Anton Paar

Measuring Extruders and Extrusiograph

Brabender Single Screw Extruders

Brabender®

A brand of **Anton Paar**

Just Plug & Play

The MetaStation 4/8/16 drives are the basic units for application oriented investigations or processing tasks in laboratories and simulation.

All Brabender measuring extruders and Extrusiograph are supplied with CAN bus technology to be docked to these units.

Application area

Laboratory scale machinery can easily simulate production processes in real time.

What kind of advantages are provided by a laboratory measuring extruder?

The design of this instrument allows for small amounts of raw material samples. The mentioned research and sample preparation tasks do not require anymore to interrupt your production processes, which equates to direct savings to your bottom line.

The Brabender modular system allows a complete instrumentation of the extruders.

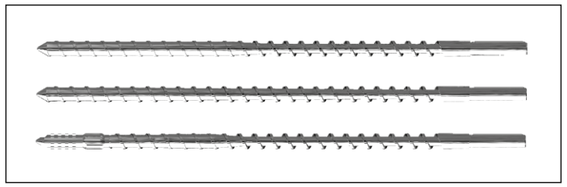
All of the measured values such as torque, melt and zone temperatures, melt pressure are recorded continuously and can be visualized in various graphs or sheets.

These mentioned parameters can support you to find the optimum processing conditions on your 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
- The temperature of the individual extruder zones is controlled and displayed by self-optimizing electronic temperature controllers
- Polished chrome plated screws – various special steel grades available as well
- Single and multistage screws with various compression ratios, zone lengths and mixing elements are available for testing a large range of materials
- Wide range of processing and measuring dies



Screw examples (top down): 4:1 metering screw, 4:1 core progressive screw, 4:1 dispersion screw with Maddock and mixing segment

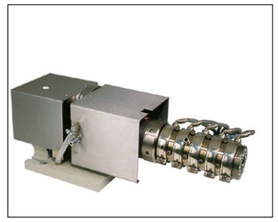
MetaStation 4E with measuring extruder 19/25 and ribbon die head

MetaStation 8E with measuring extruder 19/25 on docking station

Measuring extruders and Extrusiograph – Technical data

Measuring extruder / Extrusiograph 19/25, Application: Thermoplastics

Measuring extruder 19/10 DW Application: Elastomers



Pin barrel extruder 19/20 Application: Elastomers

Measuring extruder 30/25 Application: Thermoplastics

	Measuring Extruder 19/10 DW	Measuring Extruder 19/15	Measuring Extruder 19/20	Grooved Extruder 19/20	Measuring Extruder 19/25	Extrusiograph 19/25	Measuring Extrud-er/ Extrusiograph 19/32	Thermoset Extrusiograph 30/15	Measuring Extruder 30/25	Extrusiograph 30/25	Meas. Extruder/ Ex-trusiograph 30/32
Screw diameter D [mm]	19	19	19	19	19	19	19	30	30	30	30
Screw length [L : D]	10 D	15 D	20 D	20 D	25 D	25 D	32 D	15 D	25 D	25 D	32 D
Number of heating zones [H] and heat-ing/cooling zones [HK]	1 HK	1 H 1 HK	1 H 1 HK	2 HK	1 H 2 HK	1 H 2 HK	1 H 3 HK	3 HK	4 HK	4 HK	5 HK
Electric heating power per zone [W]	1500	250 1500	1500	liquid	1500	1500	1500	liquid	2100	2100	2100
Max. operating temperature [°C]	300	450	450	350(1)	450	450	450	350(1)	450	450	450
Max. torque [Nm]	150	150	150	150	150	150	150	400	400	400	400
Number of measuring points for:											
Control temperature	1	2	2	2	3	3	4	3	4	4	5
Melt temperature	1	1	1	1	1	3	1 / 4	1	1	4	1 / 5
Pressure	1	1	1	1	1	3	1 / 4	1	1	4	1 / 5
Output dep. on mate-rial and speed [kg/h]	0.5 - 5	0.5 - 5	0.5 - 5	0.5 - 5	0.5 - 8	0.5 - 8	0.5 - 8	0.5 - 10	0.5 - 15	0.5 - 15	0.5 - 15
Compatibility:											
MetaStation 4E	•	•	•	•	•	•	•				
MetaStation 8(E) / 16	•	•	•	•	•	•	•	•	•	•	•

1) depending on oil and thermostat

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
- Control and evaluation software for all current Windows® versions and for the new, web-based Brabender MetaBridge
- 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

Mini-Compounder B-TSE-A 12/36

Conical twin screw extruder

Single screw extruder 19

Further processing modules on request

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.

