



Mini machines
for milling, classifying, mixing
and particle design



HOSOKAWA ALPINE

PROCESS TECHNOLOGIES FOR TOMORROWSM

The picoline® is in its element here

Food dyes

Pharma

Specialty chemicals

Toner

Agrochemicals

Pharmaceut

Cosmetics

Inhalers

Dental ceramics

Electronic materials

Pigments

Metals

Performance Polymers

These mini machines are employed in research institutes as well as in the R&D departments of companies active in the fields of foodstuffs, pharmaceuticals, chemicals, plastics, ceramics, batteries, nanotechnology, functional materials as well as everywhere mini batches of powder need to be processed.

The image shows three distinct conical piles of fine powder on a white surface. The largest pile in the foreground is a bright yellow. Behind it, to the left, is a smaller pile of light brown powder. To the right of the light brown pile is a pile of vibrant red powder. The background is a plain, light-colored surface.

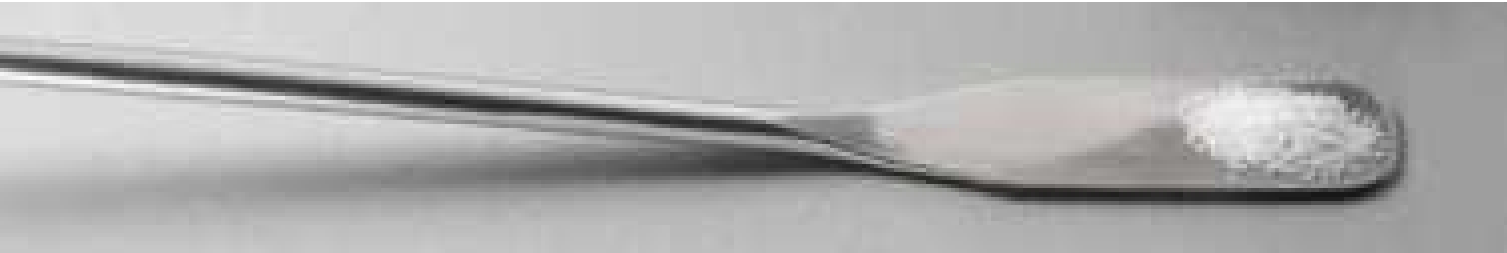
ticals

High-performance ceramics

Battery materials

Functional food

Start out small and hit it really big



The course of the later production process is set as early as in the R&D phase. R&D laboratories therefore need technologies which can be scaled up at a later date to production equipment. In this way, costly misdevelopments of processes that cannot be scaled up to a production machine can be prevented. It is therefore all-important to have suitable machines available in the R&D laboratory right from the start.

Utilise every single gram

The trend these days is more and more towards extremely expensive materials, e.g. in the fields of nanotechnology, pharmaceuticals and specialty chemicals, meaning that researchers often only have very small amounts of material to work with. And quite frequently, hundreds of product samples with minor variations are tested – leading to a further reduction of the amount of material available for each product variant.

The right process right from the start

With development of the *picoline*®, very small machines are now also available for batches of under 1 gram up to several grams. The series includes 10 function modules for fine milling, classifying or mixing powders and suspensions. And because these modules are derived from the established product lines of our own production systems, the user can rest assured that there will be no problems in scaling up a process developed with a *picoline*® machine to a production scale.

THE UNIQUE, MODULAR CONCEPT FOR R&D

A machine from the *picoline*[®] comprises three components which are combined with each other



THE PLATFORM

The platform has a universal adapter and includes the necessary electric and mechanical components for all function modules. This allows you to keep all your options open and further modules can be purchased and connected up at a later day without problem.

THE FUNCTION MODULES

The modules contain all the processing-technological functional units for the respective variant of *picoline*[®] such as classifier head, housing parts, grinding elements, motor adapter, etc. All function modules can be installed interchangeably on the same platform.

Dry milling and classifying For dry milling and classifying, either 1 or 2 identical high-speed motors are used dependent on the function module (except for the *piconizer*[®]).

Wet milling The wet mill uses a slower-speed motor with a high torque. The drive controller for the motor is integrated into the platform.

Mixing and particle design The batch mixer and the high-energy mixer for particle design both use the same slow-speed motor with high torque. The drive controller for the motor is integrated into the platform.

THE ACCESSORIES

Dependent on the operating mode (continuous, batch) and the batch size, there are numerous peripheral units optionally available such as mixers, metering units, injector assemblies, product collectors, external fans or sealing liquid units which are laid out to suit your application.



PLATFORM FEATURES

The platform consists of a housing in an ergonomic table-top design laid out to accommodate the *picoline*[®] function modules. The compact dimensions permit installation inside a laboratory fume hood. The platform surface is made of brushed stainless steel that is perfect for quick and easy cleaning.

Not only is the standardised controller for all *picoline*[®] function modules housed in

a space-saving way but, dependent on the individual platform variant, also all electric and mechanical components necessary for operation of the respective function module.

The media is supplied via an adapter, meaning that no tubes are necessary. The adapter is laid out for connection of all function modules. The advantage is that other modules can be added as and when desired.

