Vertical scraper and top discharge centrifuges for chemical, fine chemical and pharmaceutical applications

Made in Switzerland
Excellence since decades

1917 The Ferrum Ltd., engineering works and foundry, is founded as a family owned company in Rupperswil in Switzerland.

1935 For the first time Ferrum produces industrial centrifuges for the pharmaceutical and chemical industries.

1994 Ferrum takes over the centrifuge department of Sulzer-Escher Wyss with the complete range of pusher and scraper centrifuges, and also all the employees with their many years of experience. As a result of this take-over, Ferrum is able to significantly expand its product range and centrifuge know-how.

Today With more than 3500 pusher centrifuges delivered as well as more than 2700 scraper centrifuges, Ferrum is a world-leading centrifuge manufacturer.

Your benefits: A strong partner with excellent prospects!
Ferrum Ltd. is a Swiss family business and has been in the possession of the founding family since the beginning. The broad product range, the extensive know-how of the employees, the worldwide business, as well as a very high level of self-finance, ensure a very strong market position with excellent prospects for the future.

Expertise all under one roof
Ferrum offers you customer-specific complete systems from a single source and, with its unique vertical integration, guarantees the highest quality without interface problems. We build our centrifuges and automation systems in-house; we also manufacture most of the mechanical components in our foundry and production department.

Always state-of-the-art
Ferrum centrifuge systems are state-of-the-art. In collaboration with our customers we continuously further the development of our designs and automation systems, and modify them to suit the latest directives and standards.
Innovation and experience produce powerful solutions

More than 75 years of vertical scraper and top discharge centrifuges from Ferrum!
Since 1935 Ferrum has designed the latest vertical scraper and top discharge centrifuges for solid-liquid separation in the chemical, fine chemical, and pharmaceutical industries.

Vertical and horizontal scraper centrifuges in our assembly hall

VBC 1600, pressure vessel design
Our centrifuges – your benefits!

During development work our engineers simulate loads on the centrifuge structure using finite element analyses. In addition, we subject the centrifuges to comprehensive function, process and cleaning tests at our test stand.

Our designs and automation systems are continuously adapted to the latest directives and standards.

With our centrifuge systems we guarantee you the following benefits:

- High solids throughput with low energy consumption
- Gentle product discharge
- High wash efficiency
- Low residual moisture content
- Maximum functionality
- Efficient cleaning and best inspection
- Low-vibration operation
- Absolute reliability and durability
- Low maintenance costs

Configuration

Our process engineers configure the centrifuges and peripheral components to suit the specific application in accordance with your requirements. With more than 6200 centrifuges delivered, we can draw on extensive experience in the area of solid-liquid separation.

Product tests

Product tests are undertaken as required at our test stand, in the fully equipped laboratory or directly on your site. On request we will optimise your existing installations on-site and undertake semi-industrial tests.

It is our objective, in collaboration with you, to realise trouble-free solid-liquid separation with maximum performance, minimum energy consumption and consistent, reproducible product quality.
Application areas

Ferrum scraper and top discharge centrifuges have been proven in numerous applications in the chemical, fine chemical and pharmaceutical industry.

Our centrifuges offer a broad range of applications, reaching from pilot plants and small-quantity production to continuous production applications.

Pharmaceutical centrifuges are used for products that can be filtered with solids concentrations from 2 w% and particle sizes of min. 4 µm. For chemical centrifuges the corresponding figures are little higher.

Some application examples

- Pharmaceutical: API, antibiotics, salicylic acid, pharmaceutical intermediate products, etc.
- Fine chemical: herbicides, pesticides, dyes, cosmetics, etc.
- Food industry: lysine, proteins, starches, sweeteners, vitamins (C, A, K, etc.), etc.
- Special applications: ABS, iron sulphate, melamine, etc.
Type VBC vertical scraper centrifuges

Principle of operation and applications
The VBC type vertical scraper centrifuges (Vertical Bottom Discharge Centrifuge) work discontinuously, the solids are discharged vertically downwards.

