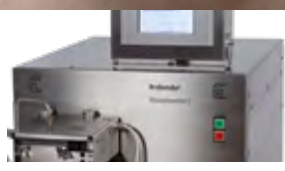
Brabender® Instruments Overview

for Material Research and Quality Control



Brabender®

… where quality is measured.

C. W. Brabender® Instruments, Inc.; New Jersey, USA

Brabender® GmbH & Co. KG; Duisburg, Germany

ООО Brabender®; Kazan, Russia

Company profile

The Brabender group

Founded in 1923 by Carl Wilhelm Brabender, Brabender GmbH & Co. KG has been the leading company for the development, manufacture, and distribution of instruments and equipment for testing material quality and physical characteristics in all fields of research, development, and industrial production in the chemical and food industries all over the world.

Today, the Brabender group of companies incorporates the headquarters in Duisburg as well as two subsidiaries in the USA and in Russia. In addition, Brabender is represented in more than 130 countries with its worldwide network of sales and service partners.

The Brabender Support

Our state of the art application laboratory is always made available to our customers.

You can choose to send material to us for testing or schedule a specific Lab Trial with our expert team. In our application laboratory, you will have access to our full product line to help come to a solution for your application.

Apart from that, numerous papers dealing with the application of the Brabender instrument systems for several tests have been published all over the world during the past decades. Please feel free to contact us respectively.

Brabender application laboratory

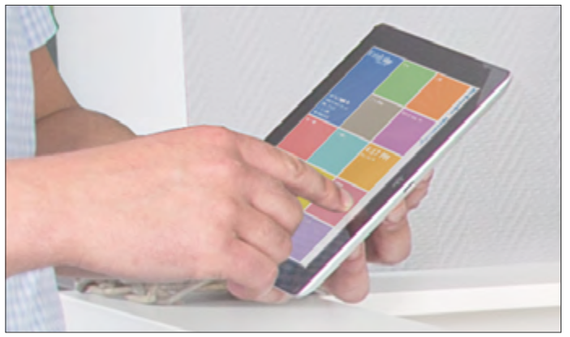
Brabender® 5-Star Service

The Brabender 5-Star Service provides you with ongoing support for your Brabender equipment:

- On-site service – inspections, maintenance, repairs
- Spare parts service – spare parts, consumables, spare part logistics, upgrade kits
- Factory service – repairs, reconditioning
- Value added services – software update agreements, reference materials, inspection/maintenance agreements, emergency service, remote maintenance, mentoring, service-related training
- 24/7 service line – contacts, spare parts, technical answers, service appointments

The Brabender MetaBridge

MetaBridge® Brabender®



Brabender MetaBridge software running on tablet

Discover the Brabender MetaBridge

The new software is characterized by its easy and intuitive handling. After log-in, the user finds all information about the device and a choice of options for his purpose on the start screen.

The advantages

- User-friendly operation by touch – perfect for tablets and smartphones
- Responsive web design: screen resolution adjusted automatically
- Ready to use, no installation necessary
- Security of tests and data through easy, password protected user log-in
- Live test tracking by authorized users from multiple end devices all over the world at a time

Intelligent features

Benefit from new and optimized functions:

- Administration mode for user access rights
- Webbased solution – possibility of sharing information and data with other users worldwide
- Live tracking of tests with end time indication for logged-in users
- Optimized basic functions like data recording and evaluation, printing and export of test results – clearer, easier, faster
- Central test administration and data storage provides for quick and easy access of authorized users
- Easy definition, clear display and quick integration of reference curves
- Optimized functions for editing and adapting diagrams to your individual needs

Brabender®

… where quality is measured.

MetaStation 4E / MetaStation 8(E) / 16

The heart of a flexible testing and simulation unit

- Modular configuration
- Multi-master system with self-intelligent modules
- Self-validation
- Real-time transmission of events and actual values
- Software-supported workflows for many norms & standards
- Real multitasking
- Easy connection of additional equipment such as mixers and extruders
- Automatic recognition of additional equipment

Fields of application

- Raw material and recipe development
- Material testing
- Quality control parallel to production
- Optimization of the production process
- Laboratory-scale production of samples for further investigations

Why go modular?

In laboratory applications, flexibility and versatility are paramount.

