



SUPERJET

KOMPAK-1



SUPERJET

KOMPAK-2



SUPERJET

KOMPAK-3



SUPERJET

ISOPAK-1



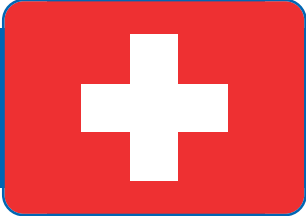
SUPERJET

ISOPAK-2



SUPERJET

ISOPAK-3



A P T M

ADVANCED POWDER TECHNOLOGY AND MICRONISATION



SUPERJET

MICRONISERS

Let us introduce ...



A swiss company specialized in powder technology and micronisation, has implemented an efficient design and manufacturing organization with modern research and development facilities, dedicated to fine micronisers and other special, related equipment.

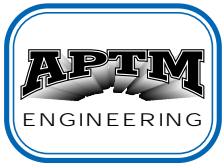
APT M has pioneered, since its 1988 foundation, ultra-fine grinding systems for a large variety of products, such as: abrasives, fine chemicals, cosmetics, pharmaceuticals, plastics, ceramics, minerals, pigments and metal alloys, and has consistently delivered the most suitable machine for every problem.



The SuperJet microniser is a spiral jetmill, without moving parts, that finds the most common application in the production of fine particles, between 0.5-5 microns average size, being also effective for sizes up to 50 microns. It gives an enormous increase of powder surface area that makes possible complete and higher reaction rates, greater absorption and faster solution, better suspensions and perfect mixing and dispersion of dry or liquid components

Micronisation has proved the practicability of combining the grinding process with other chemical or physical operations. SuperJet micronisers can blend, mix and disperse ingredients, dehydrate, deodorize, coat products with colors, sugars, vitamins, oils or waxes, improve chemical reactions such as oxidation and calcining or inhibit chemical changes through inert-gas operation.

APT M's design, in line with Good Manufacturing Practice, is based not only on the knowledge of product behaviour, gained over years of dealing with materials of all types, but also on active collaboration with many customers around the world.



Profitable operation in today's economic environment requires effective and efficient processing of the last generation of powders. It is not only confined to the micronisation operation but also involves the preparation, mixing, handling, dispensing and other successive processes.

Total engineering is the only answer to these requirements as it goes beyond careful design and precision manufacturing. APT M engineers each machine to suit the specific product requirements, in full respect of operational and environmental safety issues.



For the most demanding products: sterile, toxic or abrasive, APT M reviews the entire powder processing system and presents particular solutions such as special wear liners for contact parts or totally contained working environments, with glove-boxes and half-suit isolators.

If a substance can be ground in a jetmill, APT M has probably done it and can specify the exact microniser configuration for that product. For new requirements, APT M is uniquely qualified to develop the most efficient system configuration and process parameters to meet the specification.

Before shipment, APT M validates the micronising systems to ISO 9000 requirements, and further undertakes IQ (installation qualification) and OQ (operational qualification) works during site commissioning. For pharmaceutical systems, FDA-validation documentation or other procedures, according to local regulations, are routinely carried out.



Whether a single microniser or a complete powder processing system is required, the same skilled and experienced staff is involved to ensure that requirements are fulfilled and the most suitable equipment is offered and delivered.

APT M's InTech design features precisely what it implies: INTELLIGENT TECHNOLOGY.

All components are engineered for effective and reliable processing. Witness the SuperJet microniser with no moving parts, optimized static classifiers and built-in cyclone that delivers remarkable fineness and narrow size distribution with single-pass operation. This modular system is maintenance-free, does not need scheduled checks and has exceptionally long service life. And it's teamed with automatic controllers that intelligently monitor the process and can make instant decisions to help keep SuperJet system both operable and safe.



