquid</b>	Silicone oil, approximately 3 liters
<b>Chamber size</b>	Approx. 170 mm x 90 mm x 170 mm (H x W x D)
<b>Sample capacity</b>	Two independent sample holders
<b>Sample size</b>	Max. 25 x 20 x 20 mm
<b>Display</b>	6-digit timer display with acoustic signal 3,5" color-touch temperature display
<b>Additional Inputs (optional)</b>	PT 100 temperature port for immersion probes to measure temperature directly in the sample
<b>Chiller capacity</b>	Max. 420 Watts, air cooled
<b>Output Interfaces</b>	USB, RS232
<b>Protection levels</b>	Configurable user input modes and levels Integrated temperature and level protection switches
<b>Dimensions (H x W x D)</b>	500 mm x 425 mm x 450 mm
<b>Weight</b>	approx. 40.5 kg net
<b>Electrical</b>	230-250 V, 10 Amps, 47-63 Hz, Single phase

### Sample Preparation



Sample holder in chamber (lid open)



External Input and Output ports



Temperature control touchscreen and timer display



Sample temperature recording by optional immersion probe

# MonTech ABR 3000

## Rotary Drum DIN Abrasion tester

### Abrasion Tester ABR 3000

The MonTech rotary drum abrasion tester in accordance with DIN 53516, DIN ISO 4649, AS1683.21 and ASTM D 5963 makes abrasion testing really easy. The test specimen is fixed into a quick clamp sample holder and precisely guided - either with or without rotation - over a predefined distance of either 20 or 40 Meters and with a defined load on a sheet of abrasive paper mounted to a stainless steel rotary drum of 150 mm diameter. The drum rotates with a speed of 40 rpm. Finally the frictional loss is calculated by comparing the sample weight before and after testing.

**The MonTech ABR 3000 Abrasion tester is a tear testing instrument for determination of the resistance of elastomers in regards to the frictional loss of a rotating or fixed specimen.**

- **Standards** DIN 53516, ISO/DIN 4649, AS1683.21, ASTM D 5963
- **Description** The test is made on materials which wear off or abrade, e.g. tires, belts, conveyor belts, shoe soles.
- **Basic equipment** Stiff aluminum machine frame with brushless drive system and specimen holder, abrasion drum, metal housing, electric motor for rotation of the drum and the specimen holder

The working area is protected with translucent cover and protective safety switch. The specimen holder has a integrated dead weight of 2.5 N. Additional loading weights of 2.5 N and 5.0 N are supplied as standard accessories. Optionally additional loadweights, an automatic drum cleaning system as well as sample preparation accessories such as cutters and moulds are readily available.

#### Test Procedure:

1. After determination of the abrasiveness of the abrasion sheet, the instrument is ready for testing. Samples can easily be drilled out of a rubber sheet or final product with the optional circular cutting knife. Typically tests are performed at ambient temperature of  $23 \pm 5^\circ\text{C}$  or with the optional drum heating at elevated temperatures.
2. Initially the weight of the test specimen is measured
3. Afterwards the sample is mounted into the sample holder, the desired abrasion distance is set and the load weights are applied. The instrument cover is closed and the test is started by a simple click on the start button. The rotation of the drum will start and the specimen will be moved over the abrasive sheet. Once the pre-set abrasion distance is reached, the instrument will stop automatically.
4. After the test run is finished, the sample is removed from the sample holder and the weight of the sample after abrading is measured.
5. For calculation of the abrasion, the mass loss (average value of 3 to 10 single values) is converted to the loss of volume by help of the density and corrected for the deviation of the abrasiveness of the abrasion sheet from the set value of abrasiveness.  
Formula:  $\text{Abrasion} = \text{mass lost} \times 200 \text{ specific weight} \times \text{abrasiveness}$



### Abrasion testing redefined - with advanced ABR 3000 add-ons:

Rotary drum abrasion testing has been around for almost 70 years - with new add-on options MonTech has brought this old-fashioned method back into the modern world of intelligent testing and meeting the needs of today's rubber applications:

- **Wet abrasion testing** allows to determine abrasion resistance under wet or water saturated conditions. The system features two testing mode with a pump / spray system and a water immersion basin. Optionally thermal control of the testing fluid is also available. This technology has proven to be especially helpful for e.g. tire industry applications to determine abrasion resistance on wet roads or for the conveyor belt industry to define the degradation and wear as well as energy consumption under the environmental influence.
- **Drum heating systems** (ambient to  $+100^\circ\text{C}$ ) provides key wear data at elevated temperature e.g. for tire labelling purposes. The ABR 3000 with drum heating systems helps customer to understand and develop formulations for reduced abrasion and micro particle emissions in the environment - helping to save fuel and protect our environment.

## Technical specification

<b>International standards</b>	DIN 53516, DIN ISO 4649:2002 (E), AS1683.21, ASTM D 5963				
<b>Contact pressure for specimens expandable up to</b>	N	2.5	5.0	7.5	10.0
	N	12.5	15.0	17.5	20.0
<b>Diameter of drum</b>	150 mm				
<b>Length of drum</b>	460 mm				
<b>Drum speed</b>	40 min <sup>-1</sup>				
<b>Peripheral speed of drum with abrasion sheet</b>	0,32 m/s				
<b>Dimensions of abrasion sheet L/W</b>	472.5 mm (+2) x 400 mm				
<b>Film tape W/D</b>	50 mm x 0.2 mm				
<b>Abrasion distance of specimen</b>	40 m (20 m)				
<b>Corresponds to roller rotations</b>	84 (42)				
<b>Angle of inclination of axle center of the specimen to vertical position of the drum</b>	3 degree				
<b>Granulation of abrasion sheet</b>	60 mesh				
<b>Specimen diameter</b>	16 mm				
<b>Specimen thickness</b>	6 ... 15 mm				
<b>Maximum gripping length of specimen</b>	16 mm				
<b>Lateral feed of specimen per drum rotation</b>	4.2 mm				
<b>Number of revolutions of specimen holder for rotating specimen</b>	0,9 min <sup>-1</sup>				
<b>Dimensions (H x W x D)</b>	370 mm x 760 mm x 430 mm				
<b>Weight</b>	about 50 kg net				
<b>Electrical</b>	90-250 V, 1 Amp, 47-63 Hz, Single phase				
<b>Optional items</b>	<ul style="list-style-type: none"> <li>- Additional load weight 10 N</li> <li>- Analytical balance, 1 mg or 0.1 mg</li> <li>- Heated drum</li> <li>- Wet abrasion testing (spray/basin)</li> <li>- Drum cleaning unit</li> <li>- Circular sample cutter, diameter 16 mm</li> <li>- Standardized test elastomer specimen according to ISO 4649 and ASTM D 5963</li> <li>- Set of emery papers / abrasion sheets</li> </ul>				

## Scope of supply:

- Abrasion tester ABR 3000
- Set of emery papers / abrasion sheets
- Roll of adhesive tape
- Set of brushes
- Safety cover
- Gauge and blunting sample
- Standard accessories



Load weight system



Quick clamp sample holder



Accessories and optional items

## Cut & Chip Tester CC 3000

**The MonTech CC 3000 Cut and Chip Test provides a simple, quick laboratory method to evaluate cutting and chipping resistance of rubber compounds subjected to harsh mechanical environments**

The Cut and Chip Tester was developed to predict the service performance of passenger, truck, OTR, farm, mining and industrial solid tires, tank tracks and bogey wheels, as well as industrial products such as conveyor belts that are subjected to contacting surfaces containing sharp objects (rocks, gravel, glass, metal, etc.). The test is designed to be quick, inexpensive and furnish a high level of confidence in predictive testing of actual product performance. The Cut and Chip Test is performed on a cured rubber disc specimen mounted on a rotating spindle. The disc is impacted by a tungsten carbide knife with a precision ground cutting edge. An eccentric cam applies the knife at a specified frequency for a specified time, both of which can be set according to the application requirements.



The CC 3000 is conveniently controlled by an integrated 7" Touchscreen panel with a preselection of 11 different spindle speeds and 7 different chipping cycles providing the operator with quick and easy test setup possibilities. All speeds are digitally controlled by servo motors - for safety the instrument is fitted with a supervised safety door. The motorized cam conveniently lifts the knife support arm at the completion of the pre-selected test time. The resistance to cutting and chipping is based upon the loss of material (mass and reduction of disk diameter) over the duration of the test.

### Technical specification CC 3000 Standard

Technical specification	CC 3000 Standard
<b>Specimen size</b>	51 mm Ø, 13 mm thickness, 13 mm Ø center hole
<b>Specimen Rotation:</b>	180 - 2880 Revolutions per minute
<b>Test cycle</b>	0.1 - 999 Minutes
<b>Test time Cut/Chip Cycle</b>	15 - 150 Cycles per minute
<b>Mass @ Knife Edge</b>	454 gram (others optional)
<b>Dimensions (H x W x D)</b>	370 x 560 x 400mm
<b>Electrical</b>	~ 200-250 V, 6 Amps, 47-63 Hz, Single phase
<b>Weight</b>	~ 49 kg net



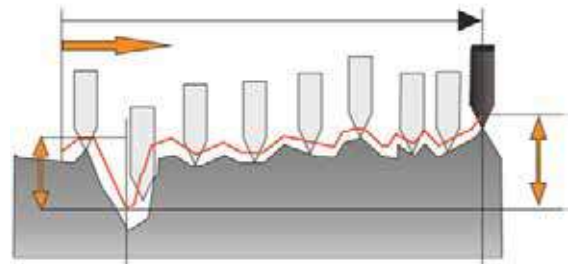
# Cut & Chip Tester CC 3000 Instrumented

## Wear testing for offroad applications redefined - the all new instrumented Cut and Chip Tester CC 3000

The new instrumented version of the CC 3000 boost cut and chip testing to the next level! Besides variable spindle speeds this new version allows a precise, closed-loop control of the chipping forces (50 to 500N) as well as a multi directional force measurement of chipping and friction forces and their respective energies. Chipping cycles with adjustable chipping frequencies, sliding times and overall test duration can freely be set.

The powerful, servo-driven main spindle and precisely controller pneumatic chipping actuator provide highest flexibility in test setups - paired with the optional IR sample temperature measurement the heat build up of the sample can also be recorded.

All data speed, force and travel are collected and transferred and presented Online in the MonChip Software System. This eliminates prior poor analytical possibilities that simply used sample weight loss or quantitative judgement of chip and cut resistance as the software automatically calculates data on sample diameter loss, impact and friction Forces and the Cut and Chip surface profile. Besides the common parameter „P“ derived from the load signal during sample contact, the instrument CC 3000 includes a revolutionary new, intelligent surface scanning method:



Automatic surface analysis and profiling for wear profile detection

A laser probe - integrated into the workarea - **automatically scans and maps the samples surface geometry profile** with accuracy of 10 microns. As a result not only the surface roughness but the exact wear profile can be analyzed such as frictional wear, wave, shark-skin, pitting, ...). (Patent pending)

The generated results allow to easily rank rubber compounds according to their chip and cut resistance e.g. the slope of increase in surface roughness indicates long term resistance to chip and cut at and extremely high precision and repeatability which has been proven by extensive field testing.

A variety of different chipping knife geometries from tungsten carbide steel (e.g. R0.1, R1, R2, R3) as well as pinpoint geometries further allow to tailor the test setup to your specific application environments.

### Technical specification CC 3000 Instrumented

<b>Specimen size</b>	51 mm Ø, 13 mm thickness, 13 mm Ø center hole
<b>Specimen Rotation:</b>	100 - 2500 Revolutions per minute
<b>Force Measurement:</b>	± 50 to 500 N (Normal) / ± 50 to 900 N (Lateral) Linearity: 0.2 % (Normal) / 0.5 % (Lateral)
<b>Test cycle</b>	0.1 - 999 Minutes
<b>Chipping frequency</b>	0.1 - 5Hz
<b>Impact stroke</b>	0 - 20mm, mechanically adjustable
<b>Surface measurement</b>	Precision laser probe for 63 - 33mm sample diameter
<b>Impact time</b>	30 ms to 100% of frequency
<b>Dimensions (H x W x D)</b>	370 x 560 x 540mm
<b>Electrical</b>	~ 200-250 V, 16 Amps, 47-63 Hz, Single phase
<b>Weight / Noise</b>	~ 93 kg net / < 54dB at typical operation conditions
<b>Optional items</b>	<ul style="list-style-type: none"> <li>- Tungsten Carbide knives in various shapes and geometries</li> <li>- Set of 5 certified control samples including test certificate</li> <li>- Analytical balance, 1 mg or 0.1 mg</li> <li>- IR-temperature measurement</li> <li>- Sample curing moulds (e.g. 9 or 16 cavity)</li> </ul>



Closed loop controlled cut and chip actuator with multi-axial force sensor



Horizontal test setup that facilitates simplified cleaning and the integrated suction system keeps the workarea free from debris at any time.