Users no longer need to have numerous stand-alone machines with many different controls. With just one drive unit, you can use manifold Brabender processing units:

- Measuring mixers
- Single screw measuring extruders
- Twin screw measuring extruders (compounders)

Using modular systems means a cost-effective solution to work flexibly with numerous laboratory machines.

The core element of the versatile modular Brabender system are the drive units or torque rheometers.

Principle: the role of the drive units

The Brabender drive units

- provide the motion by the drive motor for the processing modules
- contain the direct torque measurement system
- control and/or read the parameters of the processing modules, feeders and follow-up units, like melt and zone temperatures, speed, pressure etc.

MetaStation 8E with measuring extruder 19/25

MetaStation 4E with measuring mixer W50 EHT

Tailor-made system configurations for different applications

MetaStation 8(E) / 16

Single screw extruder 30

Measuring mixer 30/50

Planetary mixer P 600

Internal Mixer 350

Twin screw extruder B-TSE-A 20/40

Twin screw compounder TSC 42/6

Conical twin screw extruder

Single screw extruder 19

Twin screw extruder B-TSE-A 12/36

MetaStation 8(E) / 16

For applications which require higher torque and speed, we recommend these floor-standing models, where the modules are attached on their docking station.

The MetaStation 8(E) provides 400 Nm of torque on 0.2 to 200 min^{-1}.

The MetaStation 16 variant is even more powerful and offers two torque ranges, either 400 Nm with 0.2 to 400 min^{-1} or 500 Nm with 0.2 to 275 min^{-1}.

Both can handle any processing module of the Brabender modular system.

The compatibility of the different processing modules and MetaStation 8(E) and 16 drive units can be seen in the schematic on the left.

Further processing modules on request

MetaStation 4E

Twin screw extruder

Conical twin screw extruder

Internal Mixer 350

Measuring mixer 30/50

Single screw extruder 19

Planetary mixer P 600

Twin screw extruder B-TSE-A 12/36

MetaStation 4E

The Brabender MetaStation 4E is the economical table-top version for applications with lower demands as to torque and speed levels.

This model is equipped with a 4.2 kW drive motor, which provides 200 Nm torque and maximum 185 min^{-1} speed.

The MetaStation 4E has 6 ports for heat control and pressure read so it can handle the conical twin screw and the 19 mm single screw extruders.

The compatibility of the different processing modules and the MetaStation 4E drive unit can be seen in the schematic on the left.

Further processing modules on request

Measuring mixers

The efficient machines for quality control and recipe development

- Raw material and recipe development
- Material testing
- Quality control parallel to production
- Optimization of the production process
- Laboratory-scale production of samples for further investigations

Carl Wilhelm Brabender said:

”It is only testing, measuring, and recording as a function of time which efficiently helps to rise production quality; only this way, certain processes can be recognized which cannot be grasped with static measurements.”

Principle

- Non-continuous production of homogeneous polymer, elastomer, ceramic or other mixtures
- Recording of torque (resistance the material in the mixing chamber opposes to the rotating mixing blades) and temperature during the mixing process by means of an attached torque rheometer
- Visualization: a diagram illustrates the relationship between torque (viscosity) and temperature over the measuring time and shows structural changes of the material

Application areas

Brabender measuring mixers have been proven for decades for a wide range of applications, e.g:

- Batch mixing for the preparation of small sample material amounts
- Realistic lab-scale simulation of compounding, mixing, mastication and other processes relevant for the production and processing of polymers and other plastic and plastifiable materials
- Testing the processibility and material characteristics of thermoplastics, thermosets, elastomers, ceramic molding materials, pigments, and many other plastic and plastifiable substances.

Blade geometries

- Roller, cam, Banbury and sigma blades (suited for most applications on thermoplastics and elastomers)
- Special blade geometries optimized for particular measuring tasks, such as e.g. delta blades for thermoset applications

