Food Quality Testing
with Brabender® Test Instruments

... where quality is measured.

NEW
- GlutoPeak
- Kernelyzer-G
- Aqua-Injekt

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The Brabender® group

Founded in 1923, Brabender® belongs to the leading manufacturers of instruments and systems for testing physical properties in all fields of research, development, and industrial production.

Today, the Brabender® group comprises four companies, each of which is responsible for its special range of development, production, and service. This allows versatility in each of the special lines. To the benefit of our customers.

The Brabender® support

A modern application laboratory is at the disposal of all customers and interested parties for trials with their own material. All measuring systems of Brabender® can be tested under practice-oriented conditions.

An experienced expert team will assist the tests and will stay at your disposal at any time for further questions.

Apart from that, numerous articles dealing with the application of the Brabender® instrument systems for manifold tests have been published all over the world during the past decades. We shall be pleased to send you a bibliography comprising about 1500 articles at present.

Together, we will find the optimum solutions for your special problems and prove their suitability.
The mini-cleaner and grader

- Cleaning of grain before milling
- Automatic separation of impurities, determination of the percentage of impurities in compliance with EC 824/2000

Labofix

Application
The Labofix reliably processes all sorts of grain, e.g. wheat, rye, barley, oats, corn, rice, sorghum, grass, vegetable and flour seeds, and manifold other granular material.

Use the Labofix wherever you need to clean and/or grade granular samples reliably and reproducibly.

The Labofix is also suited for determining the percentage of impurities in compliance with the EC regulations for standard qualities of soft wheat, rye, barley, corn, sorghum, and hard wheat (EC 824/2000).

Concept
The Labofix combines all processing steps which in production practice require air separators, flat or round sieves, and indented cylinders - compact, and all in one.

The grain to be cleaned is loaded into the hopper and runs automatically through the entire cleaning process. In this process, all foreign particles are separated from the basic grain.

Advantages
Sample weights of 50 g are processed with the same accuracy and reproducibility as those of several kilograms. The Labofix stands out for many favorable processing features:

- Low-noise and dust-free operation
- Variable combinations of air separator, sieves, and indented cylinders to suit every need
- Inclination adjustment with positive or negative angle for prolonged residence times or quick discharge
- Easy change of indented and/or grading cylinders through quick clamping device
- Continuous rating up to approx. 50 kg/h of wheat

Mains connection
3x 230 V; 50/60 Hz + PE; 1.1 A
3x 400 V; 50/60 Hz + PE; 0.55 A

Dimensions (W x H x D)
1250 x 970 x 550 mm

Weight
approx. 75 kg net

Moisture Tester MT-C

The quick drying oven method

- Drying oven method according to ICC-Standard nos. 110/1 + ISO 712
- Type approved under German law
- VO (EG) Tobacco 2182/2005

Application
The Brabender® MT-C provides a quick method for moisture determination on all types of material, e.g. grain, flour, feedstuffs, fibers, synthetic material, etc. The method meets the Commission Regulation (EC) No. 2182/2005 for tobacco.

Furthermore, the solvent content of organic and inorganic materials can be measured.

Advantages
- Reference method – no special calibration for different samples
- Measurement of up to 10 samples at a time
- Determination of the water content with an accuracy of < 0.1%
- Fully automatic re-weighing in the drying chamber after drying
- No time-consuming cooling of the samples in an exsiccator
- Drying temperature up to 200 °C
- Measuring range (water content) 0.1 - 99.9%

Special features
- Menu controlled operation via graphic touchscreen
- Programming of up to 10 different drying methods
- Automatic balance calibration prior to each measurement
- Automatic recognition of the selected sample position by a position sensor
- Entry of any sample weight between 1 and 20 g with presetting of tolerance ranges
- Display of residual drying time
- Ethernet port for data exchange

Mains connection
1x 220/230 V; 50/60 Hz + N + PE; 6.5 A
115 V; 50/60 Hz + PE; 13 A

Dimensions (W x H x D)
800 x 690 x 630 mm

Weight
approx. 80 kg net

... where quality is measured.
**Application**
The Sedimat was developed by Brabender® in particular for grain sample preparation for the Zeleny sedimentation test (ICC-Standards nos. 116 and 118, ISO 5529). Combined with the shaker, the Sedimat is the instrumental prerequisite for this test and provides reproducible results.

**Principle**
The Zeleny sedimentation test describes the amount and quality of the gluten fraction of a flour and allows reliable predictions as to the baking quality of the flour or grain.

**Advantages**
- Reproducible results
- Fully automatic milling and sifting
- Capacity 100 g in approx. 3 min.
- No wear of milling rolls

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**Break Mill SM 3**

**Application**
The Break Mill SM 3 is a small, sturdy laboratory mill for sample preparation for the moisture determination and for analysis of e.g. protein or fat. It is for all sorts of grain like wheat, rye, oats, barley, rice, etc., and even for large kernels like corn.

The special construction of the milling system prevents heating of the sample and loss of moisture during the milling process.

**Principle**

The milling system consists of three reversible cutting plates and a rotating block with another four reversible cutting plates. The milling gap in between can be adjusted continuously by means of an adjusting thread with a scaled ring at the top of the mill.

