ALPINE PICOLINE

Flexible platform, powerful software & new possibilities

HOSOKAWA MICRON

HOSOKAWA ALPINE

Process technologies for tomorrow.

THE FIRST CHOICE FOR POWDER LABS

The latest version of Picoline boasts a wide range of exciting features and updates. A must-have for your fast to market development process (short time-to-market). The system plays the main role in processing the smallest product quantities in the gramme range. See the new Alpine Picoline for yourself.

› *EFFECTIVE SCALE-UP*

Developed for scale-up from laboratory to production: The Picoline can be used to develop processes with very small product quantities that can later be implemented on an industrial scale.

› *VERSATILE ACCESSORIES*

Expand your Picoline to suit your application: We provide you with various modules for the grinding and mixing process, which can also be used on an industrial scale. Which accessories you choose depends on the respective application.

› *STAND-ALONE VARIANTS*

Some modules are also available as cost-effective stand-alone versions.

picoline

› *INTELLIGENT SOFTWARE*

The system is controlled via a touch panel built into the platform: on separate pages, the software visualises operating data, setting values and trend curves.

› *DIVERSE FUNCTION MODULES*

A laboratory system customised to your requirements: Choose the right one for you from 10 different function modules. The system can be easily and gradually supplemented with further modules.

› *ERGONOMIC PLATFORM*

The Picoline II consists of an ergonomic two-part platform. By separating the control and work unit, you can position both parts independently of each other and operate the module rack in a safe working area.

THE RIGHT PROCEDURE FROM THE START ...

With the development of the Picoline, machines of a very small size for batches of 5 – 500 g are now also available on the market. The series includes various function modules for fine grinding, classifying or mixing powders.

Each module corresponds to a machine that can also realise this process on an industrial scale (see table).

Module name	*Machine type*	*Size*	*Fineness*
Piconizer	Spiral jet mill (AS)	33 AS	d_{90} < 20 µm
Picojet	Fluidised bed opposed jet mill (AFG)	40 AFG	d_{97} < 5 µm
Picosplit	Air classifier (ATP)	20 ATP	d_{97} < 5 µm
Picozirk	Classifier mill (ZPS)	20 ZPS	d_{97} < 20 µm
Picoplex	Fine impact mill (UPZ with pin discs)	40 UPZ	d_{90} ca. 80 µm
Picoplex	Fine impact mill (UPZ with plate beater unit)	40 UPZ	d_{90} ca. 120 µm
Picocross	High-speed fine impact mill C/CW	40 C	d_{90} ca. 50 µm
Picocrush	Hammer mill (HA)	4/2	d_{90} < 0,5 – 1 mm
Picobond	Coating (Nobilta)	NOB-80	–
Picobond	Coating (AMS)	AMS-80	–
Picomix	Mixer (Cyclomix)	CLX 0.1	–

… IN ORDER TO THEN MAKE IT BIG

The course for later production processes is already set during research and product development. Development laboratories need process technologies for their work that are also available for later production. It is crucial that appropriate equipment is available in the development laboratory at an early stage of development. This avoids costly mistakes that lead to process targets which are later not possible to fix or realise on a production scale.

PICOLINE

Feasibility study

- Material development
- Process development

PILOT PLANT

Process and throughput optimisation, production of small quantities

- Small batch production
- Process optimisation
- Throughput determination

PRODUCTION SYSTEM

Based on a medium scale-up

- Mass production
- Industrial process
- High throughput

FLEXIBLE PLATFORM

The Picoline consists of two parts: The compact function module can be operated in a safe or inert environment for critical products, while the control module can be located up to 10 metres away in the laboratory. The functional modules that are free of dead space and the work surface are quick and easy to clean wet and dry. The control module houses all the controllers required for operation, the mains connection and the control panel.

WITH POWERFUL SOFTWARE

The system is controlled via a touch panel with integrated micro-processor built into the platform. The installed function module is selected by the operator and the matching controls are automatically activated. Operating data, setting values, system flow charts and trend curves can be visualised on various display levels. The control module has a LAN interface to connect to printers or storage systems in the network. Data can be exported easily from CSV files to a USB stick.

