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regard to orders.

POWDER AND PARTICLE PROCESSING TECHNOLOGY FOR THE LABORATORY



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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HOSOKAWA ALPINE

PROCESS TECHNOLOGIES FOR TOMORROWSM



Hosokawa Alpine has been in business for over 100 years. Regardless of the field, i.e. blown film processing or powder and particle processing, we are traditional trendsetters in the market. The driving force behind refining our technologies is our self-imposed commitment to high quality as the market leader.

WIR SIND IHR KOMPETENTER PARTNER

POWDER & PARTICLE PROCESSING DIVISION

Since the company was established in 1898, Hosokawa Alpine has been developing, designing and manufacturing components and turnkey systems for the dry and wet processing of powders, granules and bulk materials for the chemical, pharmaceutical, food, mineral, metals and recycling industries. Whether the task is comminution, classification, dust removal, materials handling, metering, weighing or packing, you will find Hosokawa Alpine to be a competent and innovative partner.

BLOWN FILM PROCESSING DIVISION

As a specialist for film blowing lines to manufacture thin plastic film, Hosokawa Alpine ranks among the world's foremost suppliers in this market segment. The vast fund of know-how, the high quality standards, the continuous innovation and high degree of reliability are all reasons for the constant growth of this business division.

DIVISIONAL ORGANISATION

The name Alpine stands for competence in every possible issue of comminution technology. Many years of close cooperation between our engineers and the development departments of our customers have made us leading specialists for powder and particle processing around the world. To make it even easier for our customers from all the different branches of industry to find the right partner for their projects, we have split our powder and particle processing division into the following business segments:

- PHARMA & FOOD

The production of powdery substances for the pharmaceutical industry is a job for the specialists. The wide range of products and services offered by Hosokawa Alpine conforms with all national and international pharma standards. Over and above this, special customised processes are developed for the food industry. Regardless of the type of comminution applied, we have the requisite know-how, especially when solutions for special applications are required.

- CHEMICALS

The range of chemical products is just as wide and diverse as are the different demands on the properties of pigments or powders. We supply process-technological solutions for the chemical industry as a single-source partner. Our comprehensive range of products means that we are able to meet a vast number of different requirements. We also offer competent advice on solutions for basic chemical products and auxiliary products, as well as for toners, paints, pigments, herbicides or fertilisers.

- MINERALS & METALS

We supply complete dry and wet processes with state-of-the-art mills and classifiers for processing mineral raw materials. Our machines and systems for fillers, ceramic raw materials, metallic compounds and alloys all meet the high demands set by our customers. We are not just manufacturers, however, but also a competent partner for the engineering and design of complete turnkey systems.

- RECYCLING & GRANULATORS

We design, build and deliver complete granulator systems to include all the requisite system components. Whether the feed material is injection mouldings, sprues, film webs or film edge trims, our granulators are designed for even the most difficult cutting tasks. In addition, we also supply in-line recycling solutions for caoutchouc, cable or wood chips which are tailored to the individual requirements.

- SERVICE

Our service division provides support during the entire lifetime of a Hosokawa Alpine system or machine. Our extensive range of services includes spare parts supply, maintenance, inspection, servicing, repairs, general overhauls, system upgrading, and training. To round off our service portfolio, we also offer used ALPINE machines.

No matter what corner of the world you are in or what your processing challenge is, Hosokawa Alpine is never far away with the best solutions and support. Our range of services includes project management, installation, commissioning, training, maintenance as well as system optimisation and upgrades.

**EVERYTHING FROM ONE
SINGLE SOURCE MEANS
CENTRAL RESPONSIBILITY.**





MULTI-PROCESSING SYSTEMS

The task of laboratory development centres is usually to produce small amounts of product samples for tests with the aim of defining an industrial manufacturing process.

The laboratory-scale systems used must offer process reproducibility and the possibility of scaling up at a later date to production-scale equipment. Because new products whose grinding properties cannot always be predicted in advance are constantly being developed, maximum flexibility is a prerequisite. This is where so-called multi-processing systems have established themselves as veritable all-rounders: it takes only a few minutes to exchange the following modules:

- Opposed jet mill
- Ultrafine classifier
- Classifier mill
- Spiral jet mill
- Fine impact mill



MULTI-PROCESSING SYSTEMS FOR A HOST OF COMBINATIONS

This concept revolves around the fact that the installation frame, the feed metering unit, the valves for bearing rinsing air and grinding air, the drive, the product collection filter, the fan, the electric and the control unit are common to all processes. The latest development of Hosokawa Alpine is the extension of this combi-system by a fine impact mill which can be equipped with the customary variety of grinding elements (pin discs, plate beater units, grinding tracks, sieve grates, etc.). A newly developed drive, controlled by a frequency converter with different sets of parameters, permits (in spite of the very different design, power and speed) installation of both the grinding rotor of the fine impact mill and also of the deflector classifying wheel.