**Advantages**

The precisely adjustable milling system offers several process-technical advantages:
- Infinitely variable milling gap
- Reproducible milling to the desired fineness
- No heating of the mill stock
- No loss of moisture during milling

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**Bran Duster**

**Application**
The Bran Duster is for optimizing the flour yield. Sometimes, the ash content and yield of the grain sample do not meet the required specification.

It carefully separates flour particles still adhering to the bran - increases the yield obtained on your Quadrumat® Junior or Senior by some 10% and approach even better the ash content of your samples to that of commercial flours.

**Principle**

The sample material is filled through the feed hopper. The bran particles repeatedly hit onto the whirl battens so that any flour particle adhering to the bran are separated carefully from the bran and sifted through the round sieve.

**Advantages**

- Higher flour yield
- Precise adjustment of ash content
- Smooth separation
- Speed 2830 min⁻¹ at 50 Hz / 3400 min⁻¹ at 60 Hz
- Mesh size 200 µm (further dimensions on request)

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**Laboratory mill for automatic production of flour samples for the Zeleny sedimentation test**

- ICC-Standards nos. 116 and 118
- ISO 5529

**Application**

The Shaker was developed by Brabender® in particular for grain sample preparation for the Zeleny sedimentation test (ICC-Standards nos. 116 and 118, ISO 5529). Combined with the Sedimat, the Shaker is the instrumental prerequisite for this test and provides reproducible results.

The Zeleny sedimentation test describes the amount and quality of the gluten fraction of a flour and allows reliable predictions as to the baking quality of the flour or grain.

**Principle**

The grain is milled in a single step by three pairs of rolls and the resulting flour is dressed. With this procedure, the wedge protein is extracted.

In the subsequent Zeleny sedimentation test, this protein swells in a lactic acid stock and isopropyl alcohol solution before the supernatant liquid is removed. For this purpose, the prepared flour is filled into two shaking cylinders, mixed with the solutions prescribed in the Zeleny method and shaken in the prescribed rhythm.

The sedimentation volume determined after a defined time interval, provides valuable data as to the expected dough properties, gas-retaining capacity, proving tolerance, and the volume of the baking products.

**Advantages**

- Reproducible results
- Fully automatic milling and sifting
- Capacity 100 g in approx. 3 min.
- No wear of milling rolls

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**Break Mill SM 3**

- **Mains connection**: 1x 230 V; 50/60 Hz + N + PE; 1.85 A
- **Mains connection**: 115 V; 50/60 Hz + PE; 3.5 A
- **Dimensions**: 200 x 470 x 260 mm
- **Weight**: approx. 7 kg net

**Bran Duster**

- **Mains connection**: 3x 230 V; 50/60 Hz + PE; 2.4 A
- **Mains connection**: 3x 400 V; 50/60 Hz + N + PE; 1.4 A
- **Dimensions**: 670 x 330 x 370 mm
- **Weight**: approx. 35 kg net

**Shaker**

- **Mains connection**: 1x 230 V; 50/60 Hz + N + PE; 0.2 A
- **Dimensions**: 660 x 370 x 430 mm
- **Weight**: approx. 10 kg net

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**Additional equipment for the Zeleny test**

Apart from the Brabender® Sedimat, the following apparatus and reagents are required:

- Shaker
- Shaking cylinder
- Automatic reagent dosing unit
- Reagents: Distilled water (bromphenol blue solution), lactic acid stock solution, isopropyl alcohol

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**Sedimat**

- **Mains connection**: 3x 230 V; 50/60 Hz + PE; 2.0 A
- **Mains connection**: 3x 400 V; 50/60 Hz + N + PE; 1.1 A
- **Dimensions**: 380 x 620 x 610 mm
- **Weight**: approx. 50 kg net
**Precision laboratory mill for production-like flour samples**

- AACC Method no. 26-50
- Modified version for semolina application

**Application**
The Brabender® Quadrumat® Junior is an universal precision laboratory roller mill for milling grain for subsequent analyses. Obtain laboratory flours which are almost equal to commercially produced flours in ash content, yield, and baking quality - the multi-step grinding process only needs a single passage. The mill is suitable for wheat, spelt, rye, barley and rice.

**Principle**
The closed grinding process ensures maximum separation of the endosperm from the exosperm. The short grinding process corresponding to the elasticity of the bran prevents splitting up of the bran. After having passed the last pair of rolls, the material drops into the round sifter where it is separated into flour and bran.

**Advantages**
- Capacity 500 g in approx. 5 min.
- Yield 60 - 75%
- With Brabender® Bran Duster up to 80%
- Ash 0.3 – 0.7% on dry basis
- Max. moisture 15 – 18%
- Easy operation
- Quick and easy roll exchange
- Variable sifter screens

**Laboratory mill for testing the milling properties and yield**

- Standard BPEA – BY.102.D.9302
- Special version for durum

**Application**
The Brabender® Quadrumat® Senior is a laboratory mill for manifold applications:
- Preparation of production-equivalent test flours
- Determination of the milling properties of manifold sorts of grain (wheat, rye, and others)
- Determination of the potential yield

**Principle**
The Quadrumat® Senior uses the same 4-roll principle as the Brabender® Quadrumat® Junior with, however, two parallel 4-roll units:
- A break head
- A grinding or middlings reduction head
A bipartite plansifter with the two sifter sections, stacked one above the other, separates the fractions according to their granulation. Each sifter section produces either a single joint flour or two separate flours.

