Brabender®



Brabender® solutions for quality testing of caoutchouc and rubber





… where quality is measured.

Dear Partners in the vulcanised and natural rubber industry,

Now more than ever, the market for vulcanised and natural rubber processing is a dynamic one. In the face of global competition, those who pursue intensive sales activities and, in particular, work on constantly developing their products have the edge.

In that context there's one thing that's non-negotiable: ensuring the quality of the raw materials used. Brabender supports you with outstanding measuring technology. On the following pages, we will give you an overview of all the units that are relevant to you as a company involved in caoutchouc and rubber processing, production and research – from proven measuring mixer and extruder solutions to special applications for density testing and carbon black characterisation.

Please feel free to contact us if you have any questions or a particular interest.

We hope that you'll find this useful.

Your Brabender Team



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Absorptometer "C"

Determining oil absorption number

Stand-alone unit

Conforms to the standards:

- **ASTM D 2414 (OAN)**
- **ASTM D 3493 (COAN)**
- **ASTM D 6854 (silica)**

The Brabender Absorptometer "C", a table-top unit with a torque measuring system (dynamometer), determines the oil absorption number (OAN) of materials in powder form by accurately and reproducibly measuring the powder's change in consistency when oil is absorbed. The structure of the material being examined that is revealed by this is directly related to the processing properties, thereby allowing conclusions to be drawn about the existing material quality.

What can be tested?

- Carbon black
- Silica
- Filler materials
- Pigments
- Titanium dioxide

Advantages

- Automatic sequence-controlled precision dosing pump with preset standard values
- Cost-efficient operation thanks to short measuring cycles
- Simple operation
- Quick and simple measuring mixer change
- Easy cleaning thanks to a compact design
- Simultaneous connection of max. four units to the PC via USB



How are measurements taken?

With the aid of an automatic precision burette, oil is continuously titrated to the sample material in the mixing chamber (variably programmable). The liquid is absorbed by the sample and the powder agglomerates. This increases the torque that is typical of the mixing process, until it finally reaches a maximum.

Features

Unlike the previous Absorptometer "E" model, the Absorptometer "C" does not measure the oil absorption number at the end point of a defined torque level. Rather, it can also define the number at a reduced torque or even at 70 per cent of the maximum torque. This enables problems to be avoided that can arise from setting the torque for materials that generate a low torque level – for example in the case of cosmetic base materials or RCBs.



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Elatest®

Density measurement of natural rubber and natural rubber mixtures

Stand-alone unit

Density is a decisive factor in rubber processing, both in recipe development and in continuous process control. The Elatest reliably and reproducibly measures the density of polymers, particularly of natural rubber and nun-vulcanised rubber mixtures, and gives crucial indications of its suitability.

What can be tested?

- Elastomers
- Natural rubber
- Non-vulcanised natural rubber mixtures

Synergy to:

- **Measuring Extruder 19/10 DW**
- **Measuring Extruder 19/20 DW**

How are measurements taken?

The density is measured through measuring the sample mass with the aid of the integrated electronic scales and measuring the volume with an electronic displacement measuring unit. The sample is first weighed, and is then pneumatically compressed in the measuring cylinder by a plunger. The way in which the sample volume is measured is by measuring the difference between the plunger stroke with the cylinder empty and the plunger stroke with the cylinder filled.

A computer integrated in the Elatest controls the entire measuring sequence and automatically calculates the sample density from the weight and the measured sample volume, with the sample density being displayed on the touch screen. All data can be copied to the local network or a USB stick via the Ethernet connection.

Advantages

- Outstanding reproducibility of the measured values
- Simple handling
- Reliable, robust design





Void Volume Meter

Carbon black analysis via void volume measurement

Stand-alone unit

Conforms to the standard:
- **ASTM D 7854**

Other test methods are freely configurable

The Void Volume Meter measures the compressed sample volume of carbon black and silica samples, resulting in the optimum polymer/carbon black ratio in polymer-reinforcing materials. For quality control on incoming and outgoing goods as well as in product development, carbon black analysis with void volume measurement therefore provides a meaningful basis for drawing conclusions about the basic properties of carbon black and silica aggregate structures without the need for additives. Alternative to the standard D 2414.