SUPERJET DATA SHEET

JM-PHARMA / SM-SIMPLIFIED

SuperJet Microniser	Nominal Size		Air/Inert Gas @7bar/100psi		Superheated Steam @14bar/200°C		Expected Output (depends of grindability)	
	inch	mm	Nm3/min	scfm	kg/hr	lbs/hr	kg/hr	lbs/hr
JM/SM-1	4	105	0.7	25	28	62	0.2-1.5	0.4-3.3
JM/SM-2	8	205	3	110	120	265	0.4-38	0.9-85
JM/SM-3	12	305	6.9	245	295	650	1.5-80	3.3-175
JM-4	16	405	12.8	450	495	1090	3.5-150	7.7-330
JM-5	20	505	17.9	630	765	1690	5.0-350	11-770
JM-6	24	610	25.7	910	990	2180	8.0-550	17-1200
JM-7	30	760	39.5	1395	1650	3640	25-1200	55-2600
JM-8	36	910	54.5	1925	2350	5180	40-2000	88-4400
JM-9	42	1070	82.0	2895	3200	6950	90-3700	200-8200



... **APT M, manufacturer of SuperJet micronisers**

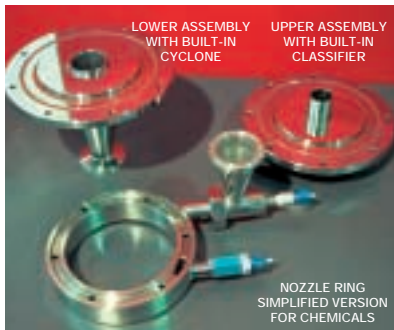
SuperJet microniser ...

Jetmills (fluid energy mills) are static equipment, without moving parts, that perform grinding through high-speed collision of particles. They are based on DeLaval nozzle principle by which the particles introduced in fluid streams with speeds of 2-2.5 Mach, accelerate at 5-6 G and get enough kinetic energy to pulverize by impact.

First impact jetmills used targets or opposite fluid streams and contaminated the product by abrasion of the collision plates or internal walls and are less appropriate for fine chemicals and modern pharmaceuticals.

PRINCIPLE OF OPERATION

SuperJet is a spiral jetmill that consists of a shallow cylindrical chamber wherein the particles, accelerated by the feeding fluid stream into a venturi system, are acted on by several grinding jets spaced at regular intervals around the periphery.



SUPERJET MICRONISER:
CLEAN DESIGN WITH FEW COMPONENTS
PHARMA VERSION IS SLIGHTLY DIFFERENT

The grinding jets intersect the imaginary trajectory of the particles, and act with an important drag force causing the suspended particles to collide and reduce one another by impact. Since the collisions occur in the stream of particles, the contacts with walls are negligible, with no risk of product contamination.

Fine particles are carried by the fluid vortex at 30-150 mt/sec tangential and 1-3 mt/sec radial speeds, while coarse, heavier particles are held in the grinding zone by centrifugal forces.

SuperJet micronisers present important innovations in respect to their class of spiral jetmills, allowing the direct collection of the product from the grinding chamber and full optimization for a specific product or range of products.

Particular design and precision machining avoid energy losses and allow incorporation of a special, high-speed cyclone at the exit of the classifying system, as part of the jetmill.

The collecting vortex with tangential speeds of 6-80 mt/sec and vertical speeds of about 1 mt/sec ends into a closed, collecting bin, below the mill.

The construction is very simple, easy to disassemble and clean and avoids risk of fiber contamination from the dust separator.

SuperJet top-discharge versions, without the microniser's built-in cyclone, are also available and used for agro-chemicals, collected in silos.

OPTIMIZATION OF GRINDING ANGLE

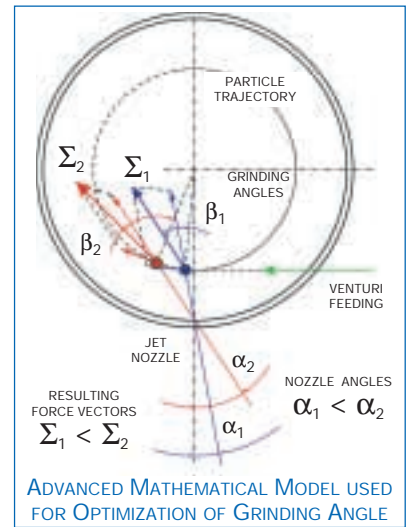
Realistically, the aerodynamics of particles is unpredictable, as it depends on the shape given by different crystallization and pre-grinding processes. The micronisation is determined by these properties and by the jet's drag forces that act on the particles. To achieve good results with difficult-to-grind materials (very hard, light weight, with needle-like shape), the process must be controlled not only by the fluid pressures but through the variation of jets, as well.