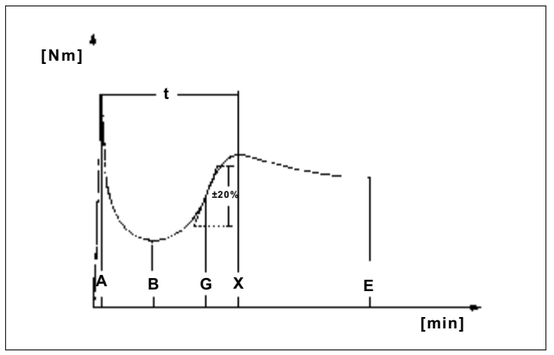
Evaluation

- Fusion behavior of PVC
- Heat and shear stability of polymers
- Flow and cure behavior of polymers
- Flow and cure behavior of elastomers
- Automatic evaluation of the black incorporation time (BIT) with selectable zero point
- Plasticizer absorption of PVC dry blends
- Liquid absorption of powders
- Semi-automatic universal evaluation
- Measuring mixer tests with temperature and speed programming
- Conductivity measurement
- Gas flow measurement
- Degree of property breakdown

Measuring mixers 30/50

- Sophisticated design for efficient mixing
- Easy handling, cleaning and manifold applications through quickly detachable and partially interchangeable mixer blades
- Precise and constant heating/cooling
- Operating temperatures of up to 500 °C
- Wide range of accessories

MetaStation 4E with Measuring Mixer 50 EHT on docking station



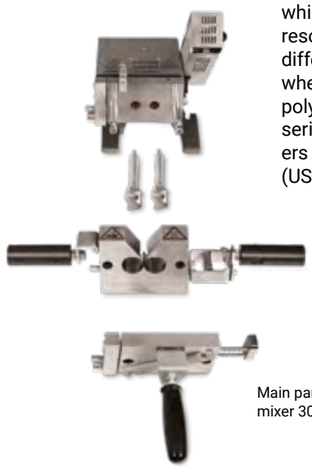
Fusion behavior

Measuring mixers 30/50 and 30/50 EHT

At most of the research and development sites, the versatility of an equipment is a basic requirement due to steadily changing samples and materials.

The most general purpose mixers are the series 30/50 mixers, comprising the liquid heated mixers 30 and 50 and the electrically heated types 30 EHT and 50 EHT.

Mixers with the extension EHT (electric, high temperature) distinguish by their electric temperature conditioning in three control zones with compressed air cooling.



Main parts of the measuring mixer 30 EHT

This feature allows to extend the operating range to a maximum temperature of 500 °C.

These measuring mixers are perfectly suited for materials like PAEK and PEEK with melting temperatures of more than 300 °C.

The liquid heated measuring mixers stand out for particularly precise heating/cooling and uniform temperature distribution. This makes these mixers the perfect tool for applications at lower temperatures (< 300 °C).

Another notable feature is the rotor speed ratio of 2 : 3 (driven to non driven, US type 5) which results in a high torque resolution and allows a better differentiation, especially when testing low viscosity polymers. Of course, all of the series 30/50 measuring mixers can be supplied with a 3 : 2 (US type 6) speed ratio either.

Application example: Fusion behavior

Use this evaluation method for testing the fusion behavior of thermoplastic polymers. Measure material-specific Plastograms which also permit to draw conclusions as to the history of the material.

The software analyzes the curve and determines, among others, the extreme values in the torque curve (as a measure for viscosity), fusion time, gelation speed, and the mechanical energy input.

These material characteristics are valuable data for incoming and final inspection or for the configuration of production processes.

Intermeshing blades

Internal mixers 350/350 E

- **Large mixer volumes**
- **Liquid or electric heating**
- **Precise and constant temperature conditioning up to 300 °C**

Internal mixer heads of the 350 series are available with liquid heating/cooling and with electric heating and air cooling. Due to the large mixer volumes of 370 to 440 cm³, these measuring mixers are frequently used for producing sample compounds for subsequent tests. The material can easily be taken out and rolled out to sheets or pressed to plates.

Control and document the entire compounding process from your computer or implement and benefit from an optional process control of each individual mixing step.

Of course, these measuring mixers can also be applied for material testing (e.g. of rubber compounds).

The series 350 mixers can be equipped with roller, cam, Banbury and sigma blades.

Internal mixer 350 SX

- **Enhanced feeding**
- **Special sealing**
- **Intermeshing blades**

Due to its special design, the internal mixer 350 SX is mainly used in the rubber and caoutchouc industry for mixing and compounding tasks or for material testing.

With intermeshing blades for optimum mixing, blending and mastication. The upper and lower half of the mixing chamber can be opened like a jaw in order to facilitate removal of the sample material. Special seals prevent the leakage of fine-particle fillers like carbon black or silica.