What can be tested?

- Carbon black
- Silica

How are measurements taken?

The carbon black sample is hydraulically compressed with the aid of a compression die. This involves pressure being applied to the plunger in a linear or gradual compression curve with the cylinder closed. The pressure transducers on the plunger and in the cover continuously record both the applied and the transferred pressure.

The void volume is obtained as the difference between the measured volume and the theoretical volume, standardised to 100 g. As the pressure increases, the void volume is continuously measured by way of a specified or freely selectable (10 MPa/s) compression rate.

Software calculates the void volume of the carbon black sample in accordance with the equations in ASTM D 7854 on the basis of a geometrical median curve. The volume change is recorded as a function of the pressure. Besides measurement under continuously increasing pressure, there is also the possibility of editing compression profiles. This means that selected compression values are approached over a certain time.

Advantages

- Quick and simple testing method
- High accuracy and reproducibility
- Easy cleaning
- Productivity: higher measuring frequency compared with oil absorption measurement
- No additives required
- No disposal necessary after the test is performed (the sample can be used again)



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Plastograph® EC plus

Examining the processability of elastomers

Drive unit

A torque rheometer for application-based tests in the laboratory or technical institute. It is used to examine the processability of elastomers, thermoplastics, thermosets, ceramic materials, filler materials, pigments and many other materials that can be plasticised. This is done quickly under realistic conditions with a minimal amount product required.

What can be tested?

- Natural and synthetic rubber mixtures
- Rolled sheet strips
- Granulate

Compatible with:

- **Measuring Extruder 19/10 DW**
- **Measuring Extruder 19/20 DW**
- **Measuring Mixer B 50 / N 50**

Compatibility

The Plastograph EC Plus is the enhanced version of the Plastograph EC. Both are enhanced table-top versions of the world-famous Plastograph universal torque rheometer. In conjunction with the Measuring Extruder 19/10 DW and the Measuring Mixer B 50 and N 50, the Plastograph EC Plus is a suitable solution for the economical and meaningful testing of both vulcanised and natural rubber mixtures.

How are measurements taken?

The Plastograph EC Plus provides the drive energy for the respective measuring attachment: It moves a pendulum dynamometer out of its zero position. This path is measured and shown as a function of time. During the entire extrusion process, it registers and regulates the various parameters of the individual measuring attachments, dosing units and take-off devices such as mass temperatures and control temperatures, speed and pressure.

What is measured?

In conjunction with the Measuring Extruder 19/10 DW:

- Heating zone temperatures and mass temperatures
- Mass compression values
- Torque
- Extruder speed
- Speeds of e.g. dosing and take-off devices, throughput (with scales)

In conjunction with the Measuring Mixer B 50 / N 50:

- Speed, torque and temperature
- Material properties and melt behaviour
- Flow/vulcanising behaviour
- Compounding with aggregates (e.g. carbon black, silica), black incorporation time (BIT)

Uses

In conjunction with the Measuring Extruder 19/10 DW:

- Practical simulation of production processes
- Optimum process parameters for every production system
- Clear cost savings

In conjunction with the Measuring Mixer B 50 / N 50:

The measured values give an indication of the product's behaviour during production and indicate its rheological properties and/or show up structural changes in the material being mixed. The saved sets of parameters can be further used e.g. for recipe development.

Advantages

- Real-time transfer of results and actual values
- Reliable and meaningful results even with small sample quantities
- No interruption of the production process
- Modular design allows application flexibility



Plasti-Corder® Lab-Station

Torque rheometer for application-based tests in the laboratory or technical institute

Drive unit

The Plasti-Corder Lab-Station is the basic unit for application-based tests or processing tasks in the laboratory or technical institute for raw material and recipe development, material testing, quality control during production, optimising production processes and making samples on a laboratory scale for further examinations.

