EXAKT Three Roll Mills
Quality for Every Application
High Quality Dispersing, Reproducibility and Finest Results
Welcome to EXAKT!

Small details have a large impact on making EXAKT products better than the rest. The very finest cutting, grinding and milling is what we’re all about. Our innovative equipment keeps us well ahead of the competition. However, equipment alone is not responsible for the years of success EXAKT has enjoyed. Our corporate culture places high value on the fact that our products are highly reliable, extraordinarily efficient and, of course, cutting-edge innovative. Our customers have come to expect nothing but the best from EXAKT. We have established a tradition of excellence and we uphold that tradition each day.

Passion and Technology

are both compatible with our company philosophy. First, we listen to our customers’ requirements and understand their needs. Then we dedicate ourselves to providing highly reliable technology and professional advice that is custom-tailored to their situation.

Tradition and Innovation

go hand in hand at EXAKT. In more than 50 years of business we have remained dedicated to our cornerstone principles of quality and reliability of product. Firmly rooted in tradition, we consistently look to the future, constantly developing new and innovative products and exploring business opportunities throughout the international community.

Made in Germany and International Business

are two sides of the same coin to us. “Made in Germany” embodies the meticulous attention to detail and pride in workmanship of the skilled workers in our home plant in Norderstedt. On the International Business side of the coin, we constantly strive to maintain and expand the preeminent position of those “Made in Germany” products on the world market.

Precision and Durability

are two key production principles. Uncompromised precision down to micrometer range is critical to the durability of our equipment. Our commitment to top quality material and stringent production standards is unrivaled.

Research and Customer Focus

come together in everything we do. Intensive R&D in cooperation with partners such as universities keep us in the forefront of product development, ahead of the curve on new market demands. Our focus remains on our customers and delivering the highest quality materials and products.
The pasty substance is fed into the hopper, where it is drawn between the feed and center rollers. When pre-dispersed, the substance sticks to the bottom of the center roller, which transports it into the second gap. In this gap, the paste is dispersed to the desired degree of fineness. The scraper system removes the finished product from the apron roller.

Finest Quality – Worldwide

Today, three roll mills made by EXAKT are in operation in more than 80 countries around the world. This success is based, in large part, on the quality and versatility of our equipment. We offer tailor-made solutions – for factories, laboratories or pharmacies – that achieve optimum results for a wide range of applications such as homogenizing, dispersing, pulverizing and de-aerating pasty substances.

We have a network of over 80 specialized dealers throughout the world, which means the EXAKT experience and know-how are always available nearby. Our close proximity to our customers results in a relationship and a dialog that helps us better recognize their individual needs. That translates into a better understanding of how we can constantly improve and refine our products.

Since uncompromized quality is indispensable for a leading precision technology company, EXAKT three roll mills are made exclusively of the finest materials and are manufactured according to strict standards. Ease of cleaning, maintenance, operation, and parts replacement are engineered into all of the EXAKT precision equipment.

Comparison of Processing Techniques

1. Substance processing with conventional mixing techniques
   → Crystalline substances are still clearly visible.

2. Substance processing with an EXAKT three roll mill
   → Smooth and even consistency of the substance.
The Advantages of Three Roll Mills

The main benefits of our three roll mills include:

**Narrow particle distribution**
In a three roll mill, particle sizes are reduced and agglomerates are dispersed by the combined crushing force of the rollers and the extremely high shearing force resulting from different roller speeds. Since the entire product is fed into the gap between the rollers, the result is a precise, controllable and narrow particle size distribution. By setting the gap width, particle size can be controlled easily and accurately, down to the micron level. With other types of systems, this is much more difficult. For instance, bead mills and dissolvers produce significantly wider particle distributions with higher percentages of very fine as well as coarse particles, since some particles are subjected to high and repeated dispersive forces, while other particles are less dispersed.

**Outstanding temperature control**
Three roll mills provide outstanding control of product temperature, since the product is processed as a thin film on the roller. As a result, the product can be heated or cooled to the desired temperature.