The large net mixer volume has proven favourable for proportioning of the recipe components. The Internal Mixer 350 SX is supplied on a special docking station. Extensive software packages are available for material tests like e.g. the determination of the black incorporation time.

Planetary mixer P 600

The Brabender planetary mixer P 600 is used for testing the properties of powders like e.g. the liquid sorption and the plasticizer sorption rate of PVC powders in compliance with international standards or the pourability of PVC dry blends, further for preparing PVC pastes for tests and testing them in compliance with DIN EN 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.

Applicable standards:

- DIN EN ISO 4612
- DIN 54802
- ASTM D 2396

Measuring extruders and Extrusiograph®

The multipurpose machines for testing and processing

- **Application in laboratories and small-scale production**
- **Development of new products**
- **Testing the processing behavior for recipe development or incoming and final material inspection**
- **Quality control during production in combination with measuring heads**
- **Production of small tubes and profiles**
- **Production of blown and flat films**
- **Development and small-scale production of 3D filaments**
- **Co-extrusion**

Application area

- Easy simulation of production processes in real time
- Small amounts of raw material samples
- No interruption of your production processes
- Complete instrumentation of the extruders thanks to the Brabender modular system
- Continuous recording of all measured values such as torque, melt and zone temperatures, melt pressure
- Visualization in graphs or sheets
- Determination of optimum processing conditions on production scale

Advantages

The Brabender measuring extruders offer the following major technical features:

- Mechanical and electronical overload protection
- Nitrided barrel surface to ensure long lifetime even with abrasive materials
- Up to 4 bores for pressure transducers and 4 further for melt temperature
- Control and display of the temperature of the individual extruder zones
- Wear-protected and corrosion-resistant screws – various special steel grades available
- Single and multistage screws with various compression ratios, zone lengths and mixing elements available for various applications
- Wide range of processing and measuring dies

Measuring extruders and Extrusiograph® series 19 and 30

- **Variable feed units**
- **Interchangeable feed zone**
- **Measuring ports along the barrel with the Extrusiograph models**

The Brabender series 19 and 30 measuring extruders and Extrusiograph models have a screw diameter of 19 mm and 30 mm, respectively and are available in different lengths.

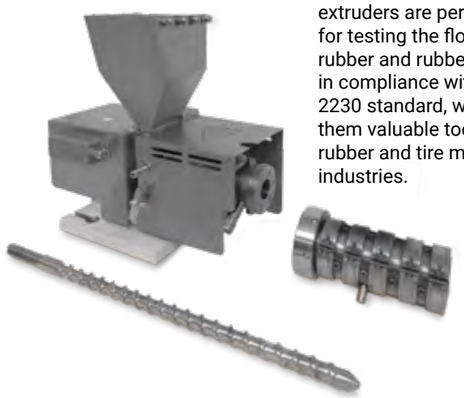
Apart from the standard feed hoppers, vibrating feed hoppers and chutes as well as various types of screw feeders and dosing units for liquid dosing are available.

Special features of the Extrusiograph models are the measuring bores (1/2" x 20 UNF) along the barrel for taking additional thermocouples and pressure transducers and, for the 19 mm Extrusiograph, the interchangeable feed zone which can be designed either conically grooved or as a smooth cylinder.

Special variants

Measuring extruders 19/10 DW and 19/20 DW

- **Feed roll**
- **Short processing length**
- **Expansible with pin barrel**



The measuring extruder 19/10 DW with its feed roll and its short length of 10 D is particularly suited for elastomers.

It is frequently used in combination with a 10 D pin barrel supplement for improved homogenization to form a 19/20 DW extruder. Equipped with a standardized Garvey die head with its special shapes, the 19/10 and 19/20 DW extruders are perfectly suited for testing the flow behavior of rubber and rubber compounds in compliance with ASTM D 2230 standard, which makes them valuable tools for the rubber and tire manufacturing industries.

Grooved extruder 19/20

- **Liquid heated**
- **Grooved barrel**
- **Pneumatic feeding**

The liquid heated extruder 19/20 has a grooved barrel over the entire length. Together with the pneumatic feed unit, it is perfectly suited for pasty materials which have a strong tendency to heat formation due to internal friction. Therefore, this extruder is frequently applied with ceramic materials.