What can be tested?

- Natural and synthetic rubber mixtures
- Rolled sheet strips
- Granulate

Compatible with:

- **Measuring Extruder 19/10 DW**
- **Twin Screw Extruder TSE 20 / TSE 25**
- **Internal Mixer 350 S**
- **Measuring Mixer B 50 / N 50**

How are measurements taken?

The Plasti-Corder Lab-Station incorporates the direct torque measuring system. It registers and regulates the various parameters of the individual measuring attachments, dosing and take-off devices such as mass temperatures and control temperatures, speed and pressure during the entire extrusion process.

What is measured?

In conjunction with the Measuring Extruders 19/10 DW and TSE 20:

- Heating zones temperatures and mass temperatures
- Mass compression values
- Torque
- Extruder speed
- Speeds of e.g. dosing and take-off devices, throughput (with scales)

In conjunction with the Measuring Mixers B 50 / N 50 and the internal Mixer 350 S:

- Speed, torque and mass temperature
- Material properties and melt behaviour
- Flow / vulcanising behaviour
- Compounding with aggregates (e.g. carbon black, silica), black incorporation time (BIT)

Uses

In conjunction with the Measuring Extruders 19/10 DW and TSE 20/25:

- Practical simulation of production processes
- Optimum process parameters for every production system
- Clear cost savings

In conjunction with the Measuring Mixers B 50 / N 50 and the internal Mixer 350 S:

The plastogram produced shows the torque (viscosity) and the temperature as a function of time, and also visualizes the material's structural changes. The measured values give an indication of the material's behavior during production and indicate its rheological properties. Saved sets of parameters can be further used e.g. for recipe development.

Advantages

- Real-time transfer of results and actual values
- Reliable and meaningful results even with small sample material quantities
- No interruption of the production process
- Flexibility thanks to a modular design

Add-ons

- Thermostat (mandatory)
- Measuring attachments for natural / vulcanised rubber applications: Measuring Extruder 19 / 10 DW and Internal Mixer 350 S
- Docking station (for connecting the Measuring Mixer 350 S)
- Take-off devices for operation with TSE / Measuring Extruder 19 / 10 DW: Conveyor belt, water bath, static mixer and winder

Synergy to:

- Two-roll mill (sample preparation for measuring mixer sample material)
- Elatest (density test)



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Measuring Extruder 19/10 DW and Measuring Extruder 19/20 DW

Realistic simulation of elastomer processing

Conforms to the standard:

- **ASTM D 2230**

The Brabender Measuring Extruders 19/10 DW and 19/20 DW are measuring attachments and work in conjunction with a Brabender Plasti-Corder Lab-Station or Plastograph EC Plus. Round and Garvey profiles are made on a laboratory scale for quality control, material and recipe development, which allow practical simulation of production processes. The optimum process parameters for any production system can be set using the recorded measurement variables.

The single-screw Measuring Extruder 19/10 DW with its roller feed and short processing section length of 10 D is particularly well suited to investigating the extrudability of elastomers and for studying development and application problems. It can be used in conjunction with a 10-D pin-type extruder attachment as Measuring Extruder 19/20 DW. Fitted with the Garvey die head, the Measuring Extruders 19/10 DW and 19/20 DW are ideally suited to investigating the flow property of rubber and rubber mixtures.

The sample is melted in the heated extruder cylinder, homogenised and transported to the die by the screw. The software measures the various parameters and records them graphically and in table form for subsequent evaluation.

How are measurements taken?

The MetaBridge software of the drive – Plastograph EC Plus or Plasti-Corder Lab-Station – records various process parameters.

- Heating zone temperatures and mass temperatures
- Mass compression values
- Torque
- Extruder speed
- Speeds of e.g. dosing and take-off devices, as well as throughput (with scales)

What can be tested?