The many application areas include, among others, demanding continuous operation in the chemical industry or complex pharmaceutical applications.

Design features
- Robust and reliable design in accordance with the latest standards, directives and GMP requirements
- Optimally designed functional devices for efficient and reliable process cycles with low vibration
- Reliable sealing of the bearing housing with the latest generation sealing systems
- Easy, quick disassembly of the basket for best inspection of the process area
- Easy maintenance due to modular design
- Suitable for Ex zone 1 (according to directive 94/9/EC)

Modularity and optional equipment
We can optimally adapt our latest VBC centrifuges to your needs due to their modularity and the comprehensive range of optional equipment:

- Application-specific feed and wash systems: feed and wash pipe or inclined feed and wash disk
- Position of filtrate discharge as well as cover opening can be chosen as required
- Scraper unit systems: scraper knife over the entire basket height or scraper knife with vertical movement
- Motor arrangement: above or below the base plate
- Clean room design using membrane connection
- Systems for effective residual heel removal, even for products that are difficult to remove
- CIP systems, entire process area can be flooded
- Various diagnostic and monitoring systems
- Pressure vessel design on request
- Ferrum InertoSafe© inertisation systems (ATEX, SIL 2 certified)
1. Scraper knife with vertical movement
2. Feed and wash disk
3. Motor below the base plate

<table>
<thead>
<tr>
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<td>1200/1500</td>
<td>950/1200</td>
<td>950/1200</td>
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<td>805/1258</td>
<td>631/1006</td>
<td>631/1006</td>
<td>503/807</td>
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<td>2700</td>
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<td>Motor power for feed/wash disk (option)</td>
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Design pressure: 300 [mbarg], operating pressure: 4-20 [mbarg], gas tightness: 40 [mbarg], product temperature range: 0-80 °C, ambient temperature: 0-40 °C, other pressure and temperature ranges as well as motor sizes upon request
Type VBC-S vertical scraper centrifuges

Principle of operation and applications
With this new development, the existing VBC model series is expanded with the VBC-S type centrifuge (Vertical Bottom Discharge Centrifuge – Swivel open housing).

The centrifuge was specially designed for use in the demanding pharmaceutical industry.

The centrifuge housing can be swivelled open completely, which permits excellent inspection under the centrifuge basket. A cover opening is available to open the housing. This cover also ensures optimal inspection of the centrifuge cover’s internals.

Design features
- Robust and reliable design in accordance with the latest standards, directives and GMP requirements
- Optimally designed functional devices for efficient and reliable process cycles with low vibration
- Reliable sealing of the bearing housing with the latest generation sealing systems
- Easy maintenance due to modular design
- Suitable for Ex zone 1 (according to directive 94/9/EC)

Modularity and optional equipment
We can optimally adapt our latest VBC-S centrifuges to your needs due to their modularity and the comprehensive range of optional equipment:

- Application-specific feed and wash systems: feed and wash pipe or inclined feed and wash disk
- Position of filtrate discharge as well as cover opening can be chosen as required
- Scraper unit systems: scraper knife over the entire height or scraper knife with vertical movement
- Motor arrangement: above or below the base plate
- Clean room design using membrane connection
- Systems for effective residual heel removal, even for products that are difficult to remove
- CIP systems, entire process area can be flooded
- Various diagnostic and monitoring systems
- Pressure vessel design on request
- Ferrum InertoSafe© inertisation systems (ATEX, SIL 2 certified)
Design pressure: 300 [mbarg], operating pressure: 4-20 [mbarg], gas tightness: 40 [mbarg], product temperature range: 0-80 [°C], ambient temperature: 0-40 [°C], other pressure and temperature ranges as well as motor sizes upon request.
Type VTC vertical top discharge centrifuges

Principle of operation and applications
The VTC type vertical top discharge centrifuges work discontinuously. The solids can be discharged vertically upward through manual action, optionally using a filter bag and a lifting device or a special suction device. The applications range from pilot plants, small-quantity production to production applications in the chemical and pharmaceutical industries.