SuperJet micronisers feature the unique possibility to modify the jet's angle, with major implications for the force vectors, as shown in the figure.

Modification of the grinding angle is currently used to optimize the mill behaviour for a specific product or range of products.

SWISS ENGINEERING & PRECISION MACHINING

The most suitable angle is determined by APTM's proprietary CAD procedure, employing an advanced mathematical model that describe the grinding process for micron-size particles. A family of 26 nozzle rings and relevant classifiers are available from stock and offer the widest possible choice for process optimization.



ADVANCED MATHEMATICAL MODEL USED FOR OPTIMIZATION OF GRINDING ANGLE

The smallest imperfection of a fluid nozzle generates undesirable turbulences that preclude the narrow size distribution and bring to poor quality of the finished product.

SuperJet's precision of nozzles is achieved through special machining and accurate calibration of jet outlets with tolerances of 0.010 mm on diameters and 0.3° machining angles.

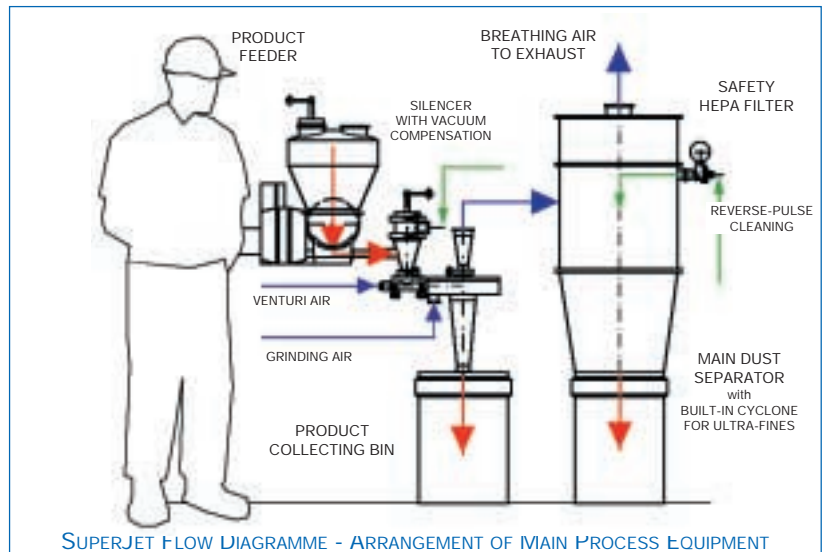
The same care of detail is extended to the whole assembly, made of AISI316 stainless steel, with mirror finishing at 320-360 grit of contact parts.

Replaceable internal linings include PTFE, polyurethane, boron carbide, and hard-metal alloys, etc.

All SuperJets can be customized and optimized according to the specification of the product.

That means complete freedom of choice.

At any time.



SUPERJET FLOW DIAGRAMME - ARRANGEMENT OF MAIN PROCESS EQUIPMENT

... a jetmill that brings you the ultimate perfection: choice

SuperJets for Cosmetics & Fine Chemicals ...

Powder micronisation techniques used in chemical and cosmetics industries are quite similar, producing particle sizes in the 10-20 micron range.

In 1988 APTM was the first company to offer an eye-shadow microniser. Since then, it has delivered machines to the best names and biggest manufacturers of cosmetic powders.

Continuous research into micronisation for cosmetic formulations has shown considerable improvement for both manufacturing technology and product quality. The result has been the development of sophisticated products that are longer lasting and easily applied without inconsistency.

Micronisation achieves the fundamental requirement of a formulation: the completely homogenous dispersion of pigments and binder into the powder.

The particle size is considerably reduced from the typical 50-150µm, and a generally spherical particle shape is an added advantage.