# MonTech RP 3000 Rapid Plastimeter for Polymers and Natural Rubber



## The MonTech Rapid Plastimeter

measures the plasticity or viscosity of polymers and unvulcanised rubbers. The test is simple, clean and quick. The instrument is typically used in conjunction with the MonTech ageing oven for plasticity testing to determine the Plasticity Retention Index (PRI) of raw natural rubbers.

The variable temperature range from 25°C to 200°C for easier to read with freely programmable conditioning and load times allow a convenient characterisation of the flow behavior of natural and synthetic rubbers at variable test conditions. For some applications this method offers a quick, low cost alternative to a Mooney Viscosity test.

The instrument is supplied in a complete set along with a table-top, mechanical volumetric specimen cutter for a reliable preparation of test specimens with a volume of 0.40 cm<sup>3</sup> according to international standards. The instrument is supplied with 10 mm diameter top platen installed period. Alternative top platens of 7.3 and 14 mm diameter are supplied as accessories. The platens are easily interchangeable.

### Plasticity Retention Index (PRI):

PRI is a measure of the resistance of raw natural rubber to oxidation.

The oxidation effect is assessed by measuring the plasticity before ageing (P<sub>0</sub>) and after ageing for 30 mins in the MonTech ageing oven for Plasticity testing at 140°C (P<sub>30</sub>)

$$PRI = \left( \frac{P_{30}}{P_0} \right) \times 100$$

### Working Principle

A modified parallel plate compression principle is used with automatically timed "conditioning" and "load" periods. A sample is compressed between two circular platens which are maintained at a temperature of typically 100°C.

The sample is conditioned for 15 seconds at a thickness of 1 mm. A compressive force of 100 N is then applied for 15 secs. The final thickness of the test piece expressed in units of 0.01 mm, is the plasticity number.

Besides this procedure described by the standards, the MonTech RP 3000 can operate at fully variable temperature and conditioning / load times.

During the loading period, the material flow and plasticity curve can be acquired by the optional MonPlast computer software.

### Test Procedure

The sample is prepared using the mechanical, double-working specimen cutter and it is then enclosed between two pieces of tissue paper, as defined by international standards, before being placed between the platens. The tissue paper prevents the material sticking to the platens or sliding between them.

The automatic test sequence is started when the start lever on the instrument is rotated. Conditioning and loading periods are then automatically controlled.

The reduction in thickness of the sample as well as the load that is applied to the sample is displayed digitally on the PC screen by the optional MonPlast software.

After testing, all results are shown on the PC screen and automatically stored in the database for recalling them later or creating batch reports.

## RP 3000 Features

The MonTech Plastimeter offers greatly enhanced operator access and is available in only one, full option version with all possible features included. One of the most important features is the powered zero and load calibration and automatic platen parallelism alignment totally eliminate the need for any manual setting of the instrument.

The RP 3000 Rapid Plastimeter can be calibrated in less than 20 seconds!

A strong aluminum and stainless steel frame, paired with direct linear drive technology ensures highest instrument rigidity and stability to guarantee the highest precision of test results.

- Fully automatic and easy operation
- Single/Median mode of operation
- Fully automatic calibration
- Built in diagnostics with Service and Diagnostics screen
- Variable platen temperature 25°C - 200°C
- Variable conditioning and load times

With optional MonPlast Software:

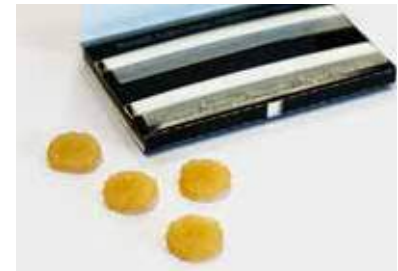
- Full PO and PRI evaluation and reporting possibility
- Single/Median mode of operation
- Display and calculation of Plasticity curve
- Various parameters can be entered and stored to each individual test:  
e.g. Batch number, Lot, Date, Time, Operator...
- Digital, continues temperature display on the PC as well as temperature graph
- By the help of the software a full traceability of aborted tests can be guaranteed
- All parameters as well as results can later be printed out together with the load, Plasticity as well as Temperature graphs as a Batch Report.
- The language on the Plastimeter as well as the software can be changed online
- Integrated calibration and service reminder

### Technical specification

<b>Standards</b>	BS 903:Pt A59: section A59.1, ISO 2007
<b>Platen sizes</b>	10 mm, 7.3 and 14 mm diameter
<b>Platen temperature</b>	25°C - 200°C
<b>Test time</b>	Default: 15 secs conditioning, 15 secs load Variable from 0 to 99 seconds
<b>Compressive force</b>	100 N
<b>Data Interface</b>	RS 232
<b>Weight</b>	approx. 35 kg net
<b>Electrical</b>	90-250 V, 6 Amps, 47-63 Hz, Single phase
<b>Optional items</b>	- MonPlast computer software - Data printer - PO 3000 Ageing oven - RS 3000 Rubber slicer

### Package including:

- Full PO and PRI evaluation possibility
- 3 sets of Platens in different sizes
- Calibration spacer shim
- Variable Temperature 25°C to 200°C
- Double-working sample cutter
- RS232 Interface
- Standard accessories package
- Optional: MonPlast computer Software  
with flow curve acquisition and  
automatic PRI calculation
- Optional: RS 3000 Rubber Slicer



Double working sample cutter for fast and easy specimen preparation

# MonTech PO 3000

## Ageing oven for Plasticity Testing

### The MonTech ageing oven for plasticity testing

ages rubber in accordance with international testing standards. In conjunction with the MonTech Plastimeter, it allows the user to determine the Plasticity Retention Index (PRI) of raw natural rubbers.

Housed in a robust stainless steel case, the MonTech ageing oven for plasticity testing features an aluminum block with four chambers that carry the drawer units and sample dishes. Heater elements are wrapped around and inside the block and high quality insulation inside the case minimizes heat loss.

An adjustable air blower system, which provides pre-heated air to the chambers, is located on the rear panel for easy service access.

Test samples are placed on round foil dishes, which are located in recesses in the drawer units. When a drawer is pushed in, a timing sequence starts only for that chamber.

As the 30 minute ageing process ends, the light next to the drawer changes color to remind the operator to remove the sample. Also the ageing oven beeps to show that ageing is finished. If the ageing period is exceeded, the light changes to red indicating that the samples should be discarded.

A temperature of 140°C (required by the standard) is maintained by a PID Controller, which continuously displays the chamber temperature. The MonTech ageing oven for plasticity testing is protected by a warning system, which is initiated if the correct temperature is exceeded by more than 10°C.

#### Features

- Temperature controlled to  $140 \pm 0.2^\circ\text{C}$
- Four chambers with independent timers
- Stability check and overheat protection
- Digital temperature display





### PO 3000 - Sample loading made easy



1 - Remove drawer from the oven



2 - Place aluminum dish



3 - Install aluminum dish



4 - Remove installation tool



5 - Load samples



6 - Put drawer back in the oven to start the 30 minute ageing sequence

### Technical specification

<b>Standards</b>	BS 903 Pt. A59, ASTM D 3194, ISO 2007
<b>Temperature Recovery</b>	1 minute at 140°C after sample insertion
<b>Operating Temperature</b>	140 ± 0.2°C (adjustable from ambient to +200°C)
<b>Chamber Dimensions</b>	4 chamber with 50 mm x 12 mm x 280 mm
<b>Max Samples per Oven</b>	48
<b>Max Samples per Tray</b>	12
<b>Dishes Per Tray</b>	4
<b>Heating Chambers</b>	4
<b>Air exchange rate</b>	adjustable 0 to 120 times / hour
<b>Weight</b>	approx. 27 kg net
<b>Electrical</b>	90-250 V, 10 Amps, 47-63 Hz, Single phase



Drawers loaded with samples

### Package including:

- Temperature controller (PID)
- 4 trays with 4 dishes each
- Electronic system with 4 independent timers, acoustic alarm and monitoring system
- Standard accessories package

# MonTech FT 3000 C-H Fatigue Tester



## Key Features

- Tension and bending fatigue (De-Mattia) in a single machine
- Stainless steel grips holding a total of 16 samples
- Frequency, Grip distance and dynamic stroke can freely be set
- the number of total cycles and cycles before automatic stop can be set
- optional image recording by CCD camera and MonFT evaluation software

## State of the art fatigue testing and lifecycle simulation

The FT 3000 is a high-end, direct linear drive fatigue tester of advanced design; providing a full test which indicates material properties such flex cracking/crack growth test and tension fatigue test in accordance with: ISO 132, ISO 6943, ASTM D 430-B, ASTM D 813, ASTM D 4482, DIN 53 522 -1/2/3.

The instrument is designed for continuous operation in compound / material research & development laboratories as well as industrial applications like in-process quality control in rubber plants requiring repetitive testing of rubber samples to assess dynamic material performance properties.

Especially due to the unique advanced linear motor design, optional arbitrary waveform programming and CCD camera data acquisition system, the machine can easily be set-up and adapted to individual customer testing needs.

## Precisely controlled thermal environment

The sample holding system is located in a thermal chamber. This 120 liter heating and cooling chamber permits temperatures between  $-40^{\circ}\text{C}$  and  $+180^{\circ}\text{C}$ , covering almost all possible application environments.

Due to the unique triple stage closed loop chiller and compressor design, a superior temperature uniformity of  $\pm 1^{\circ}\text{C}$  is achieved with no gases or external media required for the cooling process.

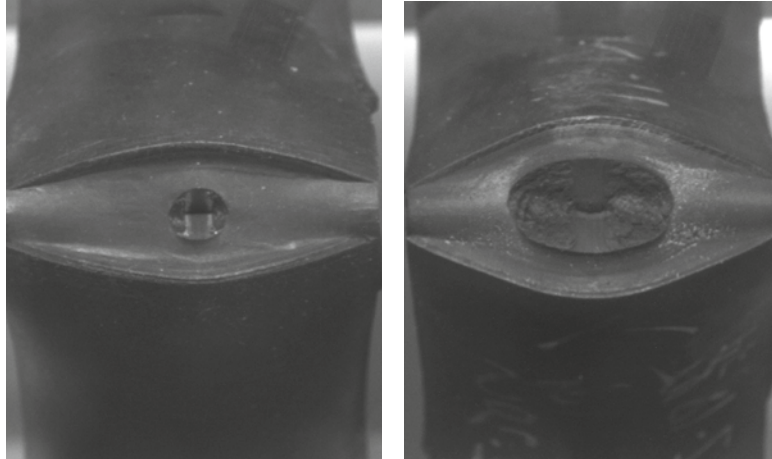
## Highest accuracy, rigidity and durability - guaranteed!

The direct drive, linear motor drive system with digital control and inline position measurement ensures extremely precise movements, low levels of noise and vibration, high durability and long lifetime. The instrument is fitted with a massive, deflection free stainless steel sample holder system. Optionally, samples can be inspected with a motorized camera CCD system for crack and crack-growth measurement - this system also includes the MonFT data acquisition software.



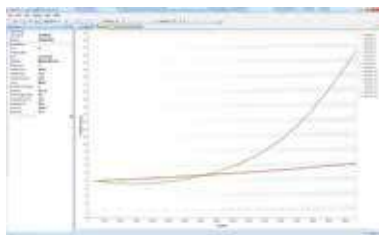
**Camera and recording system:**

The optional CCD camera system makes the FT 3000 CH the easiest to use and quickest Fatigue testing system for “De-Mattia” crack growth measurements



Automatic image recording by CCD Camera  
Initial, pierced sample acc. ISO 132

Crack growth after 100.000 samples at 60°C



MonFT Software – crack growth graph



MonFT Software – specimen identification

**Touch PLC control:**

The instrument can be controlled by a front mounted 5.7” color touch screen display for simple tests according to standards.

The following functions are incorporated in the display:

**Inputs:**

- Input number of set cycles
- Input set temperature in °C / °F
- Set motor speed in strokes per minute

**Readings:**

- Number of cycles done
- Current chamber temperature
- Actual motor speed / position
- Cycles to next pause
- Cycles since last pause

The display unit can be used to configure tests and display status alerts. It can also be used start, stop or pause testing at any time.

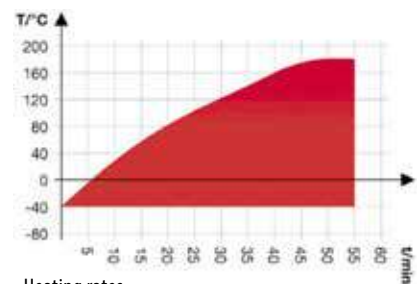
More advanced test scenarios can be programmed using the MonFT software allowing full data and cycle recording and documentation.



