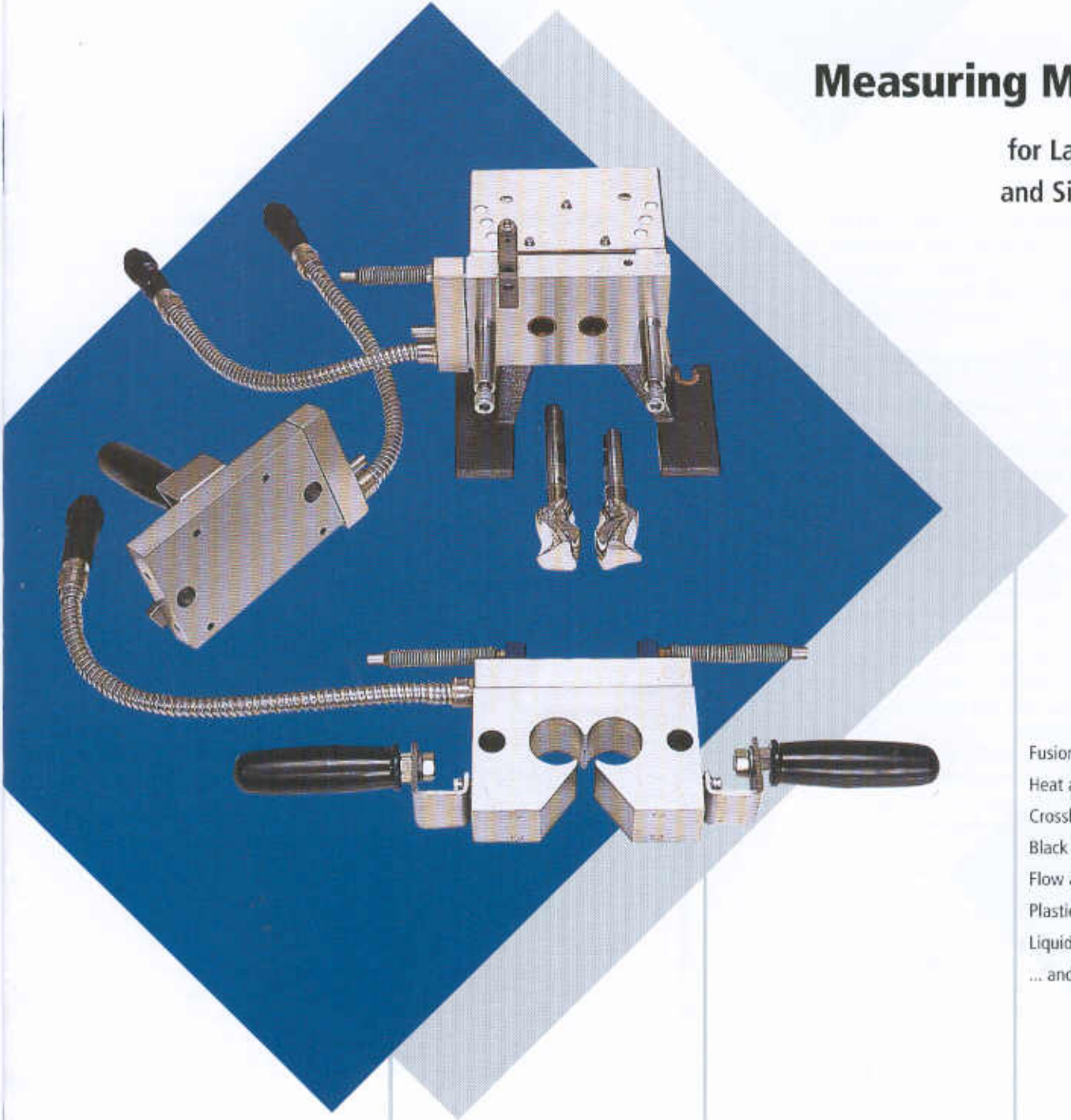


## Measuring Mixers

for Laboratory  
and Simulation



- Fusion Behavior
- Heat and Shear Stability
- Crosslinking Reaction
- Black Incorporation Time
- Flow and Cure Behavior
- Plasticizer Absorption
- Liquid Absorption
- ... and many others