ALPINE MULTI-PROCESSING SYSTEM FOR FIVE PROCESSES, ALSO SUITABLE FOR CIP/SIP PROCEDURES

- A) Opposed jet milling with the 100 AFG for materials with a Mohs' hardness up to 10 and end-product fineness values of between 2 and 40 µm,
- B) Ultrafine classifying with the 50 ATP, separation range from 2 to 120 µm
- C) Fine grinding with integrated 50 ZPS classifier for materials with a Mohs' hardness up to 3,5
- D) Ultrafine grinding with spiral jet mill 100 AS for fineness values between 5 µm and 30 µm
- E) Fine impact milling with 100 UPZ

Combination possibilities

	AFG	ATP	ZPS	AS	UPZ
1)	100	50	50	100	100
2)	140	70	70	140	-
3)	200	100	100	200	160

- CLASSIFICATION: ALPINE TURBOPLEX® ULTRAFINE CLASSIFIER ATP**
- For materials with a Mohs' hardness up to 10.
 - Separation/fineness range steplessly adjustable from $d_{97} = 2$ to 80 µm.
 - Extremely high precision of cut.
 - End products with steep particle size distributions and free from oversize particles.
 - Ideal for materials of high density.
 - Good dispersion of cohesive products.
 - Throughput approx. 3 to 50 kg/h.

JET MILLING WITH INTEGRATED AIR CLASSIFIER: ALPINE FLUIDISED BED OPPOSED JET MILL AFG

- For materials with a Mohs' hardness up to 10.
 - Fineness values of $d_{97} = 2$ to 40 µm.
 - End products with steep particle size distributions and free from oversize particles.
 - Throughput approx. 1 to 25 kg/h.
- Option: PU lining and a ceramic classifying wheel results in end products with no iron contamination.

FINE GRINDING WITH INTEGRATED CLASSIFIER: ALPINE ZIRKOPLEX® CLASSIFIER MILL ZPS

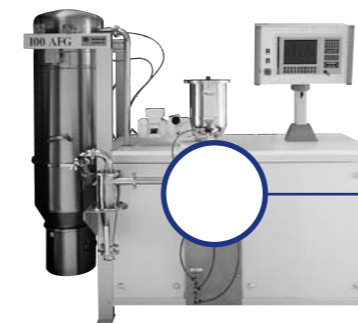
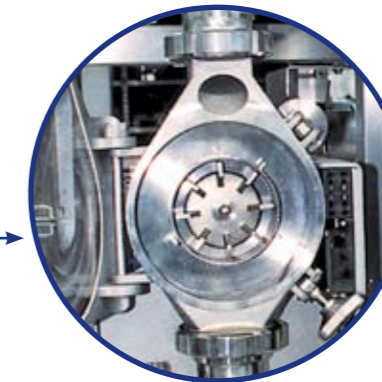
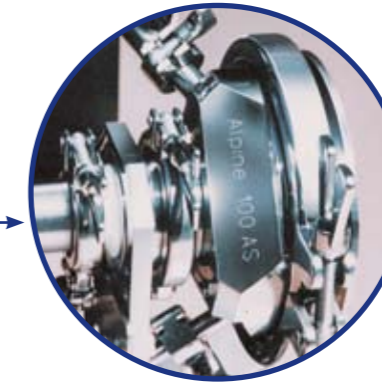
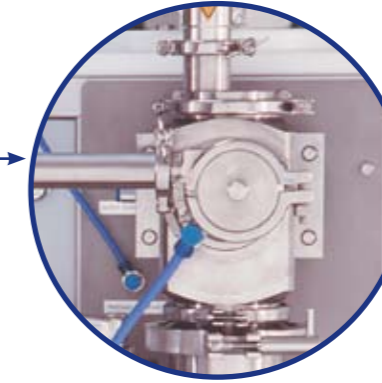
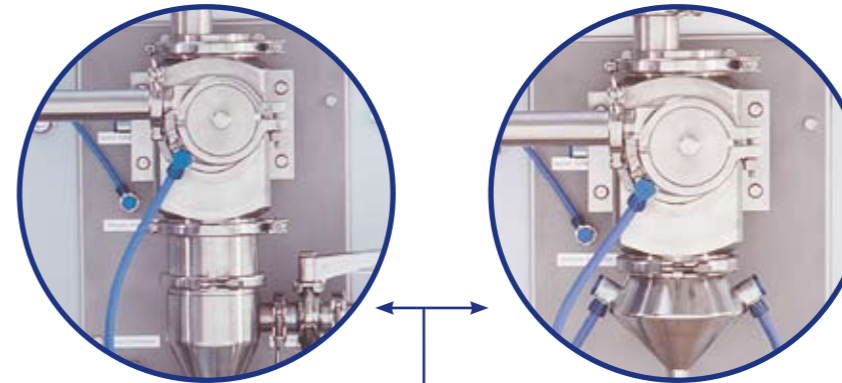
- For soft materials with a Mohs' hardness up to 3.5.
- Fineness values of $d_{97} = 8$ to 80 µm.
- End products with steep particle size distributions and exact topsize limitation free from oversize particles.