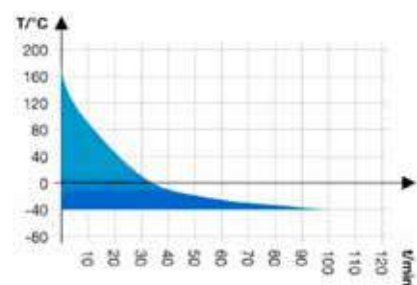
CCD Camera system  
for crack-growth measurement

**Technical specification**

<b>International Standards</b>	ISO 132, ISO 6943, ASTM D 430-B, D 813, D4482; DIN 53 522 -1/2/3
<b>Speed adjustment</b>	<b>DIRECT LINEAR DRIVE</b> from 0,05 to 5 Hz (higher frequencies possible at reduced stroke)
<b>Dynamic stroke</b>	from 0 to 60 mm (up to 150mm with reduced frequency)
<b>Static grip distance</b>	0 to 160 mm
<b>Maximum force in traction</b>	600 N (at 1 Hz oscillation frequency)
<b>Sample holder</b>	16 samples can be tested at the same time.
<b>Thermal chamber temperature</b>	From -40°C to 180°C with +/-1°C accuracy
<b>Dimensions (H x W x D)</b>	1880 x 1200 x 900 mm
<b>Weight</b>	approx. 870 kg net
<b>Electrical Requirements</b>	400 V, 50Hz, 16 Amps, Triple phase (480V / 60Hz version available upon request)



Heating rates



Cooling rates

# MonTech FT 3000 C-H

## Advanced Fatigue and Wear life testing

### Tailored lifecycle simulation and predictive testing systems

The FT 3000 series of electromechanical Fatigue Testing Systems allows the adaptation to almost any product, shape or environmental condition for determining the durability of materials and components in tension, compression or flexure. The instrument features efficient brushless linear motors with high accelerations, exceptional accuracy, and repeatability. The device can be tailored to specific application requirements with the various instrument options:

**- Camera CCD System (incl. MonFT software)**

For automated crack growth measurement and recording (De-Mattia) with variable camera setup for through hole or surface measurement, automated lateral camera travel as well as integrated LED light system.

**- Sensor grip system for FT 3000 CH** with single clip or clamp holders (replaces standard grips)

For exact measurement of completed cycles to failure of each sample - total 16 sample position available. Each position in the sample holder has a variable clamp for individual sample mounting; with an integrated, non-contact tension, precision sample sensor for exact detection of the cycle at sample failure.

The time of failure (in cycles, minutes or seconds) is automatically transferred to the software and stored. (Max. temperature limited to +100°C)

**- Arbitrary waveform programming for electric linear drive**

Allows to define, program and execute arbitrary waveform fatigue tests including rupture, tear, creep, ... to replicate specific application conditions and perform true process and product load scenario simulations. Waveforms itself with strain and frequency can be freely defined and altered.

**- Arbitrary test sequence programming**

Allows to combine standard sine-wave test steps with variable temperature cycles and conditioning times along with arbitrary waveform substeps (with option "Arbitrary waveform programming" into complex test programs and sequences.

**- Special grips** for tailored, application specific fatigue tests

**- Piercing tool** for sample preparation and piercing according to ISO 132 and ASTM D 813

**- Curing moulds and sample preparations tools** e.g. P-VS 3000 Sliding table for ASTM D 4482 sampling





## Beyond standards - advanced materials, product and component testing

Fatigue testing allows manufacturers and researchers to get a critical understanding of how a material or component will perform in real-world conditions. For accurate measurements the FT 3000 CH series has therefore been expanded - besides its thermal control which comes as standard - with specific application packages tailored to various industries and test requirements:

### Special sample and product clamps and grips

The standard sample holding system located in the thermal chamber can already accommodate a variety of standard and typical product and component samples in the standard configuration. Integrated centering and attachment possibilities allow to easily add specialized fixtures to the base grips easily accommodating to any shape of product or component that needs to be tested.

All gripping solutions are entirely made of steel and can be tailored to specific customer requirements.

Readily available solutions include fixtures for component testing of Seals, Valve Membranes, Bushings and Anti-vibrations mounts, Vacuum suction cups (against a variety of surfaces) as well as materials testing of e.g. textile and steelcord to rubber adhesion and pullout.

### Humidity control

The humidity control options allows precise setting and regulation of the air humidity in the test chamber. This allows testing of materials sensitive to humidity. The steam humidifier is connected to a drift-free capacitive humidity sensor. This ensures rapid reaction times, precise measurements, short recovery times after opening the doors, and FDA-compliant test results thanks to the microprocessor-controlled humidification and dehumidification system. The steam humidifier is connected to the water supply system which is easy to use (plug-and-play) and offers the option of connecting the system to a domestic water line as well as providing flexible solutions regardless of the water supply and installation site.

### Gas purging and Inert gas supply

Optional inert gas inlets allows customer to create special atmospheres in the test chamber - whether testing under Nitrogen, Oxygen, Carbon Dioxide is required, customized systems for safely creating the required test atmospheres are available.

Test scenarios realized include e.g. fatigue testing of rubber components, seals and membranes for exhaust system of car and truck combustion engines precisely controlled the test environment to 72 % Nitrogen, 20 % Carbon dioxide and 8% Steam

### Steam

The available steam generation systems create critical environment for medical and food applications. Controlled steam environments of either unsaturated steam, saturated steam or superheated steam can be created into the test chamber or routed directly onto or into test samples.

For the first time this revolutionary integration of steam environment into Fatigue testing allows producers of medical devices to reliable test component life for parts that undergo sterilization. The FT 3000 CHS has further proven itself e.g. for the fatigue life testing of vaccine vials, durability studies for tire curing bladders and for components underground high pressure drilling operations.

# MonTech CS 3000

## Compression Set test fixtures

### Compression set fixtures CS 3000 for constant deflection testing according to ISO 815, DIN 53517, ASTM D 395 and other International Standards.

Compression set testing measures the ability of rubber to return to its original thickness after prolonged compressive stresses.

As a rubber sample is compressed over time between two flat parallel plates with a predefined percentage and kept for a specific time at a certain temperature, it loses its ability to return to its original thickness. This loss of resiliency, also called memory or permanent set, characterizes the capability of an elastomeric product to perform over a long period of time. MonTech Compression set fixtures are entirely made of precision ground stainless steel and feature stiff compression plates as well as sets of spacers according to customer choice.

Two standard dimensions of compression set test fixtures are readily available from stock - each size is available in a single and double layer configuration. Optionally suitable tempering ovens, height gages and curing moulds in accordance with standards are available.



#### Technical specification

<b>Standards</b>	ISO 815, DIN 53517, ASTM D 395, ...	
<b>Material</b>	fine ground stainless steel	
<b>No. of layers</b>	1 or 2	
<b>Platen size</b>	96 x 96 x 17mm	178 x 98 x 17mm
<b>No. of samples</b>	8x Type A / I or 16x Type B / II	16x Type A / I or 32x Type B / II
<b>No. of bolts</b>	4 x M12	6 x M12
<b>Deflection / Spacers</b>	according to standard(s) or customers choice	
<b>Scope of supply</b>	includes bolts, washers, nuts, tools and accessories	



### Speciality Compression set fixtures CS 3000

In addition MonTech manufactures a variety of specialized compression set testing tools for various applications such as:

- Compression set testing under deflection with variable / adjustable spacing for highest flexibility
- Compression set testing under constant force ASTM D395 Method A, UNI 4913-2, FIAT 50410
- Compression set acc. PV 3307 Standard for testing 6 specimens with 15mm diameter simultaneously
- Compression set acc. PV 3330 Standard for testing on finished parts - spacers per customer request



CS 3000  
PV3307

# MonTech TGD 3000

## Digital precision thickness gauge

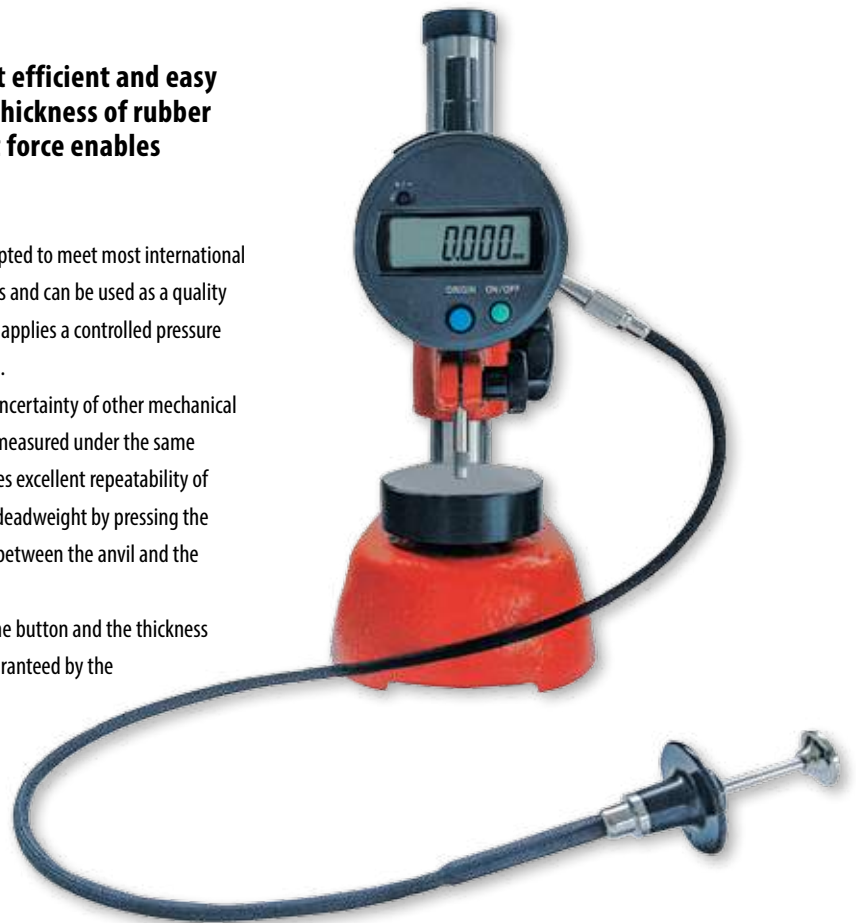
**The TGD 3000 thickness gauge is a cost efficient and easy to use instrument for measuring the thickness of rubber of rubber-like materials. The constant force enables repeatable readings.**

A standard thickness gauge for rubber which can be adapted to meet most international standards. The gauge is manufactured to close tolerances and can be used as a quality control instrument. It is crucial that any thickness gauge applies a controlled pressure (kPa) to the material whose thickness is being measured.

The TGD 3000 uses a deadweight system removing the uncertainty of other mechanical devices. This system ensures that the thickness is being measured under the same controlled conditions for each sample. This design ensures excellent repeatability of results. To measure the thickness of any sample, lift the deadweight by pressing the cable release or optionally lever and insert the material between the anvil and the presser foot.

The deadweight is lowered automatically by releasing the button and the thickness reading can be obtained. Precise measurements are guaranteed by the absolute measuring system without the need for referencing.

Optional gauge blocks are available for verification and calibration.



### Technical specification

<b>Measurement method</b>	Dead load with constant measuring force (1N standard)
<b>Display</b>	Digital with 9mm LCD display, 0.001mm Resolution
<b>Measurement table</b>	Polished, 50mm diameter
<b>Measurement tip</b>	Diameter 5mm standard, others optional
<b>Measurement range</b>	0 to 12.5mm (25 or 50mm optional)
<b>International standards</b>	ISO 23529, ISO 815, ISO 5084, ...
<b>Repeatability</b>	Better than $\pm 0.0015$ mm
<b>Output interfaces</b>	Serial (RS232) optional
<b>Electrical</b>	Battery powered, SR44, 18.000 hours lifetime
<b>Options</b>	<ul style="list-style-type: none"> <li>- Various presser foot designs and tips (4, 4.3, 6, 10, 50.5mm, ...)</li> <li>- Additional dead load weights according to various standards</li> <li>- Manual lifting lever</li> <li>- Interface kit and software</li> </ul>

*Combining the CS 3000  
Compression set testing tools  
with the TGD 3000  
thickness gauge and AO 3000  
ageing oven creates a full testing  
set according to  
ISO 815, DIN 53517,  
ASTM D 395, ...*

# MonTech AO 3000

## Universal forced air laboratory oven series

**MonTech AO 3000 forced ventilation cabinet ageing ovens are designed for precision ageing of polymer materials and rubber parts, products and components.**

The universal, multi-purpose laboratory oven is the standard appliance for temperature control in science, research and material testing within the rubber and polymer industry. The interior as well as exterior are made of high-quality, hygienic, easy-to-clean textured stainless steel - together with the easy-to-use 4" control panel, single knob operation and integrated setting for ventilation, flap overtemperature protection and timer the AO 3000 is the ideal ageing equipment for almost any application.

Temperature deviations caused by fresh air can influence the sample characteristics as well as the ageing process - therefore MonTech ageing ovens have been designed with a special pre-heating chamber in where fresh air is fed through and warmed up before being introduced into the working chamber. Air exchange rates and air flap position can be electronically set on the control panel ensuring that the required - typically low - air speed for ageing of rubber materials is met.

In the standard configuration the ovens are equipped with a Ethernet Interface for direct integration in the customers network.

A data recording software is optionally available.