MetaStation 4E

Conical twin screw extruder

Internal Mixer 350

Measuring mixer 30/50

Single screw extruder 19

Planetary mixer P 600

Mini-Compounder B-TSE-A 12/36

Further processing modules on request

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.

Stand-alone extruders

The stand-alone extruders (“KE” series) offer cost-effective solutions in case the modularity at the drive unit is not essential. These machines have a fix built-in drive motor, they do not require a separate drive unit. Except for the direct torque measurement the instrumentation possibilities are the same as in case of the modular extruders. Most of the above listed (see page 3) extruder types are available in stand-alone design either.

Stand-alone extruder KE 19

Stand-alone extruder KE 19	
Screw diameter	19 mm
Screw lengths	10 - 15 - 20 - 25 - 32 D
Drive power	2.4 kW
Speed	0.2 - 150 min^{-1}
Max. screw torque	150 Nm
Max. operating temperature	450 °C
Max. throughput	approx. 5 kg/h

Stand-alone extruder KE 30

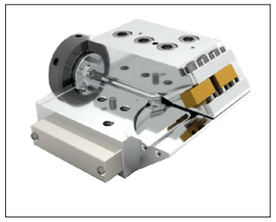
Stand-alone extruder KE 30	
Screw diameter	30 mm
Screw lengths	25 D, 32 D
Drive power	6.7 kW
Speed	0.2 - 150 min^{-1}
Max. screw torque	400 Nm
Max. operating temperature	450 °C
Max. throughput	approx. 15 kg/h

Die heads

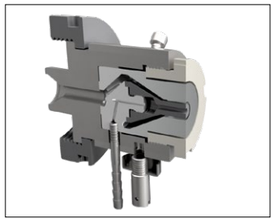
Brabender die heads are high-precision tools fitting all of the Brabender single and twin screw extruders. Mounting and interchanging them at the extruder barrel is quick and easy through a ring nut coupling.

The die heads are heated electrically and form a separate control zone triggered by the temperature control unit. They are made of corrosion-proof steel and can be disassembled for easy cleaning.

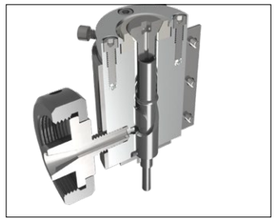
Upon request, special constructions are available, such as liquid heating/cooling, non-standard sizes or special materials. Co-extrusion dies are also available on request.



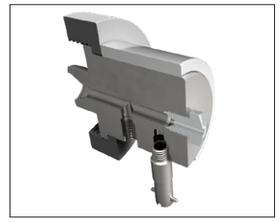
Ribbon die head, adjustable



Tubing die head



Film blowing die head with cooling ring



Round strand die head

Follow-up equipment

Brabender supplies several additional equipment for the measuring extruders:

Conveyor belt for taking off extruded profiles

Water bath for cooling the extruded strands

Pelletizer

Or complete your extrusion tasks with:

- Univex flat-film take off unit with cooled polished rolls
- Blown-film take off unit
- Winder for extruded strands or wires

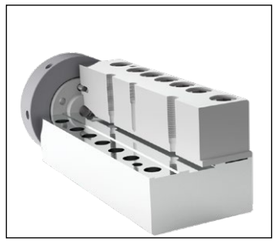
Univex with Extruder

Blown-film take off unit

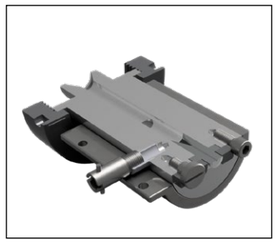
Winder

In-line measurement systems

The extruded specimens can be studied further according to various methods and parameters, such as tensile strength, ductility, color, gloss, weathering etc. Furthermore there are some specific tests, which can be performed directly by Brabender measuring extruders or in the die head.



