

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



## 2 Excellence since decades

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



*Our factory at our headquarters in Switzerland*

### **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**

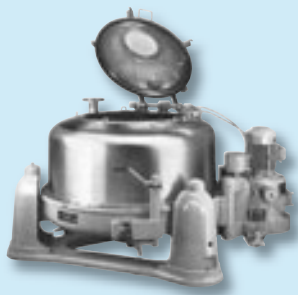
Ferrum offers you customer-specific complete systems from a single source and, with its unique vertical integration, guarantees the highest quality without interface problems. We build our centrifuges and automation systems in-house; we also manufacture most of the mechanical components in our foundry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

## 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.



1935



1995



today



1985



2005



Vertical and horizontal scraper centrifuges in our assembly hall



VBC 1600, pressure vessel design



Function tests on the test stand

**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.**

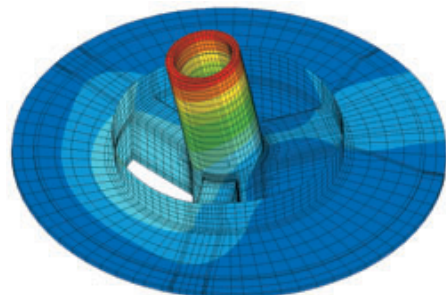
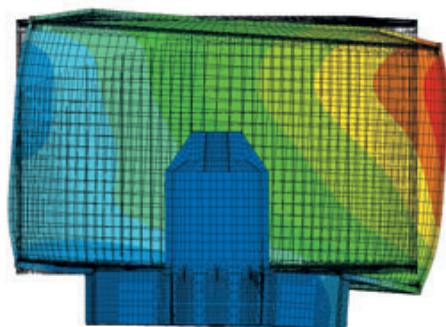
**Our centrifuges – your benefits!**

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



Finite element analyses

## 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  $\mu\text{m}$ . For chemical centrifuges the corresponding figures are little higher.



