doughLAB

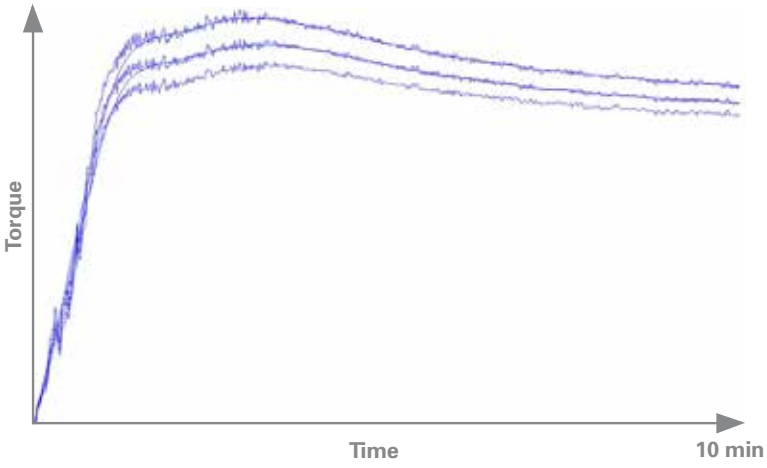
Application & Method

Flour

Dough

Bread

Pasta & Noodles



Dough Rheometer with Variable Temperature & Mixing Energy

doughLAB The New Standard

Standard Method:
AACCI 54-70.01

Perten INSTRUMENTS
a PerkinElmer company

doughLAB (dL)

The doughLAB is a flexible dough rheometer with conventional z-arm mixing action and automated water addition It determines flour water absorption (WA), dough development time (DDT) and other dough mixing parameters. Mixing speed (energy) and temperature can be programmed to imitate commercial processes. It can be used to evaluate flour, whole meal, durum semolina, bake mixes, formulations with ingredients and improvers, gluten and finished dough. It is suitable for bread dough plus its high torque range means it can also be used for dry and crumbly doughs such as pastry, cracker, noodle and pasta doughs.

Importance of protein

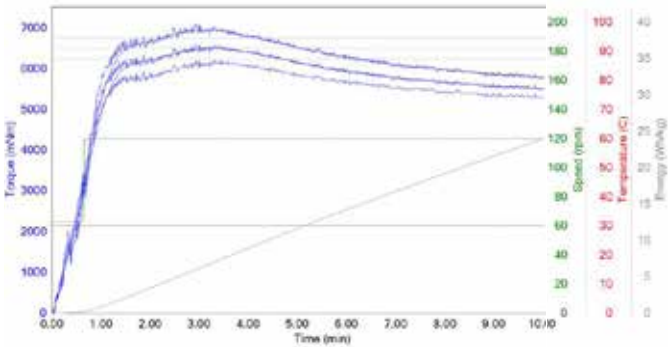
Dough mixing has three main objectives: blending and hydrating flour and ingredients and developing a gluten structure. The doughLAB mixes flour with water to form a dough. How much water the flour absorbs to achieve optimum dough consistency for producing a variety of products is an important measure of its quality.

After hydration, the dough is developed by the rotary action of two sigma-arm mixing blades. As the dough is developed, and eventually broken down, its resistance to kneading changes. This resistance is monitored as a torque value and plotted against the time taken since the test commenced. Torque-time analysis functions can be used to predict bread, or other product, making potential of a flour.

Key time-torque analysis functions

Peak torque: The maximum torque, measured from the middle curve. Indicates the optimum dough consistency for producing a variety of products. The optimum torque will depend on the product (pan bread, hearth or oven-bottom bread, crackers, biscuits, noodles, pasta etc), the recipe used and the production process (North American sponge and dough, rapid processing with spiral and other similar mixers, mechanical dough development such as Chorleywood Bread Process (CBP) and continuous mixing).

Development time (DDT): Time (min) to reach peak midline torque. Indicates when the dough has reached the strongest resistance to deformation.



doughLAB AACCI method 54-70.01 typical graph (mixing torque, temperature, speed-time)

Indicates when the dough will reach its optimum viscous and elastic properties for the retention of gas essential for bread making.

Stability: Difference between the time (min) the top torque line arrives at, and departs from, the midline peak torque. Indicates the flour's tolerance to mixing.

Softening at 5 min: Difference (mNm) in midline torque at DDT and 5 min after DDT. Indicates the flour's tolerance to mixing.

Energy at peak: Accumulated mechanical energy (Wh/kg) to peak torque. Indicates how much energy to add to the flour during commercial mixing and how cold the added water must be to give the correct temperature for proofing after mixing.