Design features
- Robust and reliable design in accordance with the latest standards, directives and GMP requirements
- Optimally designed functional devices for efficient and reliable process cycles with low vibration
- Reliable sealing of the bearing housing with the latest generation sealing systems
- Easy maintenance due to modular design
- Suitable for Ex zone 1 (according to directive 94/9/EC)

Modularity and optional equipment
We can optimally adapt our latest VTC centrifuges to your needs due to their modularity and the comprehensive range of optional equipment:

- Application-specific feed and wash systems: feed and wash pipe or inclined feed and wash disk
- Solids discharge systems: lifting device or suction device
- Loosening scraper with vertical movement
- Position of filtrate discharge as well as cover opening can be chosen as required
- Motor arrangement: above or below the base plate
- CIP systems, entire process area can be flooded
- Various diagnostic and monitoring systems
- Pressure vessel design on request
- Ferrum InertoSafe© inertisation systems (ATEX, SIL 2 certified)
### Dimensions

<table>
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<tr>
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<th>800/400</th>
<th>1000/500</th>
<th>1000/630</th>
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<td>1850</td>
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<td>1400</td>
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<td>1730</td>
<td>1900</td>
<td>1900</td>
<td>[mm]</td>
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<td>2670</td>
<td>2840</td>
<td>3080</td>
<td>3250</td>
<td>[mm]</td>
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</table>

### Technical data

- **Basket diameter**: 630 800 1000 1000 1250 1250 1600 1600 [mm]
- **Basket height**: 320 400 500 630 630 800 630 800 [mm]
- **Basket opening**: 440 560 700 700 875 875 1120 1120 [mm]
- **Filter surface**: 0.63 1.01 1.57 1.97 2.47 3.14 3.17 4.02 [m²]
- **Useful volume (100%)**: 51 102 200 252 394 500 646 820 [dm³]
- **Max. load**: 64 128 250 315 493 626 808 1025 [kg]
- **Max. rotor speed/with oil lubrication**: 1900 1500 1200/1500 1200/1500 950/1200 950/1200 750/950 750/950 [min⁻¹]
- **Max. G force/with oil lubrication**: 1270 1006 805/1258 805/1258 631/1006 631/1006 503/807 503/807 [g]
- **Centrifuge weight (without load)**: 650 1050 2400 2500 3200 3350 5600 5800 [kg]
- **Basket weight (1.4404)**: 90 180 350 380 560 625 1015 1120 [kg]
- **Motor power for main drive**: 4 5.5 15 15 18.5 18.5 37 37 [kW]
- **Motor power for feed/wash disk**: – – 3.0 3.0 3.0 3.0 3.0/5.5 3.0/5.5 [kW]

**Design pressure**: 300 [mbarg], **operating pressure**: 4-20 [mbarg], **gas tightness**: 40 [mbarg], **product temperature range**: 0-80 [°C], **ambient temperature**: 0-40 [°C], other pressure and temperature ranges as well as motor sizes upon request.
Type VTC-M mobile top discharge centrifuges

Principle of operation and applications
This special design combines centrifuge, control system, drive components and inertisation system in one system. With our mobile top discharge centrifuges we provide a turn-key, mobile unit for use in areas up to Ex zone 1 (according to directive 94/9/EC).

The system is excellently suited for pilot plants as well as small-quantity productions in the fine chemical and pharmaceutical industries.

Design features
- Reliable design in accordance with the latest standards, directives and GMP requirements
- Optimally designed controls for easy, efficient operation
- Compact dimensions
- Reliable sealing of the bearing housing with the latest generation sealing systems
- Optional CIP system
- Easy maintenance due to modular design
- Entire unit suitable up to Ex zone 1 (according to directive 94/9/EC)
Design pressure: 300 [mbarg], operating pressure: 4-20 [mbarg], gas tightness: 40 [mbarg], product temperature range: 0-80 °C, ambient temperature: 0-40 °C, other pressure and temperature ranges as well as motor sizes upon request

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Type VTC-I isolator top discharge centrifuges

Principle of operation and applications
The VTC isolator centrifuge was specially developed for use in an isolator. This combination allows you to transport toxic active pharmaceutical ingredients (HAPI) without contamination from the centrifuge to the next process step (e.g. vacuum tray dryer).