*Scraper centrifuge VBC 1000*

## 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)



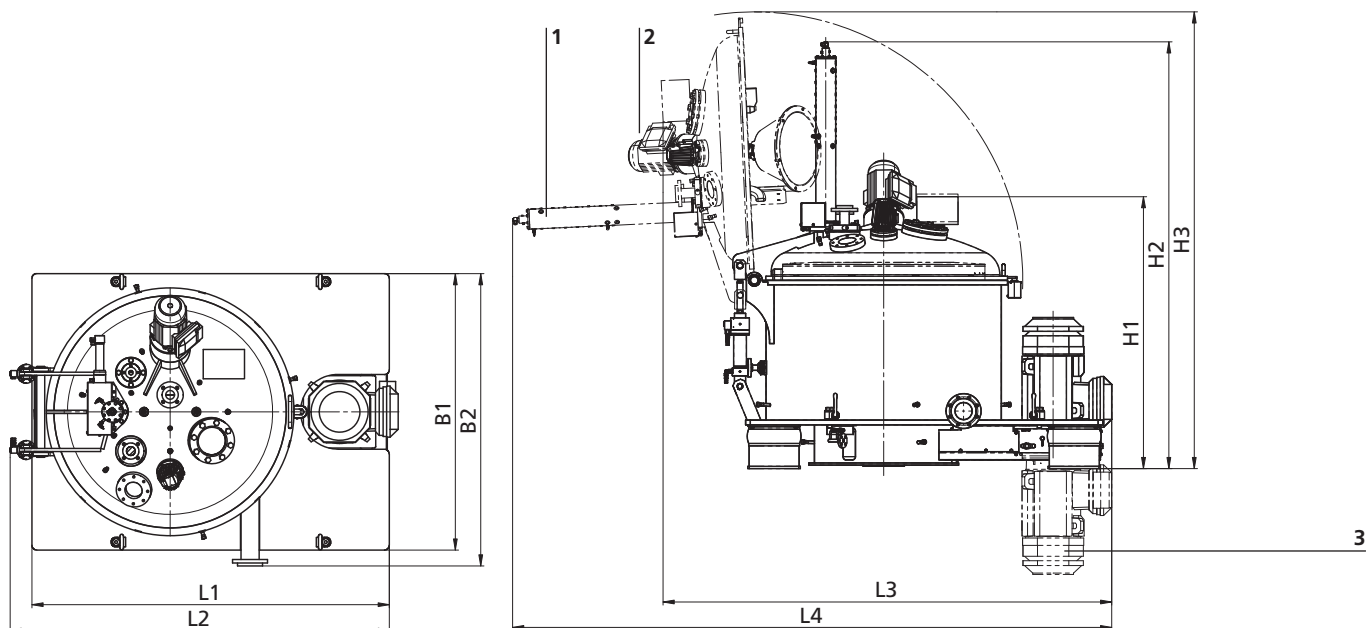
Centrifuge basket



Scraper knife over the entire basket height, feed pipe and wash pipe



Scraper knife with vertical movement, feed and wash disk



1. Scraper knife with vertical movement
2. Feed and wash disk
3. Motor below the base plate

VBC	1000/500	1000/630	1250/630	1250/800	1600/800	1600/1000	Unit
<b>Dimensions</b>							
L1	1900	1900	2250	2250	2650	2650	[mm]
L2	2010	2010	2385	2385	2920	2920	[mm]
L3 (cover open, scraper knife over entire height)	2335	2335	2635	2635	3185	3185	[mm]
L4 (cover open, scraper knife vertical movement)	3060	3060	3600	3800	4500	4500	[mm]
B1	1500	1500	1740	1740	2000	2000	[mm]
B2	1600	1600	1840	1840	2140	2140	[mm]
H1 (closed, scraper knife over entire height)	1250	1380	1450	1620	1900	2100	[mm]
H2 (closed, scraper knife vertical movement)	1970	2100	2520	2690	3060	3260	[mm]
H3 (cover open)	2230	2360	2670	2840	3250	3450	[mm]
<b>Technical data</b>							
Basket diameter	1000	1000	1250	1250	1600	1600	[mm]
Basket height	500	630	630	800	800	986	[mm]
Basket opening	700	700	875	875	1120	1120	[mm]
Filter surface	1.57	1.97	2.47	3.14	4.02	4.96	[m <sup>2</sup> ]
Useful volume (100%)	200	252	394	500	820	1011	[dm <sup>3</sup> ]
Max. load	250	315	493	626	1025	1263	[kg]
Max. rotor speed: grease/oil circulation lubrication	1200/1500	1200/1500	950/1200	950/1200	750/950	750/950	[min <sup>-1</sup> ]
Max. G force: grease/oil circulation lubrication	805/1258	805/1258	631/1006	631/1006	503/807	503/807	[g]
Centrifuge weight (without load)	2600	2700	3450	3600	6200	6400	[kg]
Basket weight (1.4404)	385	425	630	695	1255	1375	[kg]
Motor power for main drive	15.0	15.0	18.5	18.5	37.0	37.0	[kW]
Motor power for feed/wash disk (option)	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 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)