EQUIPMENT DETAILS

- Touch panel
- Microprocessor, CAN bus, I/O ports, power pack
- Mains switch, connection cable, 3 USB connections, 2 connectors
- Pivoted media supply adapter to permit attachment of the respective machine to the platform (tiltable for *picoliq*[®] and *picobond*[®])

TECHNICAL SPECIFICATIONS

Dimensions

(without function module and accessories):

L 893 mm x W 616 mm x H 488 mm

Weight dependent on equipment: approx. 80 kg



Platform without function module: the basis of all variants

...and powerful software

COMFORTABLE SOFTWARE

The system is controlled by means of a touch panel with integrated microprocessor housed in the platform.

Once the user selects the respective function module, the stored control logic is automatically activated.

Operating data, settings, system flowcharts and trend curves can be visualised on different display levels.

Every platform has a LAN interface for printer, remote control and for the connection to LIMS systems. The export of csv data files to USB memory sticks is also possible.



Selection of function module



Operating data/system flowchart



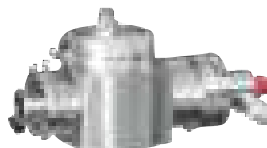
Trend curves

A wide range of possibilities at your fingertips...

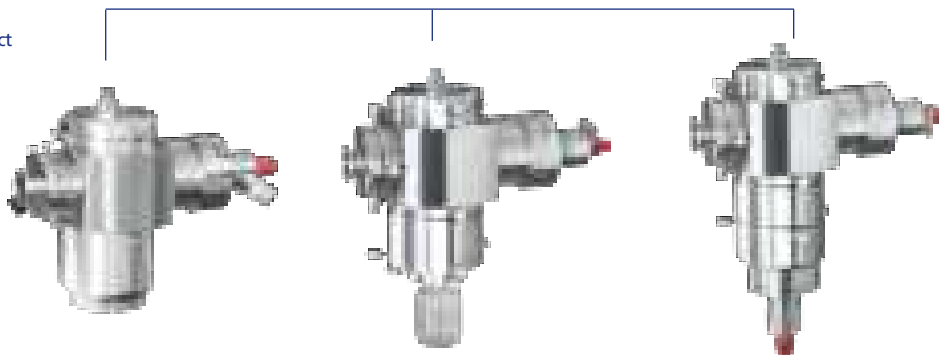
OVERVIEW OF FUNCTION MODULES

The *picoline*® series includes function modules for fine milling, classifying or mixing powders or suspensions.

The designation in brackets denotes the product line of production machines from Hosokawa's regular product range.



Pico classifier head with housing and classifying wheel for combination with the following modules:



Picojet® module
Fluidised bed opposed jet mill (AFG)

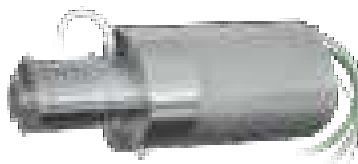
Top section with classifier head, bottom section with grinding chamber and nozzles

Picosplit® module
Ultrafine classifier (ATP)

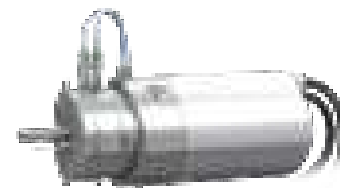
Top section with classifier head, bottom section with coarse material classifier

Picozirk® module
Classifier mill (ZPS)

Top section with classifier head, bottom section with impact mill



Picoliq® module
Wet agitated media mill (AHM)
in designs with grinding chambers of different sizes



Picobond® module
High-energy mixer for particle design (NOB)
with the mechanofusion variant (AMS)



Basic module for the inclusion
the following modules:



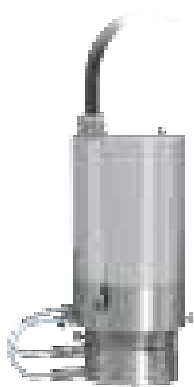
Picoplex® module
Fine impact mill (UPZ)
with grinding element



Picocrush® module
hammer mill (HA)



Picocross® module
high-speed impact mill (C)



Picomix® module
Batch mixer (Cyclomix)



Piconizer® module
Spiral jet mill (AS)

For the ultrafine classification of fine powders in the separation range 2 μm – 120 μm . Free from oversize particles over the entire separation range.



Principle of operation

The *picosplit*[®] is an ultrafine classifier for the classification of dry powders by particle size. Classification is based on the centrifugal counterflow principle in a high-speed deflector-wheel classifier. The powder is metered into the classifying chamber and is transported to the classifying wheel by the air flow. Fine particles pass through the wheel, are discharged entrained in the air and are collected in a filter. Coarse particles are rejected by the classifying wheel and are discharged into a collection bin. The classifying air is supplied to the housing bottom section via a vane ring; this serves to re-disperse the rejected coarse material and to increase the classifier's precision of cut. The cut point is set by varying the air flow rate and the classifier speed.

