NUCLEAR TECHNOLOGY

MATERIAL PROCESSING SYSTEMS & CONTAINMENT SOLUTIONS

Gloveboxes • Medical Isolators • Downflow Booths • Fume Cupboards • Material Transfer
Filling & Weighing • Drum Tipping • Milling • Granulating • Drying • Mixing • Compaction • Coating

HOSOKAWA MICRON LTD.

PIONEERING HAZARDOUS MATERIAL PROCESSING FOR MORE THAN A CENTURY

Hosokawa Micron Group – established and headquartered in Japan – has offices and representation in locations throughout the world, including manufacturing sites in Japan, Germany, Netherlands, the UK and USA.

Our pioneering group of companies has accumulated more than a century of technical, scientific, engineering and manufacturing expertise to provide you with customised processing technologies that offer optimal solutions for your application.

We are a globally recognised market leader in the specification, design and manufacture of bespoke powder, particle and liquids processing equipment and systems for a wide range of applications, such as size reduction, drying, grinding, mixing, coating, blending, agglomeration and compaction. Our comprehensive portfolio also features standard and bespoke containment equipment, including Gloveboxes/Aseptic Isolators, Downflow Booths, Fume Cupboards, Horizontal Laminar Flow Booths and systems for Filling and Weighing, as well as Drum and Container Bulk Handling.

Our expertise is trusted by a diverse and ever-increasing number of industry sectors, including nuclear, pharmaceuticals, chemicals, renewable energy, defence, space, food and nutrition, cosmetics and minerals, while our small-batch equipment is trusted by laboratories, universities and research establishments throughout the world.

With an expansive portfolio of high-performance equipment and a full range of complementary services and support – such as product trials, equipment and process system installations, maintenance, servicing, testing and upgrades, operator training, a choice of remote or in-person FATs, SATs and the supply of rental equipment – Hosokawa Micron Group consistently innovates, evolves and sets new standards and trends in processing technology.

HOSOKAWA MICRON GROUP

YOUR TRUSTED PARTNER

for nuclear material processing


CIVIL NUCLEAR


NUCLEAR MEDICINE


NUCLEAR FUSION


DEFENCE


SPACE APPLICATIONS


RESEARCH & DEVELOPMENT

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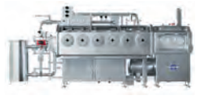
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Fill/Weigh System


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PROCESS SYSTEMS FOR NUCLEAR MATERIALS
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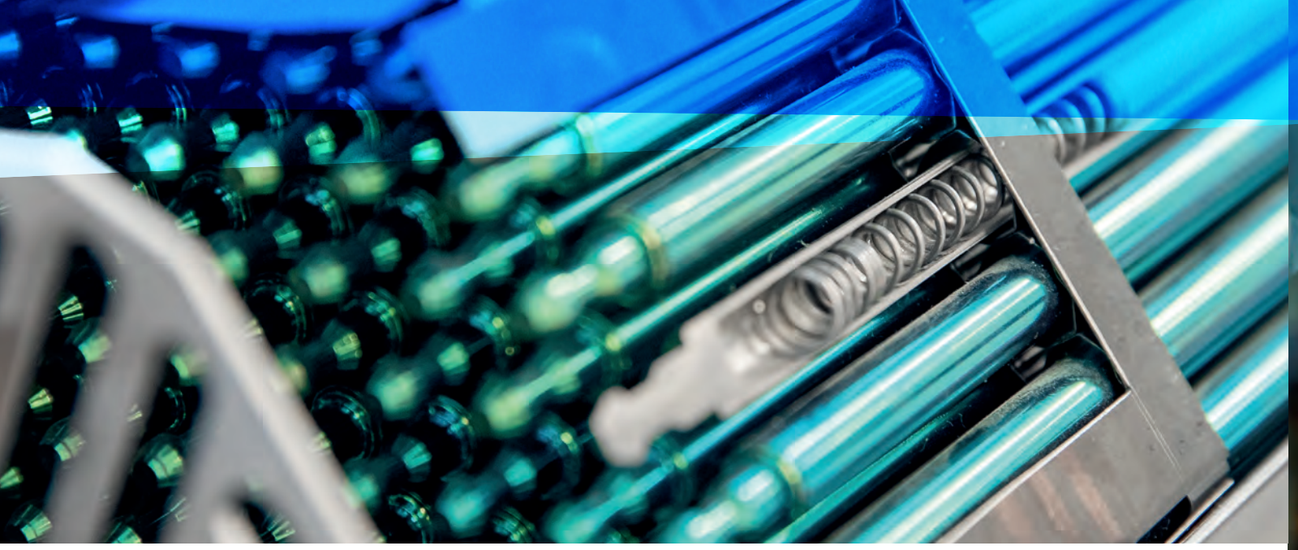
Hosokawa Micron Group materials processing technologies include state-of-the-art process systems for all phases of the manufacturing lifecycle, as well as waste processing and recycling applications. Standard and bespoke ranges offer solutions for applications including **Milling**, **Granulating**, **Feeding**, **Classifying**, **Mixing**, **Drying**, **Coating** and **Compaction**.

Process system equipment can also be integrated into Hosokawa Micron Ltd containment systems to address the requirements for operator, product and environmental protection.



WHY CHOOSE HOSOKAWA MICRON LTD?