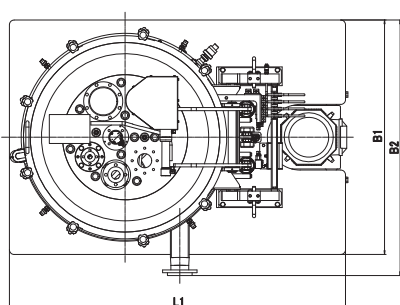
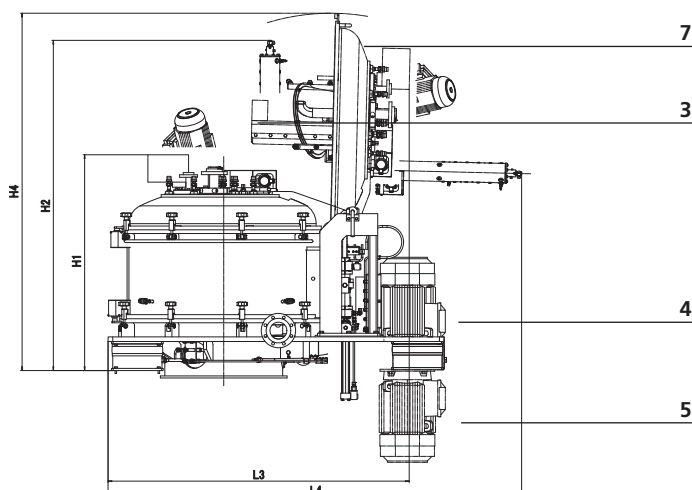
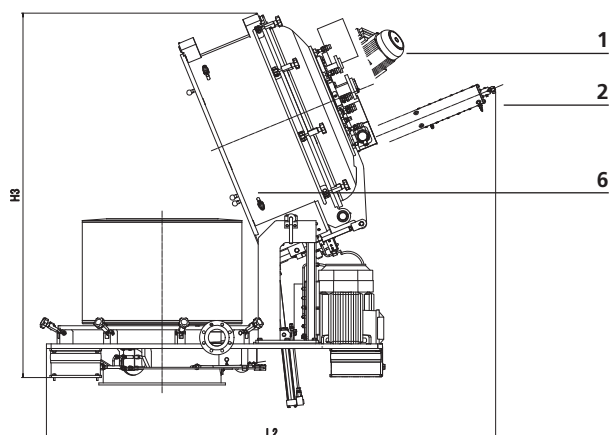
*VBC-S, housing swivelled open*



*VBC-S, with cover opening*



*VBC-S, housing and cover closed*



- |   |                       |
|---|-----------------------|
| 1. Inclined feed and wash disk                | 4. Drive, top         |
| 2. Scraper unit with vertical movement        | 5. Drive, bottom      |
| 3. Scraper unit over the entire basket height | 6. Swivelling housing |
|   | 7. Swivelling cover   |

VBC-S	1000/500	1000/630	1250/630	1250/800	Unit
<b>Dimensions</b>					
L1	2150	2150	2500	2500	[mm]
L2 (housing open, scraper knife vertical movement)	2875	2875	3600	3600	[mm]
L3 (cover open, scraper knife over entire height)	1925	1925	2410	2410	[mm]
L4 (cover open, scraper knife vertical movement)	2650	2650	3310	3310	[mm]
B1	1500	1500	1740	1740	[mm]
B2	1635	1635	1875	1875	[mm]
H1 (closed, scraper knife over entire height)	1250	1380	1450	1620	[mm]
H2 (closed, scraper knife vertical movement)	1980	2115	2520	2690	[mm]
H3 (housing open)	2200	2330	2750	2920	[mm]
H4 (cover open)	2155	2285	2690	2860	[mm]

Technical data	1000/500	1000/630	1250/630	1250/800	Unit
Basket diameter	1000	1000	1250	1250	[mm]
Basket height	500	630	630	800	[mm]
Basket opening	700	700	875	875	[mm]
Filter surface	1.57	1.97	2.47	3.14	[m <sup>2</sup> ]
Useful volume (100%)	200	252	394	500	[dm <sup>3</sup> ]
Max. load	250	315	493	626	[kg]
Max. rotor speed: grease/oil circulation lubrication	1200/1500	1200/1500	950/1200	950/1200	[min <sup>-1</sup> ]
Max. G force: grease/oil circulation lubrication	805/1258	805/1258	631/1006	631/1006	[g]
Centrifuge weight (without load)	2600	2700	3450	3600	[kg]
Basket weight (1.4404)	385	425	630	695	[kg]
Motor power for main drive	15.0	15.0	18.5	18.5	[kW]
Motor power for feed/wash disk (option)	3.0	3.0	3.0	3.0	[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 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)