A LABORATORY SYSTEM TO MEET YOUR NEEDS AND WANTS

EQUIPMENT DETAILS

- Touch panel for operation
- Microprocessor, CAN bus, power supply unit
- Power switch, connection cable, 3 USB ports
- 2 appliance sockets
- Rotatable adapter with media feed for attaching the respective machine to the platform

SPECIFICATION

Dimensions (without function module and accessories):

- W 893 mm x D 616 mm x H 488 mm
- Total weight depending on equipment: approx. 100 kg

CONTAINMENT

We also provide the Picoline integrated in an isolator for optimum protection of the system operators from the processed product. This means that all processes can be operated in a protective atmosphere (< 1 % O2) and OEL values of up to 50 ng/m³ can be achieved.

PICOSPLIT **ULTRA-FINE CLASSIFIER**

Spatter-grain-free results in the entire separation area

Characteristics

- Classifying wheel and motor bearing gas flushed
- High precision of particle size cut
- Compressed air or inert gas operation

Optional designs

- Ceramic design
- Batch and continuous operation

Technical data

Separation size range	2 – 120 µm
Classifying wheel	20 mm
Classifier speed	max. 60.000 rpm
Total air volume	max. 20 Nm^3/h

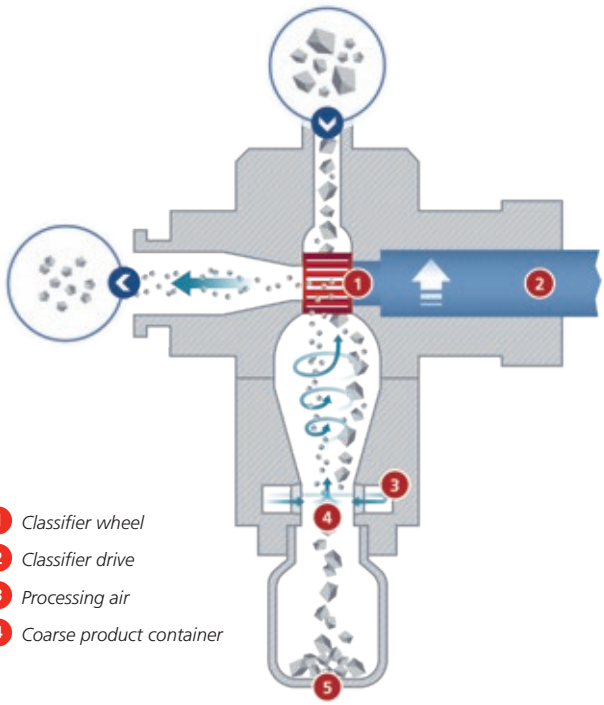
Task to solve

- Separation of different particle sizes from one feed material

How it works

Classification takes place according to the centrifugal counterflow principle in a rapidly rotating classifying wheel. The powder is dosed into the classifying chamber and transported to the classifier wheel by the air flow. Fine particles pass through the wheel, are discharged with the air and separated in a filter. Coarse particles are rejected by the classifying wheel and collected in a collection container.

The separating air is fed into the lower part of the housing via a blade ring; this disperses the rejected coarse product and increases the separating efficiency of the classifier. The separating cut is adjusted by varying the gas volume and the classifier speed.



1. *Classifier wheel*
2. *Classifier drive*
3. *Processing air*
4. *Coarse product container*

PICOZIRK **CLASSIFIER MILL**

Sharp and easily adjustable cut point

Characteristics

- Steep particle distribution
- Cool and gentle grinding
- Compressed air or inert gas operation
- Continuous operation

Optional designs

- Ceramic design

Technical data

Separation size range	15 – 120 µm
Grinding to Mohs hardness	3,5
Classifying wheel diameter	20 mm
Grinding disc diameter	40 mm
Classifier speed	max. 60.000 rpm
Total air volume	max. 20 Nm^3/h