## Simulate Production Realistically on a Laboratory Scale

Use BRABENDER® measuring mixers for testing the processibility of thermoplastics, thermosets, elastomers, ceramic molding materials, fillers, pigments, and other plastic and plastifiable materials

- under practice-oriented conditions
- cost-effectively
- with little expenditure of time and material
- reliably
- precisely
- reproducibly

In combination with a BRABENDER® Plastograph®, Plasti-Corder® or Lab-Station, all production processes relevant for production and processing of plastic and plastifiable materials, e.g. compounding, mixing, mastication, etc., are simulated realistically on a laboratory scale and documented by measurements.

Or use BRABENDER® measuring mixers for quick and easy production of samples for further tests e.g. for tensile strength, pigment dispersion, etc.

The measuring mixers consist of a mixer backstand with gear unit and a detachable mixer bowl. They are connected to a suitable drive unit (e.g. Plastograph®, Plasti-Corder®, Lab-Station) through a shear pin coupling protecting both mixer and drive unit from damage due to overload.

All measuring mixers can easily be interchanged at the drive unit.

The blades are made of special steel. Counter-rotation towards each other at different speeds provides for excellent compounding and mixing characteristics.

Heating/cooling is done either through a liquid circulation thermostat for materials that require very precise and constant temperature control or electrically with air cooling in 3 individual zones where the temperature is measured through separate control

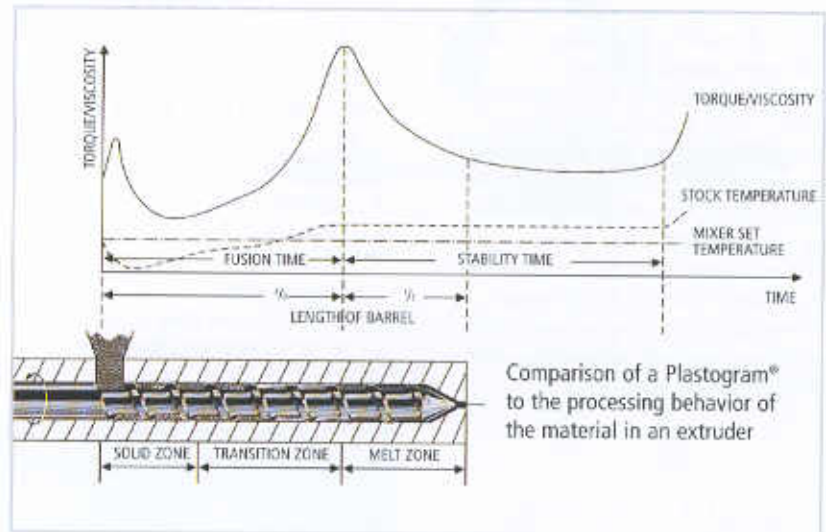
thermocouples and displayed and controlled by self-optimizing electronic temperature controllers. All series 30 and 50 EHT mixers are suited for operating temperatures of up to 500°C.

Manifold different mixer designs and blade geometries as well as a wide range of additional equipment permit to test nearly all plastic and plastifiable materials.



## The Principle

The measuring principle is based on making visible the resistance the sample material opposes to the rotating blades. The corresponding torque moves a dynamometer out of its zero position. In compliance with the existing standards and test specifications, a typical 'Plastogram'® (torque and stock temperature vs. time) is recorded for each sample material. This diagram shows the relationship between torque (viscosity) and temperature/time in consideration of structural changes of the material. The measured data are displayed numerically as a table and/or graphically as a diagram during the measurement on the monitor and can be printed and stored.