**Optionally the AO 3000 is available with:**

- Viewing windows integrated in the door of the device
- side or top openings
- additional temperature protection devices
- sample shelves, racks and hangers
- rotary carousels
- USB data interface
- data recording software



Model / Volume [Liter]	30	55	75	110	160	260	450	1060
<b>Interior dimensions [mm]</b>	400 x 320 x 250	400 x 400 x 330	400 x 560 x 330	560 x 480 x 400	560 x 720 x 400	640 x 800 x 500	1040 x 720 x 600	1040 x 1200 x 850
<b>Exterior dimensions [mm]</b>	585 x 704 x 434	585 x 784 x 514	585 x 944 x 514	745 x 864 x 584	745 x 1104 x 584	814 x 1183 x 684	1224 x 1247 x 784	1224 x 1726 x 1035
<b>Working range</b>	+ 5°C above ambient to +300°C							
<b>Resolution</b>	to 99.9°C: 0,1°C from 100°C: 0,5°C							
<b>Accuracy</b>	+/- 1.5°C (Standard), optional higher accuracies are possible							
<b>Shelves included / Maximum no. of shelves</b>	1 / 3 20 kg max.	1 / 4 20 kg max.	2 / 6 20 kg max.	2 / 5 20 kg max.	2 / 8 20 kg max.	2 / 9 20 kg max.	2 / 8 30 kg max.	1 / 14 60 kg max.
<b>Net weight / Gross weight [kg]</b>	45 / 61	57 / 76	66 / 85	74 / 99	96 / 122	110 / 161	161 / 227	252 / 416
<b>Power rating at 230V, 50/60 Hz [W] (other voltages on request)</b>	1600	2000	2500	2800	3200	3400	5800 (triple phase)	7000 (triple phase)



# MonTech OB 3000 and WB 3000

## Oil- and Waterbaths for immersion ageing

**Oil- and waterbaths are unparalleled in terms of precision, safety and comfort and perfectly suited for professional heat and immersion ageing of natural or synthetic rubber, silicones and other elastomers**

A corrosion resistance, textured stainless steel exterior and interior allows easy maintenance and cleaning - for operator safety every MonTech Oil- and Waterbath is fitted with a dual overtemperature protection as well as safety cover. MonTech thermostatic bath feature a resolution of 0.1°C, superior thermal accuracy as well as an integrated timer. All units can be equipped with according the customers' specific requirements and testing standards with a variety of optional concentric ring sample covers, tube racks and specimen holders

### Key features of MonTech thermostatic baths include:

- Available in 6 different sizes according to specific testing needs
- Easy to use with single button control
- Variety of more than 150 different types of sample holders available
- Ageing can be performed simultaneously e.g. ASTM D471 and D865
- Cross-contamination is eliminated due to individual sample compartments
- Improved heat transfer compared to block ovens
- High watt density heaters for longer service life and performance
- Optional level control and Peltier cooling system available (WB 3000 only)



Model / Volume [Liter]	7	10	14	22	29	45
<b>Bath dimensions [mm]</b>	240 x 210 x 140	350 x 210 x 140	350 x 290 x 140	350 x 290 x 220	590 x 350 x 140	590 x 350 x 220
<b>Exterior dimensions [mm]</b>	468 x 356 x 337	578 x 356 x 337	578 x 436 x 347	578 x 436 x 405	818 x 516 x 343	818 x 516 x 401
<b>Working range Oilbath / Waterbath</b>	+ 5°C above ambient to +200°C / + 5°C above ambient to +95°C (boiling stage optional)					
<b>Temperature variation Oilbath / Waterbath</b>	better than +/- 0.3°C / better than +/- 0.1°C					
<b>Temperature distribution Oilbath / Waterbath</b>	better than +/- 0.8°C / better than +/- 0.25°C					
<b>Net weight / Gross weight [kg]</b>	11 / 16	13 / 19	15 / 21	17 / 23	24 / 31	26 / 33
<b>Power rating at 230V, 50/60 Hz [W] (other voltages on request)</b>	1200	1200	1800	2000	2400	2800



## MonTech BO 3000 Multi-cell precision block oven

**The BO 3000 oven with 4 test cells is designed for precision air and immersion ageing of rubber samples and parts up to 250°C in accordance with ISO 188, ISO 1817 ASTM D 471 and ASTM D 865.**

Ageing properties are considered key material parameters for rubber formulations - in order to meet the needs of your materials and application environment, the BO 3000 provides the ideal platform for accelerated ageing test in air or liquids.

Test methods requiring precision sample ageing e.g. include the variation of mechanical properties such as tensile, elongation and tear, material hardness, variation of mass, volume and compression set as well as visual properties.

Designed as a tabletop thermal block with 4 individual test cells - which can each be equipped with a test tube (38mm dia / 300mm length) that handles numerous types of samples at the same time - the BO 3000 allows to run up to 4 different ageing experiments at the simultaneously fully avoiding cross-contamination between samples and test liquids.

The high mass of the thermal dry-well with all around insulation, superior thermal control with 0,1°C resolution, a traceable 8-point calibration (50, 70, 100, 120, 150, 180, 200, 250°C) and the integrated precision countdown timer guarantee highest reliability, repeatability and easy handling at the same time.

### Test Tubes and sample holders

The BO 3000 has 4 individual test cells allowing the insertion of different available test tubes. Test tube integrated sample holders ensure a proper spacing between the samples and to the test tube walls for reliable and uniform ageing results.

#### - Standard glass test tubes

38mm diameter and 300mm length with integrated sample holders and spacers and PTFE plug to seal off the tube.

#### - Glass Tubes according ASTM D 865

for tests in hot air with defined air circulation.

The test tubes are fitted with special plugs allowing the insertion of glass tubes for a controller air circulation.

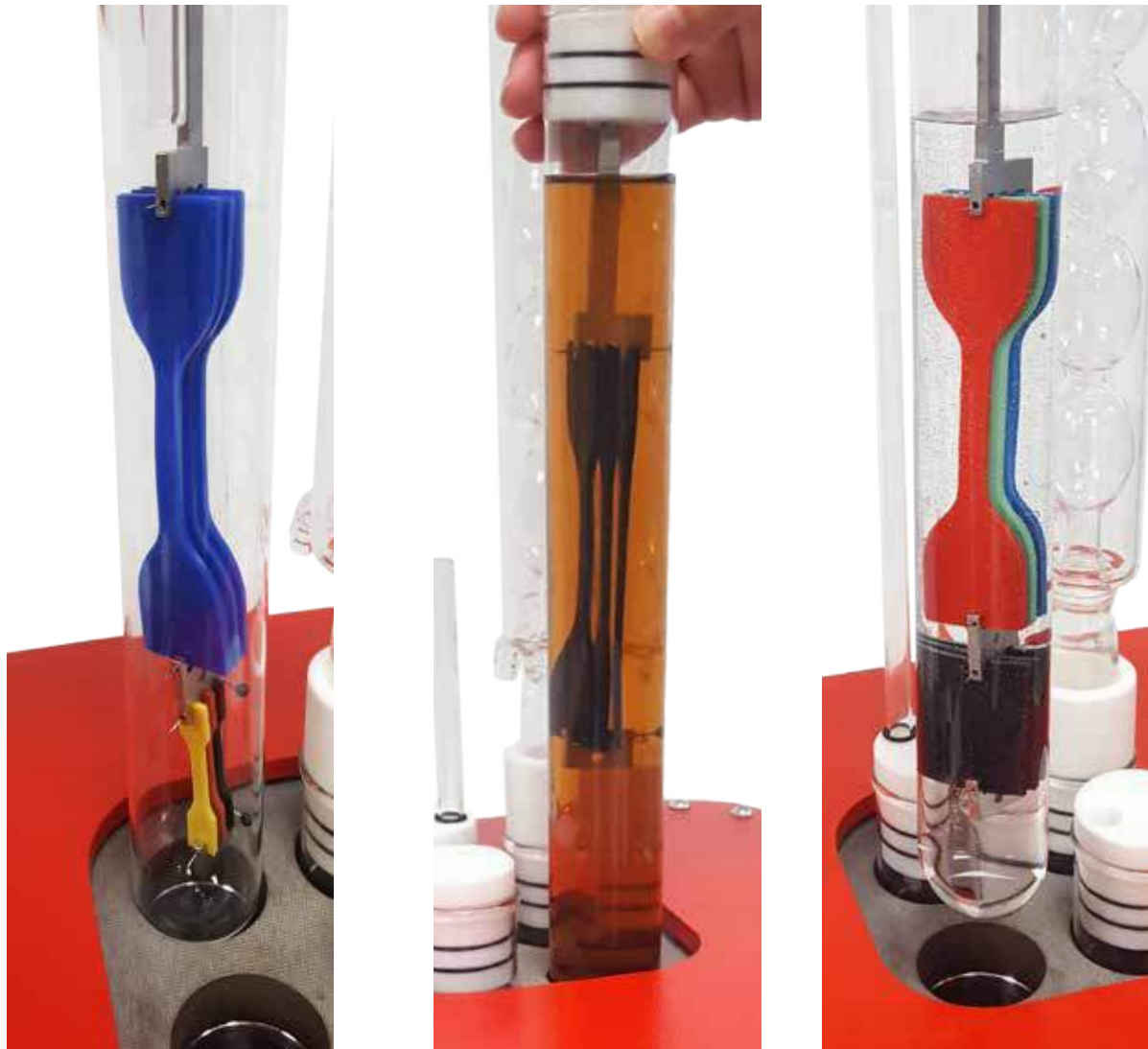
#### - Water-cooled reflux condenser

Condensation columns are used for immersion aging tests in volatile liquids.

The condensation column is connect to a water supply or chiller system to condense the volatile part of the test liquid letting it flow back into the test tube ensuring the test liquid will not evaporate or change in composition or concentration.

Test tubes, condensers or extraction glass pipes not in use can easily be stowed in the sidemounted stainless steel racks for convenience.





### Technical specification

<b>Measurement method</b>	Dry block cell oven with individual test compartments with no / natural / forced ventilation and reflux condensation
<b>International standards</b>	ISO 188, ISO 1817, ISO 12046, ISO 6916-1; ISO 6916-2; ASTM D1056; ASTM D471, ASTM D865, EN 681-1, VDA 675-301, AS_NZS 4179, ...
<b>Measurement Cells</b>	Four individual measurement stations for glass tubes of 38mm diameter and 300mm length
<b>Temperature control</b>	Ambient to 250°C, Resolution 0.1°C, Accuracy +/-0.5°C Integrated PID control with stability monitoring and indication and thermal safety protection switch
<b>Heating system</b>	Aluminum block with integrated heating rods for excellent uniformity, all-around insulation to minimize energy loss
<b>Counter and Timer</b>	Integrated countdown timer with LCD Display for up to 99 hours and 59 minutes with alarm
<b>Dimensions (H x W x D)</b>	490 x 425 x 380 mm (including test tubes holders, excluding test tubes)
<b>Weight</b>	~ 42kg
<b>Electrical</b>	200-250 V, 12 Amps, 47-63 Hz, Single phase - other voltages available on request
<b>Options</b>	<ul style="list-style-type: none"> <li>- Test tubes, test tube plugs and specimen holders</li> <li>- Reflux condensers, hoses and external chiller units</li> <li>- Test liquids according to international standards for immersion ageing</li> </ul>

# MonTech Software systems

## The IT-backbone of your lab operations!

The MonTech family of software solutions is designed with the lab manager in mind. Keeping data organized and readily available is becoming an absolute necessity for any size laboratory. The versatility of each solution allows you to quickly modify and manage complex formulations, incoming raw materials, or collect all data forms from a laboratory and analyze results instantly.

Each software solution can be easily integrated and features standalone operation, plant-wide operation, or can be activated to share information between multiple laboratories. With its extensive built-in features for instrument, test specification and sample management, MonTech software solutions will generate, store and report on valid and traceable data to support your quality and laboratory processes.



### Key features of MonTech integrated Laboratory software solutions:

- Role- and group based, multi-layer user concept
- Full sample processing beginning with the master data level up to order and sample data
- Freely definable workflows including sample preparation and ageing
- Reliable sample traceability with barcode and RFID support
- Multi-site data management for entire QC and R&D data
- Automated order processing with Pass / Fail testing and instant production feedback
- Integrated flexible reporting and document management system

# MonTech Software systems

## Software Solutions Overview

MonTech software systems will allow you to redefine your laboratory processes for improved efficiencies, cost savings and compliance with a configurable and expandable system that will grow with your business and support your data management needs in the future. Take advantage of the pre-configured solution that helps your laboratory improve efficiency, maintains records and traceability, and meets your compliance requirements for e.g. IATF 16949, FDA, ...



### MonQuality

A fully integrated Laboratory Information Management System



### MonRecipe

Bringing consistency and traceability to your Compound and Recipe development processes



### MonControl

the most easy-to-use and versatile instrument control software



### MonStat

the innovative Statistical Process Control (SPC) and reporting solution



### Customisation and integration services

#### Why pick MonTech integrated software solutions to run your lab?

##### Most Modern Lab Software Solution

Reduce maintenance costs and increase scalability by using the latest, industry standard technologies.

##### Right Information Management and lab order execution system for You

Pick from our prepackaged or pre-validated editions to accelerate implementation and go live faster.