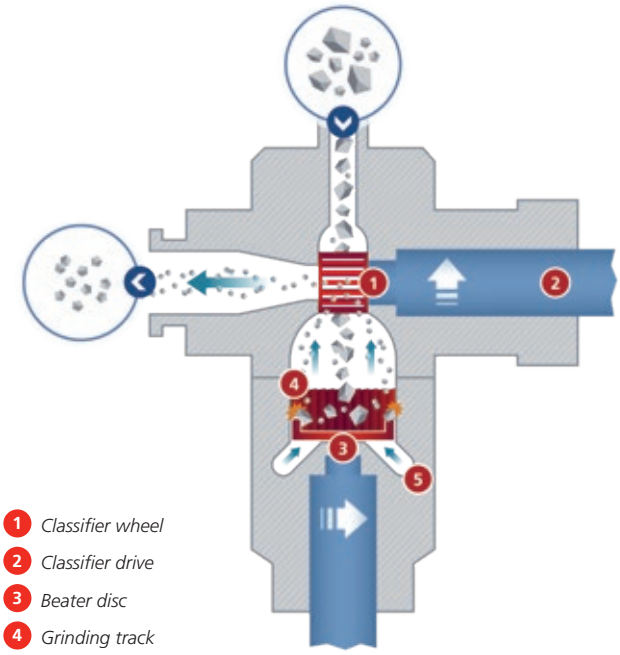
Task to solve

- Finest crushing of a product with limitation of the top grain
- Mechanical crushing with high energy efficiency

How it works

The Picozirk is a mechanical impact mill with integrated classifier for dry fine grinding of soft to medium-hard materials with a steep particle size distribution. Grinding is carried out by a high speed rotating disc with grinding tools. The ground material is dosed into the grinding container and accelerated by the grinding rotor. Crushing is achieved by particle impact on the grinding tools of the rotor and by impact on the grinding track. The grinding air flows from below through the grinding gap between the rotor and the grinding track and then through the classifier wheel located in the head of the mill. Due to the classifying effect of the classifying wheel, fine particles can escape from the grinder with the air and are separated in a cyclone-filter combination or in a filter.

Coarser particles fall back onto the rotor and are crushed further until they have reached the desired fineness. The classifier mill is adjusted via the speeds of the grinding rotor and the classifier wheel as well as via the gas volume.



1 *Classifier wheel*
2 *Classifier drive*
3 *Beater disc*
4 *Grinding track*
5 *Processing air*

JET MILL PICOJET

Contamination-free comminution

Characteristics

- Ultra-fine grinding of extremely hard materials
- Steep particle distribution
- Sharply defined upper particle size limitation
- Cool and gentle grinding
- Compressed air or inert gas operation
- Batch and continuous operation

Optional designs

- Ceramic design

Technical data

Separation size range	2 – 120 µm
Grinding up to Mohs hardness	10
Classifying wheel diameter	20 mm
Grinding chamber diameter	40 mm
Classifier speed	max. 60.000 rpm
Total air volume	max. 20 Nm³/h

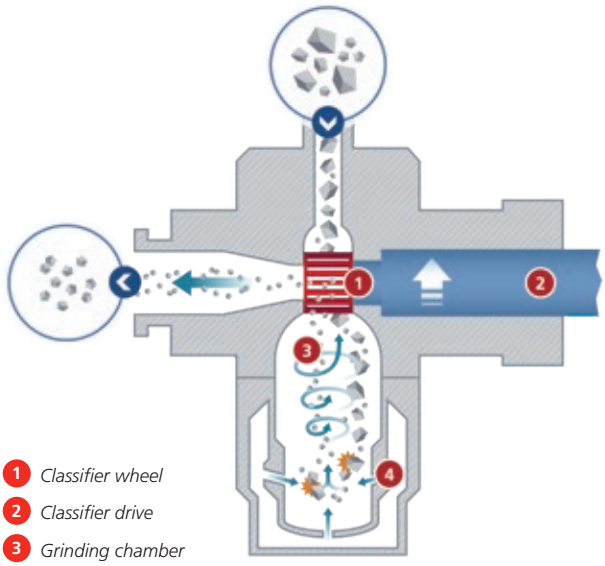
Task to solve

- Finest grinding of a product with limitation of the top grain
- Contamination-free jet milling for products with Mohs hardness up to 10

How it works

The Picojet is a fluidised bed opposed jet mill with integrated classifier for contamination-free dry ultrafine grinding of medium-hard to hard materials. The design and mode of operation largely correspond to the Alpine AFG series. The grinding energy is introduced by highly accelerated air jets via several grinding nozzles. The coarse material is dosed into the grinding container and fluidised by the air jets. Size reduction is achieved by particle impact at the centre of the mill and by shear flows at the edges of the air jets. The grinding air then flows through a classifying wheel located in the head of the mill, where classification takes place.