- Natural and synthetic rubber mixtures
- Ribbons of rolled sheets and pellets
- NBR

Compatible with:

- **Plastograph EC Plus or Plasti-Corder Lab-Station**
- **Docking station (only when operated with Plasti-Corder Lab-Station)**

Advantages

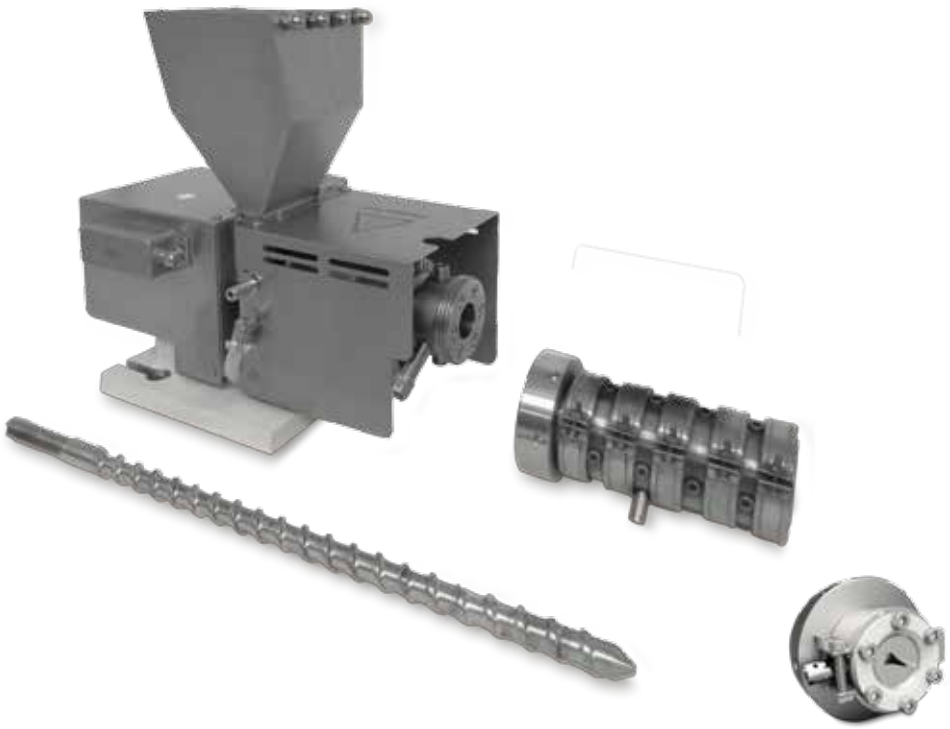
- Quicker and easier attachment onto the drive unit
- Process length can be extended to 20 D with pin-type extruder attachment
- Real-time transfer of results and actual values
- Small sample quantities thanks to a small overall size
- Clear cost reduction thanks to an uninterrupted production process

Add-ons

- Die heads: Round, Garvey, tubing and ribbon die head
- Pin-type extruder attachment
- Take-off devices: Conveyor belt, water bath, static mixer, winder

Synergy to:

- Internal mixer 350 S (preparing the material being mixed)
- Measuring Mixer B 50 / N 50
- Elatest (density tests)



Twin Screw Extruder TSE 20

Realistic simulation of elastomer production

The Brabender Twin Screw Extruders TSE 20/40 are electrically heated measuring attachments that are driven by the Brabender Plasti-Corder Lab-Station. The extruders are used for producing many different extrudates on a laboratory scale, for quality control and for material and recipe development. The Twin Screw Extruders TSE 20 and TSE 25 allow the practical simulation of production processes. The optimum process parameters for any production system can be set using the recorded measurement variables.

The Twin Screw Extruder TSE 20/40 is the ideal solution to most process tasks due to efficient and effective possibilities for adapting the machine to many different compounding tasks.

What is measured?

The MetaBridge software of the drive (Plasti-Corder Lab-Station) records the various parameters in conjunction with the Brabender Twin Screw Extruders.