**Preventing contamination**
Product contamination from metal abrasion can be avoided by selecting the proper material for rollers and scraper knives. These range from chrome-plated, hardened steel to aluminum oxide, zirconium oxide and silicon carbide.

**Small and large batches**
Three roll mills are ideally suited to processing both small and large quantities.

**Intuitive process control**
Unlike bead mills and dissolvers, only a few parameters affect the quality of the product. This results in faster success and increases product reproducibility.

**Additional benefits:**
- Low material loss
- Easy to clean

**Your cost benefit**
Convenient accessories, low operating costs, minimal loss of material and high quality results are the deciding factors that add up to significant savings.

**Ideal for a variety of products**
Three roll mills can be used to process a wide range of products with diverse rheology – from low viscosity materials of 200 cPoise to thick pastes of more than 1,000,000 cPoise.
Three roll mills enable a medium or high viscosity product to be dispersed with minimal liquid. Since liquid materials do not have to be dispersed, they can be added later.
Three roll mills have already been implemented successfully in nano technology (e.g., the lotus effect). One relatively new application is processing carbon nanotubes. Carbon nanotubes are nanoscale tubes that are harder than steel. They conduct electricity and improve the mechanical properties of polymers, which makes them especially particularly useful in nano-composite materials (e.g., epoxy resin filled with carbon nanotubes). For these properties to be effective, the agglomerates which they tend to form must be dispersed evenly in the polymer. Our three roll mills can achieve this demanding task effectively.

**High shearing forces**
The high surface area of carbon nanotubes makes it difficult to disperse them in epoxy resins. The powerful shear force of the three roll mill is ideal for the dispersion of the agglomerated carbon nanotubes. The carbon nanotubes remain undamaged and the requisite high aspect ratio (length to diameter) is retained. The surface area of the carbon nanotubes wet by epoxy resin continues to grow. As a result, the viscosity rises steadily from 10 cPoise to as much as 100,000 cPoise.

**Continuous dispersion**
The special ability of the three roll mill to spread products across a wide range of viscosities is especially important with carbon nanotubes. Dispersion increases steadily throughout the process, alongside viscosity, which results in continuous improvement of product quality.

**Processing very small quantities**
At the beginning of an R&D phase, several attempts are necessary to determine the correct composition of the end product. The three roll mill reduces development costs, especially with expensive raw materials like carbon nanotubes, since it also allows processing of very small quantities – with minimal loss of material.

Experience with epoxy resin and carbon nanotubes can be applied to many materials with nanoparticles as fillers.
EXAKT three roll mills are used in various areas of industry and research. Applications range from the food industry to nano technology. No matter which paste must be processed, EXAKT three roll mills can break up both agglomerates and powder nests and reduce particle sizes to reach optimum product quality.

The following are just some of the industries utilizing EXAKT three roll mills:

**Colors**
- printing inks
- ceramic colors
- offset inks
- silk screen printing inks
- glass colors
- thermoplastic inks
- surface coatings
- artists’ paint
- pastes for coloring of plastics and synthetics ...

**Electronics**
- pastes for coating of monitors and screens
- pastes containing noble-metal
- resistor pastes
- soldering pastes
- flux pastes
- thick-film technology
- luminescent pastes ...

**Cosmetics**
Components for:
- lipsticks
- lip liners
- eye liners
- make-up
- sunscreens ...
Food
• high-quality chocolate
• nougat
• marzipan
• aromatic compounds ...

Dental surgery
• fillings
• impression pastes ...

Ceramic substances
• pastes for ceramic injection molding ...

Nano technology
• pastes for surface coating
• pigments
• piezo actuators
• fuel cells ...

Adhesives
• manufacturing and refinement of adhesive compounds ...

Chemical and pharmaceutical products
• high performance lubricants
• gels
• ointments
• creams ...

Special applications
• soap pastes
• color pastes for restoration ...
EXAKT 80 E, EXAKT 120 E and EXAKT 120 E-450

EXAKT electronic models bring impressive new levels of operation and flexibility to a benchtop mill. The highly sophisticated control features normally found only on larger production mills can now be used in product development, pilot plant projects and small production runs. The remarkable new EXAKT E models offer exceptional operational flexibility as well as outstanding reliability and repeatability. And EXAKT E models are uniquely operator-friendly.