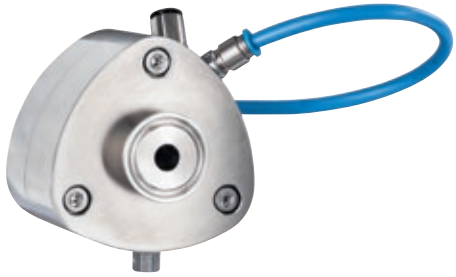
Fine particles leave the mill chamber with the air flow through the classifier wheel, get separated with the air and are then separated in a cyclone-filter combination or a filter. Coarser particles fall back into the fluidised bed and are crushed further until they have reached the desired fineness. The fineness is set via the air volume, the grinding air pressure and the classifier wheel speed.



1 *Classifier wheel*
2 *Classifier drive*
3 *Grinding chamber*
4 *Processing air*

SPIRAL JET MILL PICONIZER

For soft to medium-hard products



Characteristics

- Compressed air or inert gas operation
- Lid with integrated static classifier and integrated nozzle ring
- Mill housing with integrated injector for material feed
- Tubeless grinding and injector air supply through platform adapter

Optional designs

- Ceramic design

Technical data

Target fineness	5 – 40 µm
Grinding to Mohs hardness	3 – 8
Grinding chamber diameter	33 mm
Grinding air volume	max. 4 Nm³/h
Propellant air volume	max. 1 Nm³/h
Grinding air pressure	2 – 9 bar
Motive air pressure	2 – 9 bar

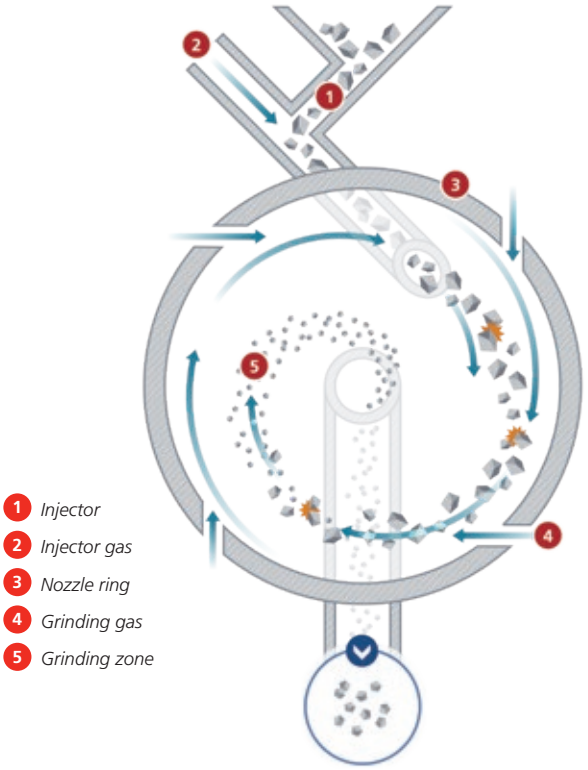
Task to solve

- Grinding of a product below 40 µm
- Simple system design; oversize grain possible
- Grinding with jet nozzles

How it works

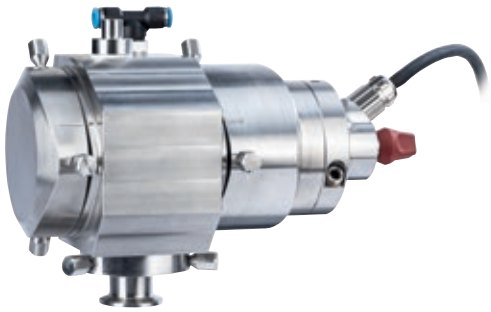
The Piconizer is a spiral jet mill for dry grinding of soft to medium-hard materials. The design and mode of operation largely correspond to the Alpine AS series. Several gas nozzles are used to generate a rapidly rotating vortex of air.

The coarse material is fed into the disc-shaped grinding chamber via an injector. The crushing takes place through particle collisions caused by the velocity gradients in the air flow. The grinding gas is discharged through an immersion tube located in the centre of the grinding chamber. The potential vortex flow creates a classifying effect so that fine particles can leave the grinder through the immersion tube and are separated in a cyclone filter combination, cyclone or filter. Coarser particles remain in the grinding chamber until they have reached the desired fineness. The grinding gas quantity, the grinding gas pressure and the throughput can be varied to set the degree of micronisation.