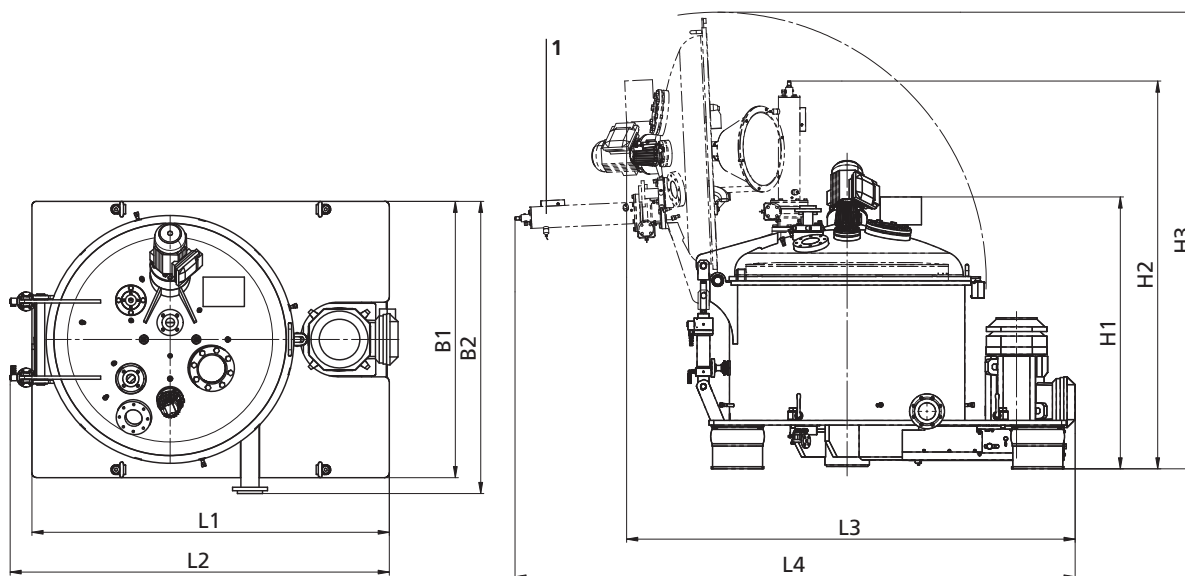
Filter bag with removable basket lip



Lifting device for filter bag



Discharge device for filter bag



1. Design with loosening scraper

VTC	630/320	800/400	1000/500	1000/630	1250/630	1250/800	1600/630	1600/800	Unit
<b>Dimensions</b>									
L1	1300	1600	1900	1900	2250	2250	2650	2650	[mm]
L2	–	–	2010	2010	2390	2390	2920	2920	[mm]
L3	–	–	2340	2340	2640	2640	3190	3190	[mm]
L4 Loosening scraper design	–	–	2990	2990	3530	3530	4200	4200	[mm]
B1	1000	1200	1500	1500	1740	1740	2000	2000	[mm]
B2	1100	1300	1600	1600	1850	1850	2150	2150	[mm]
H1	960	1050	1250	1400	1450	1620	1730	1900	[mm]
H2 Loosening scraper design	–	–	1600	1730	2275	2445	2440	2610	[mm]
H3	1480	1770	2230	2360	2670	2840	3080	3250	[mm]

<b>Technical data</b>									
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	[m <sup>2</sup> ]
Useful volume (100%)	51	102	200	252	394	500	646	820	[dm <sup>3</sup> ]
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 <sup>-1</sup> ]
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)