Graphic display of all operating parameters ensures optimal transfer of production-specific processing specifications from development to production.

The E model offers you a benchtop mill with superior levels of control, reproducibility and automation combined with the high levels of dispersion precision for which all EXAKT three roll mills are famous.
**Dual Mode for gap and pressure control**

- The EXAKT E models allow you to control the gap between the rollers (and thus the dispersion qualities) in two modes:
  - Gap mode: quantitative setting to a specific gap value (in microns)
  - Force mode: quantitative setting to a specific line pressure in the gap (in newtons/mm)
- The gaps are continuously monitored and adjusted by the control system to maintain the preset value
- The gaps can be independently set to simultaneously operate in either mode with independent monitoring and control in the mode selected
- The operator can change the mode of gap control during operation

**Automatic roller alignment for repeatable performance**

The unique calibration system adjusts the rollers after startup and, for example, after heating the rollers. This controls the gap size and keeps the rollers parallel, ensuring optimal reproducibility. Force sensors on the outer edges of the roller axes, coupled with finely calibrated motors, ensure that roller alignment remains constant.

**Programmability and Scale-up**

- Operational parameters can be stored in 99 discreet programs including sub-programs for products requiring multi-process runs
- The current operating parameters can be modified and stored during the run, and can be locked during production
- Configurable parameters include gap size, roller pressure and speed
- After adjustment, the EXAKT E models automatically default to the last operating parameters
- The control system provides real-time operational displays in both operating modes that translate to larger volume production conditions (scale-up)
  - In gap mode setting, the user-defined gap setting and the actual force value are displayed
  - In force mode the user-defined force value and both the actual (corresponding) gap and force values are displayed
- A datalog for recording process parameters is available as an option
EXAKT 80 E

Features
• maximum product fineness up to < 1µm, depending on the product
• output between 0.02 and 20 l per hour
• space-saving desktop models

Equipment components
• universal scraper system with:
  – variable apron outlet width
  – spring-loaded scraper socket, with no adjustment required during operation
  – adjustable scraper tensioning, with scale
  – PFA coating (option) to improve product flow and facilitate cleaning
• speed control by frequency converter to adjust the production speed to the product viscosity
• all rollers can be cooled or heated
• solvent dispenser
• stainless steel hopper
• splashguard for easy cleaning
• dust cover

EXAKT 120 E / 120 E-450

Features
• maximum product fineness up to < 1µm, depending on the product
• output between 0.5 and 60 l per hour
• space-saving desktop models

Equipment components
To more than meet the high requirements of production, the systems, which are based on standard models of the same size such as EXAKT 120 S, are manufactured with an extremely stable mechanical design. The highly torsion-resistant frame and rolls of the 120 E, in addition to electronic control, support the reproducibility of its results.

Front and back access makes the system easy to operate.

The EXAKT 120 E Series has the identical equipment features as the EXAKT 80 E Series. The one difference is an improved universal scraper system:

Improved scraper system
All EXAKT 120 E models are equipped with a multifunctional scraper system. In addition to the well known functions of the 80 E, it also performs the following functions:
  – self aligning scraper knife
  – damped scraper knife movement
  – adjustable scraper angle
  – exchangable scraper blade, no tools needed
Control panel
All EXAKT 120 E models allow for installation of the control panel on either the front or back of the system. Together with an equipment stand, this combination provides efficient infeed and convenient operation from both sides of the system.

120 E closed circuit cooling
120 E models can (upon request) be equipped with a rotary inlet for pressurized heating and cooling instead of the standard unpressurized option. The result can be a heating and cooling capacity of up to one third higher.
Equipment stand

Designed specifically for the EXAKT 120 E Series, we offer a convenient equipment stand that provides a user-friendly, ergonomic working height.

The stand is on wheels, which allows users to feed material from the front or back.