**Advantages**
- Superior process-technical features have made the Quadrumat® Senior one of the most commonly used instruments of its kind all over the world:
- Production of 4 milling products altogether:
  - Break flour
  - Reduction flour
  - Shorts
  - Bran
- High performance and gentle milling by a 4-roll milling system with hardened, profile-ground rolls
- 2 x 2 successive roll passes in a single step
- No intermediate sifting required
- Self-cleaning sifter
- Easy operation and handling
- Good reproducibility and constancy
- Throughput 8 - 10 kg/h
- Yield 65 - 75%
- With Brabender® Bran Duster up to 80%
- Ash 0.45 - 0.65% on dry basis

... where quality is measured.
Rotary Mill

**Application**
The Brabender® Rotary Mill grinds manifold material prior to the analysis - properly, reliably, with variable degree of fineness.

- Fibrous materials like Hay, grass, straw
- Tobacco
- Leaves
- Fibers, synthetic fibers
- Tough materials like Leather, furs, Linoleum
- Cellulose
- Plastics
- Rigid materials like Pasta, Roots, Coco nut shells, Charcoal

**Principle**
The material is loaded through the feed hopper into the grinding chamber of the mill. A slide gate at the hopper outlet permits precise dosing of the material. The grinding chamber is equipped with four special steel stationary cutting knives. The rotor, which is fixed to the motor shaft, has six exchangeable, adjustable knives operating edge against edge with the stationary cutting knives for grinding the material. Interchangeable sieves in the lower part of the grinding chamber allow any degrees of fineness. The ground material falls through the sieve into a collector, while the residues are ground until they have reached the desired degree of fineness.

**Advantages**
- Suited for a large variety of rigid materials as outlined above
- Complete grinding of the sample
- Easy knife exchange
- Speed: 665 min⁻¹ (50 Hz) / 820 min⁻¹ (60 Hz)
- Interchangeable sieves for variable degrees of fineness
- Degrees of fineness: 0.5 / 0.8 / 1.0 / 1.5 / 2.0 / 3.0 / 4.0 / 5.0 mm
- Other degrees of fineness upon request

**Dimensions**
(W x H x D) 320 x 600 x 610 mm

**Weight**
approx. 55 kg net

Rapid test for characterizing the quality of gluten

**Test procedure**
The test is simple and explained quickly. First you place the paddle in the instrument. Then, 10 g solvent (water) will be weighed out in the sample cup, the cup will be placed in the instrument. Now the sample is added into the cup and the measuring head is placed in the starting position. The instrument starts automatically and mixes the sample at the preset speed. The software will automatically record and display the data relative to the time and torque graph/curve.

For typical flour samples, approximately 10 tests can be completed within 1 hour.

**The principle**
In a flour, whole meal or gluten water slurry; gluten will be separated by the mixing action and aggregated. The sample and amount of solvent (water) added is constant during the whole test procedure. The temperature is kept at constant at 33°C (Double jacketed). The speed is held constant until the completion of the test.

**Advantages**
- Fast test execution (1-10min)
- Small sample size (~3g - 10g)
- Easy handling

GluotoPeak

**Speed profiles**
0...3500 min⁻¹

**PC port**
USB

**Dimensions**
(W x H x D) 460 x 920 x 350 mm

**Weight**
ca. 30 kg

... where quality is measured.
**NIT Technology for quick quality determinations of grain, oil seeds and flour**

The Brabender® Kernelyzer-G is a Near-Infrared-Spectrometer for a quick analysis of grains, oil seeds and flour. The spectra are recorded in the short-wavelength range of the near-infrared radiation by transmission, providing a characteristic signal for every single component. This makes an exact determination of the quality of the tested samples possible.

**Brabender® Kernelyzer-G with the state of art Near-Infrared Technology (NIT/NIR) guarantees you a:**

**Quickener method**
- Shorter Measuring Times
- Higher sample output
- Less time consumption for cleaning

**High precision**
- Exact analysis
- Very good reproducibility
- Secure material flow

**Easy handling**
- No sample preparation
- Easy application process
- No training necessary
- Increasing the efficiency in the laboratory and production

**Advantages of the Kernelyzer-Technology**
- No samples preparation necessary
- Input of the sample directly into the sample cell
- Robust, low maintenance feeding device
- Automatic multiple measurements per sample
- Automatic layer thickness adjustment
- Quick analysis of numerous samples

**Further functions**

**Flour Module**
For analyzing powdery substances like e.g. flour, a flour module is optionally available. This enables a reliable and precise grain flour, and oil seed flour determination, in regard to many parameters (moisture, protein, sedimentation value, wet gluten, ash, ...).

**Hectoliter module**
The Kernelyzer-G can optionally be equipped with a Hectoliter module. This enables to easily test the hectoliter weight, respectively the bulk density of grain precisely.