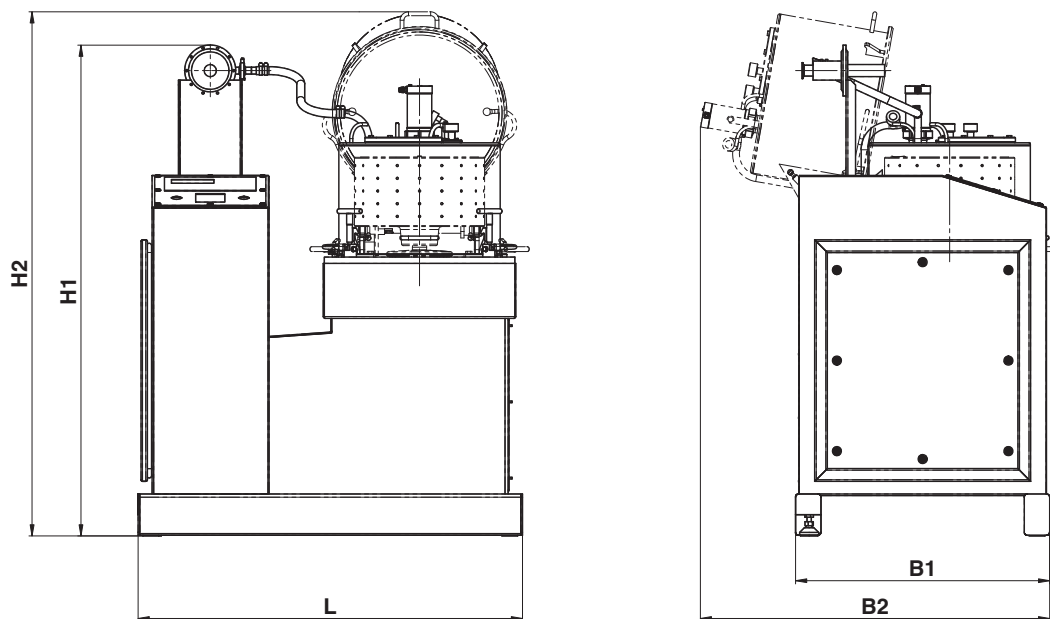
Cover closed, front view



Cover open, rear view



Best inspection with open cover



VTC-M	320/160	400/200	500/250	500/350	Unit
<b>Dimensions</b>					
L	1200	1200	1350	1350	[mm]
B1	800	800	900	900	[mm]
B2	1000	1100	1300	1300	[mm]
H1	1550	1550	1550	1550	[mm]
H2	1600	1650	1750	1850	[mm]

<b>Technical data</b>					
Basket diameter	320	400	500	500	[mm]
Basket height	160	200	250	350	[mm]
Basket opening	224	280	350	350	[mm]
Filter surface	0.16	0.25	0.39	0.55	[m <sup>2</sup> ]
Useful volume (100%)	6.6	12.8	25	35	[dm <sup>3</sup> ]
Max. load	8.2	16	31.3	43.8	[kg]
Max. rotor speed	3000	2700	2400	2400	[min <sup>-1</sup> ]
Max. G force	1610	1630	1610	1610	[g]
Centrifuge weight (without load)	200	300	400	420	[kg]
Motor power for main drive	1.5	2.2	3	3	[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-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)



VTC-I	320/160	400/200	500/250	500/350	Unit
Basket diameter	320	400	500	500	[mm]
Basket height	160	200	250	350	[mm]
Basket opening	224	280	350	350	[mm]
Filter surface	0.16	0.25	0.39	0.55	[m <sup>2</sup> ]
Useful volume (100%)	6.6	12.8	25	35	[dm <sup>3</sup> ]
Max. load	8.2	16	31.3	43.8	[kg]
Max. rotor speed	3000	2700	2400	2400	[min <sup>-1</sup> ]
Max. G force	1610	1630	1610	1610	[g]
Centrifuge weight (without load)	200	300	400	420	[kg]
Motor power for main drive	1.5	2.2	3	3	[kW]