Strength is the simplest way to characterize a flour: weak flour has short development time, low stability and high softening and strong flour has long development time, high stability and low softening.

The doughLAB Method

doughLAB

The doughLAB is a flexible dough rheometer with conventional z-arm mixing action. It includes automated systems to control bowl temperature and dispense water into the sample, and variable temperature and speed controls. The instrument uses standard or custom test configurations to determine water absorption and dough mixing profile, of wheat, rye, durum and composite flours for milling, baking, and foods laboratories. Standardized test profiles are available, including that approved by the American Association of Cereal Chemists (AACC International).

1. Select Method

Open the appropriate doughLAB method in DLW software and enter sample information.

2. Weighing

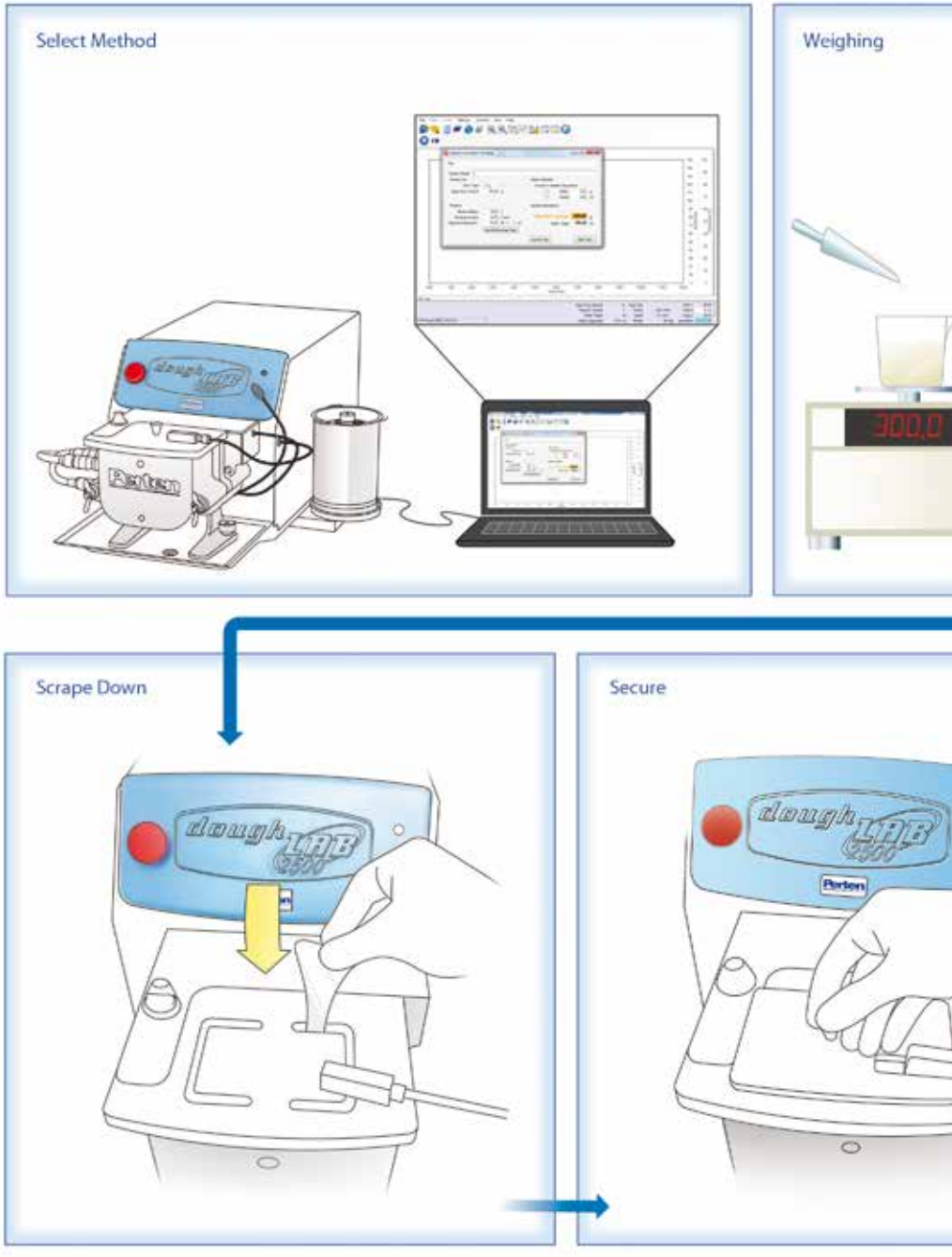
Accurately weigh the amount of flour calculated for you to an accuracy of ±0.1 g or better.

3. Dispensing

Open the lid of the mixing bowl and dispense the flour into the bowl.