The solids can be discharged from the basket manually or using a lifting device. The system is used for pilot plants as well as small-quantity productions in the pharmaceutical industry.

Design features
- Reliable design in accordance with the latest standards, directives and GMP requirements
- Compact special design for installation in an isolator
- Optimally designed controls for easy, efficient operation in an isolator
- Separation from the process area in the isolator using membrane connection
- Reliable sealing of the bearing housing with the latest generation sealing systems
- Optional CIP system
- Easy maintenance due to modular design
- Entire unit suitable up to Ex zone 1 (according to directive 94/9/EC)

<table>
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<tr>
<td>Filter surface</td>
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<td>0.25</td>
<td>0.39</td>
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<td>[m²]</td>
</tr>
<tr>
<td>Useful volume (100%)</td>
<td>6.6</td>
<td>12.8</td>
<td>25</td>
<td>35</td>
<td>[dm³]</td>
</tr>
<tr>
<td>Max. load</td>
<td>8.2</td>
<td>16</td>
<td>31.3</td>
<td>43.8</td>
<td>[kg]</td>
</tr>
<tr>
<td>Max. rotor speed</td>
<td>3000</td>
<td>2700</td>
<td>2400</td>
<td>2400</td>
<td>[min⁻¹]</td>
</tr>
<tr>
<td>Max. G force</td>
<td>1610</td>
<td>1630</td>
<td>1610</td>
<td>1610</td>
<td>[g]</td>
</tr>
<tr>
<td>Centrifuge weight (without load)</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>420</td>
<td>[kg]</td>
</tr>
<tr>
<td>Motor power for main drive</td>
<td>1.5</td>
<td>2.2</td>
<td>3</td>
<td>3</td>
<td>[kW]</td>
</tr>
</tbody>
</table>

Development and engineering of customized applications
GMP/FDA conform isolator for handling of HAPI products
Charging of vacuum tray dryer
CIP system
For cleaning the centrifuge process area, a CIP system (Cleaning In Place) can be integrated in all our vertical centrifuges. This system is used during a product or batch change to eliminate the risk of cross-contamination. The CIP nozzles, the feed and wash system as well as the residual heel removal outside the basket clean the process area.

SIP system
After the CIP cleaning, SIP cleaning (Sterilisation In Place) can be undertaken. To eliminate microorganisms, the process area is wetted with disinfectant via the CIP system (e.g. hydrogen peroxide, sodium hydroxide, etc.).

Optional flooding of the process area
The centrifuge can be flooded up to just below the cover. This process permits contact between the cleaning liquid and the soiled surfaces as long as required and therefore maximum solubility.

GMP design for efficient cleaning
Our designs comply with the latest GMP directives. The hygienic cleaning of the process area is made possible by a clean finish, excellent surface quality, compliance with minimum radii and the use of FDA-approved open O-rings.

Low solvent consumption
The compact design as well as optimised cleaning programs ensure efficient cleaning with low solvent consumption.

Riboflavin tests
We optimise the CIP programs for the different centrifuge types with the aid of riboflavin tests. This way it is ensured that even with low solvent consumption, all surfaces in the process area are wetted with cleaning liquid. Riboflavin tests will be demonstrated on request during the FAT (Factory Acceptance Test).
Process steps

Process of solid-liquid separation
The solid-liquid separation is effected discontinuously in a sequence of specific process steps. The individual process steps last from a few minutes to several hours depending on the characteristics of the product. Depending on the type of control system, the process can be fully automated, semi-automated or manual.