ULTRAFINE COMMINATION: ALPINE AEROPLEX® SPIRAL JET MILL AS

- For fineness values of $d_{97} = 5$ to 30 µm
- For product batches between 3 g and 100 g (50 AS).
- Because there are no electric components, this laboratory mill is suitable for sterilisation in an autoclave.

FINE GRINDING: ALPINE FINE IMPACT MILL

- For the fine grinding, disintegration and cutting of materials with a Mohs' hardness up to 3 and end-product fineness values dependent on the installed equipment of approx. 50 to 1500 µm.





MULTI-PROCESSING SYSTEMS MACHINE VARIANTS



STANDARD

To ensure the highest degree of resistance to chemical attack and against corrosion, all product-contact surfaces of Alpine's multi-processing systems are made of rust- and acid-proof stainless steel.

ENHANCED WEAR PROTECTION (NO IRON CONTAMINATION)

The use of oxide ceramics and PU as wear-protection elements for the product-contact surfaces makes it possible to produce extremely pure and high-quality powders with no iron contamination. With this arrangement, Fe contamination levels of less than 3 ppm are possible.



WEAR PROTECTION Al_2O_3



SiC CLASSIFYING WHEEL



PHARMA EEx

EEx design for installation in Zone 1/21 as per ATEX 95.



EXPLOSION-PRESSURE-SHOCK-PROOF TO 10 BAR (OVERPRESSURE)

Dependent on the job, i.e. whether the system will be used in batch operation or continuous mode, it is available in explosion-pressure-shock-proof design to 10 bar overpressure.

PHARMA / GMP DESIGN

The overall design with smooth surfaces and no dead spaces simplifies thorough emptying, cleaning and sterilisation. The system can be dismantled and all product-contact components can be sterilised in an autoclave. As an alternative, an SIP design is also available.

FEATURES

- Construction materials: product-contact parts 316 L, surface quality Ra = 0.4 to 0.8 μm
- System components completely in stainless steel 304, surface quality Ra = 0.8 to 1.2 μm
- Control cabinet in a special stainless design suitable for wet cleaning
- Motors cased with polished stainless steel plate
- Seals made of silicone, EPDM, Chemraz
- Operation in sterile rooms with absolute filter for filter exit air plus sterile filter with polished stainless steel housing for intake air

FOR CIRCUIT-GAS MODE WITH INERT GAS

This kind of system design calls for the system supplier to have complete command of the inerting process, an optimal gas-tight system design and a wealth of specialised know-how and experience, e.g. in the de-

sign of the circuit-gas control unit, the use of special vessels to fill the product into under inert conditions without having to switch off the machine and last but not least in selecting the type of compressor.

INTEGRATED INTO AN ISOLATOR

The most exciting new development is the integration of grinding systems into isolators. This development was motivated on the one hand by the risk to the operating personnel posed by toxic substances, and on

the other hand by the desire to protect sensitive products, e.g. sterile materials, from operator contamination. Conventional mill designs with glove ports in the isolator housing proved to be unsuitable due to the restricted access. This led to redesign of the entire mill and isolator. 3D CAD systems were used to simulate all the operations necessary for powder processing and maintenance. Even with this modern design tool, it is usually still necessary to build a wooden mock-up of the isolator and the mill to test and verify the actual system handling.

INTEGRATED INTO AN ISOLATOR

UPZ



AS



FLUIDISED BED OPPOSED JET MILLS AFG AND AFG-EC



Fluidised bed opposed jet mills require less energy than any other conventional jet mill.

FLUIDISED BED OPPOSED JET MILL 200 AFG

Optimum utilisation of the jet energy and the extremely high precision of cut of the integrated Turboplex ultrafine classifier allow up to 50% energy savings. Another advantage is that fluidised bed opposed jet mills always deliver ultrafine powders with a sharp top cut across the whole working range. Ultrafine powders can also be manufactured with extremely steep particle size distributions to match market and application demands. Because only air and no material is routed through the grinding nozzles, the AFG is also extremely low in wear.

FEATURES

- For materials with a Mohs' hardness up to 10
- Fineness values of $d_{97} = 2$ to $40 \mu\text{m}$
- End products with steep particle size distributions and a sharp top cut
- PU lining and ceramic classifying wheels result in end products with no iron contamination
- Throughput approx. 1 to 25 kg/h (100 AFG)

Product line AFG	100	140	200	280	400
Scale-up factor F	0.06	0.1	0.25	0.5	1.0
Motor output kW	1	2.2	3	4	5.5
Grinding air Nm^3/h	50	100	200	400	800



100 AFG-EC

The 100 AFG-EC was specially designed for processing extremely abrasive mineral raw materials.