Stand-alone extruders KE 19 and KE 30

- **Compact design**
- **Simple operation**
- **Versatile use**
- **Different process lengths**

The stand-alone extruders ("KE" series) offer cost-effective solutions in case the modularity at the drive unit is not essential.

These machines have an integrated drive motor so that no separate drive unit is needed. Except for the direct torque measurement, the instrumentation possibilities are the same as in case of the modular extruders.

Most of the measuring extruders of the modular program are available in stand-alone design either.

Stand-alone extruder KE 19

Stand-alone extruder KE 30

Twin screw extruders and compounders

The ideal companions for continuous compounding

- **Development of new materials**
- **Recipe development**
- **Production simulation**
- **Application in laboratories and small-scale production**

Advantages

- Good feeding characteristics, even with materials with poor flow properties
- High conveying consistency
- Well-defined plastification time and purposive shearing
- High output at long energy transfer
- High energy input as compared to the free screw volume
- Very high screw speeds
- Narrow residence time spectrum of the melt within the screw area
- Good distributive and dispersive mixing properties
- Gentle material treatment and homogenization
- Variable shearing by using manifold mixing and kneading elements
- Optimum degassing by controlling the pressure ratios in the melt
- Uniformly high extrudate quality
- Self-cleaning of the screws by intermeshing flights

Principle - application area

- Realistic simulation of the basic steps of the processing technology
- Optimal realisation of all process steps (feeding, conveying, plasticising, dispersing, reacting, degassing, pressure build-up)
- Adaptation of the system configuration to the process task at any time without significant cost expenditure
- Throughputs from 0.06 kg/h to 30 kg/h depending on machine type, material use and process task
- Add-ons such as measuring and control equipment, feeding systems and downstream equipment for setting up complete extrusion lines
- Continuous recording and display of all measured values such as torque, melt and control temperatures and melt pressure

Twin screw extruder B-TSE-S 20/40 TwinLab-C

With the compact B-TSE-S 20/40 „TwinLab-C“ twin-screw extruder, you can analyze a wide range of materials in a space-saving and cost-efficient way.

- Small footprint due to integrated drive
- Throughputs from 0.5 to 20 kg / hour possible
- Possibility to use an L-liner
- Clamshell design with hinged liner for better understanding and optimization of your recipes and process parameters as well as for easy cleaning
- Modular screw design and different dies for a wide range of applications and process tasks
- Screw speed of up to 1200 min^{-1}, depending on the liner/screw material selected
- Available in hygienic design

Liner can be opened horizontally for providing an optimal view of the entire process, easy cleaning and screw removal

Twin screw extruder B-TSE-A 12/36

With the B-TSE-A 12/36, Brabender offers a small-scale twin screw extruder for product development in the plastics, rubber, energy storage and pharmaceutical industries.

- Torque density of 15 Nm/screw
- High shear energy achieved with an OD/ID ratio of 1.43
- Up to 1200 rpm, depending the drive unit
- Processing of liquids, powders, micro-pellets and pellets up to 3 mm
- 4 feeding options (3 top / 1 side)
- Up to 400 °C in 4 separately controlled temperature zones
- Air or liquid cooling (thermostat and water distribution system required)
- Hygiene-compliant components in the area in contact with the product
- Clam shell design with an openable liner for contamination-free and easy cleaning between the trials
- Compatible to all rheological drive units of the MetaStation series
- Lab scale extruder with small footprint

Twin screw extruder B-TSE-A 20/40

Designed to be a versatile solution for most of the compounding tasks – you can adapt the machine configuration easily and effectively to the different applications.

- Full barrel length 40 D with top openings at 0 D, 10 D, 20 D, 30 D (for multiple feeders, reduction of the processing length or variation of the place of venting)
- Side openings at 12 D and 22 D for further dosing units
- Dosing systems for any material (e.g. granules, powders, fiber, fluids)
- Horizontally-split barrel (“clamshell design”) for quick opening and access to all parts in contact with the material, easy and effective cleaning and analysis of the extrusion process
- Distorsion-free, hardened, highly abrasion resistant barrel for a long lifetime
- Modular screw design – supported by our dedicated software – offers almost unlimited possibilities to optimize the configuration to your application
- Up to 1200 rpm screw speed is possible with the suitable drive units

Conical twin screw extruder (CTSE)

The counter-rotating conical twin screw extruder is perfectly suited for quality control, product development and research applications.