## The Software

The user-optimized Windows® 95/98 or NT software provides for evaluation of the measured data in compliance with the latest standards. On-line diagrams give a quick survey of the measured data and evaluation results already during the measurement. Use the advantages of the Windows® environment and save time with real multitasking - run a measurement, display stored data, and write texts, all at a time. Among others, the following tests can be run with BRABENDER® measuring mixers:

- fusion behavior of PVC
- heat and shear stability of polymers
- flow and cure behavior of cross-linking polymers acc. to DIN 53 764
- automatic evaluation of the black incorporation time (BIT) with selectable zero point
- flow and cure behavior of elastomers
- plasticizer absorption of PVC dry blends
- liquid absorption of powders
- semi-automatic universal evaluation
- mixer tests with temperature and speed programming
- degree of property breakdown

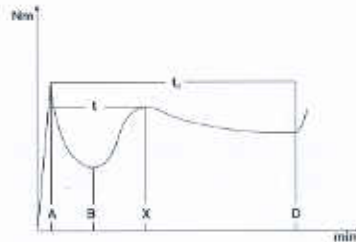
The versatile data correlation program makes it easy to directly compare the results of different tests of one or several test series. Mean values and standard deviations are calculated automatically and shown digitally and graphically. Define any measured curves as reference curves and easily check whether your sample material meets certain demands or not. The special correlation program with parameter variation shows the influence of individual parameters like temperature, mixer speed, additives, etc. on the behavior of your sample material.

# The Mixers

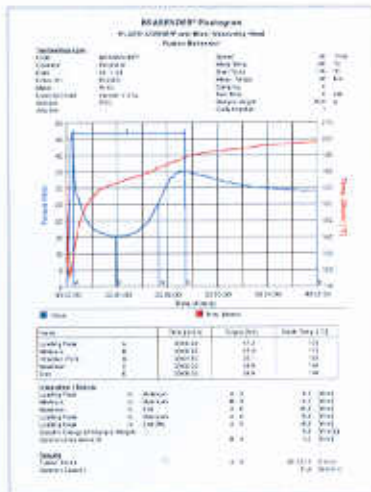
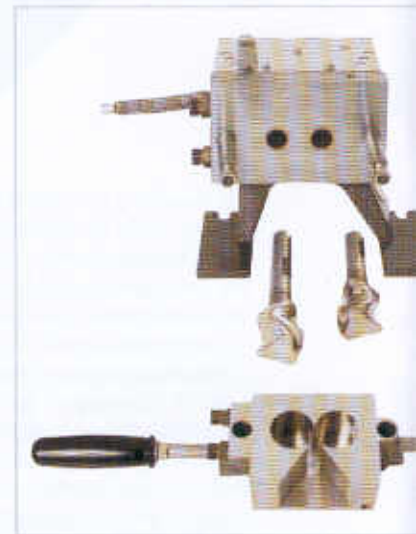
## Mixer W 50

The W 50 with its roller blades is the allrounder among the mixers. It is used for all thermoplastics. The special shape of the rotors, developed by BRABENDER® more than 50 years ago, as well as the tight clearance between rotors and mixing chamber guarantee an intensive, high shear mixing. The rotor speed ratio of 2 : 3 (driven to non driven) results in a high torque resolution which allows a better differentiation, especially when testing low viscosity polymers.

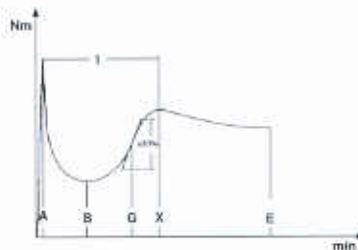
### Heat and Shear Stability



- A : Loading Peak
- B : Minimum
- X : Maximum
- D : Decomposition
- t : A - X = Fusion Time
- t<sub>b</sub> : A - D = Decomposition Time