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

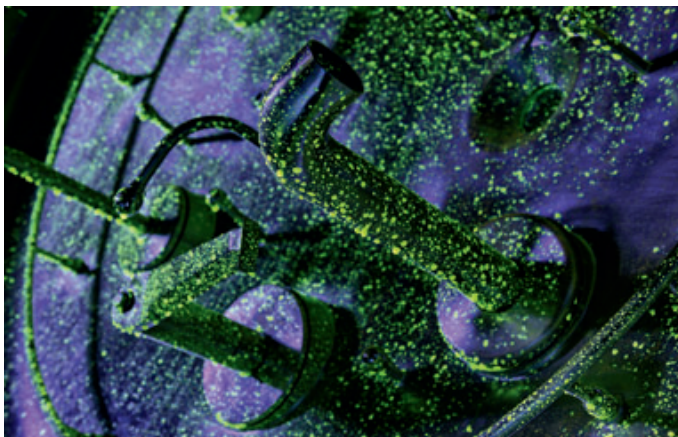
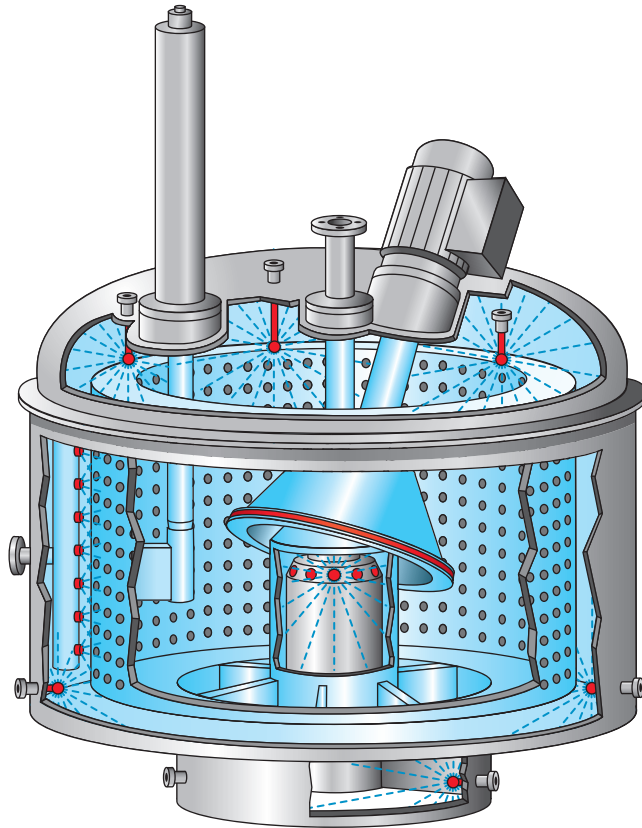
Our designs comply with the latest GMP directives. The hygienic cleaning of the process area is made possible by a clean finish, excellent surface quality, compliance with minimum radii and the use of FDA-approved open O-rings.

### 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).



*Prior to the CIP program:  
the riboflavin is made visible with UV light*



*After the CIP program:  
in UV light no more riboflavin residue is visible*

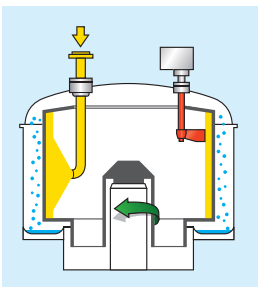
## Process steps

### Process of solid-liquid separation

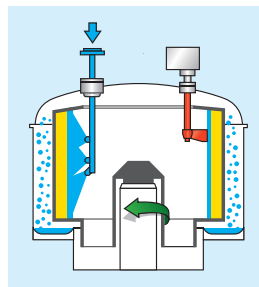
The solid-liquid separation is effected discontinuously in a sequence of specific process steps. The individual process steps last from a few minutes to several hours depending on the characteristics of the product. Depending on the type of control system, the process can be fully automated, semi-automated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