FEATURES

- Processing of mineral raw materials with no iron contamination
- Wear-optimised fines discharge
- Grinding bin lined with PU
- Ductings with polyurethane
- Product handling using pivoted slide gates and special containers
- Temperature sensor
- Visualisation using the Simatic Panel 170B with keys
- Machine and system components made of stainless steel for easy cleaning
- Cyclone pre-separation of the ground product. Cyclone with high collection efficiency, wear-protected with PU
- Automatic reverse jet filter, can be dismantled for easy cleaning
- Feed metering screw with large supply bin for processing batches up to 25 kg



READY FOR USE IMMEDIATELY

Design 100 AFG-EC	Standard	Options
Frame	Stainless	
Wear protection	PU	
Class. wheel	Al_2O_3	SiC, stainless
Nozzles	Al_2O_3	Stainless
Fines discharge	Al_2O_3 , PU	

100 AFG-EC FOR ABRASIVE PRODUCTS

100 AFG-EC tech. specs.

Electr. connection	3 phases, 16 A
Compr. air consump.	60 Nm^3/h , 6 bar (g)

TURBOPLEX® ULTRAFINE CLASSIFIERS 50 ATP, 70 ATP, 100 ATP



The multi-processing system can be converted into an air classifier in no time at all.

The classifier bottom section with air inlet is simply fitted to the fixed classifier top section. The coarse material from the classifier is collected in a hermetically sealed drum.

Product line ATP	50	70	100
Scale-up factor F	0.06	0.1	0.25
Motor output kW	1	2.2	3
Class. air Nm^3/h	50	100	250

Practical examples 50 ATP	Powder fineness % < μm^* Analysis points of PSD		Feed rate kg/h	Fines kg/h
Aluminium oxide	97% < 11.5	50% < 2.6	17	7.5
Aluminium powder	97% < 8	50% < 3.7	6	1.5
Boron carbide	97% < 6	50% < 2.5	10	0.36
Bronze powder	97% < 16	50% < 8	7	4.1
Glass beads	97% < 4.5	50% < 2	17.5	1.1
Glass powder	97% < 8	50% < 9	3.5	0.8
Limestone	97% < 4	50% < 2	6.3	2
Fluorescent powder	97% < 5.5	50% < 2.5	16	0.9
Silicon (pure)	97% < 6	50% < 2.7	13	0.15
Silicon carbide	97% < 10	50% < 4.5	7	0.7
Talc	97% < 8.5	50% < 4	3.5	12.3
Wax	97% < 7.5	50% < 4.2	7.5	2.3
Dental ceramic	97% < 26.8	50% < 7.5	17	7.9

* All values are non-binding reference values

TURBOPLEX AIR CLASSIFIER 50 ATP



FEATURES

- For materials with a Mohs' hardness up to 10
- Separation/fineness range steplessly adjustable from $d_{97} = 2$ to $80 \mu\text{m}$
- Throughput approx. 5 to 50 kg/h (50 ATP)
- Extremely high precision of cut
- End products with steep PSD and sharp top cut thanks to proven Turboplex technology
- Ideal for cohesive materials

ZIRKOPLEX® CLASSIFIER MILLS 50 ZPS, 70 ZPS, 100 ZPS

Mechanical fine impact mills with integrated Zirkoplex ZPS air classifier.

ZIRKOPLEX CLASSIFIER MILL 70 ZPS

Practical examples 50 ZPS	Powder fineness % < μm^* Analysis points of PSD		Feed rate kg/h
Aluminium hydroxide	97% < 22	50% < 9	30 - 35
Lead sulphate	97% < 8	50% < 2.6	10 - 15
Calcium stearate	97% < 11	50% < 4.7	10 - 15
Graphite	97% < 70	50% < 22	8 - 10
Limestone	97% < 8	50% < 3.5	12.5 - 2
Limestone (soft crystalline)	97% < 15	50% < 4.5	8 - 10
	97% < 80	50% < 9	30
Copper oxide chloride	97% < 12	50% < 4.8	15 - 20
Lactose	97% < 25	50% < 8	20 - 25
Phenolic resin	97% < 60	50% < 24	20 - 30
Starch derivative	97% < 80	50% < 30	20 - 25
Talc	97% < 12	50% < 7.5	10 - 15
Tricalcium phosphate	97% < 9	50% < 3.2	5 - 10
Zinc chromate	97% < 4	50% < 1.6	3 - 5
Zinc phosphate	97% < 12	50% < 5.9	15 - 20
Sugar	97% < 15	50% < 5.2	3 - 5

* All values are non-binding reference values

FEATURES

- For soft materials (Mohs' hardness to 3.5)
- Fineness values of $d_{97} = 8$ to $80 \mu\text{m}$
- End products with steep PSD and a sharp top cut free from oversize particles

Product line ZPS	50	70	100
Scale-up factor F	0.06	0.1	0.25
Classifier kW	1	2.2	3
Mill kW	1	2.2	4
Grinding air Nm^3/h	50	100	250



SPIRAL JET MILL AS FINE IMPACT MILL UPZ



ALPINE SPIRAL JET MILL 50 AS



ALPINE SPIRAL JET MILL 50 AS

The 50 AS is suitable for the ultrafine comminution of dry materials with a crystalline structure and a Mohs' hardness up to 3, with final particle sizes in the range between 5 and 30 µm. It is also ideal for processing

even extremely small amounts (up to 3 g) of pharmaceutical active substances including parenteralia, DPIs (dry powder inhalants) and other active substances.