From our UK headquarters in Runcorn, Cheshire, Hosokawa Micron Ltd provides a comprehensive design, manufacturing, testing, installation, commissioning and aftersales services to a wide range of industries throughout the world – including nuclear, defence and pharmaceuticals.

We design and manufacture all our containment systems in the UK, including Class 1 nuclear Gloveboxes, for the handling of hazardous or radioactive materials, and shielded Aseptic Isolators for manufacturing and handling radioisotopes and radiopharmaceutical products. We also work closely with all of the Hosokawa Micron Group companies to offer a single source supply for the bespoke design, manufacture and testing of fully integrated and compliant materials-handling and process systems.

For every stage of the nuclear fuel lifecycle, Hosokawa Micron has an innovative solution for your specific processing challenges, however complex, from the milling of Uranium Dioxide, mixing or milling of MOX fuel and mixing of cements and grouts for the immobilisation of waste, to drying, coating, granulating and shredding – all offered with the option of full containment for the protection of operators from exposure to toxic substances and radiation or to protect materials from contamination, oxidation or combustion.

Our wide-ranging and in-depth processing expertise, engineering skills and integration of state-of-the-art technologies ensure that the optimum solution is selected and perfected for your application. Our in-house product experts and scientists can advise on all aspects of equipment selection to meet product throughput and output specification requirements. Material processing trials can be carried out by our highly experienced technical team at our own dedicated test centre, allowing us to optimise our equipment and process systems to ensure successful scale-up, from R&D and laboratory-scale processing, to full production-scale systems.

Typical applications for Hosokawa Micron process equipment and containment systems include:

- **Uranium conversion and de-conversion**
- **MOX fuel production**
- **Drying and cementation of resins for waste immobilisation**
- **Product pack-off**
- **Waste collection**
- **Waste processing and recycling**
- **Bulk powder handling**
- **Radioisotope handling**
- **Sterile formulation and dispensing**
- **Containment of hazardous and radioactive materials**
- **Controlled environment research and testing**
- **Filtration**
- **Laboratory and R&D-scale processing**
- **Powder testing and particle size analysis**

bsi ISO 9001 Quality Management Systems CERTIFIED | ISO 14001 Environmental Management CERTIFIED | ISO 45001 Occupational Health and Safety Management CERTIFIED

CYBER ESSENTIALS

GLOVEBOXES

Hosokawa Gloveboxes and containment enclosures are designed to meet the strictest nuclear industry standards for operational safety during the handling and processing of radioactive and hazardous materials. Nuclear Gloveboxes are typically constructed using stainless steel, with additional options of integrated shielding for protection from gamma and neutron emissions. Alpha Gloveboxes are designed to comply with recently published UK ARC standards, as well as other relevant international or client-specific standards. Laminated, toughened glass panels or polycarbonate panels, fitted with safe-change gloveports, provide operator access for the handling of materials and operation of internal equipment. Filtration systems incorporate HEPA, carbon and spark arrestor filters to provide safe extraction to the external environment.

The nuclear Glovebox operates by enclosing radioactive or hazardous materials within a sealed, shielded environment. Negative pressure is maintained to prevent any risk of external leakage. In the case where moisture- or oxygen-sensitive materials are being handled, a positive pressure control system may be used in conjunction with inert gas injection to maintain a safe internal environment. Operators manipulate objects inside the enclosure via glove ports, while radiation exposure is blocked by the use of suitable construction materials, including integrated shielding where required. Optional transfer chambers, interlocks and remote-control systems further enhance process efficiency and operator safety. Engineered for manual and automated handling and processing, our Gloveboxes are available in single and multi-cell variants and support a wide range of operations, from fuel manufacture and waste processing, to R&D and decommissioning.

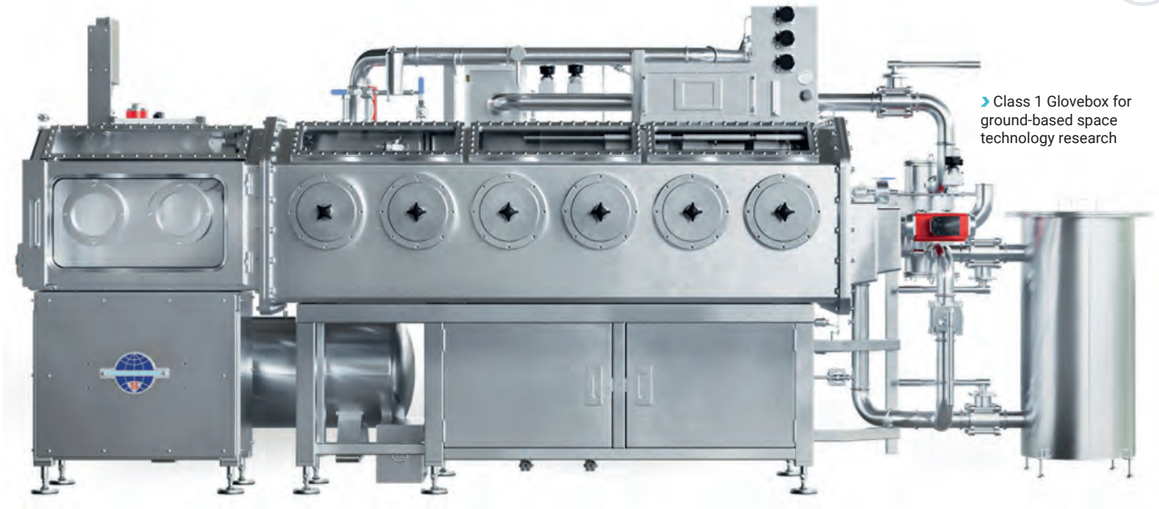
A range of Hosokawa processing equipment can be integrated into the Gloveboxes and containment systems, including powder mills, mixers, feeders etc. Through-wall drive system designs ensure contamination of motors and instruments is minimised whilst allowing safe maintenance and replacement of components located outside the primary containment chambers.