4. Starting

Close and lock the safety lid, place the water dispensing head in the bowl lid and click Start Test in the Sample Calculator window to start the test. The flour sample will be mixed for the specified zero time before the water is dispensed.

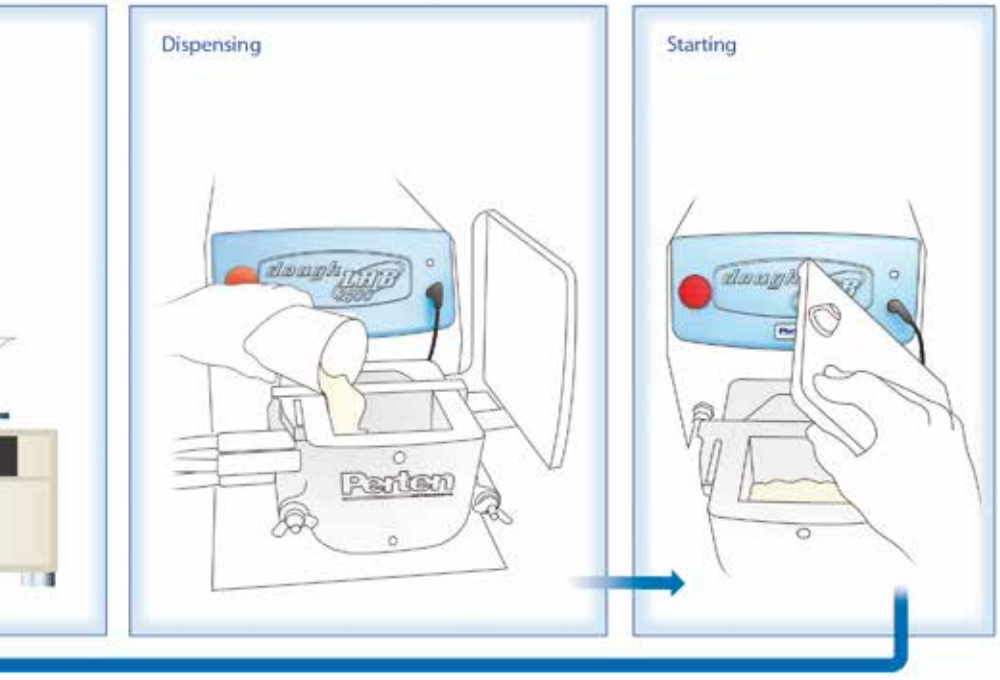


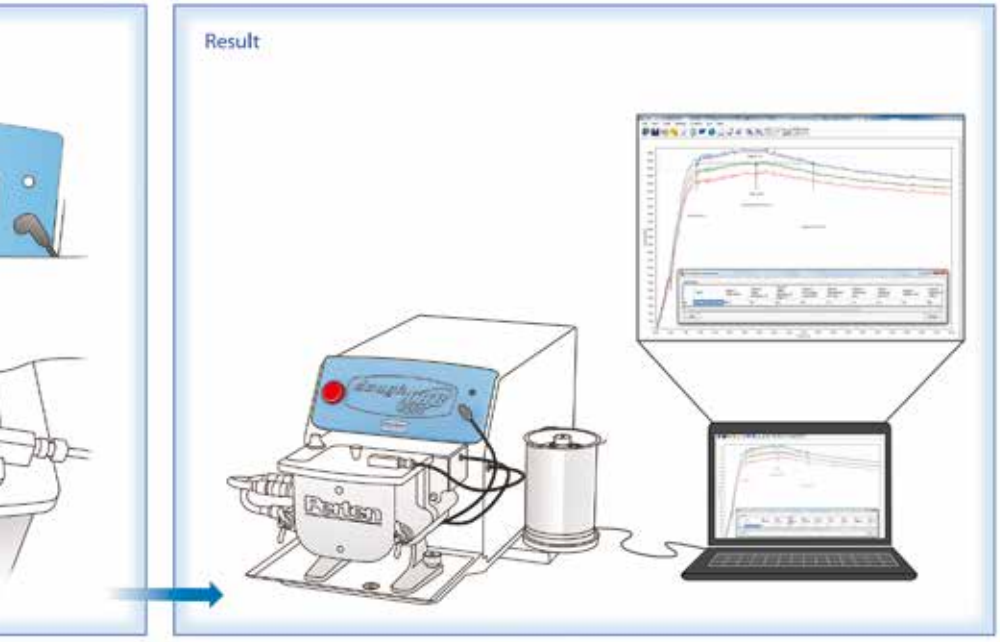
from Perten Instruments

Standard Method

High Speed Mixing Rheology of Flour using the doughLAB AACC International Method 54-70.01
The method describes a procedure which emulates the high rates of mechanical energy addition now commonly used in modern dough mixers integral in rapid bake systems. The method is applicable to any flour including, but not limited to, flours that are very strong or are difficult to develop.