Features

- Operation with compressed air and/or inert gas
- High precision of cut
- Continuous operating mode
- Collection bin for coarse material
- Classifying wheel gap and motor bearing rinsed with gas
- Classifying wheel gap easy to adjust
- Grinding and rinsing air supplied through the platform adapter (no tubes)



Technical specifications

Classifying wheel diameter:	20 mm
Classifier speed:	max. 60,000 rpm
Total air flow rate:	20 Nm ³ /h
Throughput in continuous operation:	max. 1 kg/h

Variant

- For contamination-free processing

For impact milling with integrated classification of materials with a Mohs' hardness up to 3.5. Produces powders with a steep particle size distribution and narrow size range in the fineness range 8 μm – 120 μm .



Technical specifications

Rotor diameter:	40 mm
Classifying wheel diameter:	20 mm
Mill speed:	max. 60,000 rpm
Classifier speed:	max. 60,000 rpm
Total air flow rate:	20 Nm ³ /h
Throughput:	max. 1 kg/h

Variant

- For contamination-free processing



Principle of operation

The picozirk[®] is a mechanical impact mill with integrated classifier for the dry fine milling of soft to medium-hard materials with a steep particle size distribution. Milling is conducted with a high-speed disc equipped with grinding elements. The feed material is metered into the grinding chamber and is accelerated by the rotor. Comminution is the result of particles impacting against the grinding elements of the rotor and against the grinding track. The grinding air flows from below through the gap between rotor and grinding track and then through the classifying wheel arranged in the mill head. The classifying effect of the classifying wheel allows fine particles to exit the mill entrained in the air, after which they are collected in a filter. Coarser particles fall back onto the rotor and are comminuted further until such time as they have reached the desired fineness. The end-product fineness is set by adjusting the speed of the rotor and of the classifying wheel as well as the gas flow rate.

Features

- Operation with compressed air and/or inert gas
- Continuous operating mode
- Cool and low-intensity milling
- Steep particle size distribution curves
- Sharp and easily adjustable cut point
- Collection bin for coarse material
- Plate beater rotor with grinding track
- Classifying wheel gap and motor bearing rinsed with gas
- Classifying wheel gap easy to adjust
- Grinding and rinsing air supplied through the platform adapter

For the contamination-free ultrafine comminution with integrated classification of materials with a Mohs' hardness of up to 10. The mill produces powders with a steep particle size distribution and sharp top cut in the fineness range 2 µm – 120 µm.



Technical specifications

Grinding chamber diameter:	40 mm
Classifying wheel diameter:	20 mm
Classifier speed:	max. 60,000 rpm
Total air flow rate:	20 Nm ³ /h
Milling air pressure:	2 - 6.5 bar (g)
Throughput in continuous operation:	max. 1 kg/h
Minimum batch size in batch operation:	approx. 5 g

Variant

- For contamination-free processing

Features

- Operation with compressed air and/or inert gas
- Either batch or continuous operation
- Material feed from above at the classifier head
- Horizontal nozzle arrangement, nozzles integrated into the housing insert
- Mill and classifier housing easy to separate by means of a clamp connection
- Classifying wheel gap and motor bearing rinsed with gas
- Classifying wheel gap easy to adjust
- Grinding and rinsing air supplied through the platform adapter (no tubes)

Principle of operation

The picojet[®] is a fluidised bed opposed jet mill with integrated classifier for the contamination-free dry ultrafine milling of soft to hard materials. The design and principle of operation are almost identical with that of Alpine's AFG product line of fluidised bed opposed jet mills. The grinding energy in the form of highly accelerated air jets enters the mill via several nozzles. The feed material is dosed into the grinding chamber and is fluidised by the air jets. The particles are accelerated in the air jets which intersect at the focal point.

Comminution is a result of the particles impacting in the focal point and of shear flows in the peripheral zone of the air jets. The grinding air then flows through the classifying wheel located in the mill head and the product is classified. Fine particles exit the mill through the classifying wheel entrained in the air and are collected in a filter. Coarser particles fall back into the fluidised bed and are comminuted further until they have reached the desired fineness. The fineness is set as a function of the air flow rate, the grinding air pressure and the classifying wheel speed.

For the micronisation of dry and relatively soft materials with a Mohs' hardness of up to 3.
 Produces powders in the fineness range
 5 µm – 40 µm.



Technical specifications

Grinding chamber diameter:	33 mm
Grinding air flow rate:	max. 4 Nm ³ /h
Propellant air flow rate:	max. 1 Nm ³ /h
Grinding air pressure:	2 - 6.5 bar (g)
Propellant air pressure:	2 - 6.5 bar (g)
Throughput:	approx. 0.5 - 5 g/min

Variants

- piconizer[®] for installation in the platform
- piconizer[®] as a functional stand-alone variant without platform