KEY FEATURES

- **Leak Tightness:** Up to ISO 10648-2 Class 1
- **Radiation Shielding:** Optional lead-shielding for gamma protection, as well as integration of neutron shielding systems
- **Glove Ports and Windows:** Ergonomically placed ports set into glass, lead-glass or polycarbonate viewing panels
- **Internal Pressure Control System:** Negative internal pressure for prevention of airborne contamination escape during operation or positive pressure for protection of materials including inert gas purging for additional explosion or combustion protection
- **HEPA/ULPA Filtration:** Dual-stage filtration ensures safe exhaust and air recirculation
- **Custom Automation:** Integratation of manipulators, remote handling tools or robotic systems
- **Modular Designs:** Compatible with pass-throughs, transfer hatches and drum-handling systems
- **ATEX Certification:** For safe operation where potentially explosive atmospheres are present due to dust, gases and vapours
- **Standards Compliance:** Meets ISO, UK ARC Glovebox standards and international nuclear regulatory safety codes

KEY APPLICATIONS

- Safe handling of radioactive and hazardous materials
- Reprocessing and sampling of nuclear fuel
- Packaging of radioactive waste
- Research involving fissile and alpha-active substances
- Medical isotope production
- Remote manipulation of toxic or radiological compounds
- Containment of powder processing and packaging systems
- Analysis of radioactive materials in a laboratory



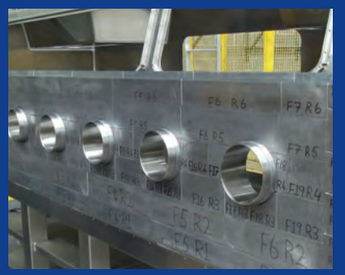
Class 1 Glovebox for ground-based space technology research

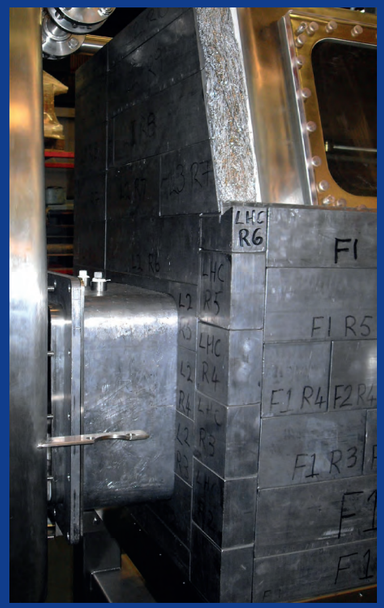
CONTAINED POWDER PROCESSING

A huge range of Hosokawa process equipment – including mixers, mills, feeders, cyclones, classifiers and pack-off systems – have been engineering for Glovebox integration to provide protection during operation, cleaning and maintenance. Through-wall drives eliminate contamination of motors and remove potential ignition sources from processing areas.

SHIELDING FOR NUCLEAR GLOVEBOXES

Depending on the material being handled, additional shielding may be required to ensure operator safety and environmental protection. The leak-tight (ISO 10648 Class 1) Glovebox with stainless steel shell and viewing panels typically acts as a barrier against exposure to alpha and beta radiation. Additionally, lead shielding can be integrated between the primary containment barrier and the external cladding to provide protection against gamma emissions. Shielding systems may incorporate neutron shielding, such as polyethylene or borated polyethylene panels. Leaded glass and leaded gauntlets also provide additional protection against radiation exposure, while sliding viewing shields provide additional localised radiation protection at the point of specific operations.





NUCLEAR MEDICINE
GLOVEBOXES AND ASEPTIC ISOLATORS

To meet the ever-increasing demand for the production and handling of radioisotopes and for aseptic formulation and dispensing of radiopharmaceuticals, Hosokawa Micron's innovative range of shielded Hot Cells, Gloveboxes and Aseptic Isolators provide protection from radiation exposure and operating environments with a validated 6 Log reduction in bio burden to ensure sterility of final dosage forms.

Hosokawa Micron Aseptic Isolators feature a fully integrated Hydrogen Peroxide Sterilisation System, which is easily controlled by the Isolator's touchscreen HMI and incorporate an independently controlled rapid gassing transfer chamber to maximise production efficiency. Ceiling-mounted H14 filters ensure a uni-directional vertical air flow to maintain a Grade A/ISO Class 5 environment. Aseptic Isolators typically operate under a positive internal pressure to ensure external contamination is excluded from the Isolator, however negative pressure control systems – in conjunction with safe-change filters – can also be used, where required, for the processing of toxic materials. As well as Hydrogen Peroxide sterilisation, much of our range of processing equipment, including mixers, mills and feeders, can also incorporate steam sterilisation to provide full aseptic processing. The design of our aseptic containment and powder processing systems draws on our extensive experience in the design and manufacture of pharmaceutical equipment.