- Gentle and effective mixing properties at shear sensitive materials such as PVC
- Nitrided barrel surface to ensure a long lifetime even with abrasive materials
- Polished chrome plated screws – various special steel grades available as well
- Vent port

Twin screw extruder B-TSE-S 30/40

The B-TSE-S 30/40 is an electrically heated, co-rotating twin screw extruder (Ø 30 mm) with integrated drive. Its compact design makes it the smallest extruder in its category on the market. It features the proven Brabender clam-shell design, which is characterized by its horizontally split, hinged liner for process monitoring and easy cleaning. With a throughput of up to 100 kg per hour, it is suitable for use in pilot plants as well as for small-scale production of various extrudates made of plastics, rubber, food, feed and many other extrudable materials. Different die geometries and screw configurations make the Big Compounder B-TSE-S 30/40 a versatile extruder that can be fed via 6 openings (4 on top, 2 on side) allowing for flexible adaptation of processing length and residence time.

Twin screw compounder TSC 42/6

The counter-rotating Brabender Twin Screw Compounder is a versatile machine which can be used for manifold applications in raw material production. The machine stands out for its most variable application possibilities.

In combination with the closing adapter, this machine can be used as a mixer for raw material batch production. After the mixing process, the product can be extruded by opening the valve of the closing plate.

Alternatively, the Twin Screw Compounder can be equipped with a two-strand die with interchangeable die inserts for continuous compounding tasks. Here, throughputs of up to 6 kg/h can be reached.

The benefits of the Twin Screw Compounder are the adjustable mixing or kneading time and the possibility of producing feedstock materials for subsequent production of e.g. injection molding products.

Brabender®

Measuring and processing die heads

Brabender measuring die heads are high-precision tools fitting all of the Brabender single and twin screw extruders.

Use the versatile Brabender measuring extruders and the extensive line program of measuring and processing die heads. Extrude all sorts of plastics and plastifiable materials such as thermoplastics, thermosets and elastomers. Analyze your material on a laboratory scale in real conditions for various criteria, e.g.

- Uniform plastification, gels, surface gloss
- Color dispersion and color check
- Transparency and formation of streaks
- Swelling and contraction behavior
- Segregation of individual recipe components of a compound at the die and/or at the screw tip (e.g. titanium dioxide)
- Output per unit of time
- Rheological properties, etc.

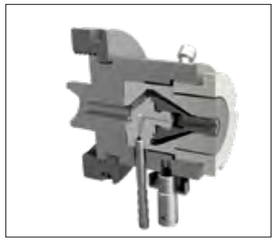
Upon request, special constructions are available, such as liquid heating/cooling, non-standard sizes or special materials.

Round strand die head

The single round strand die head is designed to accommodate nozzle inserts to allow for variation of the strand diameters without changing the entire die head. Multi-strand dies extrude several round strands at a time and can help enhancing your extrusion capacity.

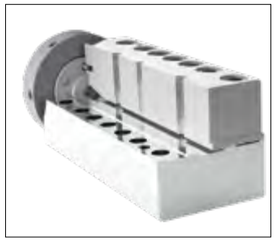
Wire coating die head

With the wire coating die head, polymeric coatings can be extruded on wires of different diameters. This die head can perfectly be combined with the Brabender Wire Take-Off Unit to obtain a laboratory-scale wire production line.



Tubing die head

The tubing die head is designed to produce tubes or hoses of different dimensions. Nozzle inserts of different diameters can be mounted to achieve different diameters and wall thicknesses without needing to change the entire die head.



Rheological die head

You can extend the capabilities of your single-screw extruder to enable it performing rheological tests. The resulting flow curve or viscosity curve mirrors the rheological characteristics of your material in the occurring shear rate range.

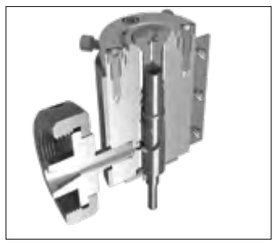
Ribbon die head

- "Fishtail" with fixed gap
- "Fishtail" with adjustable gap
- "Coathanger" design with flex-lip

All of the ribbon die heads are available with different gap widths and openings to obtain a large variety of sheet dimensions.