### Vertical scraper centrifuges

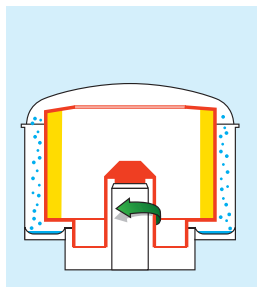
Filling and Intermediate centrifugation



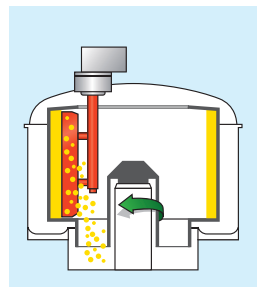
Washing



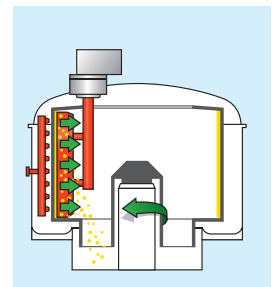
Dry-centrifugation



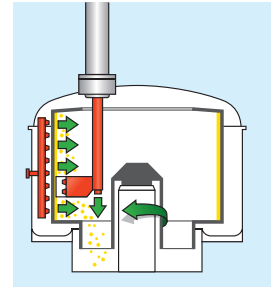
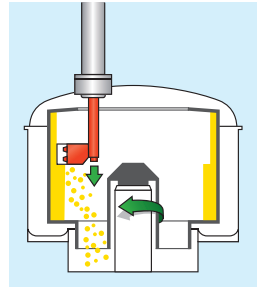
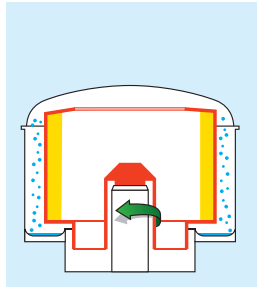
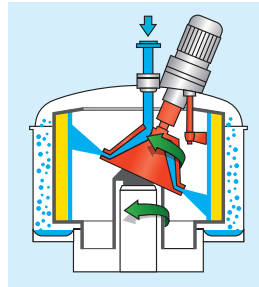
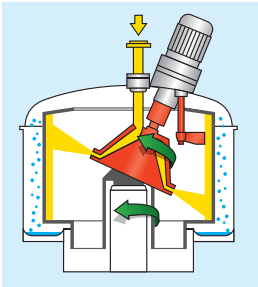
Scraping, solids discharge



Residual heel removal



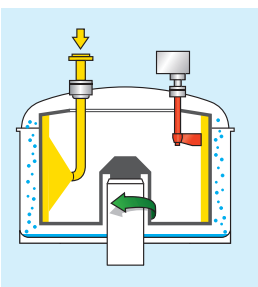
*Basic design: feed pipe and wash pipe, scraper knife over the entire basket height*



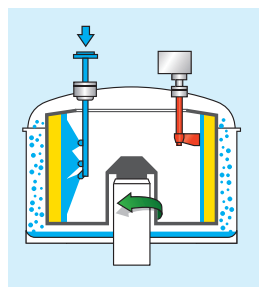
*Design with feed and wash disk, scraper knife with vertical movement*

### Vertical top discharge centrifuges

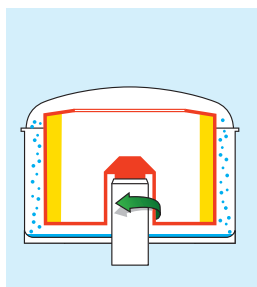
Filling and Intermediate centrifugation



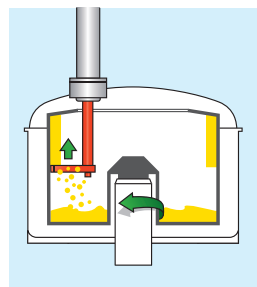
Washing



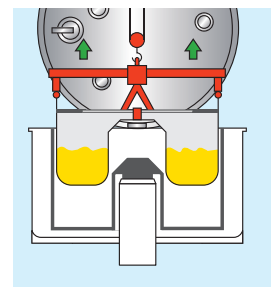
Dry-centrifugation



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.



*Vertical scraper centrifuge  
feed pipe and wash pipe, scraper knife over  
entire basket height*



*Vertical scraper centrifuge  
feed and wash disk, scraper knife with  
vertical movement*



*Vertical top discharge centrifuge  
feed pipe and wash pipe, loosening scraper*

## 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 customer-specific elements.

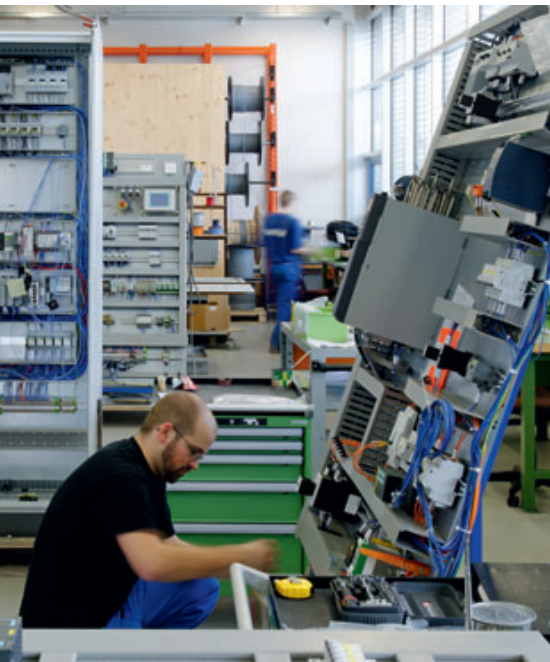
### Overview of the range of control systems and drives