### Fusion Behavior



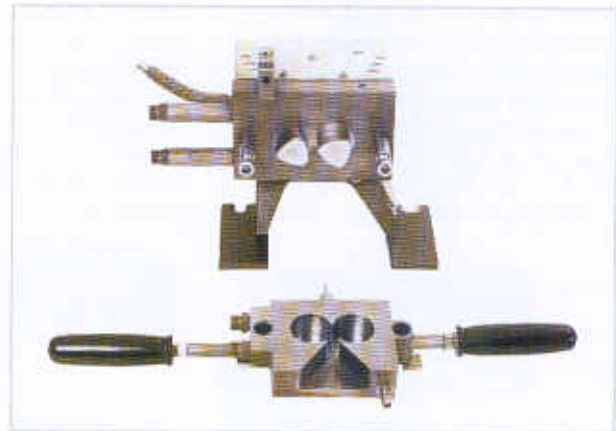
- A: Loading Peak
- B: Minimum
- G: Inflection Point
- X: Maximum
- E: End
- t: A - X = Fusion Time
- v: G ± 20% = Gelation Speed

Mixer	W 50 W 50 EHT	W 30 W 30 EHT	N 50 N 50 EHT	MB 30	B 50 B 50 EHT
Application	thermoplastics	thermoplastics	caoutchouc	thermosets	ca...
Volume of mixer bowl approx. [cm³]	55	30	80	25	70
Sample weight* [g]	40 - 70	25 - 40	40 - 80	20 - 40	40
Heating/cooling	liquid el. heating/air	liquid el. heating/air	liquid el. heating/air	liquid	liq el.
Torque max. [Nm]	200	200	200	200	200
Speed ratio driven : idle blade	2 : 3	2 : 3	2 : 3	3 : 2	1 : 3
Operating temperature max. [°C]	200 500	200 500	200 500	200	200 500
Dimensions (W*H*D) [mm]	700*200*450 500*200*450	700*200*430 500*200*430	700*200*450 500*200*450	700*200*430	700*200*450 500*200*450
Net weight approx. [kg]	18 17	13 17	18 17	13	18 17

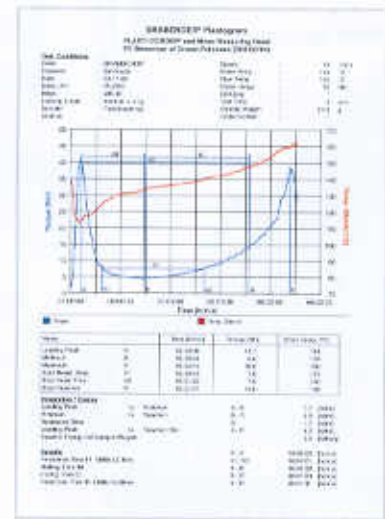
\*depending on the specific weight and bulk density of the sample material

## Mixer MB 30

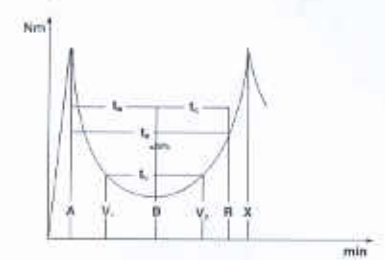
The mixer has delta-shaped rotors and is used for thermosetting materials. It was developed and designed by BRABENDER® together with a group of renowned producers and complies with the German standard DIN 53 764. It is made of a special, hardened steel to prevent abrasion. For an accurate temperature control, the MB 30 mixer is heated with liquid.



EHT	S 300 C	P 600	W/N/B/S 350 W/N/B/S 350 E	W/N/B/S 350 S	W 1000 S
chouc	powders	powders	various	various	various
	600	2500	370 - 440	370 - 440	1000 - 1200
70	200 - 600 acc. to ASTM	variable acc. to DIN/ISO	250 - 500	250 - 500	650 - 1350
asting/air	liquid	liquid	liquid el. heating/air	liquid	liquid
	50	5	400 150 (S)	400 150 (S)	1200
11	2 : 3	-	3 : 2 1 : 1.11 (B)	3 : 2 1 : 1.11 (B)	3 : 2
	300	150	250 300	250	250
200*450 200*450	230*195*350	300*420*550	550*260*400 650*260*400	450*410*200	620*2000*780
	18	11	44 46	90	570