- Heating zone temperatures and mass temperatures
- Mass compression values
- Torque
- Extruder speed
- Speeds of e.g. dosing and take-off devices, as well as throughput (with scales)

What can be tested?

- Natural and synthetic rubber mixtures
- Ribbons of rolled sheets and pellets
- NBR

Compatible with:

- **Plasti-Corder Lab-Station**

Synergy to:

- Also available as Stand-alone extruder TwinLab-C 20/40



TwinLab-C 20/40



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Measuring Mixer B 50 / N 50

Preparation of natural and synthetic elastomers

Conforms to the standard:

- **ASTM D 3182 (for elastomers)**

The Measuring Mixer B 50 (with Banbury blades and liquid temperature control) can be used as standard in conjunction with the Plastograph EC Plus or the Plasti-Corder Lab-Station. Typical applications include investigating flow and vulcanising behavior, masticating, plasticizing, dispersing, homogenizing, melting, mixing, kneading and compounding of natural and synthetic elastomers in paste, viscous, plastic and elastic form for material development and quality control.

What can be tested?

- Natural and synthetic rubber mixtures
- Ribbons of rolled sheets
- Pellets
- Iron oxide powder, carbon black, pigment and similar particle (in the µm range)

Compatible with:

- **Plasti-Corder Lab-Station**
- **Plastograph EC Plus**

How are measurements taken?

The torque and mass temperature are measured and registered during the entire kneading process. The torque is produced by the resistance with which the sample material acts against the rotating blades in the kneading chamber during the kneading process.

Uses

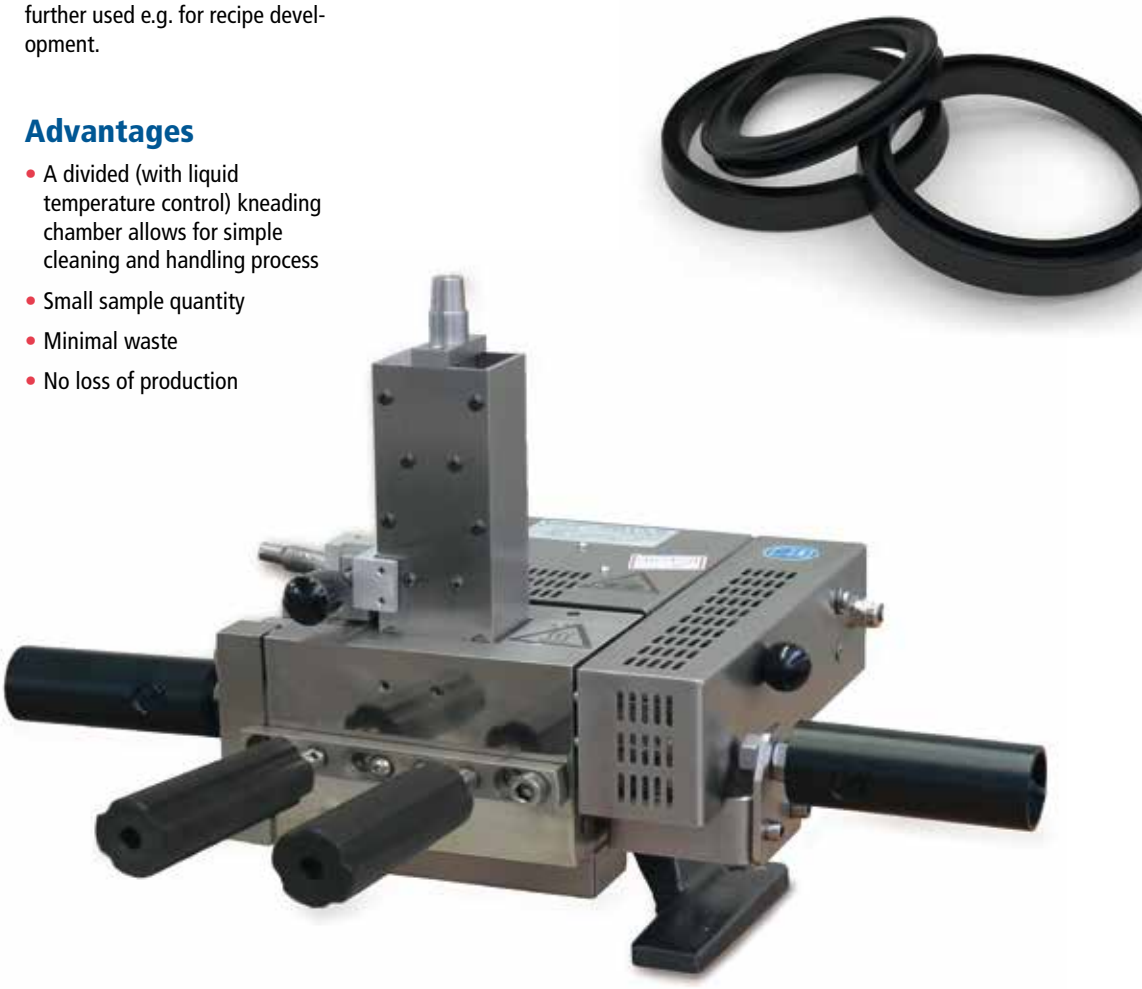
The plastogram illustrates structural changes to the material. The measured values give an indication of the material's behavior during production and indicate its physical and rheological properties. The saved sets of parameters can be further used e.g. for recipe development.