**Special features**
- Control via Icons and a modern COS (“Central Operation Slider”)
- Data storage for 100 products
- Interface RS232, USB, Ethernet, Bluetooth
- Printer (optional)

**Technical specifications**

<table>
<thead>
<tr>
<th>Kernelyzer-G</th>
<th>Kernelyzer-F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mains connection</strong></td>
<td>min. 90 V (50 – 60 Hz) max. 260 V (50 – 60 Hz)</td>
</tr>
<tr>
<td><strong>Dimensions (W x H x D)</strong></td>
<td>400 x 370 x 440 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>approx. 27 kg net</td>
</tr>
<tr>
<td><strong>Mains connection</strong></td>
<td>min. 90 V (50 – 60 Hz) max. 260 V (50 – 60 Hz)</td>
</tr>
<tr>
<td><strong>Dimensions (W x H x D)</strong></td>
<td>400 x 370 x 440 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>approx. 20 kg net</td>
</tr>
</tbody>
</table>

**Brabender® Kernelyzer-G enables**
reliable quality control at the goods receiving department of grains, flour, and oil seeds as well as surveying the production and the set values of specifications at:
- Wheat
- Rye
- Semolina
- Barley
- Oats
- Soy
- Rice
- Triticale

... further products on request

**Simultaneous determination of different parameter**
- Moisture
- Protein
- Gluten
- Sedimentation value
- Ash

... further parameters on request

**For the analysis of powdered product samples e.g. flour and starch**

The Brabender® Kernelyzer-G measures the important quality parameter for flour and starch like e.g. moisture, protein, sedimentation value, wet gluten content and ash. The spectra, recorded in the short-wavelength range of the near-infrared radiation by transmission, provides a characteristic signal for every single component. Thanks to a quick and precise analysis, the results for flour and starch are available within a short time.

**With the Brabender® Kernelyzer-F and well-known NIR-Technology to success by:**

**Quickener method**
- Shorter Measuring Times
- Higher sample output
- Less time consumption for cleaning

**High precision**
- Exact analysis
- Very good reproducibility
- Secure material flow

**Easy handling**
- No sample preparation
- Easy application process
- No training necessary
- Increasing the efficiency in the laboratory and production

**Special features**
- Reference check up prior to every measurement
- Control by a central “COB”
- Auto-diagnostics
- Available calibrations for many materials
- Transferable calibrations
- Printer (optional)

**Technical specifications**

<table>
<thead>
<tr>
<th>Kernelyzer-F</th>
</tr>
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<tbody>
<tr>
<td><strong>Mains connection</strong></td>
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<tr>
<td><strong>Dimensions (W x H x D)</strong></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
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</tbody>
</table>

... where quality is measured.
Farinograph®-AT

**Application**
The determination of the flour quality and its processing characteristics are a basic demand in the milling and baking industries for ensuring optimum and uniform flour qualities for the manifold baking and noodle products.
- **Measure the water absorption of flours**
- **Determine the rheological properties of the dough**
- **Check production and flour blends in the mill**
- **Test rye flour, sponge batters, egg foam, etc.**
- **Special applications e.g. for chocolate, chewing gum, fish, cheese, meat etc.**
- **Test full formula doughs**

**Principle**
Fill your flour/water suspension into the heated measuring mixer where it is subjected to a defined mechanical stress by the rotating mixer blades which are driven by a motor carried in a pendulum bearing. The resistance of the dough against the blades, which depends on the viscosity of the dough, causes an opposite deflection of the motor housing. This deflection is measured as torque and recorded and plotted on-line as a function of time in a clear color diagram.

**Advantages**
- **Automatic water dosing system**
- **Extended software applications**
- **Variable speed (0 - 200 min⁻¹)**
- **Higher torque 20 Nm**
- **Colored display shows temperatures**
- **Recording of two temperatures (dosing water and dough)**
- **Calculates mixing energy**
- **Patented**

**Additional software**
- **Programming of speed profiles**
- **Creating of individual test profiles**
- **Free definition of own evaluation methods**
- **Integrated videos show test procedures**
- **Auto save mode**
- **Reference curve could be integrated**

**Details of the automatic water dosing system**
- **Water tank (2 l) simple to remove**
- **Temperature control of added water**
- **Low maintenance**
- **Accuracy < 0.1%**

**Farinogram®-AT**

<table>
<thead>
<tr>
<th>Mains connection</th>
<th>1 x 230 V 50/60 Hz + N x PE; 3.2 A 115 V 50/60 Hz + PE; 6.5 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x H x D)</td>
<td>470 x 450 x 880 mm</td>
</tr>
<tr>
<td>Weight (without mixer)</td>
<td>approx. 75 kg net</td>
</tr>
</tbody>
</table>

**Sigma mixer S 300**
- For standard Farinograph® test (300 g of flour) according to ICC, AACC, ISO
- For mixing the dough for Extensograph® tests
- Removable blades

**Sigma mixer S 50**
- For standard Farinograph® test (50 g of flour) according to ICC, AACC, ISO
- Removable blades

**Sigma mixer S 10**
- For standard Farinograph® test with small sample weights (10 g)
- For breeders and research work
- Removable blades

**Planetary mixer P 600**
- For rye dough and sponge batter
- With dough hook, K-hook, whisk

**Aqua-Injekt**

- Electronically controlled, constant water temperature
- High accuracy (better than 0.1 %)
- Registration of water quantity and temperature
- Recording of the mixer bowl temperature and/or dough temperature (via PT100 sensor)
- Elimination of the glass burette
- Easy servicing and cleaning

**Hardness and Structure Tester**
- For testing the hardness of grain (wheat, barley, malt, etc.)
- Special software

**Working without glass burette**
The Aqua-Injekt is an add-on instrument for use with a Brabender® Farinograph®-E (USB) and can be used for the 300 g and 50 g mixers.