Garvey die head

This die head was specially developed for the rubber and tire manufacturing industries. The special shape of the die outlet opening, combining relatively flat surfaces, sharp corners, and thin sections, reproduces typical geometries in tire building blocks and fully complies with ASTM 2230.



Film blowing die head

Both pinole and spiral mandrel designs are available. The pinole type die heads are designed to accomodate die inserts of different sizes according to the desired bubble diameter. Co-extrusion dies are also available on request.

Swelltest die head

Used in combination with the Brabender Swelltest, this die head allows for high-precision, non-contact measurement of the diameter of objects with a circular cross-section and any transparency by means of a visible parallel GaN green LED beam.

Winder

- **Flexible and easy retrofitting of roll to belt haul-off or vice versa**
- **Precise setting of the haul-off speed**
- **Adjustable distance between haul-off and oscillating unit**
- **Ergonomic control panel**
- **Easy integration in existing Brabender extruder software**
- **Strand diameter control via laser scanner**

Complete your extrusion line and wind up your extruded round strands or hoses with the Brabender Winder.

An oscillating unit ensures even and steady winding of the extrudate. The oscillating speed is controlled automatically as a function of the preset haul-off speed and of the extrudate and coil diameters. In order to achieve a perfect winding result, the tension between the nip rolls and the oscillating unit can be adjusted. The full coil can easily be taken off and stored or be used for further tests.

Conveyor belt / Water bath

The conveyor belt takes the extruded strands, profiles or sheets directly from the die head, cools them and guides them to any subsequent processing units. It is adjustable in height and equipped with a silicone coated belt to prevent adhering of the extrudate to the belt.

For cooling the extruded strands or profiles, mobile water baths of 1000 mm or 2000 mm length are available. They can be adjusted in height to perfectly match the upstream die head.

Conveyor belt

Water bath

Pelletizer

The Brabender pelletizer stands out for its two separate servo-drives which ensure a constant pellet length even if the intake speed varies. After granulation, the plastic pellets are caught in a drawer or sack and can then simply be removed. Optional extras for this are an interchangeable drawer or secure mounting option for sacks of various sizes.

- **Adjustable pellet size**
- **Easy discharge**
- **Low-noise operation**
- **Constant pellet length even with deviating intake speed**

Blown film take-off unit

This device serves for simultaneous blowing, cooling, taking off and winding up of extruded blown films. It is equipped with has a motor-controlled height adjustment. An ultrasonic diameter control is available as an option. This unit is suitable for the small production of foils under production conditions. It can be extended with an FQA to a complete production line with inline film quality analysis.

- **Precise control of hose diameter**
- **Infinitely adjustable height up to 3200 mm**
- **Expansible with Film Quality Analyzer**

Univex flat film take-off unit

Univex

The Brabender Univex is a universal haul-off unit for taking off, cooling, and winding up flat films up to a max. film speed of 30 m/min. Liquid temperature conditioning of the nip rolls positively influences e.g. crystallization processes in the film.

The winding roll is fixed with clamping cones for easy takeoff.

- **Excellent film quality**
- **High haul-off speed**
- **Precise temperature conditioning**

Film Quality Analyzer (FQA)

The Brabender Film Quality Analyser FQA enables automated optical inline analysis of extruded blown or flat films in the laboratory and during production. The high-resolution camera system detects inhomogeneities and impurities such as black specks, gel particles, fish eyes, holes, etc.) in films of different transparency and pigmentation.

Grey value classification of different types of inhomogeneities

The FQA can be used in conjunction with a Brabender flat or blown film take-off as well as with an auto-grader. The MetaBridge software enables both optical film analysis and qualitative and quantitative statistical evaluation of film purity. The detected defects are classified according to their type and assigned to the size class. The film is evaluated according to the number of defects and their size distribution. In addition, the effect of variations in the process parameters (e.g. temperature) on the film quality can be directly observed.

Filtratest

The Filtratest fully meets the demands of DIN EN 13900-5 and ISO 23900-5 for determining the dispersion and dispersibility of pigments and extenders in plastics by means of the filter pressure value (FPV) test. The main fields of application for this method are quality control of masterbatches, compounds, and polymers as well as color recipe development.