Rheometric slot capillary die head

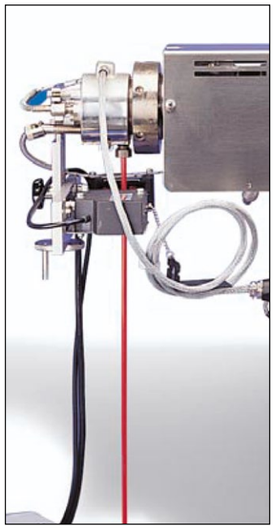


Rheometric round capillary die head

Obtain the flow curve and viscosity curve with the rheological dies. With the additional software module you can make the necessary correction calculations and have the visualized plots either.

Filtratest

With the Filtratest die head you can analyze the impurities of polymers in compliance with EN 13900 standard.



Swelltest

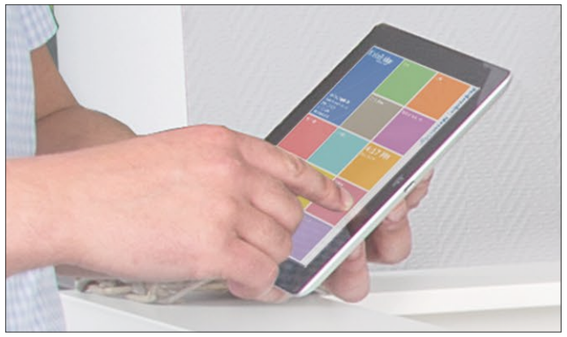
Die-swell measurement with a high-precision continuous non-contact optical system.

Film Quality Analyzer with Univex

Optical in-line analysis of the extruded films: the high-resolution camera detects the inhomogenities and impurities (e.g. black specks, gels, fisheyes, holes, arrows etc.) of transparent and pigmented films. With its dedicated software the optical and statistical evaluation is also possible.

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

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.

Brabender application laboratory

Measuring Extruders - Recommendations Concerning Technical Applications

Thermoplastics

Material	Products	Barrel length [D]	Screw compression	Barrel temperatures Zone 1	Zone 2	Zone 3	Zone 4	Die head	Remarks
Cellulose acetate (CA)	Ribbons, blown and flat films	25 - 32	CP 3:1 3Z 3:1	175	185	195	200	210	preheat 2 h at 80 °C
Polyacetals (POM)	Ribbons, tubes, rods	20 -32	CP 3:1 / 4:1	170	190	205	210	210	extrusion at low speeds
Polyamide PA 6 Polyamide PA 6.6	Ribbons, blown and flat films, monofilaments	25 - 32	3Z 3:1 / 4:1	230 250	240 260	250 270	255 275	260 280	preheat 3 h at 80 °C under vacuum, ring nut with heating
Polycarbonate (PC)	Ribbons, profiles	25 - 32	CP 2:1	290	280	270	260	240 - 250	preheat 3 h at 120 °C
Polyester linear	Monofilaments, films	25 - 32	3Z 4:1	250	260	270	275	280	preheat 3 - 4 h at 80 °C
Polyethylene (PE)	Ribbons, blown films, round strands, cables	20 - 32	3Z 3:1 / 4:1	190	200	210	220	220 - 230	
PE, grits (HDPE, UHMPE)	Ribbons, blown films, round strands	25 - 32	ZC 1:1	160 - 220	170 - 230	180 - 240	185 - 245	190 - 250	conical, grooved feed zone
Polymethylmethacrylate (PMMA)	Sheets, profiles	20 - 32	CP 2:1 / 3:1	170	180	190 - 200	210	220	preheat 5 h at 70 - 100 °C
Polypropylene (PP)	Ribbons, blown films, tubes, round strands	20 - 32	3Z 3:1 / 4:1	210	220	230	-	240	
Polystyrene (PS)	Ribbons, profiles, blown films	20 - 32	CP 2:1 / 3:1	170	180	190	200	210	
PS copolymers ABS	Round strands, blown and flat films, ribbons and tubes	20 - 32	CP 2:1 / 3:1	170 - 190	175 - 195	185 - 200	185 - 225	185 - 225	preheat 2 h at 80 °C
Polysulfone	Ribbons, blown and flat films	20 - 32	CP 2:1	250 - 280	270 - 300	290 - 320	290 - 330	290 - 330	preheat 4 h at approx. 140 °C
Polyurethane (PUR)	Ribbons, profiles	25 - 32	CP 3:1	140 - 220	160 - 220	180 - 220	190 - 220	190 - 220	preheat 2 h at 100 - 110 °C
Polyvinyl butyral (PVB)	Ribbons, profiles	25	3Z 3:1	100	120	130	140	140	
Polyvinyl chloride (PVC)									
• Rigid PVC pellets	Ribbons, profiles, blown films, tubes, round strands, cables	20 - 25	CP 2:1	150 - 160	155 - 165	160 - 170	–	170 - 190	above n = 45 min^{-1} air cooling for barrel required
• Rigid PVC powder		25	CP 2:1 / 3:1	160 - 170	165 - 175	170 - 180	175 - 185	180 - 190	
• Soft PVC pellets		20 - 25	CP 2:1 / 3:1	150 - 170	160 - 190	165 - 200	–	170 - 200	
• Soft PVC powder		20 - 25	CP 3:1	150 - 170	160 - 190	170 - 200	175 - 205	170 - 200	