KEY FEATURES

- **Flexible Designs:** Standard designs or bespoke multi-chamber systems available
- **Process Integration:** Compatible with Hosokawa Micron or third-party processing equipment
- **Sterility Assurance:** Integrated Hydrogen Peroxide Decontamination System
- **Safe Operation:** Integrated catalytic converter for safe removal of residual Hydrogen Peroxide
- **Clean Air:** H14 HEPA filtration with uni-directional airflow for ISO Class 5 (Grade A) compliance
- **Radiation Protection:** Integrated shielding for protection against emmisions from radioactive materials
- **Particle Monitoring:** Optional viable and non-viable systems
- **Internal Operating Pressure:** Positive or negative pressure and safe change filters for handling potent materials
- **Validation:** Full testing and validation services, including sterility cycle development, IQ/OQ execution and filter testing
- **Standards Compliance:** cGMP, GAMP5, FDA CFR21-11, EMA and EU GMP Annex 1 guidelines

KEY APPLICATIONS

- Sterility testing
- Aseptic product packaging
- Aseptic filling of liquids and powders
- Aseptic powder processing (weighing/dispensing)
- Formulation
- Vaccine manufacturing
- Aseptic vial filling
- Biopharma injectables fill/finish operations
- Cell and gene therapy
- Radioisotope production
- Radiopharmaceutical preparation and dispensing

ISO CLASS 5 ASEPTIC ISOLATOR

ISO Class 5 Aseptic Isolator, incorporating Atomised Hydrogen Peroxide decontamination and H14 ceiling filters, providing uni-directional airflow. Empty product containers are sterilised using a dry-heat depyrogenation oven. This system incorporates a laser etcher to add batch information to the filled containers.

› Rapid Gassing (AHP) Transfer Chamber

› Powder Feeder incorporates steam sterilisation and a through-wall drive system

DOWNFLOW BOOTHS
RECIRCULATION AND SINGLE PASS

Hosokawa Micron Downflow Booths offer a safe working zone for the protection of operators from potentially harmful airborne dust, vapours and gasses during manual handling activities such as sampling, dispensing, sub-division, charging and the offloading of powders or solvents. Downflow Booths also act as secondary containment systems when used in conjunction with other processing and containment systems, such as drum filling and tipping systems.

Hosokawa Micron offers an extensive range of standard and bespoke Downflow Booth solutions, featuring the latest energy-efficient, clean air technology. Downflow Booths provide a downward uni-directional flow of air which carries dust, vapours and gasses away from the operator's breathing zone and into a multi-stage filtration system. Air can be recirculated to minimise the impact on building HVAC systems or once-through systems can be provided if extraction of gasses and vapours is required. Booths can also incorporate cooling systems to maintain a comfortable air temperature for the operators.

Open-fronted Downflow Booths provide easy access to an extracted clean air environment. Additional segregation options include strip curtains and roller shutter doors. Booths can also incorporate entry airlocks, to further reduce the transfer of contamination to the external environment, as well as additional features such as HMI screens, weigh controllers, utilities manifolds and waste ports. As well as the standard three-stage filter systems, additional ceiling HEPA filters can be used to provide a higher level of air cleanliness (up to ISO Class 5) inside the Downflow Booth.

KEY FEATURES

- **Designed Around the Process:** Bespoke or standard-design booths are available in a wide range of sizes
- **Easy Operator Access:** Ergonomic, open-fronted designs
- **Intuitive Controls:** Siemens PLC/HMI control as standard
- **Increased Operator Protection:** Features integrated internal gloveport screens
- **Process Integration:** Integration of materials handling and processing systems
- **Energy Saving:** LED lighting, low noise EC fans and PIR-activated standby mode
- **Efficient Air Handling:** Recirculation, single pass and hybrid solutions available
- **Supplementary Extraction:** Independent, integrated Local Exhaust Ventilation (LEV) options
- **Explosion Protection:** ATEX certified with enhanced protection using conductive non-metallics and airflow screens

KEY APPLICATIONS

- Sampling, dispensing and weighing of hazardous materials
- Containment of drum filling, drum tipping and powder transfer systems
- Containment of materials process systems
- Secondary containment for equipment including mills and mixers
- Handling of explosive powders
- Reducing dust contamination of surrounding areas
- Providing a clean area environment for the handling of sensitive materials

- QUIET OPERATION
- CFD AIRFLOW MODELLING
- LOW ENERGY CONSUMPTION
- ATEX/HAZARDOUS AREA SYSTEMS
- MODULAR DESIGNS

Hosokawa Mixer inside a Downflow Booth

Booth Width	2 Metres	2.5 Metres	3 Metres	4 Metres	5 Metres	6 Metres
Internal Width (mm)	2,000	2,500	3,000	4,000	5,000	6,000
External Width (mm)	2,100	2,600	3,100	4,100	5,100	6,100
Safe Working Depth (mm)	1,800	1,800	1,800	1,800	1,800	1,800
Front Buffer Depth (mm)	750	750	750	750	750	750
Rear Stack Depth (mm)	1,050	1,050	1,050	1,050	1,050	1,050
Overall Depth (mm)	3,600	3,600	3,600	3,600	3,600	3,600
Internal Height (mm)	2,300	2,300	2,300	2,300	2,300	2,300
Ceiling Height (mm)	550	550	550	550	550	550
Overall Height (mm)	2,850	2,850	2,850	2,850	2,850	2,850

FUME CUPBOARDS
LAMINAR FLOW BOOTHS

Hosokawa Micron's Fume Cupboards for the nuclear sector are advanced containment systems custom-built for safe and efficient processing of potent, toxic or volatile materials and designed to meet the highest industry standards.