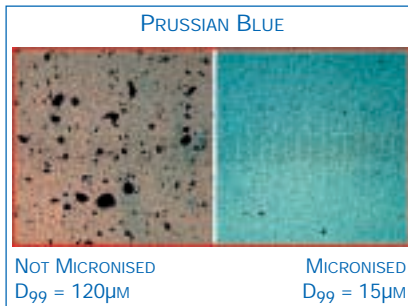
Micronised monochromatic bases, prepared with one or few pigments mixed with white base, avoid several colour corrections that are necessary in the traditional process. This technique presents many other advantages:

COLOUR COVERAGE

It is accepted that colouring, durability and luminosity of a make up are the most important features of decorative cosmetics.

The dispersion of components during micronisation induces an increased intensity of pigment coverage. Micronisation improves colour coverage, and the dispersion of the binder allows a reduction in pigment quantity. As a consequence, the risk (even if minimal) of irritation or sensitivity is reduced.

Major part of pigments absorb a part of the incident light and reflect the rest in



different directions. The perceived colour is complementary to corresponding colour in the portion of the visible spectrum absorbed by the materials.

The effect of micronisation is most evident when observing the differences between traditionally ground and micronised Blue monochromatic base. This pigment had initial agglomerates of 100-150 microns that were reduced through micronisation to 5-20 µm. Even visually, the increased intensity of the colour coverage is clearly noticeable.



SUPERJET KOMPAK-1

The micronisation process remarkably improved the colour coverage of the pigment and reduced the amount necessary to obtain the same tint of the product.

IMPROVED QUALITY

The quality of micronised cosmetics is much improved as products are longer-lasting and exhibit velvety touch and feel, being easily applied and shaded.

Generally, cosmetics present particles and agglomerates of up to 100-150µm that can be distinctly felt while micronised powders are below 20µm and exhibit a supremely smooth touch.

For certain blushers and cake eyeliners optimal combinations of harmony and luminosity are obtained through partial micronisation of some components or the complete product.



SUPERJET KOMPAK-2

As the binder is being perfectly dispersed, there is no risk of re-crystallization over time and the product maintains all properties for a longer shelf life.

COST SAVINGS

Micronisation brings process simplification and a reduction in manufacturing time and costs by the elimination of colour corrections, intermediary sievings and by the fact that the machine can run unattended for much of its operating time.

The quick and complete disassembling of all components gives a significant reduction of cleaning time between batches of very different colours.

Incorporation of the SuperJet microniser and the related technology for production of cosmetic powders results in highly sophisticated products.

Other machines, especially designed for micronised powders, such as the SuperMix blender, complete the family.

SuperJet Micronisers present a perfect combination of scientific application and technical innovation in design.

A flexible modular approach to construction offers solutions customised to every need and requirement.



SUPERMIX POWDER BLENDER



SUPERJET KOMPAK-3

... a microniser that learns what you need and delivers it

SuperJets for Pharmaceuticals ...

SuperJet-Pharma versions are in line with Good Manufacturing Practice worldwide, and feature sophisticated designs, that fulfill any technical specification or micronisation requirement:

INTELLIGENT TECHNOLOGY

- A SuperJet microniser has direct collection of the product from the grinding chamber without risk of fiber contamination. It has replaceable nozzle rings with optimized grinding angles, a horizontal venturi feeding system that avoids metal contamination and built-in, static classifying system that assures very narrow particle size distribution
- Twin-shaft feeder, volumetric or loss-in-weight models, for accurate feeding of poor flowing products, with twin concave-profile, self-cleaning, screws, able to break the agglomerates and to assure a constant feed rate for the whole batch.
- Venturi silencer with sight glass and HEPA filter attachment to avoid contamination in case of blow-backs.
- Sanitary, high-efficiency, dust separator combining inertial and static effects, equipped with membrane filter cartridges, reverse-pulse, automatic cleaning and final, safety HEPA that exhausts safe, breathing air quality to the atmosphere.
- Sanitary U.S.D.A. accepted design, without recessed surfaces, allowing full and easy access to internal parts.

PHARMACEUTICAL SPECS

The process equipment is made of stainless steel AISI316, hand polished and extrafine finish of contact parts, with 320-360 grit, Ra 0.25-0.32µm. Super-mirror finish, 400-600 grit, Ra 0.16-0.25µm is available on request.



SUPERJET ISOPAK-2 DETAIL

Connections feature quick-release clamps designed to meet U.S.D.A. 3A specification, that disassemble by hand. FDA-approved materials such as silicone or PTFE are used for air hoses, gaskets and O-rings.