Features

- Separate circulation thermostat for liquid temperature control of the kneading chamber
- Possibility of examining the flow property of electrode masses and ceramic moulding compounds as a function of temperature and shear

Advantages

- A divided (with liquid temperature control) kneading chamber allows for simple cleaning and handling process
- Small sample quantity
- Minimal waste
- No loss of production



Internal Mixer 350 S

Special mixer for the vulcanised and natural rubber industry

Conforms to the standards:
- **ASTM D 3186**

The Brabender Internal Mixer 350 S (roller, cam, Banbury or sigma blades) was specially developed for the vulcanised and natural rubber industry as a measuring attachment with liquid temperature control (internal mixer). It is used in conjunction with the Plasti-Corder Lab-Station drive unit to investigate natural and synthetic elastomers in paste, viscous, plastic and elastic form in the context of material testing, and also in material and recipe development. Preparation is done by means of masticating, plasticising, dispersing, homogenising, melting, mixing, kneading and compounding.

How are measurements taken?

The torque and the mass temperature are measured and registered during the entire kneading process. The torque is produced by the resistance with which the sample material acts against the rotating blades in the kneading chamber during the kneading process. The plastogram shows the maximum filling level, the flow behaviour of the mixture at the torque minimum, and also the rise in the curve up to the torque maximum that results from the vulcanisation.

Features

- The mixer is divided horizontally in the centre part: The top and bottom halves can simply be swivelled down, the material can be easily removed and new material added for follow-up tests.
- Special seals ensure the clean mixing of fine-particle products such as silica and carbon black.
- The free kneading volume of 370 to 440 cm^3 (depending on the blade geometry) has proved to be beneficial to the requirements of the vulcanised / natural rubber industry in terms of dimensioning the recipe components.
- A corresponding software package is available for material investigations such as determining the black incorporation time (BIT).
- Optional: conductivity measurement by means of sensor technology

Uses

The plastogram produced shows the torque (viscosity) and the mass temperature as a function of time, and also visualises the material's structural changes. The measured values give an indication of the material's behaviour during production and indicate its physical and rheological properties. The saved sets of parameters can be further used e.g. for recipe development.

What can be tested?

- Natural and synthetic rubber mixtures
- Ribbons of rolled sheets
- Pellets

Compatible with:

- **Plasti-Corder Lab-Station**

Advantages

- Small sample quantity
- Minimal waste
- No loss of production

Add-ons

- Thermostat (mandatory)
- Own docking station for connection to the Lab-Station
- Optional: Conductivity sensor, pump for dosing liquids

Synergy to:

- Two-roll mill (for sample preparation)
- Measuring Extruder 19/10 DW (for further processing the material being mixed)
- Elatest (testing the developed recipe)



… where quality is measured.