##### Range of Services

Our implementation, validation and managed services make adoption and maintenance easier.

##### Innovating Faster

We are innovating faster, adding features that will maximize the value of your lab software system over time.

# MonTech Software Systems

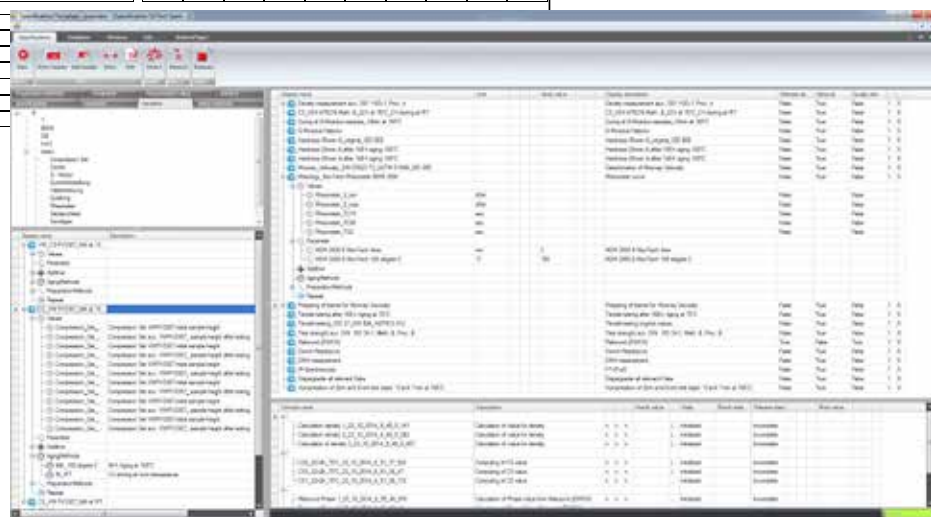
## MonQuality Laboratory Information Management System LIMS



### MonQuality - A fully integrated Laboratory Information Management System

Information is the biggest asset in every lab. Our MonQuality Laboratory Information Management System (LIMS) helps you to guarantee its integrity and enhance its value. MonQuality has been designed to help you to meet all your information management objectives, manage all your complex lab processes and provide exactly the information needed, at the right time and in the right format. MonQuality flexibility is manifested in multiple levels of the system, from automated workflow and records management to closed-loop traceability. Developed specially for the rubber and polymer industry, providing unique features such as full multi-site collaboration capabilities, remote data access and customized reporting, MonQuality LIMS truly is the ideal software platform for your laboratory.

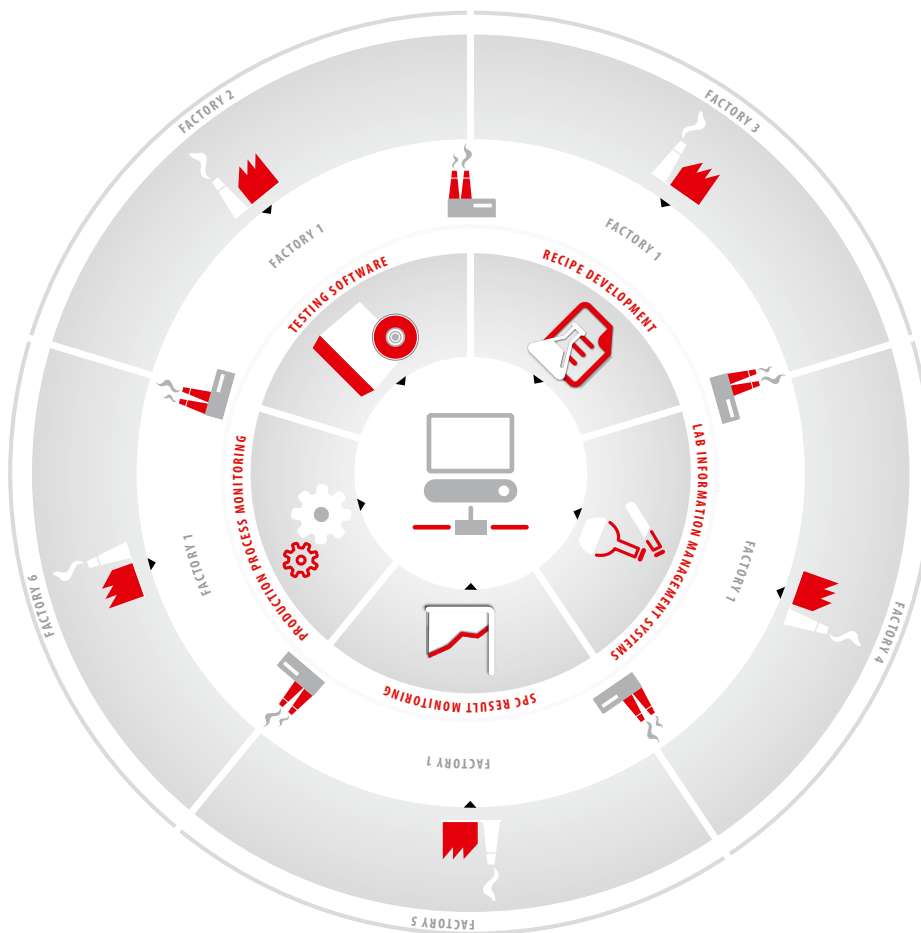
Seite 1 / 1 26.03.2015		MonTech Materialprüfanlagen GmbH									
Material: MonTech Demo1											
	S' Min	S' Max	TC 0	TC 10	TC 90	Time to Peak	Time@E	S' Peak	Final Temperature	Peak Rate	Peak Rate (S' /min)
Obere Toleranzgrenze	1,50	21,00	n/a	78,00	162,00	97,20	0,00	9,03	0,00	22,79	
Obere Kontrollgrenze	1,32	19,16	n/a	72,00	156,00	94,20	0,00	8,77	0,00	21,96	
Obere Wangrenze	1,16	18,64	n/a	66,00	150,00	91,20	0,00	8,52	0,00	21,13	
Sollwert	1,00	18,00	n/a	60,00	138,00	88,20	0,00	8,26	0,00	20,29	
Untere Wangrenze	0,85	17,61	n/a	54,00	126,00	85,20	0,00	8,00	0,00	19,46	
Untere Kontrollgrenze	0,69	17,10	n/a	48,00	120,00	82,20	0,00	7,74	0,00	18,63	
Untere Toleranzgrenze	0,50	15,00	n/a	42,00	114,00	79,20	0,00	7,48	0,00	17,80	
	dNm	dNm		Sec	Sec	Sec	Sec	dNm	°C	dNm/Min	
Anzahl	6	6	1	6	6	6	6	6	6	6	6
Minimum	0,76	16,31	5,8	21,70	99,82	27,00	234,00	7,13	160,10	18,01	
Maximum	1,96	28,76	5,8	69,20	146,38	90,20	480,00	8,30	189,88	37,39	
Mittelwert	1,21	20,96	5,8	50,59	129,91	67,83	349,00	7,60	182,51	24,76	
Standardabweichung	0,54	5,61	0,0	20,56	21,34	28,91	95,52	0,41	10,27	8,94	
Varianz	0,29	31,48	0,0	422,55	455,48	836,97	9125,00	0,17	105,38	79,88	
Varianzkoeffizient	0,44	0,27	0,0	0,41	0,16	0,43	0,27	0,05	0,06	0,36	



MonQuality easily allows you to manage and trace all your compounds with fully digital workflows including test and control plans and work order instructions and specifications providing you with any required information of any laboratory related process such as sampling, routine quality control testing, customer specific or custom testing and research and development work orders at any time. MonQuality features full integration of any MonTech testing instrument as well as also the possibility to connect, send and retrieve data from any kind or type of third party instrument.

MonTech's Strategic Software Consulting team is an essential resource for complex laboratory IT projects that cut across areas of technology, business and scientific processes. Let us help you to resolve the complex planning and execution tasks associated with your LIMS project.

With our certified project management and transition services, a smooth software implementation and your project's success is guaranteed!



### Multi-site networking

MonTech's Software system can be expanded to wherever your factory and laboratory might be located. Featuring multi-site data collection and replication for full production continuity, providing global and local business rule management and compliance. This enhanced fully digital process chain- for the first time - allows global, collaborative Research and Development as well as Quality Control in the rubber industry. Intranet or internet-based global laboratory solutions can be implemented, meeting any standard on data security and traceability.

MonTech multi-site software solutions even permit further vertical business integration by making data accessible in web-based portals for suppliers and customers, providing the highest possible consistency and transparency in all laboratory related business processes.

# MonTech Software Systems

## MonRecipe *Compound and Material management*

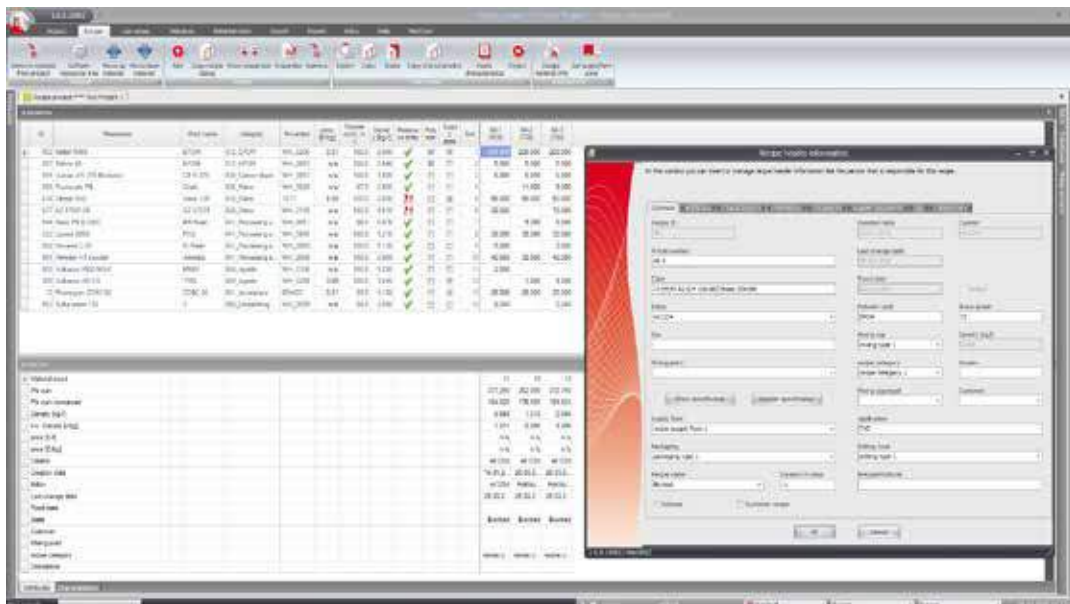


### MonRecipe - Bringing consistency and traceability to your Compound and Recipe development processes

MonRecipe was specifically designed for formulation and compound development needs in the rubber industry. This unique software system helps you to create, cost, maintain and modify complex formulations quickly and easily with unprecedented version control, allowing you to streamline your formulation process along with speeding up and reducing costs of bringing new products to the market.

MonRecipe is the dynamic workbench for your recipe ideas, allowing you to experiment and manage multiple scenarios for even the most complex recipes with the ability to simultaneously optimize raw material and process costs for true value engineering.

Excellence in rubber compound formulation development: MonRecipe is the ideal solution to streamline the recipe and formulation development process, adding integrated capabilities for single-stage, multi-stage and trial mixing, masterbatch management, production upscaling, management of recipe specifications and acquired laboratory data and test results. Set and enforce corporate compounding compliance with the integrated advanced multi-site collaboration capabilities, allowing you to create global recipe and compounding standards with the ability of answering local needs of recipe customizing based on raw material and mixing equipment availability.



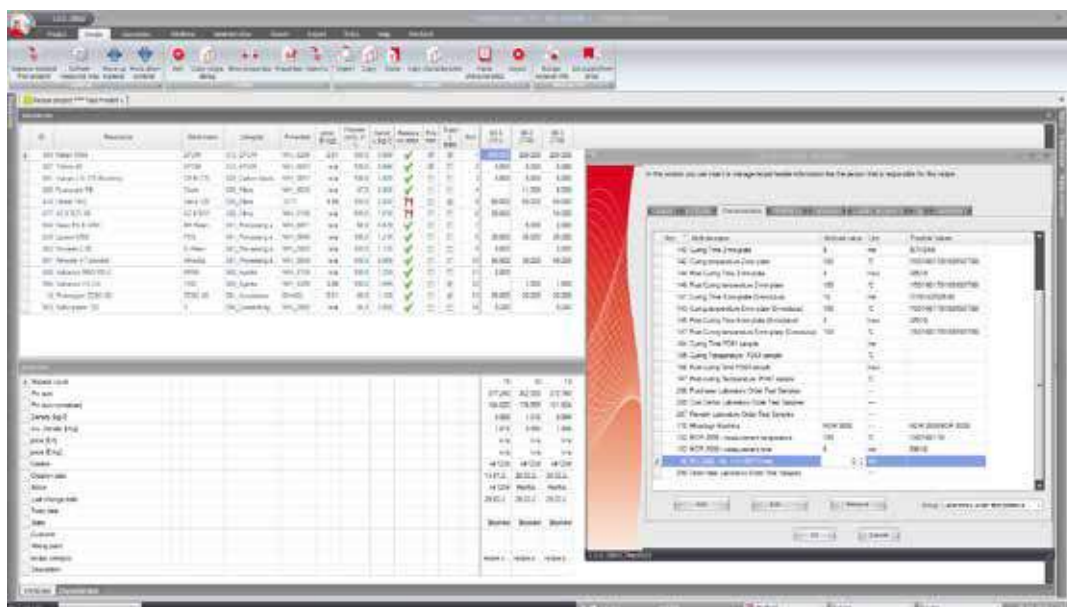


A vital part of the MonRecipe compound development system is MonMaterial for driving your ingredient, supply and raw material specification lifecycles. MonMaterial will transform your specifications collection, approvals and management - speeding it up, reducing your effort and tightening your control.