HEPAs are modular, 99.999% (EU14) absolute retention at 0.3µm DOP, scanned per IES standards and individually certified for efficiency.

TOTAL CONTAINMENT

The new concept of total containment technology is applied to Isopak-series, used for sterile or toxic products:

Process glove-boxes or isolators hold all the process equipment and are kept at negative or positive pressures, to avoid contamination of the product or of the environment.



SUPERJET ISOPAK-2 CUSTOMIZED

Inside the isolators, the working areas are Class 1000 or better, with laminar flows and high-speed, air recirculation through HEPA filters to capture the ultra-fine dust released during the disassembling and cleaning operations.

Purified water showers, washing sinks, vacuum and ultrasonic cleaners and trapped drains allow perfect cleaning of all components, inside the isolators, without risk of cross-contamination.

The dialogue with the external room is made through airlocks that are kept at differential pressure in respect to the working environment and to the room.

Clean-in-place, on and off-line steam sterilized equipment along with sterile, contained environments are used for highly sensitive products.

CAREFUL ERGONOMICS

Each isolator's design is subject of a particular ergonomic study to assure that all the process equipment and air filtration systems can be serviced without breaking the containment.

The working areas are easily accessible through half-suits and feature service and stand-by lights that are built into the ceiling to assure perfect working conditions according to all GMPs.



SUPERJET KOMPAK-2 10BAR RESISTANT

The half-suit operator has a substantially greater working area and can handle effortlessly any part of equipment.

The double-walled half-suit allows natural breathing and permits heat discharge. Breathing air supply, located inside the isolator, has independent air flow controls, fan and HEPA filters. By virtue of a pressure-equilibrium phenomenon, the half-suit is suspended by a cushion of air around the operator, thereby facilitating movement. Vision is very wide through the transparent helmet, welded on the half-suit.

Many process and auxiliary controls are duplicated inside the isolator, to allow operation from the half-suit.

PHARMA VALIDATION

To satisfy the requirements of pharmaceutical Regulatory Authorities (FDA, MCA, etc.) each piece of equipment, utility and facility affecting the quality of the product must be certified and undergo validation.

APTM routinely undertakes on-site Installation Qualification (IQ) and Operational Qualification (OQ) and participates, during Performance Qualification (PQ), with the process and equipment optimization, for the specified class of products.



SUPERJET KOMPAK-2 SPECIAL, 10BAR DESIGN

... the perfect balance of total engineering and profitable operation

SuperJets for Special Applications ...

SuperJet micronisers have several applications in different industries that require customized versions, such as pigments, ceramics, insecticides, metal alloys, rare earths or other hard and abrasive products.

In many cases, the design specification is issued in close collaboration with the customer, who is also involved in approval of manufacturing drawings.

Powder processing systems for sterile or highly reactive products, with risk of explosion or oxidation, qualify for customized machines.

When a product requires special micronisation conditions, the customization is limited to the process equipment and to the right choice of the nozzle ring, with an optimized grinding angle.



SUPERJET CONTROL PANEL DETAIL

Safety or environmental issues might require the total containment of the process and in this case, SuperJet-Isopak series is customized for intrinsic safety and special working conditions.



SUPERJET KOMPAK-5



SUPERJET KOMPAK-2
WITH SUPERLOOP N₂ CLOSED-LOOP SYSTEM

Among many design and safety issues, particular attention is given to the process controls, with state of the art electronics and software to monitor and document all parameters.

Automatic controls enable unattended running. A system monitors continuously the factory supply lines and stops the process in case of failures.

High-precision, electronic pressure controls monitor the microniser with proportional pressure regulators or pneumatically-actuated V-ball control valves that are specifically dimensioned for very quick response and steady operation. The good operation of the microniser is achieved with pressure offsets below 0.1 bar and 2% feeding.

Synoptic and LCD-alarms with fault messages displayed in plain english, signal process pressure drops on the microniser lines and across the filters. All alarms are centralized for relay output and serial RS232 ports are available for remote PC control.

Every HEPA filter is independently monitored, as are the negative pressures inside the isolators, for which APTM developed special relief valves, able to operate at 8-12 mmH₂O.