HAMMER MILL PICOCRUSH

Coarse or pre-comminution of soft to medium-hard materials



Characteristics

- Interchangeable sieve inserts
- Engine bearing with rinsing gas
- Tubeless purge air supply
- Continuous operation

Optional designs

- With suction to support the product feed
- Sieve inserts with different opening diameters

Technical data

Target fineness	1 – 3 mm
Grinding to Mohs hardness	4
Rotor diameter	40 mm
Speed	max. 30.000 rpm

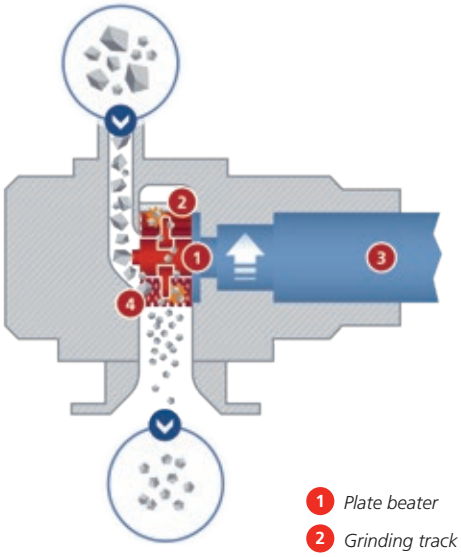
Task to solve

- Coarse crushing of a product
- Crushing with mechanical impact mill

How it works

The Picocrush is a mechanical hammer mill for dry pre-comminution of larger granulates and agglomerates of soft to medium-hard materials. The mode of operation corresponds to that of the HA hammer mill series, and the structure consists largely of elements from the Picoplex fine impact mill.

The coarse material is fed into the hammer mill from the side and crushed by impacting on the rotor and stator tools. After passing through the grinding zone, the ground material enters the grinder housing through interchangeable sieve inserts with different opening geometries. The ground material is transported from there by gravity and the air flow into the filter housing by being separated from the air flow by a filter material. An extraction system on the outlet side of the mill can be installed to improve product feed.



FINE IMPACT MILL PICOPLEX

For soft and medium-hard materials

Characteristics

- Grinding of soft to medium hard products
- Tubeless purge air supply
- Continuous operation

Optional designs

- Pin disc rotor
- Plate beater rotor with grinding track

Technical data

Target fineness	50 – 500 µm
Grinding to Mohs hardness	4
Rotor diameter	40 mm
Speed	max. 60.000 rpm
Propellant air volume	max. 1 Nm^3/h

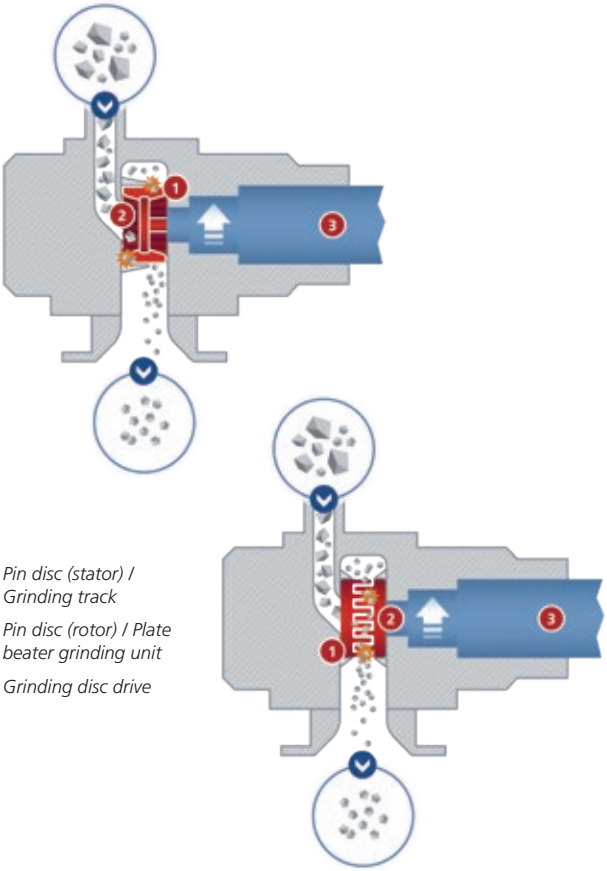
Task to solve

- Grinding of a product with a particle size of less than 500 µm
- Grinding with mechanical impact mill

How it works

The Picoplex is a mechanical impact mill for dry grinding of soft to medium-hard materials. The design and mode of operation largely correspond to the Alpine Ultraplex fine impact mill UPZ series.
The material to be ground is dosed to grinding elements and crushed by impact on the rotor and stator tools.