The Aqua-Inject provides for:
- **Automatic dosing of water**
- **High reproducibility**
- **Exact tempering of the dosing water**
- **Connection of a balance, for registering the weight of the flour quantity into the software**
- **Connection of a thermostat, for controlling a temperature profile which was programmed into the software**
- **The added water quantity and temperature are registered and stored by means of the software**

**Mixing tools for the Farinograph®-AT**

- **Sigma mixer S 300**
- **Sigma mixer S 50**
- **Sigma mixer S 10**
- **Planetary mixer P 600**

**Aqua-Injekt**

- **Mains connection**
  - 1 x 115 V 50/60 Hz + PE 1.2 A
  - 1 x 230 V 50/60 Hz + N x PE 0.6 A

- **Dimensions**
  - 280 x 430 x 540 mm

- **Weight**
  - approx. 25 kg

... where quality is measured.
Measuring the stretching behaviour of the dough and baking characteristics

- ICC-Standard no. 114/1
- ISO 5530-2
- AACC Method no. 54-10
- RACI, GB/T, GOST R, IRAM, FTWG, and others

Application

Use the Brabender® Extensograph®-E for measuring the stretching properties of your dough, in particular the resistance to extension and the extensibility, to make reliable statements about the baking behaviour of the dough. Like no other instrument, the Extensograph®-E shows the influence of flour additives like ascorbic acid, enzymes (proteinases), and emulsifiers and, thus, permits to determine the rheological properties of each flour and to adjust the “rheological optimum” for the respective purpose.

Principle

Before starting the test in the Extensograph®-E, prepare your sample dough from flour, distilled water, and salt in the Farinograph®.

After a certain proving time, the dough is stretched until rupture in the Extensograph®-E. The force exerted is measured and recorded. This procedure is repeated three times. This corresponds to the actual practice in the bread and bread roll production. The Extensogram recorded on-line, and represented as a color diagram on the monitor, shows the exerted force as a function of the stretching length (time).

The shape of the measuring curve and its variation during the individual proving times, the area below the curve as well as the numerical values of the different evaluation points, allow to make reliable and reproducible statements as to the flour quality and the suitability of the flour for a certain task. Furthermore, the influence of flour additives on the flour characteristics can be made evident.

The Extensogram includes:

- Resistance to extension
- Maximum
- Area below the curve (energy)
- Ratio number (extensibility/resistance)
- Ratio number Db/Max (extensibility maximum/resistance)

Advantages

- Long test duration - results close to practice
- Applicable for all kinds of wheat flour
- Determination of the rheological optimum
- Optimization of wheat and grain mixtures
- Shows the influence of additives
- PC connection by USB

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- Shows the influence of additives
- PC connection by USB

Influence of flour additives

- Short method: Apart from the standard methods, there is an accepted short method (ICC 114/1) which allows to save time with reduced proving times (30/60/90 min.), that are similar to those in production - the results correlate very well with those from the standard methods.

- Software for data correlation: Up to 10 curves can be shown and evaluated simultaneously within one chart.
Testing the quality of wet and dry gluten

**Glutograph®-E**

**Application**
Apart from dough-rheological measurements of the flour quality, e.g. with the Farinograph®-E or Extensograph®-E, separate quality control of wet and dry gluten which are used as a flour additive gains more and more importance. The Brabender® Glutograph®-E represents the state of the art on the sector of gluten testing.

**Advantages**
The convincing features of the Glutograph®-E:
- Method describes gluten properties
- Small sample size (2 - 3 g)
- State-of-the-art measuring electronics
- Easy and comfortable operation via touch-screen
- Integrated computer
- Printer and Ethernet output
- USB- and Ethernet-connection

**Principle**
The measuring system of the Glutograph®-E consists of two parallel, round, corrugated plates mounted at a defined distance opposite to each other. The sample is put in between these two plates. The fixed distance and diameter of the two plates provide a defined sample volume and a reproducible sample geometry.

**Evaluation**
The first diagram shows the stretching process (rising curve). The falling curve in the second part represents the recovery of the sample. The shearing time (time up to reaching a certain preset deflection) is a measure of the stretching properties of the sample. The recovery of the sample after a certain time mirrors the elasticity.

<table>
<thead>
<tr>
<th>Application</th>
<th>Testing the quality of wet and dry gluten</th>
</tr>
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<tbody>
<tr>
<td>The baking properties of flour mainly depend on the gelatinization of the starch and on the enzyme activity (α-amylase) in the flour. The Amylograph®-E measures wheat, rye, maize, and rice flour and provides:</td>
<td>The method describes gluten properties, small sample size (2 - 3 g), state-of-the-art measuring electronics, and easy and comfortable operation via touch-screen.</td>
</tr>
<tr>
<td>- Assessment of the flour quality</td>
<td>- Method describes gluten properties</td>
</tr>
<tr>
<td>- Suitability of the flour for various applications</td>
<td>- Small sample size (2 - 3 g)</td>
</tr>
<tr>
<td>- Measurement of the baking characteristics of flours</td>
<td>- State-of-the-art measuring electronics</td>
</tr>
<tr>
<td>- Assessment of special flours</td>
<td>- Easy and comfortable operation via touch-screen</td>
</tr>
<tr>
<td>- Control of enzyme addition</td>
<td>- Integrated computer</td>
</tr>
<tr>
<td><strong>Principle</strong></td>
<td><strong>Advantages</strong></td>
</tr>
<tr>
<td>A suspension of flour and destilled water is heated with a constant heating rate of 1.5°C/min within a rotating bowl. Depending on the viscosity of the suspension, a measuring sensor reaching into the bowl is deflected. This deflection is measured as viscosity over time, i.e. vs. temperature, and recorded on-line.</td>
<td><strong>Method describes gluten properties</strong></td>
</tr>
<tr>
<td><strong>Evaluation:</strong></td>
<td><strong>Small sample size (2 - 3 g)</strong></td>
</tr>
<tr>
<td>- Beginning of gelatinization [°C]</td>
<td><strong>State-of-the-art measuring electronics</strong></td>
</tr>
<tr>
<td>- Gelatinization maximum [AU]</td>
<td><strong>Easy and comfortable operation via touch-screen</strong></td>
</tr>
<tr>
<td>- Gelatinization temperature [°C]</td>
<td><strong>Integrated computer</strong></td>
</tr>
</tbody>
</table>