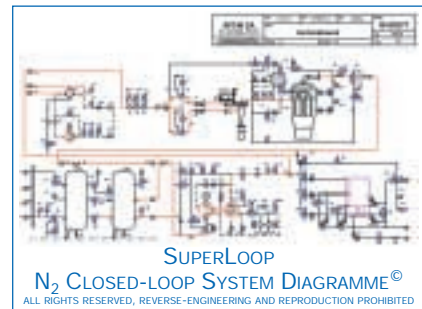
Electronic motor controllers allow stepless regulation of feed screw speeds across the specified range and feature an adjustable current limiting circuit factory-set to prevent overloading.

APTM supplies if required the compressed air station with oil-free or lubricated screw, compressor, single or double-stage, along with air drying and treatment equipment.

Pharmaceutical applications require sanitary, sterilizing filters that intercept any contaminant that might come in contact with the product.

Standard batch validation equipment with 4-20 mA loop signals use pressure transducers with 0.6% overall deviation and multi-pen, fully overlapping process recorders that are fully settable from the integral control panel.

Configuration and process data stored in EEPROM and battery-backed RAM and optional RS422 communication ports are available.



SUPERJET ISOPAK-3 CUSTOMIZED

For products that present risk of explosion, the process equipment is designed and certified for pressure vessel inspection with local authorities.

Generally, at APTM, the possibilities for customization are unlimited and include inert-gas, closed-loop systems or 10/16-bar pressure-shock resistant versions, with hydraulic tests and full inspection (welding X-rays, etc.) as locally specified.



SUPERJET CONTROL PANEL DETAIL

... lavish attention to detail for best operating standards

APTM commitment

- **SINGLE-PASS EFFECTIVENESS:** requested particle size is achieved in a one pass, continuous operation that avoids material overwork and losses during additional handling.
- **PRODUCT STABILITY:** the absence of moving parts avoids attritional heat and the cooling effect of the compressed air, as it expands at the jets, provides an ideal environment for pharmaceuticals, plastics, insecticides and other heat-sensitive materials. Highly-reactive products with risk of oxidation or explosion in conventional grinding are micronised with inert gases.
- **OPTIMIZED EFFICIENCY:** while many jetmills produce micron-size particles, none can match the uniformity and narrow particle size distribution of SuperJet micronisers that benefit from APTM's proprietary optimization algorithm, an established computational procedure routinely applied for every machine. SuperJet micronisers feature replaceable nozzle rings with an optimized grinding angle for each product. The particle shape and narrow size distribution are optimized by classifiers and the built-in cyclone.
- **OUTSTANDING PURITY:** particle-on-particle collision grinding and horizontal feed into the mill chamber avoid any metal contamination. Direct product collection from the grinding chamber, avoids fiber contamination. The whole system is sanitary, USDA-accepted design and made of AISI 316 stainless steel, with mirror finish, 320-360 grit (Ra 0.25-0.32µm) of contact parts, without threads or recessed surfaces. This allows perfect cleaning of components and fast changeover without risk of cross-contamination.
- **VERSATILE SIMPLICITY:** the clean design of SuperJet micronisers is an embodiment of simplicity with very few, cylindrical parts and quick-release clamp connections that disassemble by hand. Different products, crystalline structures and grinding specs can be processed with the same machine through simple substitution of three components. The SuperJet is a unique system - a microniser that is second to none in terms of versatility in the laboratory or production environment.
- **COMPACT MODULARITY:** years of extensive research on materials and technologies have brought SuperJet systems to a very compact, modular design that allows customization and quick delivery. Complete modularity and interchangeability give low initial costs and the flexibility to re-configure the system should the range of products change.
- **INTRINSIC SAFETY:** every SuperJet microniser represents a closed system that avoids release of fine dust to the environment, even in case of machine failure or human faults. When special safety issues are required by sterile, toxic, reactive or potentially explosive products, APTM offers intrinsically safe machines that answer all these issues.

Due to the compact size of equipment, full-containment technology can be applied without compromise and features glove-boxes and half-suit isolators, kept at negative or positive pressure in respect to the environment.