Flow-Curing Behavior of Crosslinking Polymers acc. to DIN 53 764

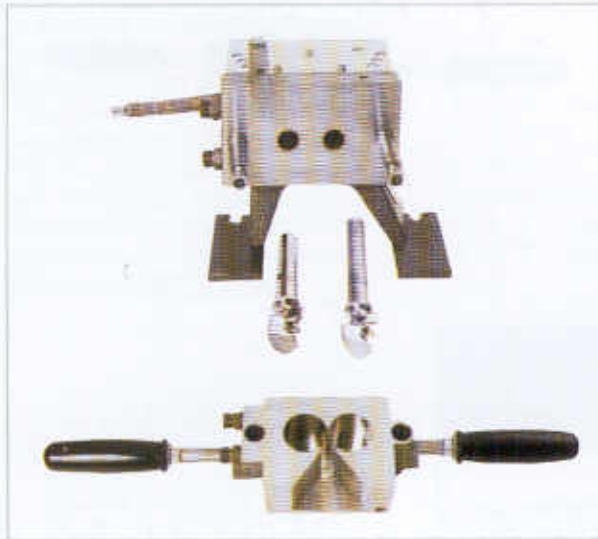


- A: Loading Peak
- B: Minimum
- X: Maximum
- V<sub>1</sub>: Start Residence Time
- V<sub>2</sub>: Stop Residence Time
- R: Stop Reaction
- t<sub>0</sub>: Residence Time at B + 3.0 Nm
- t<sub>m</sub>: Melting Time
- t<sub>c</sub>: Curing Time
- t<sub>r</sub>: Reaction Time at B + 10.0 Nm

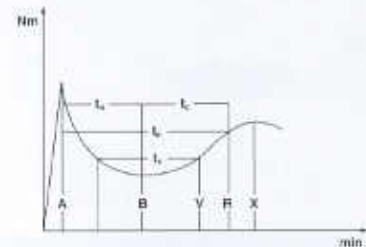
## Mixer N 50

The BRABENDER® N 50 mixer with its cam blades is the standard mixer for testing natural and synthetic elastomers with regard to flow and cure behavior, mastication, compounding with additives such as carbon black, silicic acid, etc., breakdown index, and black incorporation time BIT. Furthermore, the flow

behavior of electrode masses and ceramic molding materials can be determined as a function of temperature and shear, and absorption tests can be run on materials like iron oxide powder, carbon black, pigments, and similar materials with particle sizes in the  $\mu\text{m}$  range.



### Flow-Curing Behavior of Elastomers



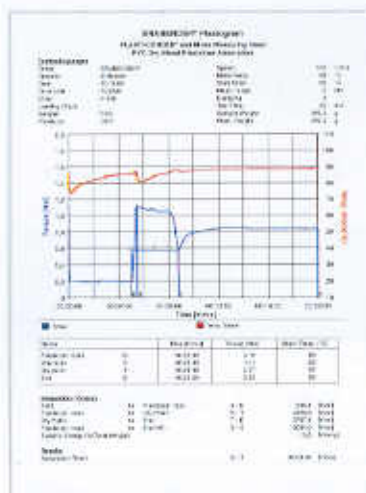
- A : Loading Peak
- B : Minimum
- X : Maximum
- V : Residence
- R : Reaction
- $t_r$  : Residence Time
- $t_{m}$  : A - B = Mastication Time
- $t_s$  : B - R = Scorch Time
- $t_{c}$  : A - R = Reaction Time

## Planetary Mixer P 600

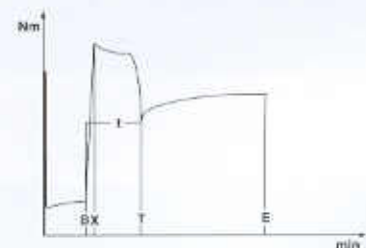
The BRABENDER® planetary mixer P 600 is used for testing the properties of powders like e.g. the liquid absorption and the plasticizer absorption rate of PVC powders in compliance with inter-

national standards or the pourability of PVC dry blends, further for preparing PVC pastes for tests in compliance with DIN 54 800 and for testing PVC pastes in compliance with ISO 4612.