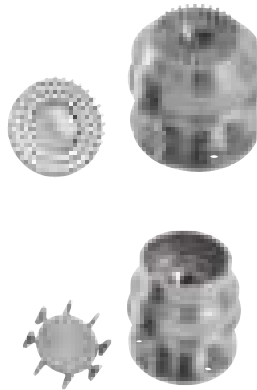
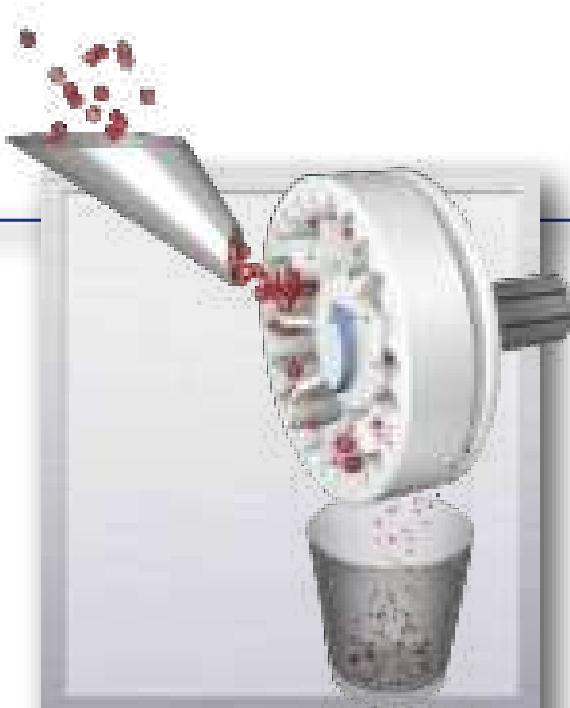
Features

- Optimal grinding chamber geometry
- Operation with compressed air and/or inert gas
- Cover with integrated static classifier and integrated nozzle ring with 4 nozzles and grinding gas connection
- Nozzles milled into the nozzle ring with no dead spaces
- Mill housing with integrated injector assembly for material feed
- Cover and housing connected by a clamp connection
- Filter with housing, product collection bin and membrane filter hose
- Grinding and propellant air supply via the platform adapter (no tubes)

Principle of operation

The piconizer[®] is a spiral jet mill for the dry milling of soft to medium-hard materials. The design and principle of operation are largely identical with that of Alpine's Aeroplex spiral jet mill AS product line. A number of gas nozzles generate a high-speed air vortex. The feed material is fed into the disc-shaped grinding chamber via an injector assembly. Comminution is a result of particle collisions brought about by the speed gradients in the air flow. The grinding gas exits the mill through a dip pipe located in the centre of the grinding chamber. The free vortex generates a classifying effect so that only fine particles can exit the mill through the dip pipe and be collected in a filter. Coarser particles remain in the grinding chamber until such time as they have reached the desired fineness. The degree of micronisation can be adjusted by varying the grinding gas flow rate, the grinding gas pressure and the throughput.

For end-product fineness values of 50 μm – 500 μm , dependent on whether equipped with pin discs or plate beaters.



Technical specifications

Rotor diameter:	40 mm
Speed:	max. 60,000 rpm
Throughput:	max. 1 kg/h

Variants

- With pin disc rotor
- With plate beater rotor and grinding track

Principle of operation

The *picoplex*[®] is a mechanical impact mill for the dry milling of soft to medium-hard materials. The design and principle of operation are largely identical with that of Alpine's UPZ Ultraplex fine impact mill product line. The feed material is metered into the centre of the rotor equipped with grinding elements and is comminuted as a result of impacting against the rotor and stator elements.

After being processed in the grinding zone, the product enters the mill housing before exiting the mill by gravity. The rotation generates an air flow from which the product is extracted in a filter. Different grinding elements can be used, e.g. rotor/stator discs with axial pins or a plate beater rotor with profiled grinding track or sieve. The fineness of the end product is set as a function of the rotor speed and the feed rate.

Features

- Continuous operation
- Collection bin for the end product
- Filter element as an air vent
- Rinsing air supply via the platform adapter (no tubes)

Designed for precrushing granules and agglomerates in preparation for fine grinding with other *picoline*® modules

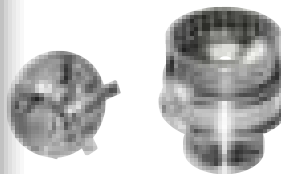


Technical specifications

Rotor diameter:	40 mm
Speed:	max. 30,000 rpm
Throughput:	max. 5 kg/h
Feed size:	max. 6 mm

Variant

- Sieves with different opening geometries
- With dedusting unit for smoother product feed



Features

- Continuous operating mode
- Hammer beater unit with swing beaters
- Grinding track with exchangeable sieve
- Collection bin for the end product
- Filter element for venting
- Motor bearing gas-rinsed
- Rinsing air supply without tubes via the platform adapter