**Amylograph®-E**

**Application**
The baking properties of flour mainly depend on the gelatinization of the starch and on the enzyme activity (α-amylase) in the flour. The Amylograph®-E measures wheat, rye, maize, and rice flour and provides:
- Assessment of the flour quality
- Suitability of the flour for various applications
- Measurement of the baking characteristics of flours
- Assessment of special flours
- Control of enzyme addition

**Advantages**
The use of the Amylograph®-E provides the following advantages:
- Shape of curve provides additional information
- During the test the influence of enzymes can be observed
- Reference curve
- USB operated

**Principle**
A suspension of flour and destilled water is heated with a constant heating rate of 1.5°C/min within a rotating bowl. Depending on the viscosity of the suspension, a measuring sensor reaching into the bowl is deflected. This deflection is measured as viscosity over time, i.e. vs. temperature, and recorded on-line.

**Evaluation:**
- Beginning of gelatinization [°C]
- Gelatinization maximum [AU]
- Gelatinization temperature [°C]

<table>
<thead>
<tr>
<th>Amylograph®-E</th>
<th>Glutograph®-E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mains connection</strong></td>
<td>Mains connection</td>
</tr>
<tr>
<td>1x 230 V; 50/60 Hz + N + PE; 2.8 A</td>
<td>1x 230 V; 50/60 Hz + N + PE; 2.0 A</td>
</tr>
<tr>
<td>115 V; 50/60 Hz + PE; 5.6 A</td>
<td>115 V; 50/60 Hz + PE; 1.0 A</td>
</tr>
<tr>
<td><strong>Heating rate</strong></td>
<td><strong>Dimensions</strong></td>
</tr>
<tr>
<td>Standard: 1.5°C/min adjustable 0.1…3.0°C/min</td>
<td>(W x H x D)</td>
</tr>
<tr>
<td></td>
<td>290 x 320 x 340 mm</td>
</tr>
<tr>
<td><strong>Sample volume</strong></td>
<td><strong>Weight</strong></td>
</tr>
<tr>
<td>approx. 550 ml</td>
<td>approx. 12 kg net</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td><strong>Dimensions</strong></td>
</tr>
<tr>
<td>Standard 75 min⁻¹, adjustable 0 - 300 min⁻¹</td>
<td>(W x H x D)</td>
</tr>
<tr>
<td></td>
<td>290 x 320 x 340 mm</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td><strong>Weight</strong></td>
</tr>
<tr>
<td>(W x H x D)</td>
<td>approx. 12 kg net</td>
</tr>
<tr>
<td>490 x 890 x 400 mm</td>
<td>approx. 30 kg net</td>
</tr>
</tbody>
</table>
The combined solution for flour and starch

- Small sample size - fast measurement
- Temperature measurement within the sample

Special features and special software for Micro Visco-Amylo-Graph® and Viscograph®-E

Special features
- Beside a fixed speed, the software allows to create own speed profiles, to run the instrument at e.g. 100 RPM for 1 minute, 75 RPM for 20 minutes and 50 RPM for 10 minutes. This enables the user, combined with the universal evaluation software, to see more detailed the physical properties of the material used during heating and cooling with different speeds.

Data correlation program
Up to 15 curves can be shown and evaluated simultaneously within one chart

Universal evaluation profiles
Beside the standard evaluation with peak viscosity, own evaluation profiles can easily be programmed and used. These profiles can include for example areas, peaks, fixed points, drops, etc.

Micro Visco-Amylo-Graph®

Mains connection
1 x 230 V; 50/60 Hz + N + PE; 2.8 A
115 V; 50/60 Hz + PE; 5.6 A

Dimensions (W x H x D)
450 x 750 x 380 mm

Weight
approx. 30 kg net

Application
The Micro Visco-Amylo-Graph® combines the procedures of Viscograph®-E and Amylograph®-E in a single instrument. Profit from the versatility and reliability of this instrument - in the food industry, in the paper and textile industries, or in the chemical industry:
- Measure the gelatinization properties of flour and native or modified starch
- Measure the enzyme activity of flour (e.g. sprouted)
- Adjust the diastatic activity by adding enzymes (e.g. malt flour)
- Measure the influence of extrusion conditions onto the extruded product

Advantages
- Suited for starch and flour
- Usage for acid and lye
- Small sample size (5 - 15 g)
- Short measuring times
- Speed (0 - 300 min⁻¹)
- Temperature measurement within the sample
- Heating/cooling rates of up to 10°C/min
- No follow-up costs
- Evaluation in BU, mPas, cP or cmg