- 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

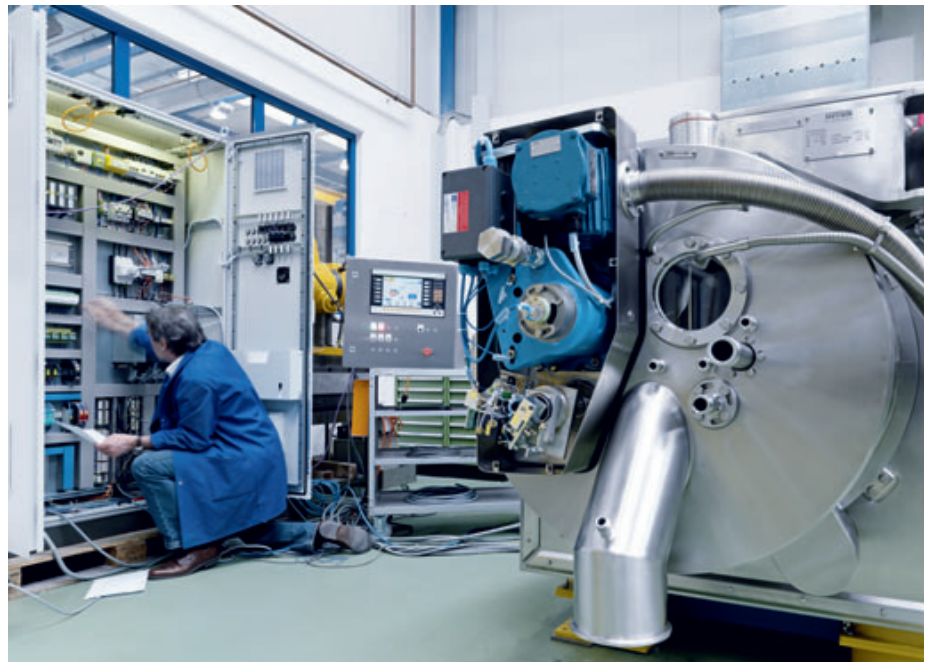
### Drive systems and safety control systems

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.



*Ferrum automation department: design and assembly of drive and control systems*



*Automation system with terminal, control and drive system*

### 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 a easy-to-use recipe management system.



*Terminal with pushbuttons*



*Eco-terminal with visualisation*



*Terminal with process visualisation*

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 N<sub>2</sub> flow rate and pressure monitoring, O<sub>2</sub> 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 N<sub>2</sub> flow rate and pressure monitoring, O<sub>2</sub> measurement optional
- Monitored by the centrifuge control system
- UL, CSA certificates for all instruments

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.

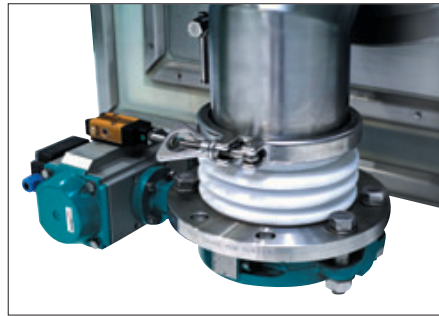
- Various valves and butterfly valves
- Solids discharge cones
- Flexible connections and flow sight glasses
- Siphons and pressure relief valves to ensure the nitrogen overpressure is maintained in the centrifuge
- CIP collectors and valves for the regulation of the CIP cleaning cycles
- Collectors 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



*Siphons*



*Pressure relief valves*



*Valves, flexible connections*

## 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.





*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*



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