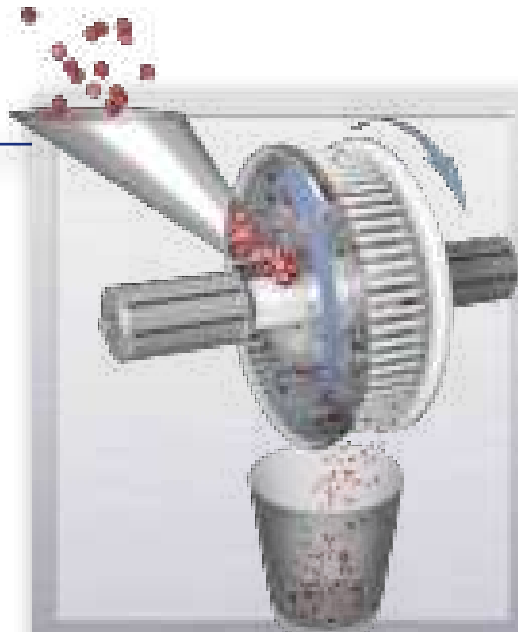
Principle of operation

The *picocrush*® is a mechanical hammer mill designed for the dry precrushing of large granules and agglomerates made of soft to medium-hard materials.

The principle of operation is the same as that of the hammer mill Ha product line, whereas the design revolves mainly around elements from the *picoplex*® fine impact mill.

The feed material is fed to the hammer beater unit from the side and is comminuted as the result of impact against the rotor and stator elements. Once it has passed through the grinding zone, the product enters the mill housing via exchangeable sieves with different types of apertures. The force of gravity combined with the air flow conveys the product to the filter housing, where a filtering element separates it from the air. Installation of a dedusting unit is advisable to ensure better product feed control.

The contra-rotating pin mill with 2 driven pin discs. It produces high powder fineness values in the range 10 μm – 500 μm .



Technical specifications

Rotor diameter:	40 mm
Pin disc speed:	max. 60,000 rpm
Counter-rotating disc speed:	max. 60,000 rpm
Throughput:	max. 1 kg/h



Principle of operation

The picocross® is a 2-rotor contra-rotating impact mill designed for the dry milling of soft to medium-hard materials. The mill is created by equipping the picoplex® with a second driven pin disc. The design and principle of operation are largely identical with that of Alpine's Contraplex impact mill C product line. The feed material is dosed into the centre of two contra-rotating pin discs and is comminuted by impacting against the grinding pins.

The high shear speed of the contra-rotating discs permits a particularly intensive stressing of the particles. After being processed in the grinding zone, the product enters the mill housing before exiting the mill by gravity. The rotation generates an air flow from which the product is extracted in a filter. The fineness of the end product is set by varying the speed of the two rotors and the feed rate.

Features

- Continuous operation
- Pin disc rotor with contra-rotating pin disc
- Motor bearing rinsed with gas
- Collection bin for the end product
- Filter element as an air vent
- Rinsing air supply via the platform adapter (no tubes)

Wet Agitated Media Mill

For the wet processing of small to mini product batches and fineness values down to the submicron and nano-range.



Technical specifications

Grinding chamber volume:	12 ml
Speed:	max. 10,000 rpm
Mill drive:	630 W
Product batches:	approx. 0.5 - 500 g

Variants

- For grinding chamber volumes of 25 ml or 90 ml (convertible)
- Grinding chamber cover for batch or continuous mode
- Grinding elements made of different materials for contamination-free milling
- Separating element for grinding beads from 0.05 mm to 1 mm in size



Features

- The grinding beads are prevented from exiting the mill by means of a dynamic separating system
- Product-contact components made of PU, stainless steel, ceramic or polyethylene
- Grinding chamber can be cooled
- Grinding beads ranging from 0.05 to 1.0 mm in size can be employed
- Mill can be tilted for easy filling and emptying
- Shaft sealing by means of a mechanical seal, double shaft lip seal and rinsing connections (for connection to the on-site water supply)
- Measuring devices for product temperature, sealing liquid pressure, mill speed, motor output and torque
- Filling, venting and sampling via hollow needles in batch mode

Principle of operation

The *picoliq*[®] is an agitated media mill for the continuous or batchwise wet milling of particles in liquids. The design and principle of operation are largely identical with that of Alpine's AHM product line. The grinding chamber of the mill is usually filled with ceramic beads which are set into motion by a rotating agitator. The feed material is suspended in a liquid and is filled into and discharged from the grinding chamber by a pump.

The particles are stressed between the grinding beads by impact and friction and are thus comminuted. In continuous mode, the suspension exits the mill after passing through the grinding zone, whereby a separating element in the form of a screen retains the grinding beads in the mill. The mill settings are made by varying the rotor speed, the amount of grinding beads and the suspension flow rate as well as in addition the size of the grinding beads.

Dry process for the production of functionalised particles (particle design) and high-precision mixtures.



Technical specifications

Process chamber volumes:	approx. 190 / 220 ml
Speed:	max. 10,000 / 7300 rpm
Rotor drive:	630 W
Product batch:	max. approx. 20 g

Variants

- Mechanofusion rotor with stator cover
- Inclined-paddle agitator for contamination-free processing

Principle of operation

The *picobond*[®] is a mixing reactor designed to give a functional design to dry particles using a mechanochemical process. The design and principle of operation are almost identical to that of the Alpine Nobilta product line. A high-speed agitator is located in a reactor vessel which strongly compresses a powder mixture for a brief period of time, at the same time stressing it through shearing action. The pressure is then relieved and the powder re-mixed. In batch mode, this process is repeated many times during the residence time of the material in the machine. The product is then emptied out of the machine through an outlet port. As a result of the high stressing intensity, mechanochemical reactions occur on the surface of the particles. The particles are brought into contact with each other in such a way that stable coatings, compound particles or changes to the particle shape come into being. The process parameters are set as a function of the rotor speed and the reaction time.