FEATURES

- Compact and smooth monobloc design with no welding seams
- Grinding chamber geometry with no dead spaces for optimum yield
- Suitable for mini batches (minimum 3 g)
- Surface finish Ra < 0.8 µm or better
- Small and easy to handle - ideal for set-up in a laboratory fume hood
- The standard design requires only compressed air and no electric power
- Completely preassembled gas distributor with separate pressure regulation valves
- The laboratory unit can be dismantled and cleaned quickly and easily without tools
- The individual components can be sterilised in an autoclave

OPTIONS / ACCESSORIES:

- Stainless steel filter element
 - Stainless steel product container feed metering system
 - Hermetically sealed system with glove box (OEL < 1 µg/m³)
- Other options available on request

Pract. examples AS	Powder fineness % < µm*	
	Analysis points of PSD	
Antibiotics	97% < 10	50% < 4
	95% < 25	50% < 10
Lactose	97% < 5	50% < 1.5
	97% < 40	50% < 12
Nifedipine	99% < 10	50% < 2.4
Pesticides	97% < 10	50% < 4
Salbutamol	97% < 4.2	50% < 1.4
Steroids	97% < 7.2	50% < 1.7

* All values are non-binding reference values.

UPZ FINE IMPACT MILL

UPZ fine impact mills are reliable and universal in use.

The following designs are available as standard:

- Pin mill without sieve with one rotating and one fixed pin disc
- Beater mill with swing or plate beater unit for operation with grinding tracks or sieves

The grinding elements are quick and easy to exchange, meaning that the mill can be converted to permit tackling different grinding tasks with a minimum of effort.



Product line UPZ		100	160
Scale-up factor F approx.		0.06	0.25
Standard drive	kW	1.5	5.5
Standard speed			
Pin disc	rpm	22,000	18,000
Plate beaters	rpm	18,000	14,000
Swing beaters	rpm		7,600
Beater disc	rpm	18,000	7,600
Fine cutting equipment	rpm	18,000	
Drive motor	rpm	3,000	3,000
Weight w/o motor & feed unit	kg	36	100

MIKRO ACM CLASSIFIER MILL



With the newly developed laboratory design and the Easy Clean concept, the Mikro ACM 2 EC offers a high degree of user friendliness.



DESIGN

The most important development objectives of this mill type were the following: firstly, to reduce the cleaning effort to an absolute minimum when changing products, and secondly, to offer a machine that is extremely compact and simple in design and which requires as little space and maintenance as possible and no more than a 380-V mains power connection.

The Mikro ACM 2 EC laboratory system is supplied as a compact unit whose height can be adjusted to suit the existing laboratory equipment. This mobile system can be set up anywhere where there is a mains power socket. The entire unit comprises the feed chute, the metering rotary valve, the classifier mill, the cyclone, a flap valve for product discharge and an industrial vacuum cleaner (fan and residual dust filter). The touch panel is part of the proven PlexControl system and displays all the essential parameters such as speed, air flow rate, temperature and current loading, etc.

FEATURES

- Easy to clean
- Easy to open
- Extremely compact
- On wheels, and thus mobile
- Throughputs up to 80 kg/h and 150 kg/h
- Quiet in operation
- Classifying wheel gap rinsing
- Reliable scale-up

APPLICATION AREAS

- Laboratory and testing operations
- Production of mini batches for sampling and tests
- Determination of the optimum parameters for other Mikro ACM machine sizes



**MIKRO PULVERIZER
BANTAM HAMMER MILL**



PRINCIPLE OF OPERATION

The MP Bantam mills are high-speed hammer mills. The product is fed by means of a steplessly adjustable metering screw or direct by the force of gravity. Comminution is a result of the feed material impacting between the rotating hammers and the liner installed in the mill housing cover. The product exits the mill entrained in the air through a screen clamped in the bottom section. The screen is available in a number of designs. The product falls direct into the desired packing unit (e.g. carton, sack or drum) or into a bin. To permit cleaning, the grinding chamber is opened, thus providing access to the grinding elements, the screen and the product inlet.

APPLICATIONS

Classic application areas are spices, pharmaceuticals such as paracetamol, cosmetics such as face powder and minerals such as uranium oxides. End-product fineness values of between 40 and 2000 µm can be achieved.

LABORATORY MILL

- Suitable for grinding tests and the production of mini batches
- Reproducible results with test batches of only a few grams
- Execution of test series with minimum amounts of product
- Reliable test results for the scale-up to other Mikro Pulverizer machine sizes
- Quick and easy assembly and cleaning of the grinding elements



TECHNICAL SPECIFICATIONS

- Motor output 0.75 kW
- Max. rotor speed 14,000 rpm
- Air flow rate approx. 0.6 m³/min
- Weight approx. 80 kg
- Construction material: available in either stainless or mild steel
- Screens. available in different sizes and with different perforations



**LABORATORY HAMMER MILLS
20/10 HA, 25/12 HA**



Laboratory hammer mills in pharma design for the comminution of pharmaceutical and chemical products. The mill can also be delivered already integrated into an isolator.