The Fume Cupboard is designed to protect operators and the surrounding environment during potentially hazardous processing tasks involving powders, vapours, solvents or potent and toxic substances. It works by drawing air from the room through a partially open sash window, creating a controlled airflow that prevents harmful materials from escaping the work area. This air is then filtered – typically using HEPA or carbon filters – and either recirculated or safely exhausted.

Shielded Fume Cupboards incorporate additional shielding materials, such as lead, or can be used to house lead castles to provide additional operator protection when handling radioactive materials, including during the preparation of radioisotopes for nuclear medicine applications. Hosokawa Micron Fume Cupboards are available in ducted and ductless configurations and can be fully tailored to accommodate specific workflows and spatial constraints. Whether used for pharmaceutical formulation or hazardous material handling, these units deliver reliable performance, cleanability and ease of validation.

As well as ATEX-certified systems, Hosokawa Micron Fume Cupboards can be designed to contain explosive powders, incorporating fully conductive components and elastomers to further reduce the potential for static build-up.

KEY FEATURES

- **Built to Last:** High-grade stainless steel or epoxy coated mild steel construction
- **Controlled Access:** Toughened laminated glass sash with mechanical stops and interlocking
- **Energy Saving:** Efficient LED lighting and EC fan technology
- **Operational Safety:** Integrated airflow monitoring and safety alarms
- **Safe Extraction:** Optional safe-change HEPA/carbon filtration
- **Bespoke Design:** Ducted/ductless, benchtop and walk-in designs available
- **Radiation Protection:** Optional integrated shielding
- **Explosion Protection:** Optional ATEX certification
- **Airflow Testing:** BS EN 14175 standard

KEY APPLICATIONS

- Handling and processing of hazardous materials
- Harvesting of radioisotopes and dispensing of nuclear medicines
- Solvent processing and vapour control
- Processing explosive powders
- Materials testing and quality control
- R&D and laboratory applications

Safe-Change Filter Housing

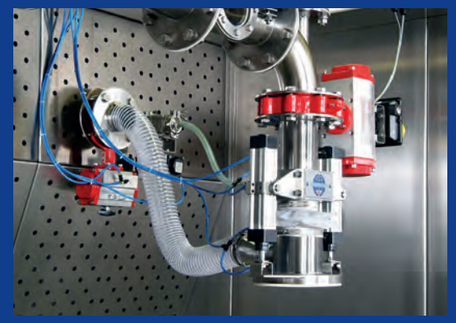
Integrated filter monitoring

HORIZONTAL AND VERTICAL LAMINAR FLOW BOOTHS

In uni-directional **Horizontal Laminar Flow systems**, air is extracted from the room and through the open-fronted booth via a rear plenum to ensure the operator's breathing zone and external environment is kept free from airbourne dust, gasses and vapours. Applications include drum filling, IBC filling, dispensing, cutting, grinding and containment of process systems.

Uni-directional **Vertical Laminar Flow systems** supply filtered air into the working area via ceiling-mounted H14 HEPA filters to protect materials, filling and dispensing operations etc. from external contamination.

Walk-in or tabletop versions of both types of booth are available. Bespoke systems are also available, engineered to suit your specific application.



MATERIAL TRANSFER
FILLING & WEIGHING

Accurate and repeatable weight-controlled Fill/Weigh systems from Hosokawa Micron maintain the highest levels of dust control and product integrity.

Available in standard or bespoke designs, our Fill/Weigh systems can be designed for use in hazardous areas, including during the processing of nuclear materials. The systems incorporate interchangeable inflatable or static sealing heads for reliable containment. Powder feed systems can incorporate screw feeders, rotary valves or other dosing valves, which operate in conjunction with integrated weighing systems to provide high-accuracy, repeatable and automated filling control. Powder feed systems can also incorporate pneumatic vibrators to eliminate the risk of blockages. In addition, in-line sampling systems can be incorporated into feed chutes to allow contained sampling of material.

For high-hazard applications, filling systems can be integrated into Gloveboxes, Downflow Booths and Laminar Flow Booths, which can also incorporate automated drum handling and include automated entry and exit doors, conveyors and turntables to minimise operator interaction with product containers.

KEY FEATURES

- **Process Control:** Accurate weighing of powders, granules and liquids
- **Operator Interface:** User-friendly panel displays weights, flows and other process parameters, as well as acting as an interface with other process equipment and systems
- **Adaptable Designs:** Suitable for a range of container sizes, including charge bottles and drums with or without liners
- **Flexible Operation:** Suitable for single bag or continuous liner filling operations
- **Integrated Extraction System:** Internal filter and reverse jet filter cleaning function to reduce product loss
- **Explosion Protection:** ATEX-compliant designs and inert gas purging provide safe operation when handling dusty materials

KEY APPLICATIONS

- Contained filling of powders and other hazardous materials
- Product pack-off
- Waste material collection
- Liquids and slurry collection and dispensing
- Product sample collection

Fill/Weigh System

Gravimetric Drum Fill/Weigh System

- Gravimetric filling with high flow and fine control powder dosing
- Inert gas purging, integrated filter with reverse jet cleaning
- Safe-change continuous liner cage
- Integrated in-line sampling system

Contained Drum Fill System

Contained Drum Fill System

- Drum Fill system inside a Horizontal Laminar Flow Booth for additional operator protection
- Local operator control panel interfaces with the powder feed system, incorporating process interlocks for safe operation

MATERIAL TRANSFER
DRUM TIPPING

Hosokawa Micron's robust, reliable Drum Tipping systems provide safe, contained transfer of bulk powders and hazardous materials for a wide range of nuclear sector processing applications.