Micro Visco-Amylo-Graph®

The MVAG® measures the:
- Beginning of gelatinization
- Gelatinization maximum
- Gelatinization temperature
- Viscosity during holding
- Viscosity at the end of cooling

The standard for starch testing

- ICC-Standard no. 169
- AACC Method 61-01

Viscograph®-E

Application
The Viscograph®-E is the standard instrument worldwide for measuring the viscosity of starch and products containing starch. The instrument measures native starch - wheat, corn, potatoes, rice starch - just like all types of modified starch reliably and reproducibly and supplies a complete profile of the rheological properties of your products:
- Gelatinization and gelification properties of starch and starch containing products
- Hot and cold viscosity
- Stability of thickening agents or binders
- Acid stability of starch
- Extrude testing
- Measurement of industrial starch
- Measurement of liquids, suspensions, pastes, etc.

Advantages
- Automatic test procedure
- Storage of any number of temperature programs
- Heating/cooling rates of 0.5...3°C/min.
- Electronic speed control (0 - 300 min⁻¹)
- Low-deflection torque measurement
- Free selectable measuring ranges
- Automatic adaptation of the diagram scaling
- Evaluation in BU, mPas, cP or cmg

Viscograph®-E

Mains connection
1 x 230 V; 50/60 Hz + N + PE; 2.8 A
115 V; 50/60 Hz + PE; 5.6 A

Dimensions (W x H x D)
560 x 890 x 430 mm

Weight
approx. 30 kg net

... where quality is measured.
Stand-alone Extruder KE 19

**Application**
The application of measuring extruders in the food laboratory is a must for setting optimum production conditions and for ensuring a constant high product quality. Profit from the flexibility and high performance of the Brabender® single and twin screw extrusion technology for optimally adapting your processing conditions to most different products and processing tasks:

- Quality control and testing of raw materials
- Product development and recipe optimization
- Testing of the extrudability of different materials
- Investigation and optimization of processing conditions
- Development of pigments and temperature-stable flavourings
- Measurement of the rheological properties of blends and compounds
- Extrusion of degradable products
- Production of biodegradable starch products
- Rheometric capillary die heads

**Powerful software**
The convincing features of the Stand-alone Extruder KE 19 are completed by a powerful control and evaluation software under all current Windows versions, saving of operating and evaluation data in a MS Access database, and convertibility of the data for commercial Office programs.

Apart from manual operation, this machine can optionally network with local data nets.

<table>
<thead>
<tr>
<th>Stand-alone Extruder KE 19</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mains connection</strong></td>
</tr>
<tr>
<td><strong>Barrel diameter</strong></td>
</tr>
<tr>
<td><strong>Screw length</strong></td>
</tr>
<tr>
<td><strong>Drive power</strong></td>
</tr>
<tr>
<td><strong>Speed</strong></td>
</tr>
<tr>
<td><strong>Max. torque</strong></td>
</tr>
<tr>
<td><strong>Max. operating temperature</strong></td>
</tr>
<tr>
<td><strong>Output</strong></td>
</tr>
<tr>
<td><strong>Dimensions</strong> (B x H x T)</td>
</tr>
</tbody>
</table>

Single screw laboratory extruder

**Application**
The measuring Extruder 19/20 DN with 19 mm screw diameter has a grooved barrel over the entire length of 20 D in order to obtain an improved shear ratio and optimum material flow in the barrel. The two barrel zones are heated electrically with heating/cooling jackets and cooled with air.

If you need this extruder with liquid heating/cooling for sensitive material - no problem, just tell us.

**Die heads**
- Round strand die heads
- Noodle die head
- Flat sheet die heads
- Tubing die heads
- Rheometric capillary die heads

**Screws**
- Compression ratios 1:1 up to 1:5
- Various geometries

**Extruder 19/20 DN**

- Screw-Ø: 19 mm
- Screw length: 20 L : D
- Flight depth: 3.8 mm
- Drive power: 3.312 kW
- Max. screw speed: 250/175° min⁻¹
- Max. screw torque: 150 Nm
- Max. barrel temperature: 400°C
- Max. melt pressure: 800 bar
- Output (depending on the material): 1 - 10 kg/h
- Segmented barrel/screw: no
- Screw rotation/spiral features: grooved barrel
- Drive: Do-Corder/Lab-Station

**Simulate production realistically on a laboratory scale**
The material to be tested is plastified and extruded in a practice-oriented way. All measuring values like torque, melt temperature, melt pressure, etc. are recorded continuously and displayed in a numerical or graphical form.

**Comfortable evaluation software**
The user-optimized Windows software automatically evaluates your test results in compliance with the most recent standards. Profit from the versatility of the data correlation program and directly compare the results of different tests of one or several test series.

... where quality is measured.
**Extrusion**

**Twin Screw Drives**

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**Twin Screw Extruder DSE 20**

The co-rotating Twin Screw Extruder DSE 20 with its low output rates of 0.6 to 20 kg/h is specially designed for research and development applications. A special feature is the divided barrel which can be tilted open completely to ensure easy access to the segmented screws.