The system allows you to gather and collect any specification data that you might require when creating any possible formulation.

All raw materials can be hierarchically grouped together making them easy to retrieve while creating or editing formulations. MonMaterial is able to handle any kind of specification data from specification sheets, suppliers and supply forms, storage conditions, chemical characterizations, availability at different production sites, ROHS status, test certificates, images, web-links, barcodes, documents or any other type of attachment. Even alternative materials can be specified, providing flexible compounding alternatives in case of raw material shortages.

Software Integration included: MonRecipe and MonStat feature full application capabilities to integrate in your factory and laboratory environment, retrieving and providing data automatically to ERP, MES and Mixer control systems, creating a lean and fully digital compound development process.



# MonTech Software Systems

## MonControl *Analyses Software for testing instruments*



### MonControl - the most easy-to-use and versatile instrument control software

MonControl represents a totally new generation of universal testing software, developed on the latest Microsoft Windows platform using state-of-the-art software technology, cutting edge calculation algorithms and a open database connectivity. MonControl operation is designed to be purely intuitive for a variety of instruments, providing your laboratory staff the same unique and user-friendly interface on every workstation and instrument in your laboratory.

#### **This includes for example:**

- Rheometers (MDR/ODR/RPA)
- Processability testers
- Mooney Viscometers
- Rebound testers
- Tensile testers
- Hardness testers
- Abrasion testers
- Balances / Scales
- Density testers



#### **Experience flexibility in your testing**

From a single workstation to work order based testing as a Laboratory Information Management System (LIMS), MonControl can be configured to reflect your laboratory setup and daily workflow needs. MonControl provides the most versatile platform for managing your laboratory and testing data, from a single machine with remote MonView data viewers for office clients, to multi-machine integrated laboratory systems.

Flexible programming, simple instrument control and fully automated data acquisition & processing make MonControl a stable software solution to count on every day. Whether static or dynamic testing, MonControl already comes with preloaded test routines for most standard industrial applications and test sequences according to international standards (ISO / ASTM / DIN), allowing even new or untrained users to start testing within minutes.

### ***Automate processes and increase the efficiency of your operators***

Customizable user input fields for sample identification along with integrated automation features such as instant Pass / Fail feedback with various trend displays and levels, tolerances, limit curves, gate calculations, batch series and label printing provide users with information exactly when they require it.

### ***Improve the accuracy of your results***

Automated input checks for plausibility of test configurations, multiple levels of security with usernames and passwords, individually defined permissions and an electronic help assistant with step-by-step procedures bring additional value to your lab operation and help you to avoid mistakes.

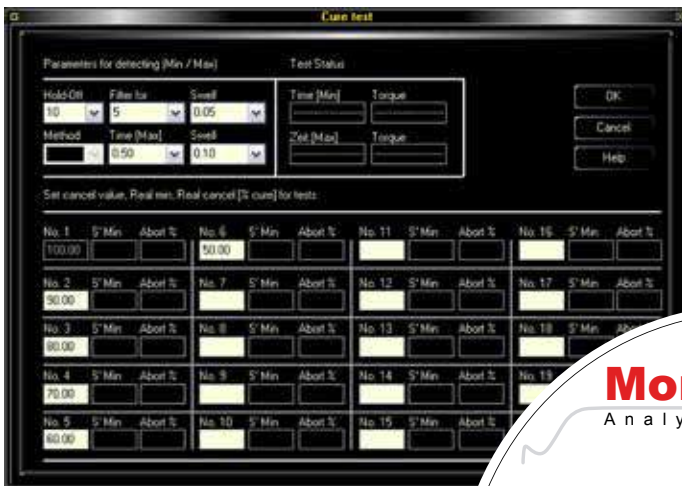
### ***Create a professional appearance***

MonControl is able to create customized reports by user selection or automatically. This covers multiple graphs, report tables, test parameters, logos, remarks, test dates and more. Reports can be printed, saved as PDF, exported or e-mailed.

### ***MonControl speaks your language:***

Integrated terminology swapping allows you to adapt MonControl to your industry by matching terms, abbreviations and symbols, parameters and units to your individual requirement, even per test configuration.

Single-click language changeover opens new possibilities for collaborative laboratory testing, especially in multi-national companies and laboratory environments.



### ***MonControl does more than other software:***

Possibilities include simple export functions, direct data transfer to Excel or integration of third party data interfaces and structures. Featuring Open Database Connectivity (ODBC), MonControl can work with any type of database system.



# MonTech Software Systems

## MonStat Statistical Process Control (SPC) Software

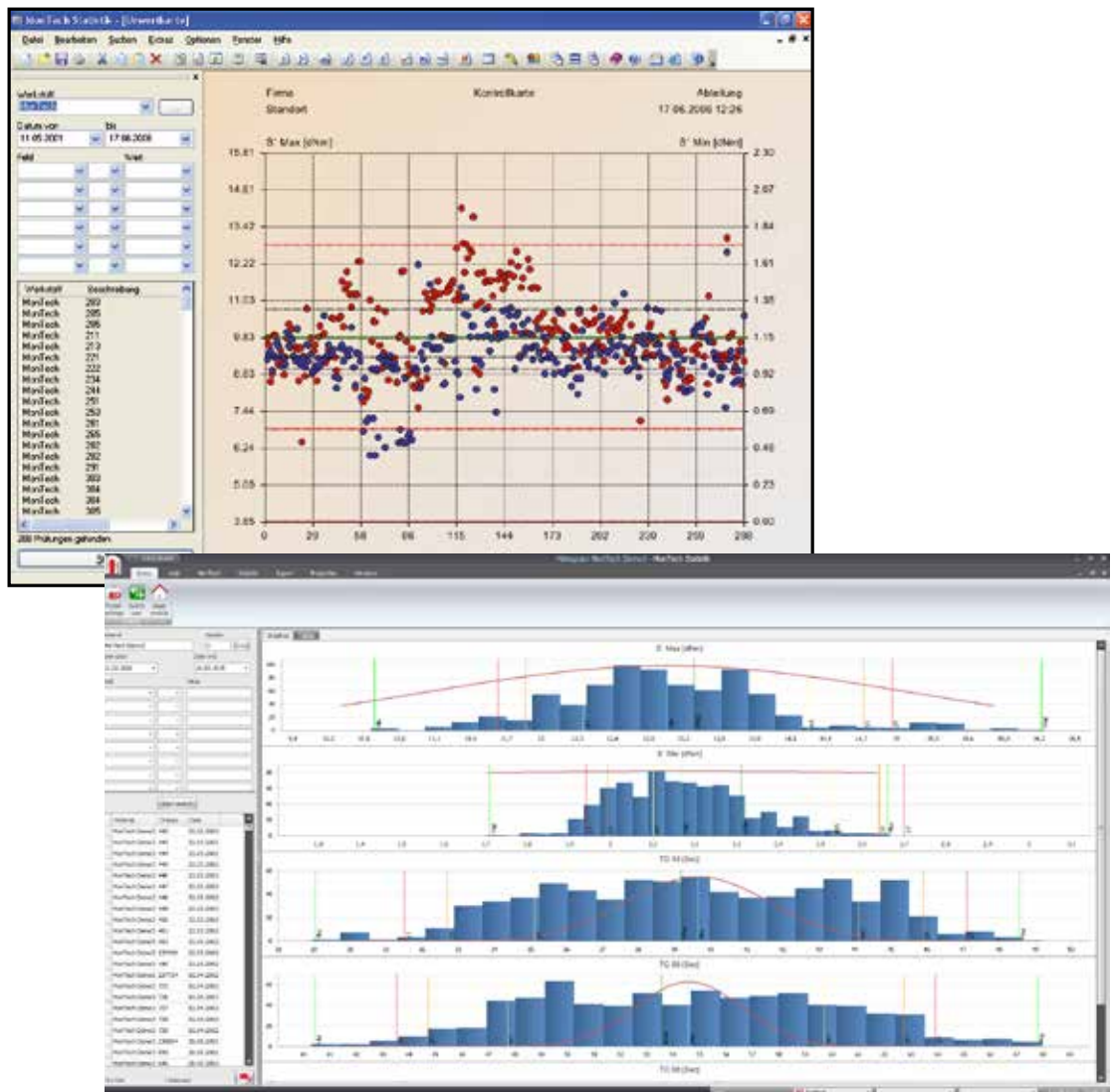


### MonStat - the innovative Statistical Process Control (SPC) and reporting solution

Statistical Process Control Software helps to quickly reduce variations and costs as well as improve productivity.

MonStat is a dynamic and adaptable software for SPC featuring both realtime and historical data analysis to help you to improve product quality and understand and optimize manufacturing processes.

MonStat offers powerful analytical techniques by joining data retrieved from LIMS database systems with data collected from production machinery on the shop floor, transforming it into actionable quality information.





# MonTech Software Systems

## Application specific software systems

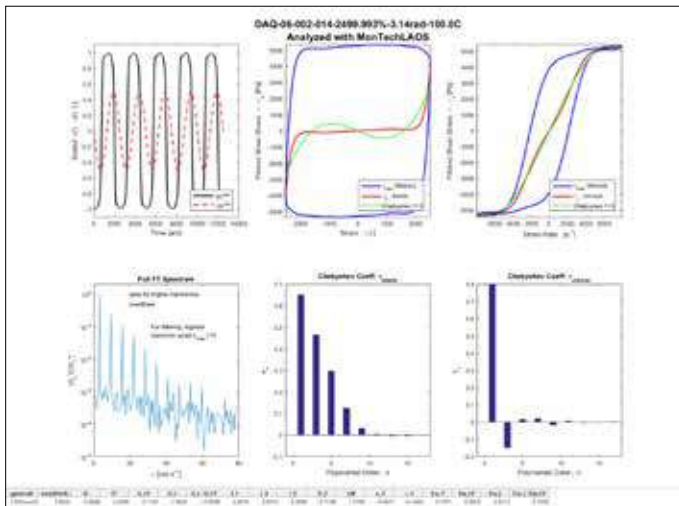
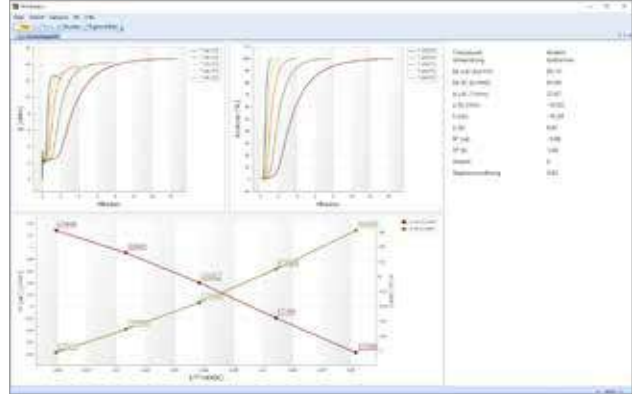
### MonKinetics

The MonTech Kinetics software package allows the calculation of important material data which is required for process modelling and simulation.

This includes activation energy, incubation time, ... on isothermal and non-isothermal cure processes.

Based on acquired temperature profiles a accurate cure and conversion rate simulation can be performed.

The additional "Online cure simulation" allows the connection of dataloggers and measurement devices to calculate state of cure online directly on the shopfloor by acquiring and displaying data from production machinery.



### MonLAOS

MonLAOS is a dedicated software tool for the rheological characterization under „Large Amplitude Oscillatory Shear“ (LAOS) conditions.

In combination with MonTechs' high speed data acquisition system the LAOS system is able to analyze polymers and rubber compounds in the linear and non-linear viscoelastic domain up to the 30th harmonic.

The software is based on Fourier-transformation (FT) Rheology automatically analyzing the frequency spectrum of stress vs. strain and strain-rate, calculating key datapoints and plotting Lissajous curves as well as the elastic and viscous frequency spectrum. Besides storage modulus at different harmonics and Chebyshev coefficient also the Long Chain Branching Index (LCBI) is calculated with each analyses.