FEATURES

- cGMP-conform design
 - Modular design
 - Easy to dismantle. This results in easy and effective cleaning of all product-contact components
 - Clear-cut separation of the product-contact area from the bearing unit and drive
 - Product-contact components can be sterilised in an autoclave
 - Beater unit fixed with only one bolt
 - Design of sieve order-specific
- Options:
- Housing door supported by means of an articulated arm

APPLICATIONS

- Disintegration of agglomerates and lumps (e.g. from drying processes)
- Achievable fineness values < 500 µm
- Particle size distributions with low ultrafines portion



Practical examples 20/10 Ha	Powder fineness % < µm* Analysis points of PSD	Feed kg/h
Alkaloids	97% < 1,000	70
Hormones	50% < 100	40
Muscle relaxants	90% < 150	100
Sterile act. substance	90% < 45	70
Active substances	7% < 1,000	220

* All values are non-binding reference values.

Product line		20/10 Ha	25/12 Ha
Diameter of beater unit	mm	200	250
Number of beaters		14	22
Drive power	kW	2,2	4
Max. speed	rpm	6,000	4,800

HORIZONTAL LABORATORY AGITATED BALL MILLS 90 AHM AND 132 AHM



The 90 AHM is the laboratory version of the AHM product line and is designed as a table-top model with separate control unit.

This mill is suitable for small amounts of product and for development trials - also on the nano technology sector.

Extremely small grinding beads (< 0.2 mm) can be employed with this mill, which is ideal for conducting tests regarding the stabilisation of suspensions in the submicron range.

PRINCIPLE OF OPERATION

The laboratory version AHM has a variable-speed direct drive. The slotted-hole screen is either in the form of a flat screen deck or is designed as a dynamically relieved pipe screen. The 90 AHM can be tilted on a pivoted support to permit filling and emptying. When in upright position, the slotted-hole screen can be cleaned without having to empty the mill.

HORIZONTAL LABORATORY AGITATED BALL MILL 132 AHM

SELECTION OF GRINDING ELEMENTS



APPLICATIONS

- Engineering ceramics
- Mineral substances
- Pigments, paints
- Fine-grade chemicals
- Pharmaceutical products
- Dental ceramics
- Food supplements
- Abrasives
- Submicron and nano grinding

Product line AHM		90	90/3	90/1	132
Drive power	kW	2.2	2.2	2.2	7.5
Grind. bin volume	litres	1.10	0.50	0.25	5.0
Max. speed	rpm	4,000	4,000	4,000	2,500



HORIZONTAL LABORATORY AGITATED BALL MILL 90 AHM

HANDLING

The high degree of flexibility is a result of being able to fit grinding bins and agitator shafts of different length to give different grinding bin volumes. This makes grinding bin sizes of 250 ml, 500 ml and 1100 ml possible. Clamp closures guarantee simple cleaning and dismantling.

WEAR PROTECTION

The wear parts of the machine are exchangeable and can be made of PU, stainless steel, ceramic, tungsten carbide or plastic.

MULTI-PLEX CLASSIFIERS 100 MZR AND 1-40 MZM



MULTI-PLEX-ZIGZAG CLASSIFIER 1-40 MZM

This laboratory classifier is an up-stream classifier. The zigzag geometry of the classifying tube ensures that the coarse material is repeatedly rinsed by the classifying air. This results in a multi-stage classification and the classifier achieves an extremely high precision of cut. The cut point can be adjusted over a range from 0.1 to approx. 6 mm. The classifier is mainly used for sorting and separating different materials. Because the classifying process can be viewed through the Plexiglas cover, the 1-40 MZM is ideal as a demonstration model for up-stream classification and as a test stand for laboratory trials during the course of teaching activities.

FEATURES

- Plexiglas cover allows the classifying process to be observed.
- Classifying tube cross-section 40 x 40 mm.
- Air flow rate 6 - 60 m³/h, corresponds to 1 - 10 m/s flow velocity.
- Batch mode, batch size either 0.5 or 25 litres.
- Throughput approx. 3 - 30 kg/h.
- Maximum feed size approx. 10 mm.
- High precision of cut with coarse material free from fines.



1-40 MZM MULTI-PLEX® ZIGZAG CLASSIFIER IN PHARMA DESIGN

APPLICATIONS

- | | |
|------------------------|-------------------------------------|
| Leaf drugs/tobacco | Separation of leaves and stalks |
| Spices | Removal of sand or stones |
| Rose hips | Separation of seed pods |
| Hard gelatine capsules | Rejection of empty capsules |
| Wood shavings | Manufacture of different fractions |
| Cable scrap | Separation of copper and insulation |
| Cacao | Determination of the shell content |
| Plastic granules | Separation of dust and angel hair |
| Seeds/pulses | Separation of shells and pods |
| Vitamins | Dust extraction at approx. 100 µm |

MULTI-PLEX LABORATORY CLASSIFIER 100 MZR

A laboratory classifier that is easy to operate with an extremely high separation precision, and which is also suitable as a production-scale classifier for small batches.