To keep the workspace tidy, storage surfaces are integrated for accessories and tools.
Safety features
Incorporated into EXAKT E models are unique safety features:

- cleaning mode: mill defaults to an intermediate gap spacing and minimum torque
- reverse mode: once stopped by either the emergency stop system or during normal operation, the direction of the rollers can be reversed. Once activated, movement in the reverse direction is controlled in steps until the foreign object can be removed from between the rollers
- electrical overload protection
- emergency stop function: in the event of an emergency stop, the rollers are automatically opened to the widest possible gap (both sides for 120 E-450)
- additional switches in antenna form, in the area behind the roller gap (for operation without a hopper), optional
- drip tray with integrated hand guard and security switch, removable for easy cleaning
- hopper with hand guard
- nip guard, optional
- lockable scraper socket
- electronic brake
- CE mark

Materials
The choice of roller components as well as the proper scraper knife is essential to achieving optimal results. For this reason, we offer a wide range of materials and surface finishes.

- chemically neutral rollers made of various sorts of ceramics (silicon carbide, aluminum oxide and zirconium oxide)
- special easy-to-clean surface with zirconium oxide rollers and polished aluminum oxide rollers (Superfinish)
- non-corrosive steel rollers, chrome-plated
- scraper knife made of a variety of materials (steel, plastics, aluminum and zirconium oxide)
High Performance Models
Floor Units for Ultra Fine Processing of Viscous and Elastic Products

EXAKT 120 H/HF and EXAKT 120 H/HF - 450

Features
- product particle fineness from 1 to 20 µm, depending on the product (submicron for special applications)
- output from 0.05 to 100 liters per hour
- high-efficiency floor models

Equipment components
- two frequency inverters for variable speed control (standard)
- variable friction (two drive units provide independent variable speed ratio control between center and front roller) for processing highly viscous or elastic products:
  ➔ reduces multiple processing runs
  ➔ increases product throughput
- continuously adjustable roller gap with one-point gap adjustment
- EXAKT pretensioning system for constant roller spacing guarantees uniform particle size
- universal scraper system with:
  ➔ variable apron outlet width
  ➔ spring-loaded scraper socket for optimum efficiency (no readjustment required)
- heating and cooling capability for all rollers (standard)
- stainless steel hopper
- splashguard for easier cleaning
- dust cover

Safety
- stainless steel hopper with hand guard
- secured scraper socket
- emergency-stop pushbutton
- knee safety switch
- electronic brake
- CE certified
- option: explosion protection

Materials
- chemically inert rollers made of ceramics (aluminum or zirconium oxide)
- special easy-to-clean surface available on zirconium oxide rollers or polished aluminum oxide rollers (Superfinish)
- non-corrosive steel rollers, hard chrome plated
- scraper knife made of a variety of materials (steel, plastics, aluminum and zirconium oxide)
Superfine Models
Precision Desktop Units for More Demanding Products

EXAKT 80 S, EXAKT 120 S and EXAKT 120 S-450

Features
• product particle fineness from 1 to 20 µm, depending on the product (submicron for special applications)
• output quantities from 0.02 to 60 liters per hour
• space-saving desktop models

Equipment components
• EXAKT pretensioning system for constant roller spacing guarantees uniform particle size
• 80 S: two-speed motor
• 120 S: single- or two-speed motor
• 80 S and 120 S (option): frequency inverter for variable speed control for adjusting production speed to product viscosity
• continuously adjustable roller gap with one-point gap adjustment
• universal scraper system with:
  – variable apron outlet
  – spring-loaded scraper socket for optimum efficiency (no readjustment required)
  – adjustable scraper tensioning (80 S only)

• option: heating and cooling capability for all rollers and all roller materials (80 S standard)
• stainless steel hopper
• splashguard for easy cleaning
• dust cover

Safety
• stainless steel hopper with hand guard
• drip tray with integrated hand guard and security switch, removable for easy cleaning (80 S only)
• secured scraper socket
• emergency-stop pushbutton
• electronic brake
• CE certified
• option: explosion protection