After passing through the grinding zone, the material enters the mill housing and exits the mill by gravity. The product is then transported with an air stream to the filter, where the product is separated and collected. Different grinding tools can be used, e. g. rotor/stator discs with axial pins or a plate beater rotor with a profiled grinding track. The fineness of the grinder is adjusted by the rotor speed and the feed rate.



COUNTER-ROTATING PIN MILL PICOCROSS

Ultra-fine impact grinding of soft to medium-hard materials

Characteristics

- Extension module for the Picoplex
- High precision due to counter-rotating pin discs
- Engine bearing gas rinsed
- Tubeless purge air supply
- Continuous operation
- Particularly suitable for adhering product

Technical data

Target fineness	30 – 500 µm
Grinding to Mohs hardness	4
Rotor diameter	40 mm
Speed of pin discs	max. 60.000 rpm

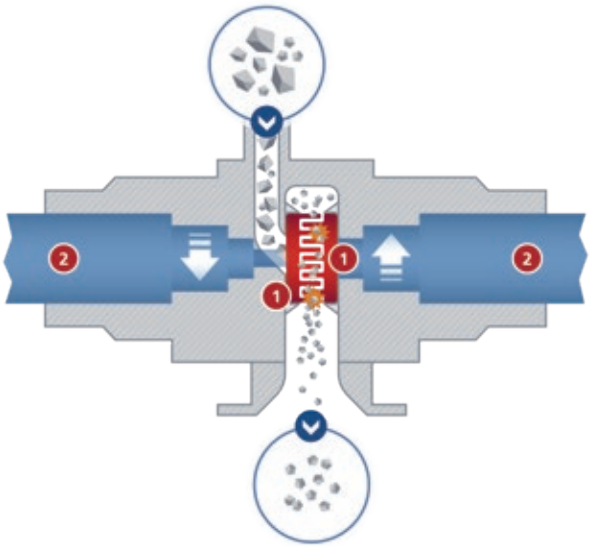
Task to solve

- Produce maximum fineness with a fine impact mill
- No upper particle size limitation

How it works

The Picocross is a two-rotor, counter-rotating impact mill for dry grinding of soft to medium-hard materials. It is created by extending the Picoplex with a second driven pin disc. The design and mode of operation largely correspond to the Alpine Contraplex impact mill C series. The ground material is dosed into the centre of two counter-rotating pin discs and crushed by impact against the grinding pins.

The high shear rate of the counter-rotating discs enables particularly intensive stressing of the particles. After passing through the grinding zone, the ground material enters the mill housing and exits the mill by gravity. The rotation creates an air flow from which the ground material is separated in a filter. The grinder is adjusted by the speed of the two rotors and the feed rate.



1 *Counter-rotating pin discs*
2 *Pin disc drive*

BATCH MIXER PICOMIX

Homogeneous mixture of dry powders

Characteristics

- Process chamber can be cooled (by external unit)
- Shaft seal with flushed shaft seal ring
- Measuring devices for product temperature, rotor speed, motor power
- Batch mode