Available in standard or bespoke designs, our Drum Tipping systems are designed for the safe transfer and charging of powders and hazardous materials. For additional operator or product protection, our Drum Tippers can be integrated into Hosokawa Micron Gloveboxes and other containment solutions. In addition to process system and vessel-charging applications, Drum Tippers can be used for the safe transfer of bagged materials to and from containment systems when used in conjunction with the Glovebox drum dock system. The Glovebox drum dock can incorporate static or inflatable seals and drum adaptors can provide additional flexibility when handling multiple drum sizes. For hazardous material handling, additional containment chambers can be added for safe de-lidding and decontamination operations.

Hosokawa Micron Drum Tippers can be designed to incorporate automated drum handling, including electrically driven entry and exit doors, conveyors and turntables to minimise operator interaction with product containers. The systems can be pneumatically operated, while fully electric designs are also available to eliminate the risk of hydraulic fluids or gases leaking into process areas.

KEY FEATURES

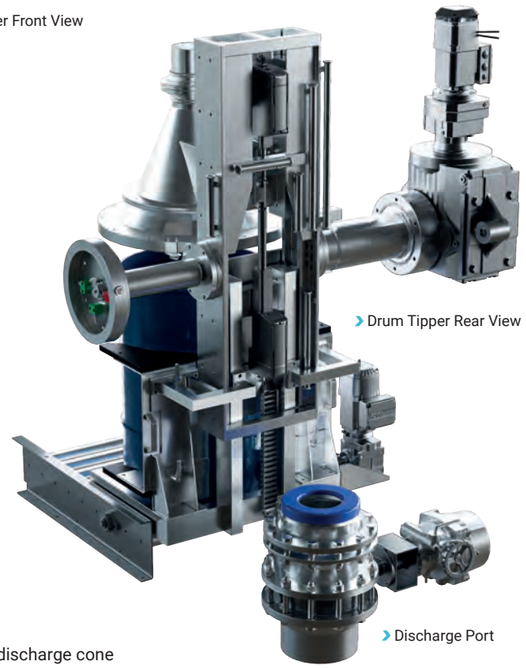
- **Flexible Designs:** Adaptable to a wide range of drum and container sizes
- **Robust, Safe Operation:** Designed and tested to accommodate 200-litre steel drums weighing up to 500kg
- **Automated Container Handling:** Integrated conveyors and entry/exit doors for easy handling
- **Operator Interface:** User-friendly operator panel for standalone Drum Tippers or full integration into other process systems
- **Explosion Protection:** ATEX-compliant designs provide safe operation when handling dusty materials

KEY APPLICATIONS

- Contained discharge of powders and other hazardous materials
- Reactor and vessel charging
- Waste material discharge
- Process system feeding
- Contained material transfer into gloveboxes

Drum Tipping Glovebox

Drum Tipper Front View

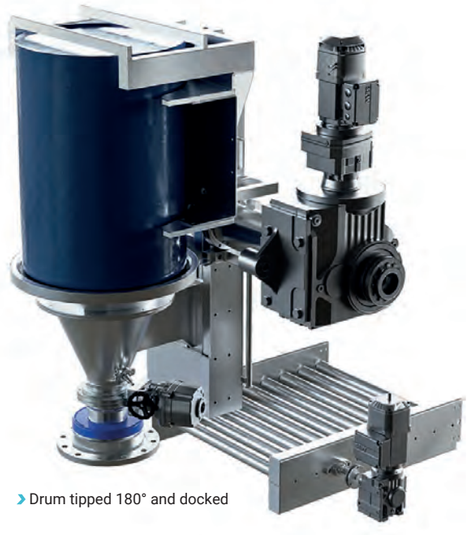


Drum Tipper Rear View

Discharge Port

Nuclear Drum Tipper

- Designed for nuclear applications with a fully electric drum clamp and rotate drive system
- Sensors ensure correct drum positioning prior to clamping of the discharge cone
- Interlocks prevent discharge valves from opening until a ready signal from the receiving vessel is detected
- Designed for contained applications, using through-wall drives and with automated conveyors or as standalone installations



Drum tipped 180° and docked

Glovebox Drum Tipper system for bulk material charging into an Ion exchange vessel. Includes an integrated extract system, automated drum-loading system, vacuum cleaner and a waste disposal port

HOSOKAWA MICRON
nuclear materials process systems

Hosokawa Micron's extensive experience of powder and hazardous materials processing and handling encompasses delivering diverse processing solutions for a wide range of nuclear-related industries. We engineer and manufacture turnkey shielded containment and process systems for our drying, mixing, coating, immobilisation, milling, agglomeration and compaction equipment, as well as fully compliant containment systems to house third-party process equipment.

The combination of our containment expertise and hazardous materials processing knowledge makes us a unique, single source designer and manufacturer of standalone equipment, as well as complex process plant, from large-scale bespoke system solutions to individual modular concept units. Many of Hosokawa Micron Group's equipment ranges can be integrated into Hosokawa Micron Ltd containment systems using through-wall technology, which ensures that contamination of drive systems is avoided, improving cleanability, reliability, performance and ease of maintenance.