Vertical scraper centrifuges

Filling and Intermediate centrifugation
Washing
Dry-centrifugation
Scraping, solids discharge
Residual heel removal

Basic design: feed pipe and wash pipe, scraper knife over the entire basket height

Design with feed and wash disk, scraper knife with vertical movement

Vertical top discharge centrifuges

Filling and Intermediate centrifugation
Washing
Dry-centrifugation
Loosening scraper
Solids discharge

Design with loosening scraper and lifting device
Filling
The suspension is evenly applied to the centrifuge basket via the feed pipe or optionally via the feed disk. The fill level control prevents overfilling of the basket.

Intermediate centrifugation
The basket accelerates to centrifuge the liquid from the surface of the cake.

Washing
After intermediate centrifugation, the wash liquid is evenly applied to the product cake; this liquid enters the centrifuge via the feed disk or the wash pipe.

Dry-centrifugation
After washing, centrifugation takes place — until the required residual moisture content in the filter cake is achieved.

Scraping, solids discharge
At reduced speed, the scraper knife swings into the filter cake and scrapes the product out vertically downward. If required, the residual heel removal on the scraper device can be switched on during scraping.

Loosening scraper
The product can be released using a loosening scraper on top discharge centrifuges. Depending on the product, this action will make subsequent discharge easier.

Top discharge
On top discharge centrifuges the product is discharged vertically upward. The solids can be discharged manually, optionally using a filter sack and lifting device or special suction device.

Residual heel removal
To protect the filter cloth clamped in the basket, during scraping a residual heel of the product is left on the filter cloth. This heel may prevent fine content in the filtrate passing through the filter cloth during subsequent batches. The residual heel is removed after each batch, or periodically, to suit the specific application. The heel can be blown into the solids discharge using gas pressure pulses applied via nozzles outside the basket or, if necessary, additionally via nozzles on the scraper device. If the process area is purged with inert gas, nitrogen is used for blowing off the heel.
Efficient automation of centrifuge systems

The automation of centrifuges is of central importance at Ferrum.

Ferrum has invested many years of effort into the development of centrifuge automation. Proven, standardised hardware and software modules are used as a basis and are supplemented with customerspecific elements.

Overview of the range of control systems and drives
- Safety analyses, safety circuits
- Automation of the process, software programming
- Design and installation of cabinets for control systems and drives, as well as operator panels
- Regenerative breaking unit, sensors and measurement acquisition
- Interface to process control systems, remote maintenance
- Explosion protection up to Ex zone 1 (according to directive 94/9/EC)
- Documentation: diagrams, concept descriptions, operating instructions, safety certificates, etc.
- Commissioning of complete systems on-site

Drive systems and safety control systems
Our drive systems and safety control systems guarantee a safe, optimised operation of the centrifuge. The systems are state-of-the-art. They are continuously further developed and adapted to our risk analyses as well as the latest directives and standards.

Frequency converters of the latest generation with integrated safety functions are used to control the speed.
Control systems and terminals for best possible ease of use
The control and information display software permits easy operation and control of the solid-liquid separation process. Due to our extensive range of different control systems and components from leading suppliers, we efficiently implement comprehensive customer requirements.

Ferrum supplies simple operator panels on which the basic functions are controlled manually using pushbuttons, up to fully automatic process control systems with visualisation for multiple product systems.

The centrifuge can be operated in an automatic, semi-automatic, manual or service mode. A wide range of production recipes can be saved in an easy-to-use recipe management system.
If the centrifuge process area is classified as an explosive zone, the machine must be purged with inert gas (e.g. nitrogen). The certified inertisation systems developed by Ferrum, InertoSafe® SIL 2 and InertoSafe® ATEX guarantee you safe, trouble-free operation.

**Ferrum InertoSafe® SIL 2**
- For the inertisation of vessels of any type
- SIL 2 (EN 61511) certified inertisation system with control system
- Based on N₂ flow rate and pressure monitoring, O₂ measurement optional
- Independent system – no validation costs
- SIL 2 (EN 61511) validation certificate included
- UL, CSA certificates for all instruments

**Ferrum InertoSafe® ATEX**
- Can be used on all Ferrum centrifuges
- ATEX certified
- Based on N₂ flow rate and pressure monitoring, O₂ measurement optional
- Monitored by the centrifuge control system
- UL, CSA certificates for all instruments
Peripheral elements and collectors

Ferrum supplies various peripheral components that are required for the operation of the centrifuge. If necessary, these components can be integrated into the customer’s or Ferrum’s control system.

