

**The Brabender® ‘3-Phase-System’ indispensable for quality control, research and development**M. Löns*Brabender GmbH & Co. KG Duisburg, Germany*

Founded in 1923 by Carl Wilhelm Brabender, Brabender® GmbH & Co KG develops, manufactures and distributes as a leading supplier instruments and equipment for determination of material quality and physical characteristics in all fields of research, development and industrial production in the chemical and food industry worldwide. Brabender® laboratory instruments are for testing the quality of grain, flour, and dough; laboratory mills, laboratory measuring extruders, moisture testers, NIR technology, break mills, grain cleaner, hardness tester; rheological tests on dough and foodstuffs, testing of chocolate and fat, starch testing (viscosity and gelatinization properties). Many international and national standards like AACCI, ICC and ISO are fulfilled. The Brabender® 3-Phase-System was developed to provide mills and flour processing industries with a reliable and secure possibility for testing and evaluating the used flours in respect of their properties. The raw materials influence at a high level the quality of the final end product. Absolute test results like moisture, protein and ash content enable a first classification of flours. Important for the complete production process of baked goods is also the rheological characteristics of flour and the produced dough. These characteristic properties of each flour and dough can be tested with the Brabender® Farinograph®-AT, the Brabender® Extensograph®-E, and the Brabender® Amylograph-E, which together form the Brabender® 3-Phase-System. Of specific importance when applying the 3-Phase-System is the use of practice orientated time laps, which in many cases allows for a direct conversion into practice. The test procedure and evaluation of the single tests are regulated in many international (ICC; AACCI; ISO) and national standards and methods.

**Brabender® Farinograph®-AT**

The optimum water absorption of flour plays a major role in the production process and quality of baked goods. Additionally, there is a direct economic influence because the use of optimized water quantities leads to a higher profit. In the Farinograph® water is added to a pre-defined flour quantity until a certain dough consistency is reached. In the course of the test procedure, the dough is kneaded and the rheological properties are recorded graphically. The evaluation is done for the water absorption, dough develop-

ment time, dough stability, and softening of the dough. The required water quantity is added by a software controlled automatic water dosing system in the Farinograph®-AT. The uniform water temperature provides for high reproducibility. For special applications which are not covered by standards and methods, the kneading intensity can be adjusted steplessly. Furthermore, it is possible to programme kneading programmes with different kneading intensities and kneading times, as they are used in production dough mixers.

**Brabender® Extensograph®-E**

The stretching properties and elasticity of dough is of importance during the production process and at the beginning of the baking process. The dough is processed manually or mechanically during production. For an optimum production process it is important to know how the dough will react. It is also possible to predict the probable baking properties. The dough is extended at the beginning of the baking process and the bread attains its characteristic volume. With the help of the test results it is possible to judge if a flour is suitable for a specific product, and how the piece of dough will be extended in the oven. The proving times are adjusted to a common fermentation time in the production process. With the instrument, the microbial and biochemical processes from the beginning of the dough production until the baking process is started can be recorded and evaluated.

**Brabender® Amylograph-E**

The enzyme activity of flour is important for building up the crumb during the baking process. Too high enzyme activity leads to a starch degradation, reduces water retention, and has a negative influence on the consistency of the crumb structure. A correctly adjusted enzyme activity, however, influences the freshness as well as the sensory properties of baked goods. In the Amylograph, a water-flour suspension is slowly heated and the gelatinization of the starch is measured. The curve progression shows the enzyme activity and whether the flour can be used directly or if it needs to be optimized with flour additives or by blending with other flours.

**Keywords**

flour; dough; rheology; quality control; Brabender; Farinograph; Extensograph; Amylograph; water absorption; enzyme activity; standard.