Internal Mixer B 350 / N 350

Preparation and batchwise processing of natural and synthetic elastomers

Conforms to the standards:
- **ASTM D 3182**

The Brabender internal mixers of the 350 series can be equipped with both: banbury blades and cam blades. The kneader is operated with a Lab-Station as standard. With comparatively large free volumes of 370 to 440 cm³, these mixers are frequently used for the production of test mixes for follow-up tests.

How are measurements taken?

The torque and the mass temperature are measured and registered during the entire kneading process. The torque is produced by the resistance with which the sample material acts against the rotating blades in the kneading chamber during the kneading process.

Uses

The plastogram illustrates structural changes to the material. The measured values give an indication of the material's behavior during production and indicate its physical and rheological properties. The saved sets of parameters can be further used e.g. for recipe development.

Features

- Separate circulation thermostat for liquid temperature control of the kneading chamber
- Possibility of examining the flow property of electrode masses and ceramic moulding compounds as a function of temperature and shear

Advantages

- Simple cleaning and handling process of the kneading chamber
- Small sample quantity
- Minimal waste
- No loss of production

What can be tested?

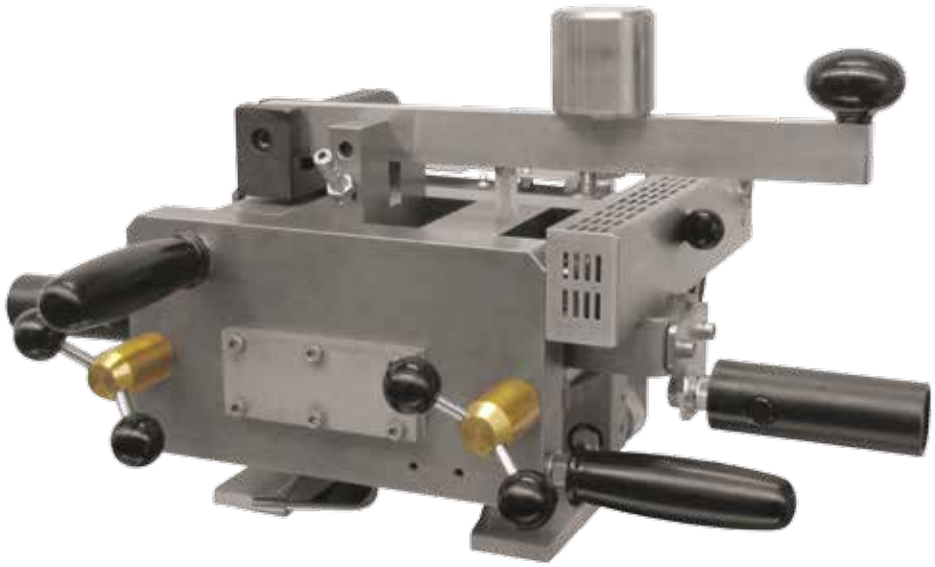
- Natural and synthetic rubber mixtures
- Ribbons of rolled sheets
- Pellets
- Iron oxide powder, carbon black, pigment and similar particle (in the µm range)

Compatible with:

- **Plasti-Corder Lab-Station**

Synergy to:

- Two-roll mill (for sample preparation)
- Measuring Extruder 19/10 DW (for further processing the material being mixed)
- Elatest (testing the developed recipe)



Brabender®

Stand-alone unit

TSSR-Meter

Anisothermal testing of stress relaxation for characterising TPE, plastics and elastomers

Conforms to the standard:

- **Standard bar S2 bar in accordance with DIN 53504, corresponds to test body 5A in accordance with EN ISO 527**

The TSSR-Meter allows conventional isothermal relaxation measurements to be taken as well as temperature scanning stress relaxation (abbreviated TSSR), an anisothermal stress relaxation measuring method (AISR method). The mechanical and thermal properties of TPE, plastics and elastomers can be characterised with the aid of this process. The TSSR-Meter is suitable for material development and for quality control during production. As the importance of TPE increases, this is a decisive factor in the automobile industry in particular.