### MonScan

A universal formatting and conversion software for data input into MonTech or external software systems and database from simple devices such as e.g.: Hardness testers, Scales and Balances, Rebound testers, Specific gravity testers, Tack testers, ...

### MonLink

Universal test specification and data management software for simple devices featuring test specification, test scheduling, test execution and reporting. Data can be stored into a common shared lab database or directly exported to host systems such as MES, ERP, SAP, ...

### MonNotify

Software for instrument condition monitoring, supervision of test instrument and remote notification in case of maintenance requirements or alarms.

## MonTech Projects and Consulting

### MonTech partners with customers for any kind of laboratory projects:

Whether for greenfield R&D or QC laboratories, extensions or refurbishment of existing laboratories we perform holistic planning and provide a harmonised infrastructure of work areas, laboratory equipment, media and room conditions.

Furthermore, we coordinate the interfaces to the individual lots (architecture, technical building equipment), support customers to create specifications and tender documents, develop standard operating procedures and document processes and finally provide assistance during the start-up period of the lab and take care that all regulations, rules and standards are met.

#### PLAN

We independently plan laboratories and lab buildings

#### BUILD

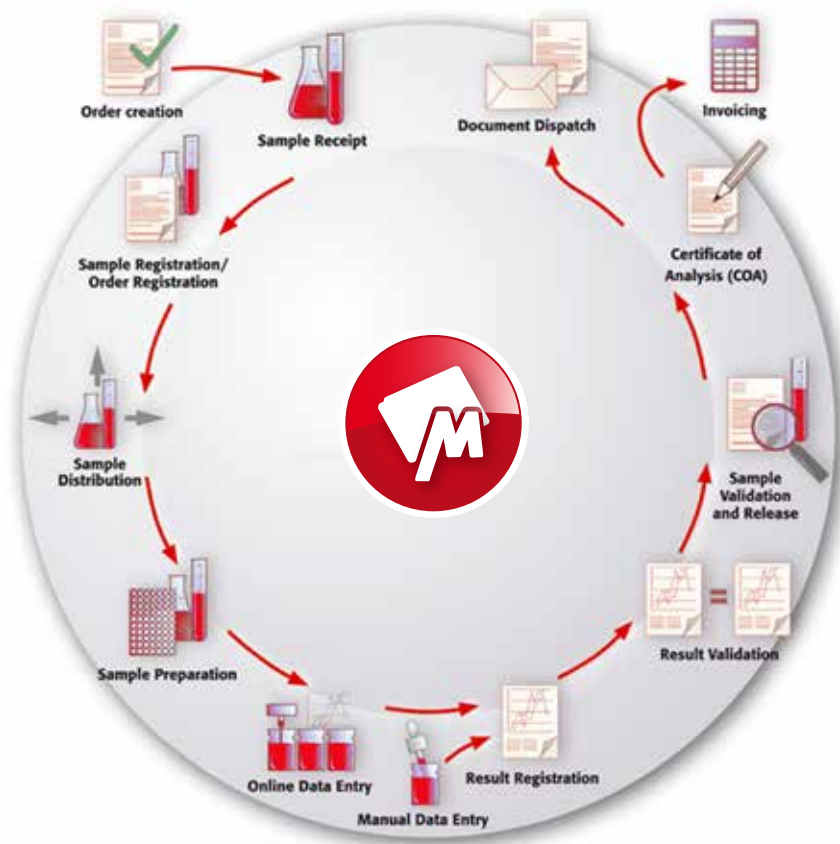
We support during the construction of buildings, lab container and mobile labs.

#### SUPPLY

Turnkey laboratories including lab furniture and lab equipment.

#### CONSULT

We develop and support your laboratory project - from start to finish



**Get in touch with us today to start to discuss your laboratory project!**

# MonTech Worldwide Support, Maintenance and Calibration



## Global customer support

Customer orientation is our top priority. That is why we are active on your behalf worldwide with one aim: to provide first-class service and support throughout the entire life-cycle of your instrument.

MonTech's customer support services include consulting, demonstration, pre-testing, successful and trouble-free commissioning, preliminary acceptance and installation, initial calibration, instruction on hardware and software, safety briefings, application seminars, workshops and of course, a continuous on-site hotline and remote support. We also supply testing film, consumables, spare parts and instrument upgrades or repairs.

Whenever our customers need help of any kind, we are at their service! Therefore, we are available 24 hours a day, 365 days a year worldwide.



## Single source ISO 17025 calibration services

MonTech's on-site calibration service provides ISO 9001 certified and ISO 17025\* accredited field calibrations to any brand, type or model of rubber testing machinery or lab equipment. These on-site service visits and calibrations are designed to be fast and reliable with minimum down time.

MonTech employs a global team of the most qualified field service engineers, strategically positioned for cost-effective service wherever calibration services or assistance may be needed.

Our KWP preventive calibration, maintenance and service program can be tailored to the customer's environments and specific demands for test data traceability with the highest instrument precision. On-site service intervals can be scheduled to minimize the risk of any unplanned downtime.



## Service, maintenance, calibration

MonTech provides fully traceable calibration services using the latest equipment and methodology by highly skilled field service engineers keeping your instrument in a perfect shape. All work and calibration procedures are fully in compliance with ISO, ASTM, DIN and other applicable standards, proven by our ISO 9001 certification, ISO 17025 accreditations\* held at various of our global sites and membership of the German calibration service (DKD).

This allows us to offer a huge scope of mechanical, dimensional, thermal and many other calibrations wherever your laboratories might be located.

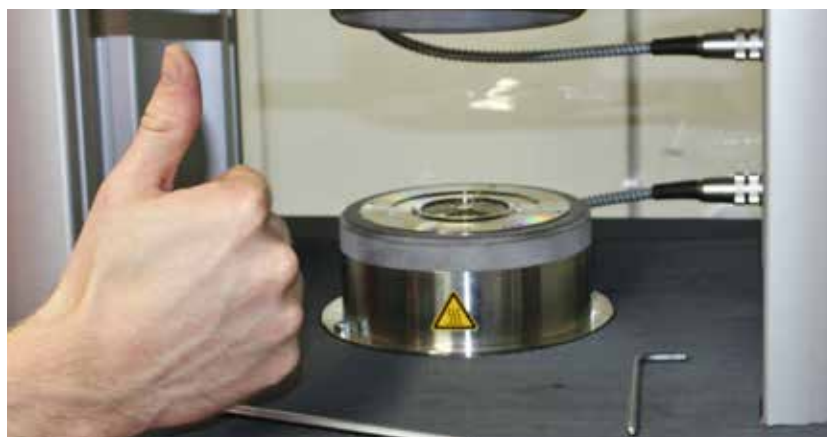
Our services ensure that your testing instrumentation is reliably providing you with consistent and accurate data, instrument-to-instrument correlations and site-to-site crosschecks.

Preventive maintenance is essential for guaranteeing instrument performance in tough environments, producing accurate and reliable data and minimizing the risk of instrument breakdowns or unplanned downtime.



\* Please refer to individual certificates for scope of certification / accreditation and services offered





### Remote and emergency support

Our remote and hotline provides help and support whenever it might be needed.

Whether you might have questions on specific instrument applications, test setups, test executions, results, calibrations, correlations or diagnostics and troubleshooting, our superb team of technical and application specialists is only a quick phone call away.

Dedicated MonTech remote assistance software allows us to connect directly with the instrument in your lab, helping you with full instrument diagnostics, data transfer and immediate software and firmware updates.

Our qualified team of software specialists is available for any kind of IT assistance that might be needed for your laboratory operations including software coaching, configuration, re-installation, upgrades, data export and database setup.



### Training and application support

MonTech's unique range of training covers everything from basic rubber rheology and testing courses, software classes for data management and Laboratory Information Management System trainings, advanced polymer and rubber rheology seminars in different operator levels to high-end scientist courses.

MonTech helps you to ensure that you get the most benefits out of any investment in MonTech instruments or software, making these products a truly safe investment that you can rely on.

Training courses are offered at any MonTech facility or on-site in the customer's laboratory with a tailored focus on their specific environment and challenges, including QA as well as R&D, consulting services for recipe development, raw materials, production and machinery including compounding and downstream processes. With these services we assist our customers to quickly increase efficiency and quality at reduced costs for an overall improved customer satisfaction and business performance requiring less internal resources.

## **MonTech GREEN Technologies and Services** **Because we care about our environment!**

***We strongly believe that long-term success is only possible if we preserve natural resources and continuously reduce our environmental impact.***

**The guiding principle of building a better future has guided us for more than two decades. Considering the dangers posed by climate change and the social challenges that go with it, we have stepped up our efforts to become the first environmentally friendly company in our industry and to make a more positive contribution to society**



To achieve this over 400 individual measures were taken over a period of 5 years - from sourcing local raw materials, optimizing travel and logistics to packing our products with locally grown and processed wood. As a result, the surplus of renewable energy produced by the MonTech factories is equivalent to an amount sufficient to power 50 households. This energy is currently being used to provide power to local houses and other neighbouring businesses.



### **MonTech is the first GREEN service and calibration provider - for your benefits:**

#### **Compatible & Reliable**

More than just a replacement. For repairs and maintenance, we use only original replacement parts – namely, those parts used in the original manufacturing process. This ensures that your devices will operate reliably for as long as possible. Our engineers carry always critical parts for machines with them and our local warehouses ensure immediate delivery over short distances.

Common parts used over many different machine models further reduces complexity and the need for many different items stocked.

#### **Competent**

We don't accept a "don't know"! Every service technician at MonTech undergoes continuous training on all our devices and products being capable of multi-disciplinary work e.g. in the area of mechanical, electrical, calibration and software and basic application/technology support eliminating the need for multiple engineer trips and significantly reducing waiting times.

#### **Available at any time**

Immediate hotline and remote support can solve your question or problem in more than 80% of the cases in minutes - without the need for on-site visits avoiding emissions wherever and whenever possible.

Helping hands around the world: Our global service network includes over 100 certified technicians in more than 35 countries.

This ensures that we can help you quickly – online, via telephone, or on location.

#### **A positive impact to your CO<sup>2</sup> balance**

Last but not least and with a ever growing importance for many of our customers:

MonTech services will NOT create any negative impact to the CO<sup>2</sup> balance of your organization - even the opposite is true: With every activity performed we actively are able to grow our sustainability efforts. This actively helps our clients to achieve their environmental goals!

## Carbon Neutrality

CO<sup>2</sup> emissions are among the main drivers of climate change. We acknowledge that operation of our plants and business locations, as well as our global sales activities, contribute to the generation of CO<sup>2</sup>. All our business processes, starting from raw materials to manufacturing and logistics have carefully been assessed on their environmental impact. We have tried hard to reduce these emissions as much as possible and have already in 2020 achieved the goal to be carbon neutral.

*But of course we have not stopped here but continue to...*

- REDUCE** our direct CO<sup>2</sup> footprint through efficiency measures and behavioral training.
- OFFSET** CO<sup>2</sup> emissions that cannot be completely avoided by making CO<sup>2</sup> savings of an equal amount elsewhere.
- REPLACE** fossil energy with our self-generated green electricity and climate-friendly alternatives for heating energy. Also we are converting our global vehicle fleet to run on more environmentally friendly technologies over the next few years.



## Green materials and supply chains

The environmental impact plays a major role in the design of machines and the parts they are made of - mainly by their material and how they are processed. We carefully select raw materials and production technology that has the environmental impact and select suppliers and supply chains that minimize environmental impact and avoid emissions. As part of our effort to ensure transparency, more and more of our raw materials and supply chains used are certified in terms of environmental and health aspects by external agencies.



## We lead our industry in circularity

In a circular economy, economic success is separated from resource consumption, resulting in resource conservation. The focus is on durability, reuse and recycling. These principles are consistent with the values we have always lived by.

We strongly focus on the entire life cycle of our products: from design to production to service & repair.

MonTech design engineers already consider the ability to recycle the materials we use in the development stage of our products.

During production, we minimize the use of water and energy and continuously reduce the amount of production waste.

Any waste generated is carefully separated in different waste streams and recycled. Also the quality, durability and reparability of our products are central to this circle.

We constantly offer updates and upgrades incorporating new technologies in older systems without the need for purchasing new machinery.

At the end of product life we offer trade-ins and provide free recycling which in many cases means test instruments are given a second life.

The "use instead of own" approach for a wide range of MonTech equipment is becoming increasingly popular with our customers.

## Instrument upgrades and rebuilds

All MonTech upgrades feature the most advanced technologies placed directly into the instrument. These 75 different modifications breath new life in the instrument, allowing factory 4.0 connectivity and most accurate and repeatable results for aging laboratory instruments

### Instrument modernization, upgrade and rebuild programs

MonTech has designed specific programs to answer every customer's instrument needs and budget and guarantee the highest instrument performance.

#### → **Repair, Rebuild and Upgrade:**

Heavily used instruments that are worn or have suffered severe damages can easily be repaired on-site or in one of our local MonTech workshops.

At the same time, instruments can be upgraded to PLC-based controller technology with digital data acquisition and the latest software systems.