METHOD The doughLAB is a conventional sigma arm dough mixer which measures water absorption (WA) and dough mixing parameters. The doughLAB incorporates programmable mixing speed and temperature, integrated water dispensing, Windows software to control both testing and analysis, and traceable calibration.





5. Scrape down

If necessary scrape down the sides of the bowl carefully to integrate the dough, using the plastic spatula provided.

6. Secure

Secure the evaporation shield to minimise evaporation of water.

7. Result

As the test progresses, the test data will be displayed in DLW in the form of a torque-time chart. The resistance of the dough will be graphed on the monitor.

At the completion of a test, clean the mixing bowl by dispensing a small quantity of additional flour into the bowl, closing the lid and selecting Clean Blades. Once the dough has been sufficiently mixed stop the mixing blades, remove and discard the dough mass and thoroughly clean and dry all components.

Benefits of the doughLAB

The doughLAB is a unique tool for rapid wheat, rye and durum flour and dough product development, quality and process control and quality assurance for milling, baking, and food applications.

Rapid Standard Dough Mixing Profile: Water absorption, development time, stability, softening, energy at peak torque and other parameters using standard methodology.

High-Energy Performance: Use high-speed mixing to emulate commercial mixing processes.

Composite Flour Performance: Use programmable mixing speed and temperature to study the performance of multi-component formulations.

Protein and Starch Performance: Gluten and carbohydrate behavior in real time.

Effect of Ingredients and Treatments: Evaluate the performance of flour treatments, dough ingredients and enzymes.

Blend Modelling: Predict the result of commercial scale flour blending.

Flour rapid standard test

High speed/energy mixing for flour, wholemeal, bake mixes, full formulations and novel formulations. Imitate high energy commercial bread dough processing, increase laboratory sample throughput, study the response of a dough to changing stress, incorporate ingredients. Accelerated testing reduces long development times, clarifies indistinct development peaks and eliminates multiple peaks.

Starch

Cook a dough to study starch granules.

Protein

Study the response of proteins to different processing conditions.

Crumbly dough

High torques tests for low water absorption doughs such as pizza crust, pastry, cookie, cracker, pasta, and noodles.

Durum semolina

Variable temperature and high speed/energy mixing to evaluate difficult to develop flour and durum semolina for pasta production, and to emulate industrial mixing.

Ingredients and Improvers

Stepped speed tests to incorporate dry and liquid ingredients such as vital gluten, reducing and oxidizing agents, salt, sugar, enzymes, emulsifiers, fibre and other additives and fat. Imitate commercial processing. Evaluate bake mixes, and full formulations.

Finished dough

Rapidly measure the consistency of a premixed dough to be used in subsequent processing such as sheeting, rolling, and baking or sold as a half-product such as chilled dough.

Dough samples for further testing

Use defined energy input testing to cease mixing the sample once the specified amount of mechanical energy has been applied. Produces repeatable samples for further testing such as texture analysis and test baking.

Predict the performance of flour blends

Mathematically combine data from several doughLAB tests to quickly and easily predict the effect of blending mill streams. Do complex "what if" analyses without having to run lots of tests. Use blend models to manage crop changeover issues and design flour blends for specific purposes and products while reducing costs.

Ver 4.1 2015.01.09

Required Equipment

doughLAB Models

doughLAB with 300g or 50g mixing bowl and blades set

doughLAB with doughLAB for Windows (DLW) software can be used with 300g and 50g mixing bowl and blades sets to perform a wide variety of tests, graph data, predict flour blend performance and analyse test results.

micro-doughLAB with 4g mixing bowl and blades set

micro-doughLAB with doughLAB for Windows (DLW) software is supplied with a 4g mixing bowl and blades set for when sample availability is limited. It can be used to perform a wide variety of tests, graph data, predict flour blend performance, measure dough elasticity and analyse test results.

Accessories

300g mixing bowl and blades set

Conventional scale testing for the AACCI doughLAB standard method.

50g mixing bowl and blades set

Small scale testing for convenient handling and clean up.

Calibration check flour

Ensure that the doughLAB is operating within specifications in compliance with the principles of Good Laboratory Practice. Reference flours are specified using the AACCI doughLAB standard method.

Getting started

To test samples you will require a standard single phase power supply, a suitable cold water supply and a doughLAB 300g or 50g mixing bowl and blades set. An analytical balance accurate to at least ±0.1 g is also needed. To run doughLAB for Windows (DLW) you will require a personal computer.