How are measurements taken?

Two different measurement processes are possible with the TSSR-Meter:

- Conventional isothermal relaxation measurement
- The TSSR method

The measuring sequence with the TSSR-Meter involves two steps: The sample bar is placed inside and is then stretched by a certain amount (e.g. 50 %). Short-term relaxation processes can subside over a freely selectable time (e.g. 2 h) at a constant temperature (e.g. 23 °C).

The anisothermal phase follows in a second step. In this the sample is heated up to the defined temperature (max. 300 °C) at a constant, freely selectable heating rate (e.g. 2 K / min). The maximum working temperature and the relaxation spectrum of the test material are determined during this process. In both phases, the TSSR-Meter records the force characteristics. These form the basis of the evaluation.

Features

- Special holders for thin hoses

Uses

- The TSSR index is a relative measurement for the elastomer-like temperature behaviour of a TPE or elastomer material
- Information about the relaxation behaviour and structure of the sample material

What can be tested?

- Natural rubber
- Synthetic natural rubber mixtures
- Vulcanised rubber
- Elastomers
- Thermoplastic elastomers

Advantages

- The crosslinking density is determined very quickly
- Minimal testing effort and time requirement
- Simple operation
- Measurement and evaluation are done automatically
- Very good reproducibility



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Laboratory two-roll mill

Universal mixer for vulcanised and natural rubber

The laboratory rolling unit is a universal machine for mixing and kneading vulcanised and natural rubber. The two-roll mill is used throughout the world for raw material and recipe development, material testing, quality control during production and optimising production processes.

What can be tested?

- Natural rubber
- Synthetic natural rubber mixtures
- Vulcanised rubber

Synergy to:

- Measuring Mixer B 50 / N 50
- Internal Mixer 350
- TSSR-Meter
- Laboratory press

What is measured?

The two-roll mill is a pure preparator and performs no measurement tasks.

How does it work?

Two fixed roller speeds guarantee a constant friction. The unit can be operated at both a fixed and a variable speed. The roller diameter is 100 mm and is corrosion-resistant, hardened and smoothed.

Uses

- Production miniaturisation
- Recipe development
- Mixing vulcanised and natural rubber
- Clear and simple operation

Features

The mixing rollers can be heated and / or cooled.



Laboratory table press

Laboratory press for vulcanised and natural rubber

The laboratory press is a universal machine for making plate-shaped samples out of natural and vulcanised rubber. It is used throughout the world for raw material and recipe development, material testing, quality control during production and optimising production processes.

What can be tested?

- Natural rubber
- Synthetic natural rubber mixtures
- Vulcanised rubber

Synergy to:

- Measuring Mixer B 50 / N 50
- Internal Mixer 350
- Elatest
- Laboratory two-roll mill
- TSSR-Meter

What is pressed?

All common plates and samples can be made in the laboratory with the simple platen press. Precise adaptation to customer-specific requirements is possible with extension units.

The table press is a hydraulic upstroke press. The press plates are housed in a robust four-column press unit. Generously dimensioned yoke plates and columns absorb the resulting forces. The bottom press plate lies on top of the press table, which is moved by a hydraulic cylinder. The extended stroke of the cylinder guarantees optimum guiding properties.

The press plates are of a multi-layer design and have a working surface made of polished steel. The arrangement of the cooling water circuit and heating cartridges in an aluminium block guarantees even temperature distribution and quick cooling. The press plate is connected to the press unit via a temperature-resistant and pressure-resistant insulation plate.

Uses

The operator receives the rubber plates, which are conditioned differently depending on the process conditions, in order to show various property profiles.





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25099 / Brabender C / Vulcanised and natural rubber use / 09 / 2019