Thermosets

Material	Products	Barrel length [D]	Screw compression	Barrel temperatures Zone 1	Zone 2	Zone 3	Zone 4	Die head	Remarks
Epoxy resins (EP)	Rods	15	ZC 1:1	80	80 - 90	110 - 130	-	110 - 130	possibly liquid heating/cooling of barrel and die head
Urea resin (UF)	Rods	15	ZC 1:1	80	80 - 90	110 - 130	-	110 - 130	possibly liquid heating/cooling of barrel and die head
Melamines (MF)	Rods	15	ZC 1:1	80	90	110	-	130	possibly liquid heating/cooling of barrel and die head
Phenolics (PF)	Rods	15	ZC 1:1	80	90	100	-	110	possibly liquid heating/cooling of barrel and die head
Polyester (UP)	Rods	15	ZC 1:1	70	80	90	-	100	possibly liquid heating/cooling of barrel and die head

Elastomers

Material	Products	Barrel length [D]	Screw compression	Barrel temperatures Zone 1	Zone 2	Zone 3	Zone 4	Die head	Remarks
Natural rubber compounds, ribbons of rolled sheets, pellets, NBR	Round and Garvey profiles	10	ZC 1:1	80	-	-	-	100	feed roll for ribbons, feed hopper for pellets
Synthetic rubber, compounds, ribbons of rolled sheets, pellets	Round and Garvey profiles, ribbon profiles	20	ZC 1:1 CP 2:1	60 - 80	70 - 90	-	-	100 - 110	feed roll for ribbons, feed hopper for pellets, for flat profiles die up to 50 x 0.5 mm, scew CP 1:3

Other materials

Material	Products	Barrel length [D]	Screw compression	Barrel temperatures Zone 1	Zone 2	Zone 3	Zone 4	Die head	Remarks
Electrodes	Round and flat profiles	20	ZC 1:1	70	75	75	-	80	vertical feed screw, air cooling of barrel required, for flat profiles die up to 50 x 0.5 mm
Ceramics	Round and flat profiles, tubes	20	ZC 1:1	40 - 60	50 - 70	60 - 80	-	80 - 100	screw and barrel made of special materials
Powder coatings	Ribbon and round profiles	25	CP 2:1 ZC 1:1	70	80	90	100	100 - 120	frequently special screws with mixing section required, air cooling required

CP = core progressive screw
ZC = zero compression
3Z = 3-zone metering screw
- 25 D total length: 10 D + 3 D + 12 D
- 20 D total length: 10 D + 3 D + 7 D

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