Technical data

Process chamber volume	20 – 100 ml
Speed	max. 6000 rpm

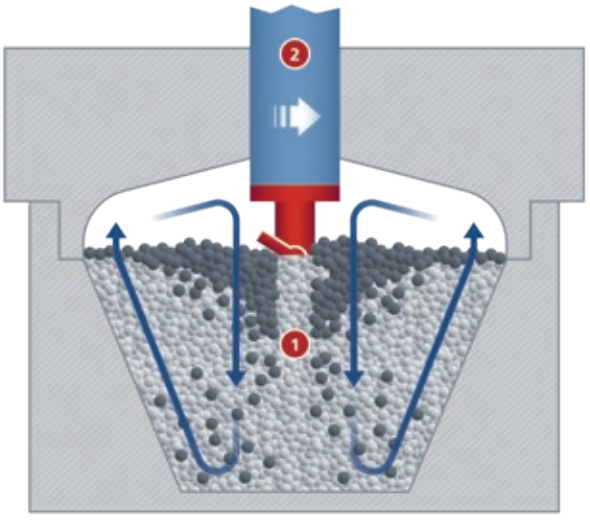
Task to solve

- Mixing of different products with high mixing quality

How it works

The Picomix is a high-performance batch mixer for dry powders. The rotating mixing tool is arranged in a conical mixing container. The special geometry of the mixing tool and the high shear rate ensure intensive, homogeneous and rapid mixing of the powder components.

The components to be mixed are filled into the mixing container and the machine is then closed. After the mixing process, the container is removed from the machine and the finished mixture is emptied. The mixing quality is set via the rotor speed, the mixing time and the filling quantity.



1 *Mixing tool*
2 *Mixing tool drive*

HIGH-ENERGY MIXER PICOBOND

Functionalisation of dry particles

What is mechanofusion?

Mechanofusion is a technology for generating innovative composite materials with special chemical-physical properties. The principle is based on purely mechanical bonding and enables the combination of chemically different products. Mechanofusion is used to design and manufacture highly functional particle composites. In contrast, mechano-chemical reactions can also take place, which are converted with high mechanical energy without solvents and catalysts. Two or more products can be combined with each other.

Characteristics

- Mixing or intensive mixing (coating) possible
- Segregation prevention through mechanofusion
- Protection against product heating through process chamber cooling
- Easy filling and emptying
- Measuring equipment for influencing the desired end product quality
- Batch mode

Optional designs

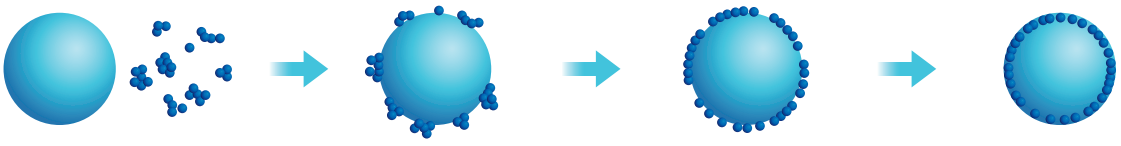
- Rotor variant Nobilta (NOB)
- Mechanofusion (AMS) rotor variant

Task to solve

- Connection of different materials without chemical reaction

How it works

The Picobond is a mixing reactor for the mechanical or mechano-chemical functionalisation of dry particles. The design and mode of operation largely correspond to the Hosokawa Nobilta series.
A reactor vessel contains a fast-rotating agitator that briefly compresses a powder mixture and simultaneously stresses it by shearing. The powder is then released and remixed. This process is repeated many times during the dwell time in batch mode, after which the material is discharged from the machine via an outlet opening.
The high stress intensity can lead, due to product characteristics, to mechano-fusion or mechano-chemical reaction reactions on the particle surfaces. Particles can be brought into contact with each other in such a way that stable coatings, composite particles or changes in particle shape are created. The process parameters are set via the rotor speed and the reaction time. Measuring devices for product temperature, rotor speed and motor power are present.



PICOBOND NOB

Mechano-chemical functionalisation of dry particles

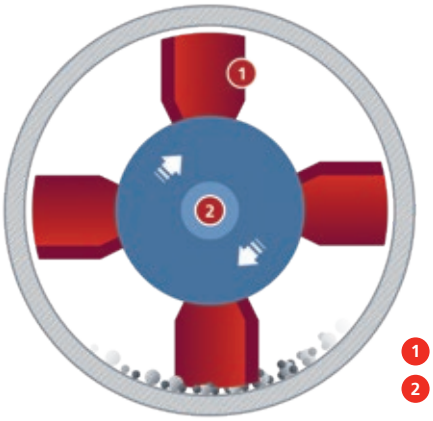
Nobilta principle of operation

The principle of operation is shown in the picture on the right. The powder mixture (shown as dots) is completely centrifuged by the rotor and moves as a circulating ring layer along the inner wall of the mixer housing.