- Various valves and butterfly valves
- Solids discharge cones
- Flexible connections and flow sight glasses
- Siphons and pressure relief valves to ensure the nitrogen overpressure is maintained in the centrifuge
- CIP collectors and valves for the regulation of the CIP cleaning cycles
- Collectors on the centrifuge for the management of the control air, the nitrogen and the hydraulic oil
- Pilot valve blocks for the control of various system parts

Project management and documentation

Efficient project management
From project start (kick-off) through acceptance (FAT) in our factory to commissioning (SAT) on your site, our project managers guarantee professional project management.

Together we will run through the various approval as well as project phases based on an agreed schedule.

Clear documentation
With our centrifuges we supply detailed, customer-specific documentation. This documentation includes documents to meet obligations as per customer specification (e.g. 3.1 Certification), various documents to support DQ/IQ/OQ, AS BUILT documents, data sheets, operating manuals as well as a clear spare parts catalogue.
Customer-oriented Aftersales service

Overview of our range of services
- Large stock of spare parts
- Prompt and uncomplicated support from our customer service team
- Worldwide service centres
- Maintenance, inspections, maintenance contracts based on BGR 500
- Various modifications, upgrades and integration of new drive and control systems
- Customer-specific training

Customer service and consultation
A large team of experienced service specialists as well as various service centres are available to our customers worldwide. This way we ensure uncomplicated support as quickly as possible.

Large stock of spare parts
We maintain a large stock of spare parts at our factory in Schafisheim. Our inventory and careful stock management ensure continuous availability and short delivery times.

Reliable Ferrum used equipment

Know-how from the original equipment manufacturer
As the original supplier we make available to you our decades of centrifuge know-how. We therefore offer optimum consultation and support to implement customer-specific requirements.

Safe operation of used centrifuges
We know which regulations must be met and which modifications are necessary to ensure the safe operation of the used machine on your site.

Short delivery time and 12 month guarantee
With short delivery times, a 12 month guarantee as well as an excellent price-performance ratio, Ferrum offers you used equipment as an interesting alternative to new machines.

Complete overhaul
The centrifuges are completely overhauled in our factory in Switzerland and are subjected to various function tests and safety tests.

Application-specific modifications
If required we will modify the machine to suit your requirements using optional equipment and special designs. The latest drive and control systems can also be integrated.

Detailed documentation
With the centrifuge we supply a detailed documentation, including a corresponding spare parts catalogue.
Overview of the Ferrum product range

PM–230
Pusher centrifuge – Chemical applications

P-32 to P-50
Pusher centrifuges – Chemical applications

P-60 to P-120
Pusher centrifuges – Chemical applications

VBC 1000 – 1600
Vertical scraper centrifuges
Chemical, pharmaceutical applications

HPZ 630 – 1600
Horizontal scraper centrifuges
Pharmaceutical applications

HCZ 1000 – 2000
Horizontal scraper centrifuges
Chemical applications

VTC 630 – 1600
Vertical top discharge centrifuges
Chemical, pharmaceutical applications

VTC 320 – 500 mobile systems
Vertical top discharge centrifuges
Chemical, pharmaceutical applications

VTC 320 – 500 isolator centrifuges
Vertical top discharge centrifuges
Pharmaceutical, HAPI applications

Inertisation systems
Ferrum InertoSafe® SIL 2,
Ferrum InertoSafe® ATEX

Automation – Customer-specific control and drive solutions, explosion protection up to Ex zone 1 (according to directive 94/9/EC)

Used equipment at good value
Overhaul incl. function tests by Ferrum Ltd., short delivery times, 12 month guarantee
Over 60 representatives worldwide