BESPOKE SOLUTIONS

Hosokawa Micron Group is a global provider of equipment, process systems and after sales services. We guarantee innovative, high performance process solutions for multiple industries and business areas, including civil nuclear, nuclear medicine and defence.

MORE THAN 100 YEARS OF EXPERIENCE

Hosokawa Micron has been developing innovative processing equipment and systems for a wide variety of products and markets for more than a century. As a result, we can draw upon an unparalleled amount of know-how when designing new process systems for our customers.

INNOVATIVE TEST CENTRE

Our research and testing facilities contain a wide choice of equipment for the most varied plant configurations. Our skilled and knowledgeable experts are available to determine the best possible powder processing solution for your process, ensuring that all your requirements are met.

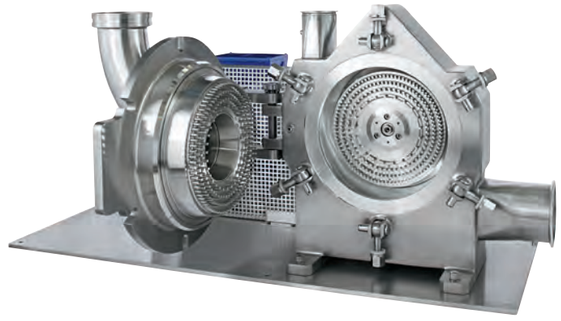
Integrated Powder Processing Solutions
Feeding • Milling • Compaction

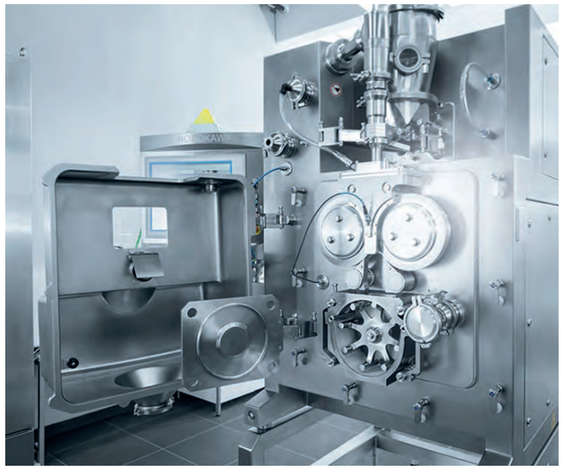
FEEDING

Accurate and efficient transfer of feed material between process steps is essential to maintain the efficiency and quality of material milling, mixing and other processing operations. Hosokawa integrated process systems are designed to incorporate state-of-the-art storage, conveying, dosing and weighing technology.

MILLING

For pre-grinding Uranium Dioxide or crushing of MOX tablets in a reprocessing step, the Hosokawa Pulverizer (type MP1 or MP2) is ideal. Hosokawa Hammer Mills have been used successfully to mill waste UO_2 solids prior to dosing into acid dissolvers. The extensive range of Hosokawa mills and micronisers, from micro-scale laboratory units through to high through-put production systems, includes pin mills, jet mills and ball mills. Fixed screens or Hosokawa dynamic classifiers are used to accurately control output particle size distribution.





COMPACTION

For compaction and granulation, the Hosokawa Roller Compactor ARC L200/50, in combination with the Hosokawa Flake Crusher AFC 300 or the Hosokawa Compactor ARC C250/30 with integral Flake Crusher are proven processes. The design of the latest version has been optimised for shielded Glovebox integration.

Integrated Powder Processing Solutions

Mixing • Mixing and Coating • Drying and Immobilisation

MIXING

Hosokawa's Nauta® Conical Screw Mixer has proven its usefulness in the production of nuclear fuel. It can be used for mixing Uranium Oxides, for mixing Plutonium (recovered from used reactor fuel) with depleted Uranium in the manufacturing of Mixed Oxide (MOX) fuel and also for the reprocessing of weapons-grade Plutonium (from military sources) to fabricate nuclear fuel rods for the production of electricity.

MIXING AND COATING

The Hosokawa Nobilta is a small batch reactor designed to give a functional design to dry particles using a mechano-chemical process to produce compound materials. In the nuclear industry it can be used for the coating of Mixed Oxides (MOX). The system is then installed in a shielded Glovebox, where fully contained operation is possible.

DRYING AND IMMOBILISATION

The Hosokawa Nauta® Vacuum Dryer can be used to increase the dry mass content of wash liquids. It is also suitable for drying (low level) contaminated materials prior to immobilisation for long-term waste storage. The immobilisation process can be performed using a Flexomix mixer/agglomerator. It mixes a solidifying mixture with contaminated wet nuclear material and water.

PROCESS SYSTEM CONTROLS AND PROCESS AUTOMATION

Hosokawa Micron process systems incorporate state-of-the-art controls, ranging from simple relay logic-based systems through to PLC and HMI controls. Process systems can be supplied as standalone 'plug and play' versions or with interfaces for communication with, or full control by, plant DCS.

Design standards such as GAMP5 and FDA CFR21-11, typically used in pharmaceutical manufacturing applications, can also be applied to nuclear process system designs to ensure a robust design process, control and capture of process data, as well as control of electronic signatures for full audit traceability.