FEATURES

- Steplessly adjustable separation range of $d_{97} = 2 \mu\text{m} - 80 \mu\text{m}$
- Suitable for products with a Mohs' hardness up to 5
- Batch mode, minimum batch size approx. 50 g, max. 1 liter of feed material
- Throughput 1 to 5 kg/h



MULTI-PLEX LABORATORY CLASSIFIER 100 MZR



AIR JET SIEVE 200 LS-N

Analysis sieve units with state-of-the-art equipment for extremely precise and reproducible particle size analyses in the laboratory. The membrane keypad is impressive in its functional clarity and is easy to operate. The singularly good dispersion of the feed material by the nozzle jet makes measurements down to less than 10 µm possible with microprecision sieves. The 200 LS-N is the successor to ALPINE's tried-and-tested 200 LS air jet sieve, of which 13,000 have been sold over the last 50 years.

ANALYSIS RANGE

- 20 µm to approx. 4000 µm with Ø 203 mm analysis sieves
- 10 µm to 30 µm with Ø 75 mm microprecision sieves

FEATURES (STANDARD UNIT)

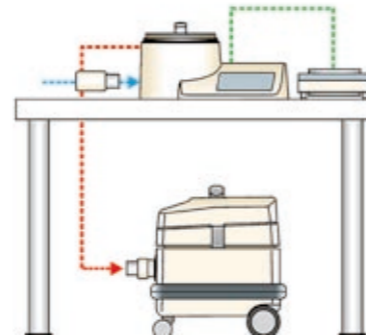
- Integrated processor for evaluation of the analysis results: the particle size distribution is calculated from the weights of the sample and the sieving steps, manual conversion is superfluous.
- Optional: software program or matrix printer

- Two RS 232 C serial interfaces for the direct connection of a laboratory balance, printer, underpressure controller, tapper and for connection to a PC (LS-PRO).
- Electronic timer with pause feature
- Tare reset for optional laboratory balance
- Underpressure indication in display: underpressure controller (optional)
- Parameters can be assigned easily via the keypad, e.g. language selection (D, GB, F, E), type of balance, reset of cleaning and inspection counters, selection of different modes for sieve identification
- Ergonomic cast aluminium housing with standard appliance socket for vacuum cleaner. Other construction materials and coatings upon request
- Sieve housing with self-centring sieve holder for analysis sieving drum
- Rotating slotted nozzle made of stainless steel 1.4581, gearmotor N = 20 W
- Plexiglas cover; tapping hammer
- To order, either 230 V, 50/60 Hz or 115 V, 50/60 Hz

From Summer 2010 onwards, the revolutionary successor model will be available

FULLY AUTOMATIC SIEVE IDENTIFICATION

Sieve identification effected by means of an antenna in the basic unit and a transponder on the sieve frame, control via either the unit itself or by means of the LS-PRO software with stored database. A prerequisite for perfect functioning of the fully automatic sieve identification is the transponder on the sieve and the antenna in the 200 LS-N basic unit.



ALPINE AIR JET SIEVE 200 LS-N

IN-LINE PARTICLE SIZE ANALYSIS WITH THE INSITEC ANALYSER

Fully automatic optical in-line measuring system permits analysis of the particle size and concentration of dry powders.

FEATURES

- Analysis principle: laser diffraction
- By-pass for direct extraction of a partial product stream from the main product stream
- Time-consuming manual sampling and sample handling no longer necessary
- Continuous signal in the form of a controlled variable permits automatic fineness regulation
- Connection to PlexControl system control for product monitoring or parameter adjustment (control)
- Encapsulation protects the analyser against dust and splash water
- Product-contact parts made of stainless steel



IN-LINE PARTICLE SIZE ANALYSIS WITH THE INSITEC ANALYSER



Product development on a miniature scale

Alpine's Picoline series stands for fully blown production technology for R&D laboratories. And that at an early stage and at low capital investment costs! Machines for grinding, classifying, mixing and for particle design are included in the Picoline series. Picoline is synonymous with maximum yields when wet or dry processing sample sizes ranging from 0.5 g to 100 g. The space requirement

of the mini machines is modest and they are easy to operate, dismantle and clean. Knowledge gathered during R&D activities with the Picoline can be scaled up to pilot- and production-size machines. In terms of design and process technology, the machine concepts of the Picoline orient themselves to the well-established product lines from Hosokawa Alpine and Hosokawa Micron B.V.



And because the operating principle of Alpine's Picoline machines corresponds to the big production-scale machines, R&D departments can be sure that a production process developed using a Picoline machine can be transferred to any production machine by Hosokawa Alpine.