A special rotor runs in a planetary motion in the mixer bowl. A revolving scraper prevents the sample material from sticking to the mixer wall.



### PVC Dry Blend Plasticizer Absorption

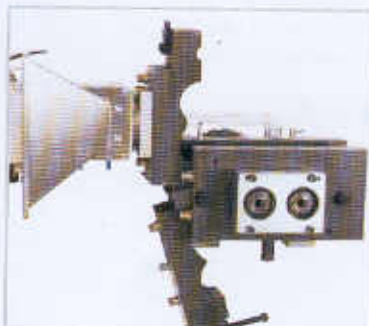


- B : Plasticizer Input
- X : Maximum
- T : Dry Point
- E : End
- $t$  : B - T = Absorption Time

## Special Mixer 350 S

The special mixer type 350 S was developed above all for the rubber and caoutchouc industry. The middle section of the mixer bowl is divided horizontally in the middle to permit quick and easy opening of the mixer e.g. for taking material for subsequent or comparative tests.

The mixer is perfectly suited for the determination of the black incorporation time BIT, for measuring the breakdown index, or for compounding and mixing various components while measuring the material behavior at the same time. The large volume permits to process enough quantities of material.



### Measuring mixers W 50 / W 50 EHT

ASTM D 2538 Fusion test of PVC resins

### Measuring mixer Ws 30

ASTM D 3795 Thermal flow and cure properties of thermosetting plastics

### Measuring mixer N 50

ASTM D 3185	General evaluation method for SBR + Oil
ASTM D 3186	General evaluation method for SBR + Carbon Black
ASTM D 3187	General evaluation method for NBR
ASTM D 3188	General evaluation method for IIR
ASTM D 3189	General evaluation method for Solution BR
ASTM D 3190	General evaluation method for CR
ASTM D 3191	General evaluation method for Carbon Black in SBR
ASTM D 3192	General evaluation method for Carbon Black in NR
ASTM D 3403	General evaluation method for IR
ASTM D 3484	General evaluation method for Oil extended Solution BR
ASTM D 3848	General evaluation method for NBR + Carbon Black
ASTM D 3568	General evaluation method for EPDM + Oil

### Measuring mixer MB 30

DIN 53 764 Flow and cure behavior of thermosets

### Planetary mixer P 600

DIN 54 800	Preparation of PVC pastes
DIN 54 802	Determination of the plasticizer absorption of vinyl chloride (VC) polymer compounds
DIN EN/ISO 4612	Preparation of a paste from PVC paste resins

### Measuring mixer S 300 (sigma blades)

ASTM D 2396 Powder-mix test of PVC resins

Standard  
Methods with  
**BRABENDER®**  
Measuring  
Mixers

## Convincing Processing Advantages

BRABENDER® measuring mixers stand out for many favorable processing features:

- easy handling and cleaning through bipartite (with liquid heating/cooling) or tripartite (with electric heating) mixer bowl
- precise and constant heating/cooling of the mixers with electric heating through three separate, independent heating zones
- operating temperatures of up to 500°C with electric heating
- easy cleaning and manifold applications through quickly detachable and partially interchangeable mixer blades
- large program of additional equipment like e.g. loading chutes, blade extractors, sealing covers for tests under inert gas or for gas flow measurements, automatic precision dosing pumps for adding liquids, etc.

## The BRABENDER® Support

A modern applicational laboratory is at the disposal of all customers and interested parties for trials with their own materials.

All measuring systems of BRABENDER® OHG can be tested under severe conditions. An experienced expert team will assist the tests and will stay at your disposal at any time for further questions.

Together, we will find the optimum solutions for your special problems and prove their suitability.



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