Features

- Batch mode
- Process chamber can be cooled
- Can be rinsed with inert gas
- Machine can be tilted to allow filling and emptying
- Measuring devices for product temperature, rotor speed and motor output
- 2 rotor variants: Nobilta (NOB) or mechanofusion (AMS)

Intensive mixer with
an effective volume of 20 ml – 100 ml.



Technical specifications

Effective volume:	20 - 100 ml
Speed:	max. 6,000 rpm
Mixer drive:	630 W
Product batch:	max. approx. 20 g

Variants

- picomix® for installation in the platform
- picomix® as a stand-alone variant without platform
- For contamination-free processing

Features

- Batch mode
- Process chamber can be cooled
- Shaft sealing with rinsed shaft lip seal
- Measuring devices for product temperature, rotor speed and motor output

Principle of operation

The picomix® is a high-performance batch mixer for dry powders. The rotating mixing element is arranged in a conical agitator vessel. As a result of the special geometry of the mixing element and the high shear speed, an intensive but homogeneous and fast blending of the powder components takes place. After filling the powder components into the agitator vessel, the machine is then closed. Once the mixing process is complete, the vessel is removed from the machine and the mixture is emptied out. The mixing efficiency is a function of the rotor speed, the mixing time and the degree of filling.



Technical specifications

OEL: 50 ng/m³
Operating pressure: - 150 Pa
Dimensions (LxWxH) in mm: ca. 1400 x 1000 x 2000

Design

- Suitable for all modules
- High containment for OEL values < 50 ng/m³
- Media supply through the isolator rear panel
- Control of the fully automatic isolator operation using the picoline touch panel.
- Transfer of samples and tools via rapid transfer port (RTP)
- Isolator operation with automatic air intake and with inert gas

Features

The safety and protection of personnel takes highest priority. But what kinds of hazards does a new substance harbour? In the initial phases of development, not much is known about these risks, and it is exactly here that the picoline[®] as the solution for mini batches comes into its own.

The high-containment solution picocont[®] is the answer to this challenge. Based on long years of experience with the integration of grinding processes into isolators, Hosokawa Alpine has developed a system which is absolutely perfect to master the special challenges posed by R&D applications. The existing picoline[®] modules can simply be integrated into the new isolator system.

Ergonomics played a major role during development of the system in order to make the work with mini product batches and machines inside an isolator as simple and comfortable as possible.

OEL values of less than 50 ng/m³ can be realised by careful merging of grinding process and isolator, e.g. by the clear separation between the technical zone outside and the grinding process inside the isolator, and by fully automatic isolator operation within the system control.

OVERVIEW OF SYSTEM ACCESSORIES

Numerous optional accessories are available to match the selection criteria which are laid out to suit the individual application.

SELECTION CRITERIA

- Processing of dry powders or free-flowing suspensions
- Contamination-free milling
- Operation with compressed air or with inert gas
- Continuous or batch operation
- Batch size and/or throughput rate
- Manual or mechanical product feed
- Operation in pressure or suction mode

WET PROCESSING

Hose pump

- For continuous wet milling
- Integrated into the platform,
- Flow rate 50 - 500 ml/min

Agitator vessel

- For free-flowing suspensions
- Can be cooled
- Effective volume 0.5 l with
- Propeller agitator

External sealing liquid unit

- For the mechanical seal of picolinq[®]



Micro metering screw PMD, shown in the two different setting angles

Agitator for
picolinq[®]



DRY PROCESSING

Micro metering screw PMD

- For continuous product feed
- Throughput range approx. 5 - 100 ml/min
- Depending on the flow ability of the product two different angles are adjustable
- 3 Liter Version available for the containment solution
- Wear protected execution is available (ceramic coating)

Mini-batch metering unit

- For continuous product feed
- Suitable for volumes up to approx. 100 ml

Collection bin

- With threaded screw and cover
- Made of glass or plastic, different sizes
- Available 30 - 500 ml

Injector assembly

- For product feed in pressure mode.
- Feed section to permit charging the product into the flow of air entering the mill

Suction fan

- For operation under negative pressure
- Class L or H available

Cyclone-Filter

- For the operation with the Piconizer®
- For the separation of the product from the process air
- Due to combination of a cyclone with the integrated filter cartridge even higher product recovery rates are possible

Jet-Filter

- For dry processing
- For the separation of the product from the process air
- Can be used for all dry processes
- Available in three different sizes, which can be chosen depending on the amount of material, which should be processed and can be exchanged with minor effort
- Filter cartridges are made from sintered PE-HD and are therefore easy to clean

Cleaning unit for the Jet-Filter

- For the installation with the Jet-Filter
- Makes a manual cleaning of the via pulsed air possible
- Recommended for big batches or for continuous operation



Zyklonfilter attached to the Piconizer®



Jet-Filter with cleaning unit

Tests and rental units

TEST- AND RENTAL FACILITIES

Do you want to try out a *picoline*® before purchasing one? We are happy to offer you several ways to test our system.