Materials
• chemically inert rollers made of ceramics (aluminum or zirconium oxide)
• special, easy-to-clean surface available on zirconium oxide rollers and polished aluminum oxide rollers (Superfinish)
• non-corrosive steel rollers, hard chrome plated
• scraper knife made of a variety of materials (steel, plastics, aluminum and zirconium oxide)
Basic Models
Compact Desktop Units for High Quality Results

EXAKT 50 and EXAKT 80

Features
• product particle fineness up to 20 µm, depending on the product
• output quantities from 0.02 to 45 liters per hour
• space-saving desktop models

Equipment components
• EXAKT 50: single-speed motor (optional speed control system)
• EXAKT 80: two-speed motor
• continuously adjustable roller gap with one-point gap adjustment
• universal scraper system with:
  – variable apron outlet width
  – spring-loaded scraper socket for optimum efficiency (no readjustment required)
  (EXAKT 50 option)

• option: heating and cooling capability for rollers (available for steel rollers for EXAKT 80)
• stainless steel hopper
• splashguard for easier cleaning
• dust cover

Safety
• stainless steel hopper with hand guard for EXAKT 80
• drip tray with integrated hand guard and security switch, removable for easy cleaning (EXAKT 80)
• lockable scraper socket for EXAKT 80
• emergency-stop pushbutton for EXAKT 80
• electronic brake for EXAKT 80
• CE certified
• option: explosion protection for EXAKT 80

Materials
• chemically inert rollers made of aluminum oxide
• non-corrosive steel rollers, hard chrome plated
• scraper knife made of steel and plastics (ceramic scraper knife available for EXAKT 50 equipped with a universal scraper)
1 Heating Device
The EXAKT heating device, which heats and circulates the tempered liquid, can be used for open-loop temperature control of the rollers as an alternative to tap water. (Note: Only to be used with rollers equipped for cooling and heating.)

2 Cooling and Heating Device
Some substances are optimally processed under certain temperature conditions. The Basic, S, and H models of EXAKT three roll mills (except EXAKT 50) can be equipped with a cooling and heating unit. With this device, the rollers can be cooled or heated electronically to between -5°C and +60°C. (Note: Only to be used with rollers equipped for cooling and heating.)

3 Solvent Dispenser
Processing certain products can lead to higher frictional heat. This heat can dry the product, especially on the sides of the rollers and in the area of the flow guides. The dispenser adds specified amounts of solvent during operation to prevent the product from drying. This promotes higher quality product.

4 Automatic Dispensing Unit
Especially for the EXAKT 120 H/HF, fluid products can be automatically dispensed. An external feed system, controlled by a height-adjustable sensor dispenses the product into the mill resulting in fully automatic operation. The feed mechanism only operates when the machine is in operation to prevent product overflow. EXAKT can help you select the external feed system for your three roll mill.

Technical Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature constancy</td>
<td>+/- 2 K</td>
</tr>
<tr>
<td>Pump pressure</td>
<td>max. 300 mbar</td>
</tr>
<tr>
<td>Circulation open immersion bath</td>
<td>17 l/min</td>
</tr>
<tr>
<td>Max. output at a circulation</td>
<td>12.5 l/min</td>
</tr>
<tr>
<td>via hoses of 12 mm Ø</td>
<td></td>
</tr>
<tr>
<td>Dimensions (WxDxH)</td>
<td>195 mm x 355 mm x 570 mm</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1300-2300 VA depending on the mains voltage</td>
</tr>
<tr>
<td>Power supply</td>
<td>via separate power plug</td>
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</table>
## Technical Specifications