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**Twin Screw Extruder DSE 25**

The co- or counter-rotating Twin Screw Extruder DSE 25 with a barrel diameter of 25 mm is the true allrounder among the Brabender® extruders. With its variable processing length of 16 to 48 D, it can be used for multi-stage compounding tasks, as a pilot plant, for reactive extrusion, and for recipe development.

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**Conical Twin Screw Extruder KDSE**

The counter-rotating, Conical Twin Screw Extruder KDSE stands out for perfect utilization of the screw core heat. This supplies additional heat to the raw material in the feed zone and ensures optimum preheating. The increased channel volume in the feed zone is favourable for processing voluminous bulk goods.

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### Table: Specifications of Twin Screw Extruders

<table>
<thead>
<tr>
<th></th>
<th>TSE 20</th>
<th>TSE 25</th>
<th>CTSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw diameter</td>
<td>20 mm</td>
<td>25 mm</td>
<td>42/28 mm</td>
</tr>
<tr>
<td>Screw length</td>
<td>24 L : D</td>
<td>16 - 48 L : D</td>
<td>(350) L : D</td>
</tr>
<tr>
<td>Flight depth</td>
<td>3.75 mm</td>
<td>4 mm</td>
<td>8 mm</td>
</tr>
<tr>
<td>Drive power</td>
<td>3.3/12 kW</td>
<td>12 kW</td>
<td>12 kW</td>
</tr>
<tr>
<td>Max. screw speed</td>
<td>250/275 min⁻¹</td>
<td>550 min⁻¹</td>
<td>275 min⁻¹</td>
</tr>
<tr>
<td>Max. screw torque</td>
<td>2x40 Nm</td>
<td>2x90 Nm</td>
<td>2x100 Nm</td>
</tr>
<tr>
<td>Max. barrel temperature</td>
<td>450°C</td>
<td>400°C (short 450°C)</td>
<td>350°C</td>
</tr>
<tr>
<td>Max. melt pressure</td>
<td>300 bar</td>
<td>300 bar</td>
<td>500 bar</td>
</tr>
<tr>
<td>Output (depending on the material)</td>
<td>0.5 - 10 kg/h</td>
<td>0.6 - 50 kg/h</td>
<td>0.5 - 10 kg/h</td>
</tr>
<tr>
<td>Segmented barrel/screw</td>
<td>no / yes</td>
<td>yes / yes</td>
<td>no</td>
</tr>
<tr>
<td>Screw rotation / special features</td>
<td>co-rotating, barrel divided horizontally</td>
<td>co-rotating, counter-rotating</td>
<td>counter-rotating</td>
</tr>
<tr>
<td>Drive</td>
<td>Do-Corder „Plus“/Lab-Station</td>
<td>Lab-Station</td>
<td>Lab-Station</td>
</tr>
</tbody>
</table>

---

*\(^1\) conical screws \(^2\) depending on drive unit*
The universal measuring drive for all measuring tasks

- Plug & Play
- A single drive unit for all measuring heads from measuring mixer to DSE
- Modular configuration
- Scaleable
- Real multitasking
- State-of-the-art fieldbus technology with standard bus system

Do-Corder “Plus” with measuring mixers

Test your sample material under practice-oriented conditions in the measuring heads. The measuring drive simulates all important production processes like compounding and mixing under conditions that are near to production reality, and documents the tests. Use the Do-Corder “Plus” with the Farinograph® mixers or with the planetary mixers for simple Farinograph® tests or for tests with variable speed and mixing intensity.

Do-Corder “Plus” with measuring extruders

Or combine the Do-Corder “Plus” with a measuring extruder and simulate all types of extrusion that are relevant for practice - on a laboratory scale, but under production-like conditions:
- Cold forming
- Gelatinization and plastification
- Cooking and expansion
- Texturing
- Extrusion of biodegradable polymer-starch compounds

Lab-Station

With the Lab-Station, you get the result of a continuous development which has been pursued over several decades. It is the basic unit for practice-oriented investigations or processing tasks in laboratories and simulation. Just dock the movable and self-centering measuring heads like mixers and extruders to this basic unit. The fully digital 6.8 kW motor ensures full torque of 300 Nm over the entire speed range from 0.2 to 200 min⁻¹. The inverter drive allows precise and constant speed even under this load. Furthermore, a torque measurement is integrated.

Lab-Station EC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamometer</td>
<td>digital AC inverter motor, carried in a pendulum bearing</td>
</tr>
<tr>
<td>Power</td>
<td>6.8 kW</td>
</tr>
<tr>
<td>Speed</td>
<td>0.2 - 200 min⁻¹ infinitely adjustable, digital display</td>
</tr>
<tr>
<td>Speed deviation</td>
<td>±0.2 % through digital feedback</td>
</tr>
<tr>
<td>Sense of rotation</td>
<td>forward or backward (key-operated switch)</td>
</tr>
<tr>
<td>Torque measuring range</td>
<td>0 - 300 Nm</td>
</tr>
<tr>
<td>Torque deviation</td>
<td>±0.15 %</td>
</tr>
<tr>
<td>Temperature control</td>
<td>maximum 8 zones</td>
</tr>
<tr>
<td>Mains connection</td>
<td>3x 400 V; 50/60 Hz + N + PE; 32 A</td>
</tr>
<tr>
<td>Dimensions (W x H x D)</td>
<td>630 x 1300 x 1170 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 302 kg net</td>
</tr>
</tbody>
</table>

… where quality is measured.