Tests at the ALPINE Test Centre

We are able to offer a trial date in our technical center for individual experiments under guidance from an experienced ALPINE employee. The scope of services at customer trials includes:

- Test preparation for smooth, time-saving test execution
- Material handling
- Energy costs
- Carrying out the experiment including the necessary grain size analyzes through ALPINE employees
- Creating the test report
- Accompaniment is available for questions and ambiguities by an experienced ALPINE employee any time



Rental Facilities

Would you like to try out the *picoline*® but you have numerous materials to form a single experiment is not sufficient for you? In this case, we would like to offer you the opportunity to rent a *picoline*® system for your testing. What this means for you:

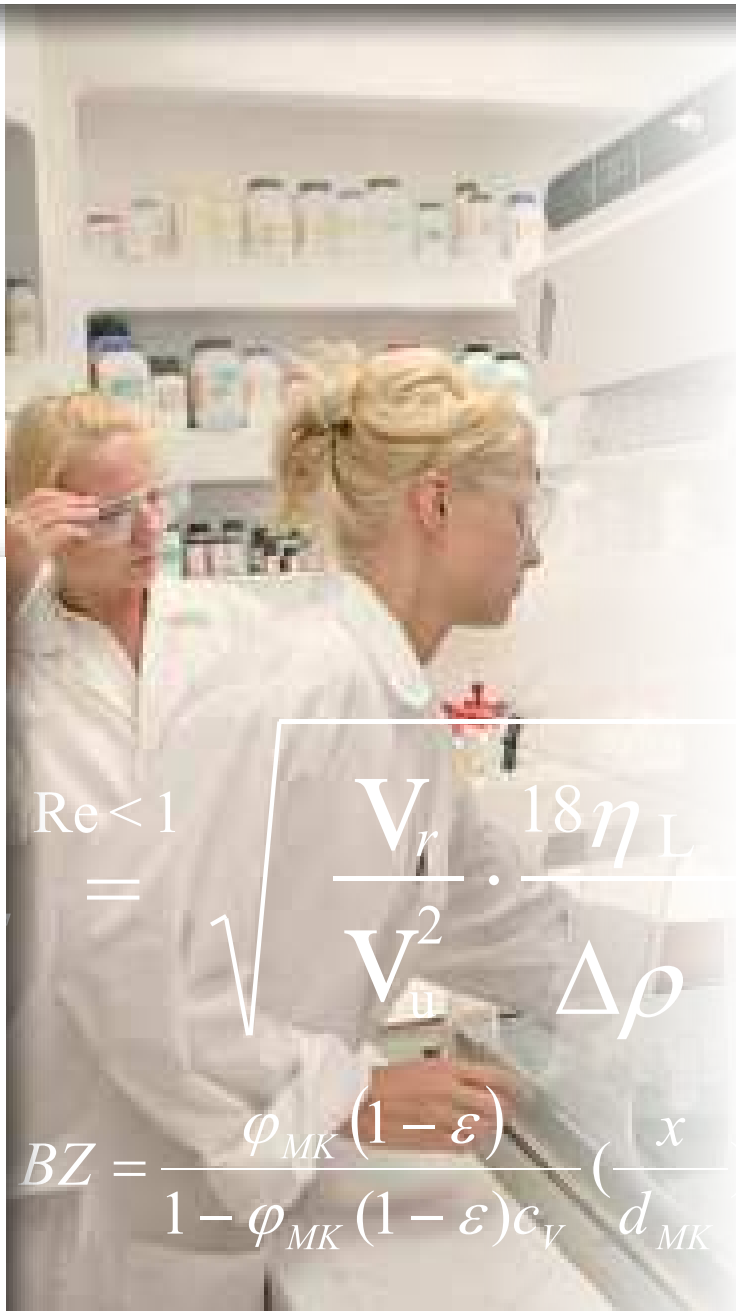
- Rental of a complete *picoline*® system over several weeks
- Free configuration of your modules and the corresponding accessories according to your wishes. We like to also advise you in this case in the selection of modules according to your desired process
- Your employees can familiarize themselves with the possibilities of the new system before buying
- *If necessary:* Possibility of training on the system by an ALPINE Process Engineer

picoline® – from the idea to the system

THE OBJECTIVE

The aim is to offer end-to-end particle process technology - from the development at a very early stage through laboratory and pilot scale right up to the production process. And to process product batches upwards of 1 g with as little loss as possible. The mini machines should have as much similarity as possible in both design and process technology to the existing production machines. This all sums up to an enormous challenge for the creativity of our engineers.