- **Quick change of screen packs through drawer system**
- **Integrated preheating of the screen packs**
- **Short cycle times and continuous extrusion by by-pass operation**
- **Convenient process and evaluation software**

Auto-Grader®

- **Objective**
- **Continuous**
- **Real-time testing**
- **Integration into process control system**

Due to the frequently high material throughputs in continuous production, continuous in-line quality control is essential in industrial production lines. With the Brabender Auto-Grader, product specifications like constant of a rheological power law, MFR and MVR values at different loads, transparency and purity of a film can be surveyed directly at the production site.

All data can be shown and monitored in a control room of the production plant. Even the machine alarms or the film purity video line can be connected to the control room. Whenever inadmissible deviations are reached, a signal will be transmitted to the appropriate device.

The Auto-Grader adjusts itself automatically to different polymer grades. According to the needs, further in-line measuring systems can be integrated, e.g. a colorimeter or hazemeter.

The Brabender Auto-Grader continuously determines the quality characteristics (typically: MFI, MVR, optical properties) relevant to production practice. The complete machine control as well as the representation of the measured results are done fully automatically and continuously within seconds.

The Auto-Grader can be integrated in-line into a pellet conveying system or in bypass to a production extruder.

Aquatrac-V

- **Moisture determination according to DIN EN ISO 15512:2019 (calcium hydride method)**
- **Water-selective, robust, compact, transportable**
- **Absolute measuring instrument (no adjustment for different substances)**
- **High resolution (0.01 mg / 1 ppm/ 0.0001 % H_2O)**

Determination of moisture content is essential for proper adjustment of the drying process to ensure that the material being processed is in the correct moisture range. The Aquatrac-V can be used for all types of polymers. In addition to granules, also powders and ground samples can be tested. The measuring time is approx. 15-40 minutes, depending on the sample size and moisture content. Due to its robustness and compactness, it is practically portable and can be used directly on site at various process stations.

TSSR-Meter

- **Low test and time effort (4 h TSSR vs. 72 h DVR)**
- **Patented measuring method with very good reproducibility**
- **Fast determination of crosslink density**
- **Information about relaxation behavior and structure**

The TSSR meter can be used to perform conventional isothermal relaxation measurements as well as Temperature Scanning Stress Relaxation (TSSR), an an-isothermal stress relaxation measurement method (AISR method). With the ever-increasing demands on materials, the determination of crosslink density is an important advantage. Therefore, the TSSR meter is particularly suitable for material development and for quality control during production.

Absorptometer "C"

Precise and reproducible absorption test

- **High-precision measuring mixer with special blades**
- **Automatic (sequencer controlled) buret with ready to use default settings**
- **Choice between local and remote operation for economic test procedure**
- **Separate location of the PC for clean operation and long lifetime**

Application

The oil absorption number (OAN) is widely used for characterizing the structure of carbon blacks and other free flowing materials which has a strong effect on the processing and vulcanization parameters and the quality of the product as well.

Principle

The Brabender Absorptometer "C" is a tabletop instrument with a torque measurement system (dynamometer), which is used for the precise and reproducible determination of the oil absorption number (OAN) of powdery materials.

The test method is based on the changes of the consistency of powdery materials during oil absorption.

The Absorptometer "C" consists of two main parts: a drive unit with a torque measurement system and an attached mixer with special blades.

The torque is measured and recorded throughout a special mixing process: the oil is gradually added by an automated buret into the mixer. The free flowing, powdery material absorbs the liquid and starts agglomerating.

The Brabender Absorptometer "C" for running precise and reproducible absorption tests fully meets:

ASTM D 2414 (carbon black)
ASTM D 3493 (carbon black)
ASTM D 6854 (silica)

Elatest®

Compact density measurement

- **Excellent reproducibility of the measured values**
- **Easy handling**
- **Reliable, sturdy design**

The Elatest determines the density of polymers, in particular of rubber and non-vulcanized rubber compounds – a dimension which is of decisive importance for rubber processing both during recipe development and for continuous production control.

MT-CA

Moisture determination based on the drying oven method

- **Automated method**
- **Gentle drying, precise results**
- **Time-saving workflow**
- **Analysis of up to 10 samples simultaneously**

The instrument determines the material moisture content to an accuracy of 0.1 % and can record values ranging from less than 1 % to more than 99 %.

The sample is weighed in, dried in circulating air and automatically weighed back. The time-consuming cooling phase required by the conventional method is eliminated.

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