Fluidised bed opposed jet mill



picojet

Grinding chamber diameter	40 mm
Number of nozzles	3
Nozzle pressure	3-8 bar
Total air volume	12 m³/h
Class. wheel diameter	20 mm
Class. wheel speed max.	50,000 rpm
Classifier drive	0.15 kW
Min. product quantity (batch)	ca. 5 g
Throughput	ca. 1 kg/h



Mechanofusion Particle Design



picobond

Rotor speed	max. 6,000 rpm
Drive power	0.75 kW
Volume V / litre	0.1
Rotor geometries	Mechanofusion AMS, NOBILTA special rotor
Dimensions L x B x H	700 x 400 x 350 mm



Agitated ball mill



picoliq

Grinding chamber volume	8 - 90 ml
Rotor speed, max.	11,000 rpm
Grinding bead size	0.1 - 1 mm
Drive power	0.63 kW
Min. product quantity (batch)	ca. 0.5 g
Throughput	0.2 - 30 l/h



Batch mixer

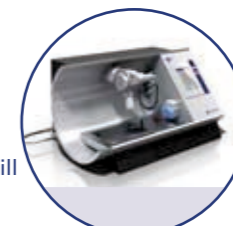


picomix

Rotor speed, max.	6,000 rpm
Max. peripheral speed	20 m/s
Drive power	0.75 kW
Min. mixer volume	25 ml
Max. mixer volume	100 ml

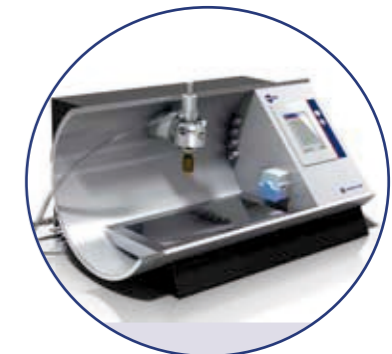


Universal impact mill



piconizer

Grinding chamber diameter	33 mm
Nozzle pressure	5-8 bar
Total air volume	12 m³/h
Throughput	0.1 - 5 g



IN PREPARATION



Classifier mill



Ultrafine classifier



High-speed impact mill with 2 rotors



Spiral jet mill

HOSOKAWA ALPINE

ONE COMPANY – TWO BUSINESS DIVISIONS

TESTING CENTRE AND TESTING LABORATORY

THE ALPINE TESTING CENTRE

- 3000 m² floor space over 4 stories
- Wet and dry processing
- 20 test engineers, laboratory technicians, process assistants and mechanics
- Over 60 state-of-the-art machines and systems on a production and laboratory / pilot scale
- Testing possibilities for just about every product
- Technologies: comminution, air classification, sieving, mixing, drying, dedusting, nanoparticle design.

Around 500 customer trials are carried out every year aimed at optimum system configuration and determination of process-related guaranteed values.

PARTICLE CHARACTERISATION

A - PARTICLE SIZE ANALYSIS

Sieving analysis

- Alpine air jet sieve 200 LS-N for exact and reproducible dry sieving analyses: range from 20 µm to approx. 4000 µm
- Alpine wet sieving unit: analysis range from 10 µm to 100 µm
- JEL 200 multi-deck test sieving machine: analysis range from approx. 100 µm to a few mm

Sedimentation analysis

- **Micromeritics SediGraph 5100**, analysis range from approx. 0.2 µm to 300 µm. Typical applications: abrasives, minerals, etc.
- **CPS disc-type centrifuge for fast and high-resolution sedimentation analysis at up to 24,000 rpm, analysis range 10 nm - 50 µm**

Laser diffraction units

- **Malvern Mastersizer S**, analysis range from approx. 0.1 µm to 800 µm
- **Insitex**, Malvern Instruments, on-line particle analysis from 0.5 to 200 µm
- **Sympatec HELOS**, 5 analysis ranges from approx. 0.1 µm to 2000 µm
- **Horiba LA 950**, analysis range 0.01 µm to 3000 µm

Counters

- **Multisizer 3 COULTER COUNTER**, Beckman Coulter; application: toner

Microscopic analysis

- SEM scanning electron microscope **JOEL**, max. magnification up to approx. 100,000-fold
- Stereo microscopes

B - BET SURFACE ANALYSIS

- **Quantachrome NOVA 2000E**, specific surface and pore size measurement

C - PARTICLE CHARGE ANALYSIS

PA particle analysers

Field ESA – zeta potential measurement by means of electrokinetic sonic amplitude technology

Measuring range of particles in a suspension: as small as desired up to 30 µm

- **Particle Metrix CAS-02 Charge Analysing System** - particle charge analyser for titration using streaming current potential as the monitor signal

MATERIAL CHARACTERISATION

- **STA 6000 thermal laboratory system**, Perkin Elmer; simultaneous system for the thermogravimetric measurement and calorimetric analysis in the temperature range between 15° and 1000°C.

- **Spectrum 100 FT-IR infrared spectroscopy**, Perkin Elmer, measurements in transmission and reflection using a KBr pellet or an ATR unit

DATA COLOR, ELREPHO

Spectral photometer for whiteness measurements
Typical application: filler systems for the paper and plastics industries

Other analysers and test units

Argon pycnometer for density analysis, stamping volumeter (drying lamps, muffle furnace, drying cabinets, samplers, ultrasound dispersion, etc.)



LABORATORY TECHNOLOGY

A total of 10 complete systems and processes are available for comminution, air classification and particle design.