Stresses such as pressure, shear, impact and rebound are initiated within the compacted component fill in this ring layer. On contact with the following rotor element, the direction of action of the transmitted pulse changes. This creates a complex, three-dimensional material circulation, which causes intensive, repeated pressure, impact, rebound and shear stress as well as intensive mixing of the material. The high energy input into the mix compared to conventional mixing systems causes particle fusion, coating, agglomeration and particle rounding in addition to the basic operations such as macro and micro mixing.

Technical data

Process chamber volume	220 ml
Rotor diameter	40 mm
Speed	max. 8.000 rpm



1 *Agitator*
2 *Agitator drive*

PICOBOND AMS

Mechano-chemical functionalisation of dry particles

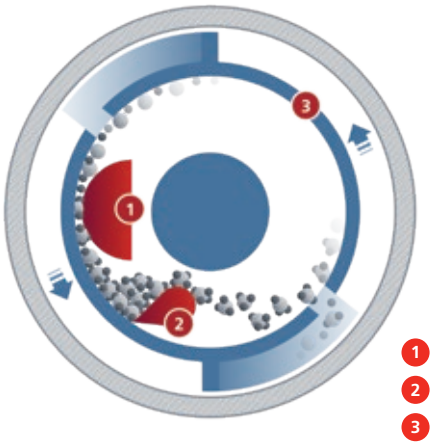
AMS principle of operation

The principle of operation is shown in the picture on the right. The powder mixture (shown as dots) is forced into the gap between the rotating rotor and the stationary stator, whereby the stress mechanisms of pressure and shear occur.

The formed edge layer is then separated from the inner surface of the rotor by a scraper and leaves the rotor through the side openings. In the outer area, the blades attached to the rotor cause a return transport into the processing area. This results in a permanent circulation of the material in the machine, which leads to the most homogeneous loading of the particle mixture possible.

Technical data

Process chamber volume	190 ml
Rotor diameter	40 mm
Speed	max. 7.300 rpm



1 *Stator*
2 *Scraper*
3 *Circulation blade*

STAND-ALONE SOLUTIONS

Do you want to operate the individual processes without a platform? With the latest version of Picoline, this is also possible without any problems. This means that task-specific solutions can be used for specific processes. The process is controlled purely manually and enables a cost-effective entry into the world of micro-processes.

SPIRAL JET MILLING PICONIZER

Integrated process

- Very precise control
- Archiving of process data in the platform
- Automatic process control
- Dosing and vacuum cleaner are controlled automatically

Stand-alone variant

- Most favourable solution for an electricity-free version purely via compressed air, without dosing
- Less space required
- Control via manual valve
- No data recording

PICOBOND AND **PICOMIX**

Integrated process

- Centralised automatic control of the process
- Data recording

Stand-alone variant

- Low-cost solution
- Manual control
- Low space requirement

SYSTEM ACCESSORIES

PMD – Pharmaceutical Micro Dispenser

The PMD single-screw feed metering unit with four different screw spirals is ideal for continuous product feeding. A wear-protected design with ceramic coating is possible.

PDR – Pharmaceutical Dosing Tube

The PDR pharmaceutical dosing tube ensures gentle product conveying by means of vibration. The dust-tight design guarantees very easy cleaning.

Cyclone

The cyclone is suitable for separating the product before the filter and guarantees easier product recovery and faster cleaning.

Standard filter

Flexible, customised, standard filter equipment with either filter bags or filter cartridges is also possible with Safecoat coating as wear protection for highly abrasive products.

Hepa filter

The Hepa filter is recommended for processing toxic and other critical materials to protect employees and the environment (filter class H13).

Vacuum cleaner

The vacuum cleaner provides the necessary negative pressure in the grinding and classifying processes. It is started and stopped by the Picoline.

PSD – Pharmaceutical Disc Dispenser (very small quantities)

The PSD small-volume feed metering unit ensures continuous product feeding for maximum process stability. Six different reversible dosing discs are available.

KF – Cold screw conveyor

The KF cold screw conveyor is suitable for the use of liquid nitrogen in cryogenic grinding processes, even for very sensitive or difficult-to-grind products.

Temperature control unit

The temperature control unit cools or heats the Picobond and Picomix modules within a temperature range of 5 – 70 °C.

HOSOKAWA ALPINE

Process technologies for tomorrow.

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