Every development process generates new insights and ideas. During its more than 100-year company history, Hosokawa Alpine engineers have repeatedly tested and overcome limits and in doing so, have set new standards - regardless of whether we are talking about powder fineness values, throughput rates or energy efficiency.



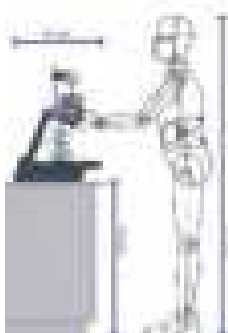
$$\text{Re} < 1 = \sqrt{\frac{V_r}{V_U^2} \cdot \frac{18\eta_L}{\Delta\rho}}$$
$$BZ = \frac{\varphi_{MK} (1 - \varepsilon)}{1 - \varphi_{MK} (1 - \varepsilon) c_V} \left(\frac{x}{d_{MK}} \right)$$



THE DEVELOPMENT

It was clear right from the beginning that a simple miniaturisation of the machine components was not going to be an adequate solution. This is why every single process was scrutinised and then optimised for the mini machines. During the detailed design stage under application of rapid prototyping, the product line was continually refined and new manufacturing sequences were defined. The platform is almost as important as the function modules themselves, for besides the complete supply engineering, it also has an intelligent control unit and offers maximum operating comfort and safety.

Product ergonomics



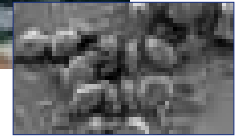
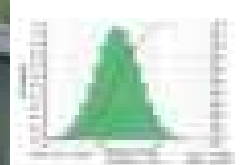
THE RESULT

The result is the *picoline*, a product line of mini machines with an unmistakable, specific product language. Choose from 1 central platform, 5 processes and 9 *picoline* machines - they all open up completely new perspectives for researchers and developers.



THE FUNCTION TESTS

The product line was then subjected to exhaustive tests and was made fit for practical operation during numerous tests with representative products. After that, the successful tests carried out in the laboratory were validated.



Alpine's company portfolio...

CONSULTING SERVICES

Problem specification, exploration of different technical solutions, product-specific processes, consideration of safety aspects, different system concepts, e.g. pressure-shock-proof, inert-gas mode, CIP/SIP, etc.

TRIALS

Milling and classifying trials, laboratory analyses, determination of energy requirements and production costs, manufacture of product samples, rental systems.

ENGINEERING

Initial design stage: concept studies, basic engineering, flowcharts, installation planning, safety concepts, e.g. ATEX, project documentation.

Detailed engineering: P&I diagrams, calculation and layout, specification of components, design, programming and networking of visualisation systems; structural steel engineering with static analysis; planning the piping and ductwork; official acceptance of subcontractor work.

DOCUMENTATION

- Operating instructions, operating manuals
- "As built" documentation
- Software documentation
- Documentation as per 21 CFR Part 11 for the pharmaceuticals industry
- CE certification

PROCESS AUTOMATION

Control cabinets, conventional control units (PlexWire), process control with PLC, visualisation, process data archiving, logic diagrams, teleservice connection for remote maintenance.

PRODUCTION

Our production department comprises a sheet metal and structural steel engineering shop to permit the manufacture of complex and also pressure-shock-proof subassemblies, as well as a machine shop with an extremely wide range of equipment and production machines.

In 2007/2008, two new production halls were built on the company grounds to accommodate our production and assembly shops as well as our apprentice training shop.

ASSEMBLY

- Assembly of complicated subassemblies and machines of different design and dimensions
- Test runs, preliminary acceptance procedures by our customers (FAT)

ENGINEERING PLANNING & SUPERVISION

- Project coordination
- Installation and assembly of complete systems on the customer's premises by competent field service erection engineers - anywhere in the world
- On-site supervision

COMMISSIONING

- Commissioning, training, test run, system hand-over (SAT)

TOLL PROCESSING

Our subsidiary Hosokawa Micron Powders GmbH in Cologne offers a wide range of toll processing and secondary packaging services.

For further details see:

www.hosokawamicron.de

...and a promise of quality



HOSOKAWA ALPINE Aktiengesellschaft,
Augsburg, Germany

A high-quality product calls for competence in development, design, manufacture and assembly. And this competence in turn stems from the training, know-how, experience and motivation of the company staff. The environment of the company headquarters in Augsburg has always fulfilled these requirements in the best possible way. It is here that we find the dedicated and excellently trained staff who make a big contribution to the company, the products and to the business success of our customers. For this reason and in the tradition of our own self-imposed commitment to high quality, we will continue to lay store by Germany as a business location. The logo on our letterheaded company stationery with the message ENGINEERED, MANUFACTURED AND ASSEMBLED in GERMANY underlines this commitment.



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HOSOKAWA ALPINE Aktiengesellschaft

Hosokawa Alpine is a member of the Hosokawa Micron Group, a high-performance manufacturer of systems for powder and particle processing, systems for the confectionery industry as well as plastics processing machines and systems. The group is known and reputed the world over for its power of innovation, constant product care and market-oriented R&D. The most important group resources are R&D, engineering and manufacturing as well as customer service in all global markets.

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