<table>
<thead>
<tr>
<th></th>
<th>Electronic Models</th>
<th>High Perf Mod</th>
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<tbody>
<tr>
<td></td>
<td>- Desktop Units -</td>
<td>- Floor M</td>
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<tr>
<td></td>
<td>80 E</td>
<td>120 E</td>
</tr>
<tr>
<td>Throughput liters/hour min. - max.*</td>
<td>0.02 – 20</td>
<td>0.5 – 30</td>
</tr>
<tr>
<td>Roller diameter mm</td>
<td>80</td>
<td>120</td>
</tr>
<tr>
<td>Roller length mm</td>
<td>200</td>
<td>250</td>
</tr>
<tr>
<td>Roller material</td>
<td>chrome-plated hardened steel, aluminum oxide, polished aluminum oxide (Super-finish), zirconium oxide, silicon carbide</td>
<td>chrome-plated hardened steel, aluminum oxide, polished aluminum oxide (Super-finish), zirconium oxide, silicon carbide</td>
</tr>
<tr>
<td>Universal scraper system (optional PFA coating)</td>
<td>standard</td>
<td>standard</td>
</tr>
<tr>
<td>Scraper knife material</td>
<td>steel, plastics, aluminum oxide, zirconium oxide</td>
<td>steel, plastics, aluminum oxide, zirconium oxide</td>
</tr>
<tr>
<td>Required power: 1 speed moter kW</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Required power: 2 speed moter kW</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Frequency converter Speed control** motor output kW</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>Rollers which can be cooled and heated up to 60°C</td>
<td>standard</td>
<td>standard</td>
</tr>
<tr>
<td>Solvent dispenser</td>
<td>standard</td>
<td>standard</td>
</tr>
<tr>
<td>Explosion protection</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Dimensions mm (width x depth x height, with scraper system and hopper)</td>
<td>720 x 550 x 550</td>
<td>820 x 650 x 740</td>
</tr>
<tr>
<td>Weight kg</td>
<td>ca. 70</td>
<td>ca. 250</td>
</tr>
<tr>
<td>Power supply***</td>
<td>3 x 400 V/50 Hz</td>
<td>3 x 400 V/50 Hz</td>
</tr>
</tbody>
</table>

*average, depending on the product; **to process highly viscous products; ***special voltages available.
<table>
<thead>
<tr>
<th></th>
<th>Superfine Models</th>
<th>Basic Models</th>
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<tbody>
<tr>
<td></td>
<td>80 S</td>
<td>120 S</td>
</tr>
<tr>
<td>1 – 100</td>
<td>0.02 – 20</td>
<td>0.05 – 30</td>
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<tr>
<td>120</td>
<td>80</td>
<td>120</td>
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<tr>
<td>450</td>
<td>200</td>
<td>250</td>
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<tr>
<td>9 – ∞ : 3 : 1</td>
<td>9 : 3 : 1</td>
<td>9 : 3 : 1</td>
</tr>
<tr>
<td>chrome-plated hardened steel, aluminum oxide, polished aluminum oxide (Super-finish), zirconium oxide, silicon carbide</td>
<td>chrome-plated hardened steel, aluminum oxide, polished aluminum oxide (Super-finish), zirconium oxide</td>
<td>chrome-plated hardened steel, aluminum oxide, polished aluminum oxide (Super-finish), zirconium oxide</td>
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<tr>
<td>standard</td>
<td>standard</td>
<td>standard</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>1.5</td>
</tr>
<tr>
<td>–</td>
<td>0.3/0.45</td>
<td>0.55/1.1</td>
</tr>
<tr>
<td>2 x 2 2</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>standard</td>
<td>standard</td>
<td>optional</td>
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<td>optional</td>
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<td>optional</td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td>1200 x 850 x 1250</td>
<td>610 x 550 x 550</td>
<td>800 x 600 x 660</td>
</tr>
<tr>
<td>ca. 370</td>
<td>ca. 70</td>
<td>ca. 130</td>
</tr>
<tr>
<td>3 x 400 V/50 Hz</td>
<td>3 x 400 V/50 Hz</td>
<td>3 x 400 V/50 Hz with electronic speed control</td>
</tr>
</tbody>
</table>

Subject to technical alterations.
EXAKT
For more than fifty years our company name has been synonymous with experience and unsurpassed quality as well as professional and reliable service.

EXAKT Three Roll Mills
- “Made in Germany” signifies durability and quality
- Perfect for processing a wide range of basic materials
- Dispersing and homogenizing capacity to meet any need
- Finest particle grinding available
- Consistently reliable de-aeration of processed substances