Nitrogen-inerted systems, argon isolators, class 1000 sterile processing, inert gas, closed-loop systems that are independent of liquid storage or 10/16-bar pressure resistant systems operated with compressed air are available and designed to local safety and pressure-shock resistant regulations.



SUPERJET
MICRONISING
SYSTEM
10-BAR PRESSURE-SHOCK
RESISTANT
WITH
TOTAL
CONTAINMENT
ISOLATOR
CUSTOMIZED
FOR
TOXIC
AND
POTENTIALLY
EXPLOSIVE
PHARMACEUTICALS

SuperJet ... what a high-tech microniser should be

Before purchase decision ... call micronisation pros at APTM

AUSTRIA Metallurgical Powders	SuperJet Microniser model Isopak-3, with inerted glove-boxes is for rare earth alloys and features a closed-loop nitrogen circuit
CANADA Pharmaceuticals	SuperJet Microniser model Isopak-1, Pharma, U.S.D.A. accepted design, used for toxic pharmaceuticals, features nitrogen blanketing and isolation enclosure
COLOMBIA Cosmetics	SuperJet Microniser model Kompak-2, standard, employed for high quality blushers and eye-shadows, features PTFE lining
DENMARK Pharmaceuticals	SuperJet Microniser model Kompak-2, Pharma U.S.D.A. accepted design, operated by compressed nitrogen for St2 powders
ENGLAND Pharmaceuticals	SuperJet Microniser model Isopak-1, Pharma, U.S.D.A. accepted design, used for R&D active ingredients, features nitrogen closed-loop and isolation glove-box
ENGLAND Pharmaceuticals	several SuperJet Micronisers model Kompak-2, Pharma, U.S.D.A. accepted and 10-bar pressure-shock resistant design, also feature a closed-loop nitrogen circuit
ENGLAND Pharmaceuticals	several SuperJet Micronisers model Isopak-2/T, complete transfer/processing lines for inhalation therapy products, with several isolators and 10-bar pressure resistant
ENGLAND Metallurgical Powders	SuperJet Microniser model Isopak-3, with nitrogen-atmosphere enclosure employed for permanent magnets and features a closed-loop nitrogen circuit
FRANCE Metallurgical Powders	SuperJet Microniser model Kompak-1, standard, used for research and development works and features nitrogen blanketing
FRANCE Cosmetics	several SuperJet Micronisers model Kompak-2 and Kompak-3, employed for eye-shadows, feature PTFE lining and 3-bar pressure resistance
FRANCE Pharmaceuticals	SuperJet Microniser model Kompak-2, modular, with PharmaLift column, for St2-class explosion-risk products, features 10-bar pressure-shock resistant design
FRANCE Pharmaceuticals	several SuperJet Micronisers model Isopak-2, Pharma, U.S.D.A. design inhalation therapy products, 10-bar pressure resistant design and isolation enclosure
GERMANY Fine Chemicals	several SuperJet Micronisers model Kompak-2 and Kompak-3, employ pigments and other fine chemicals and feature a very compact design
IRELAND Pharmaceuticals	SuperJet Microniser model Isopak-2/C, totally customised engineering, for very toxic products, with double isolators that allow dispensing and safe cleaning
ITALY Pharmaceuticals	several SuperJet Micronisers model Isopak-1 and Isopak-2, Pharma, U.S.D.A. design, that feature compressed air and nitrogen blanketing, with full isolation enclosure
ITALY Cosmetics	several SuperJet Micronisers models Kompak-1, Kompak-2 and Kompak-3, used for compact powders and eye-shadows, feature complete automatic operation
JAPAN Pharmaceuticals	SuperJet Microniser model Kompak-1, Pharma, employed for R&D works and features U.S.D.A. accepted design and PTFE lining
PERU Cosmetics	SuperJet Microniser model Kompak-2, standard, used for high quality blushers and eye-shadows, with complete automatic operation
USA Cosmetics	several SuperJet Micronisers model Kompak-1, Kompak-2 and Isopak-3, employed for blushers and eye-shadows and feature U.S.D.A. accepted design
USA Pharmaceuticals	SuperJet Microniser model Kompak-2, Pharma, U.S.D.A. accepted design is used for inhalation therapy products and features 10-bar pressure resistant design
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