SMALL BATCH MATERIAL HANDLING FOR RESEARCH & DEVELOPMENT

PICOLINE

Extensively redesigned recently by Hosokawa Alpine Group, the Picoline is a mini laboratory mill which features numerous interchangeable modules, designed for a wide range of applications and processes, such as fine milling, classifying, coating and mixing.

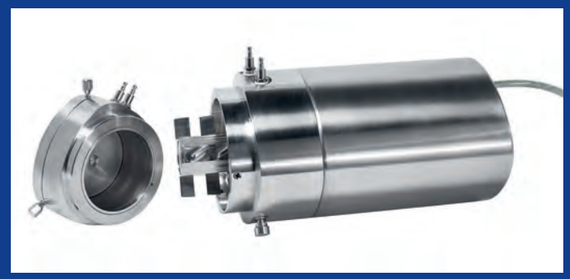
The Picoline was specifically created for laboratories, universities and research institutes to use in the formulation and development of products and materials such as pharmaceuticals, chemicals and battery materials and can also be utilised to refine processes.

Importantly, Picoline's collection of process modules corresponds to pilot and full-scale Hosokawa process equipment, allowing for seamless scale-up, from feasibility study to bulk material production. For example, the Picobond module (right) is a miniature version of the Nobilta high-energy mixer (left) and has many potential applications to support research and development of new and innovative manufacturing processes.

Simple to use and easy to clean, the Picoline can easily be integrated and contained inside a Glovebox or Fume Cupboard, offering endless possibilities for radioactive material analysis and the development of products made from hazardous or toxic materials, including radiopharmaceuticals and nuclear fuel. The equipment's neat multi-platform design means that its freestanding touch-screen control panel can be placed outside of the contained environment for enhanced operator safety and ease of use.

The Picoline is offered with a range of accessories, operation modes and design variants to suit multiple applications.

› Picoline inside an Isolator



› Picobond Module

WORLD-LEADING PROCESS EXPERTISE

The know-how and experience of numerous specialists are combined in the Hosokawa Micron Group to provide the best possible solutions to challenging applications. Extensive process engineering experience, derived from a variety of industry sectors, ensures that you, as a Hosokawa customer, enjoy optimised solutions for every product – from an individual component to an entire process plant.

YEARS OF EXPERIENCE

Profit from our many years of experience in the provision of solutions and our mastery of sophisticated processes. Well-known customers all over the world place their trust in the technology and knowledge accumulated by Hosokawa Micron Group.

INNOVATIVE TEST CENTRES

Our research and testing facilities can provide you with a wealth of equipment and complete process systems for the most varied plant configurations, all available on a global level. Precision, quality and innovative technologies – test your products with us.

GLOBAL SERVICE

Our friendly, professional service teams are based around the world and take care of repairs and maintenance smoothly and speedily, both on site and in our modern workshops, which are equipped with the latest technology. The Hosokawa Micron Group is a partner you can rely on.

CONTRACT MANUFACTURING

The Hosokawa Micron Group is your professional and reliable partner for contract manufacturing/toll processing. Our service allows you to concentrate fully on your core business and offset capacity bottlenecks without investment risks or long-term personnel commitments. Whether for a one-time project or recurring contract, our team, facilities and equipment are very flexible and can adapt to your exacting specifications.

MAINTENANCE PACKAGES

Hosokawa Micron's Planned Maintenance packages ensure your equipment performs optimally, thus preventing costly or unnecessary production downtime.

Hosokawa Micron site service engineers will ensure your plant continues to operate safely and efficiently for years after initial site acceptance testing through regular planned servicing and preventative maintenance visits. Critical components, such as seals, bearings and motors, are inspected for signs of wear and can be replaced or serviced before a failure leads to unplanned disruption to critical operations. Every system is supplied with a recommended spares list and optional service plan.

QUALIFICATION & VALIDATION SERVICE

To ensure your containment equipment operates correctly and meets critical standards, our trained engineers will carry out a full range of testing and validation procedures in accordance with the latest ISO standards, including:

- HEPA filter integrity testing
- Leak testing
- Classification of air cleanliness by particle concentration
- IQ/OQ/PQ validation

CONTAINMENT TESTING

Operator dust exposure testing, traditionally used for pharmaceutical validation, can be carried out on site by Hosokawa Micron, in accordance with ISPE and SMEPAC Guidelines. Operator Exposure Limit (OEL) testing is carried out using a placebo material to demonstrate that any airborne dust reaching an operator's breathing zone is within specified limits.

QUALITY-ASSURED SPARE PARTS

Our lifecycle team will support you by fulfilling all your spare parts requirements.

ADVANTAGES INCLUDE:

- We carry stock of consumable spare parts used in our equipment to help minimise downtime
- Our Spare Parts packages are carefully tailor-made for you
- We provide a full range of genuine, reliable spare parts for all our Hosokawa-branded equipment
- Each part undergoes a Quality Assurance Inspection

OPTIMISATION & UPGRADES

Hosokawa Micron can provide expert assistance by upgrading your equipment to reduce plant running costs, improve performance and ensure your machinery is as eco-friendly as possible.

OUR UPGRADING PRODUCTS AND SERVICES INCLUDE:

- 5D flexible or rigid containment screens
- Energy/noise-reducing extraction fans
- Energy-efficient LED lighting
- Temperature Control packages
- PIR sensors (standby mode)
- Wireless glove integrity testers

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Hosokawa Micron Group has established offices and agencies across various regions worldwide.
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Nuclear Technology Material Processing Systems and Containment Solutions (NTHML BRV1)