#### → **Convert:**

Convert your instrument to adapt it to your specific testing needs while bringing your testing operation up-to-date again e.g. by converting your ODR to an MDR, providing significantly better accuracy and reproducibility, much easier instrument operation and even shorter test times.

#### → **Exchange:**

Exchange your instrument for another already upgraded and rebuilt instrument available from stock at many MonTech locations.

#### → **Trade in:**

Trade in your used instruments towards the purchase of a new instrument.



Rebuilt Series 2000 Instruments

### Instrument rebuilds and upgrades

A full instrument rebuild typically covers the following work items, making the instrument as reliable as a new one:

- New instrument covers and panels to make the instrument fanless and rugged enough for harsh environments by sealing off the electronic system.
- Overhaul of the mechanical system including main stack, dies, frame, drive system, pneumatics
- Replacement of all sensor switches as well as the entire wiring harness of the instrument
- Single-button control or optional 5.7" color touchpanel control with LED status lights
- Removal of all custom boards and upgrade electronics to a new PLC-based system featuring Ethernet, USB and RS232 connectivity
- An optional upgrade of the drive system to either a fixed speed brushless DC or direct servo drive
- Of course all instrument options that are available for new instruments are also available for instrument upgrades as well as many further upgrade kits such as:
  - Touchpanel control displays
  - Various transducer options
  - LED cabinet lights
  - Retrofit automation systems
  - Cooling and data output options
- Software upgrade to the latest version of MonControl Software
- Optional shotblasting and repainting of the instrument frame
- Fully traceable instrument calibration, commissioning, installation and training along with a 1 year warranty.

### Why upgrade?

Upgrading your materials testing equipment and software not only extends the system's life, but brings you our latest technology and operational features. Also, some components in your material testing system can become obsolete while other components still have years of useful life.

An upgrade of your system utilizes up-to-date technologies enabling you to increase productivity, reduce overhead, maximize machine uptime and improve the accuracy and reliability of results. Most upgrades and improvements will unlock new functionality and features not previously available to you, while still retaining your core system and minimizing costs.

Upgrading your instruments allows you to retain your machine frame while replacing or overhauling older components and software.

This results in a revitalized testing system at a fraction of the cost of new testing equipment.

The upgrade of your machinery is carried out by MonTech's qualified engineers together with the appropriate services including calibration, preventative maintenance, software updates, system set-up, and training to ensure a successful startup of your revitalized material testing system.

#### **Maximize the Potential of Your Testing Equipment:**

Upgrading is one element of your MonTech solution ownership experience. We can help you extend the life of your materials testing system by working with you to plan ahead with an equipment protection and upgrade program – helping you to avoid unexpected surprises and keep you operating at peak performance for the life of your materials testing system.



Fully rebuilt TechPro ViscTech



Converted Techpro MDPt to MD+



Upgraded PPA 2000 with automation



Automatic, software guided calibration sequence



Rheometer brushless DC drive upgrade



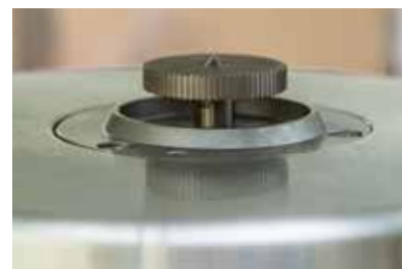
Advanced, PLC based control and DAQ electronics



Die upgrades including precision heaters and probes



Integrated safety controls and diagnostic circuits



Mooney Viscometer variable rotor speed upgrade

# Quality precision testing film

for simplifying instrument operation and increasing efficiency

## MonTech advanced testing films

have been precisely developed and are typically used for Rheometers, Mooney Viscometer testing applications as well as cure wrapping and various laboratory compression moulding applications.

While using testing film is not required for most test applications, it is highly recommended in order to protect dies, seals, seal plates and moulds from test material contamination and wear, minimizing the need for cleaning, increasing the lifetime of major components such as seals and extending calibration as well as maintenance cycles.

Being one of the first companies that introduced precision testing films to the market, MonTech provides testing films that are fully lot traceable, providing our customers the guarantee that every production lot has been thoroughly inspected and tested according to strict product-specific tests and having passed an extensive test cycle including a round robin test covering different testing instruments and fields of application in the polymer and rubber industry.

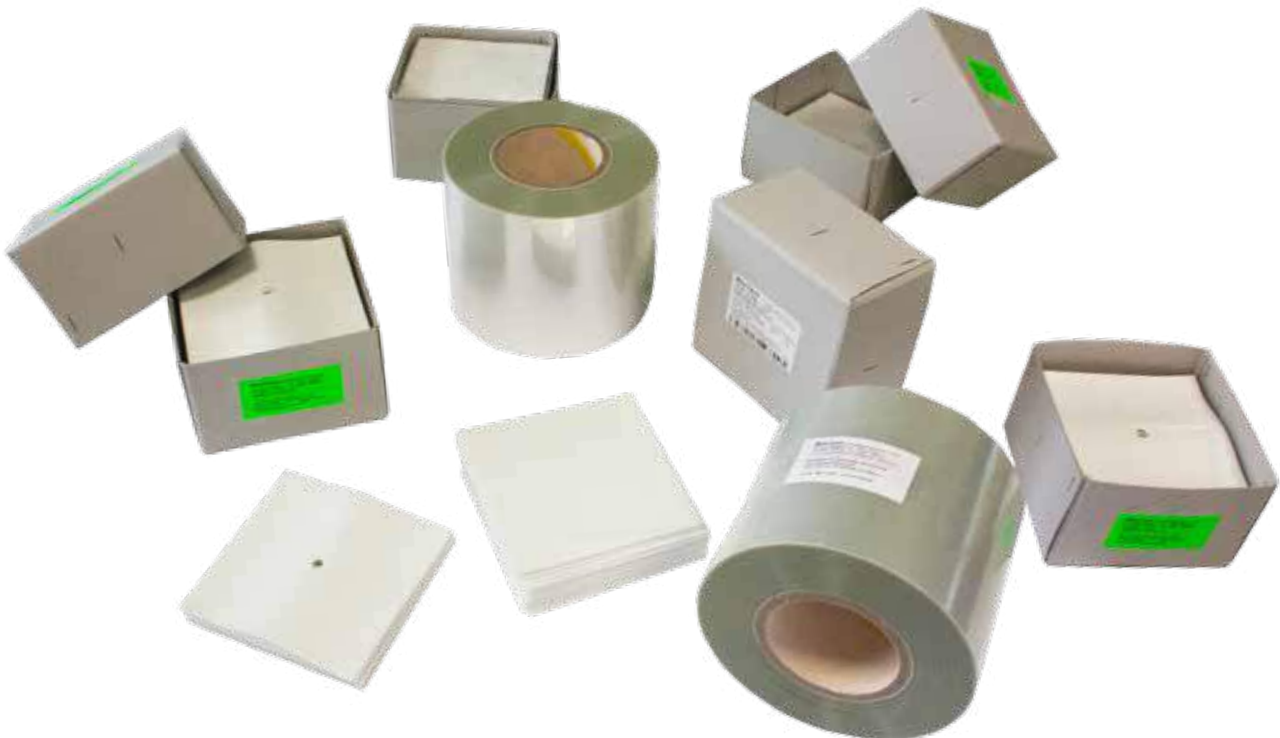
The scope of testing films includes various types, grades and thicknesses made from Polyester, Polyethylene and Nylon. Of course any type or grade of film can be tailored to specific shapes, dimensions or forms of supply, specifically for your demand and application.

MonTech therefore keeps an extensive stock of almost any type and grade of film ensuring shortest delivery times on even customer specific forms or sizes.

## Films available from stock include:

- Pre-cut sheets of Polyester films for Rheometer and Mooney testing: Supplied with or without separation paper in several formats readily available. Optionally also available with center-borehole for Mooney and Rotor Rheometer lower die usage.
- Pre-cut sheets of Nylon films for Rheometers specially designed for demanding dynamic testing applications such as high strain testing, silica filled compounds, highly oil-loaded mixes, aggressive and abrasive materials.  
Films are supplied with or without separation paper in several formats.
- Rolls of Polyester and Nylon films for Rheometer applications are spooled on paper or plastic cores providing the highest reliability especially for automated instruments. Rolls are also available for multi-roll and multi-feed applications.

For more information please get in touch with us today to discuss your specific testing requirements and suitable types of testing films.



# Consumables and spare parts

Maximize uptime and productivity of your laboratory equipment



## Instruments and laboratory consumables

With over 500.000 different parts and assemblies in our worldwide warehouses, along with our global supply chain, we can guarantee rapid response and fastest delivery of high-quality genuine consumables and spare parts that you may need for maximum uptime of your laboratory machinery.

Spare part availability is guaranteed for at least 20 years for every MonTech Instrument. For more information, please request our spare parts and consumables brochure.



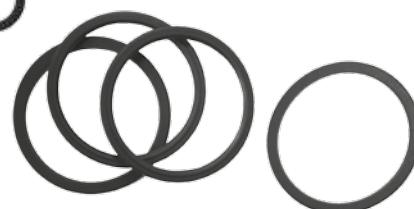
MDR and MV Standard and Longlife seals



MDR / RPA dies



MV dies



Heaters



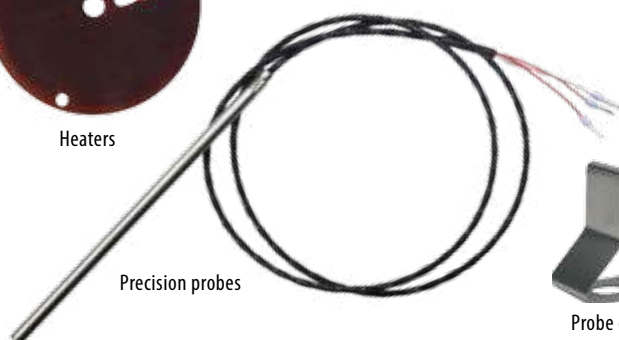
Rotors



Adjustment screws



Central shafts



Precision probes



Probe clips



Bearings



Air mufflers



Knives and dies



Display boards



Control boards and PCBs

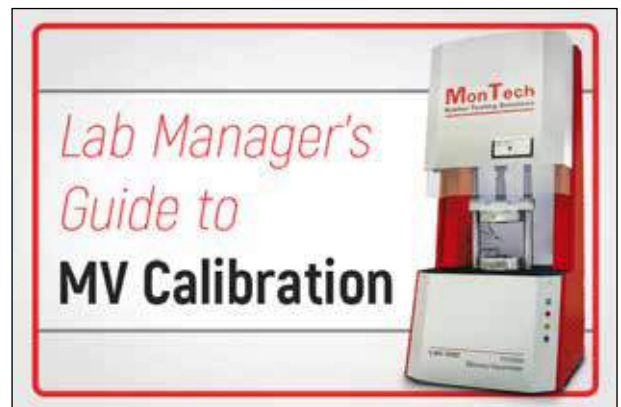
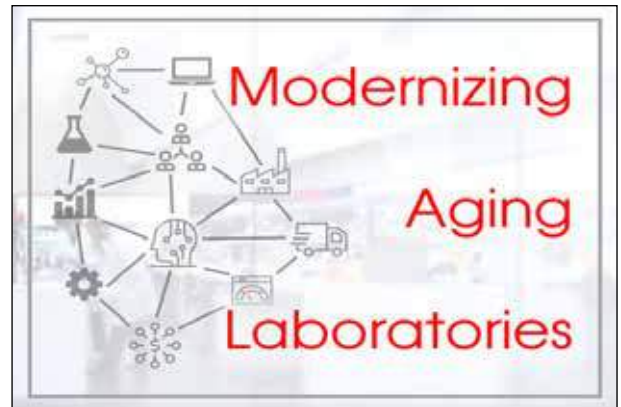
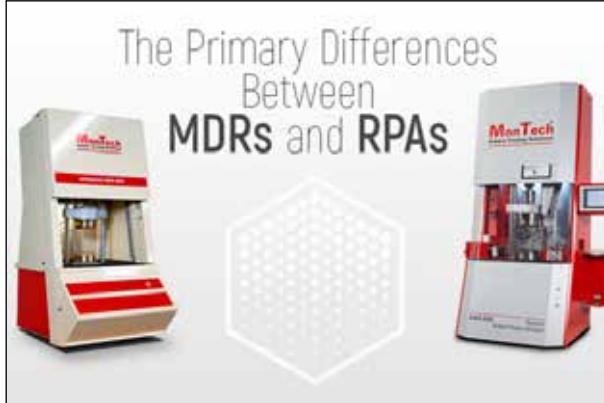


Wire brushes

# Did not find what you are looking for? There are more things to discover!

Consult with our team of experts today to find the answer to your testing needs.

Additional literature available includes:



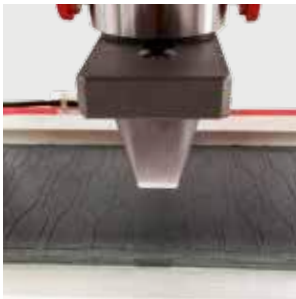


***[www.rubber-testing.com](http://www.rubber-testing.com)***

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