

Pusher centrifuges
for basic, agricultural and petrochemical industries



ferrum

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

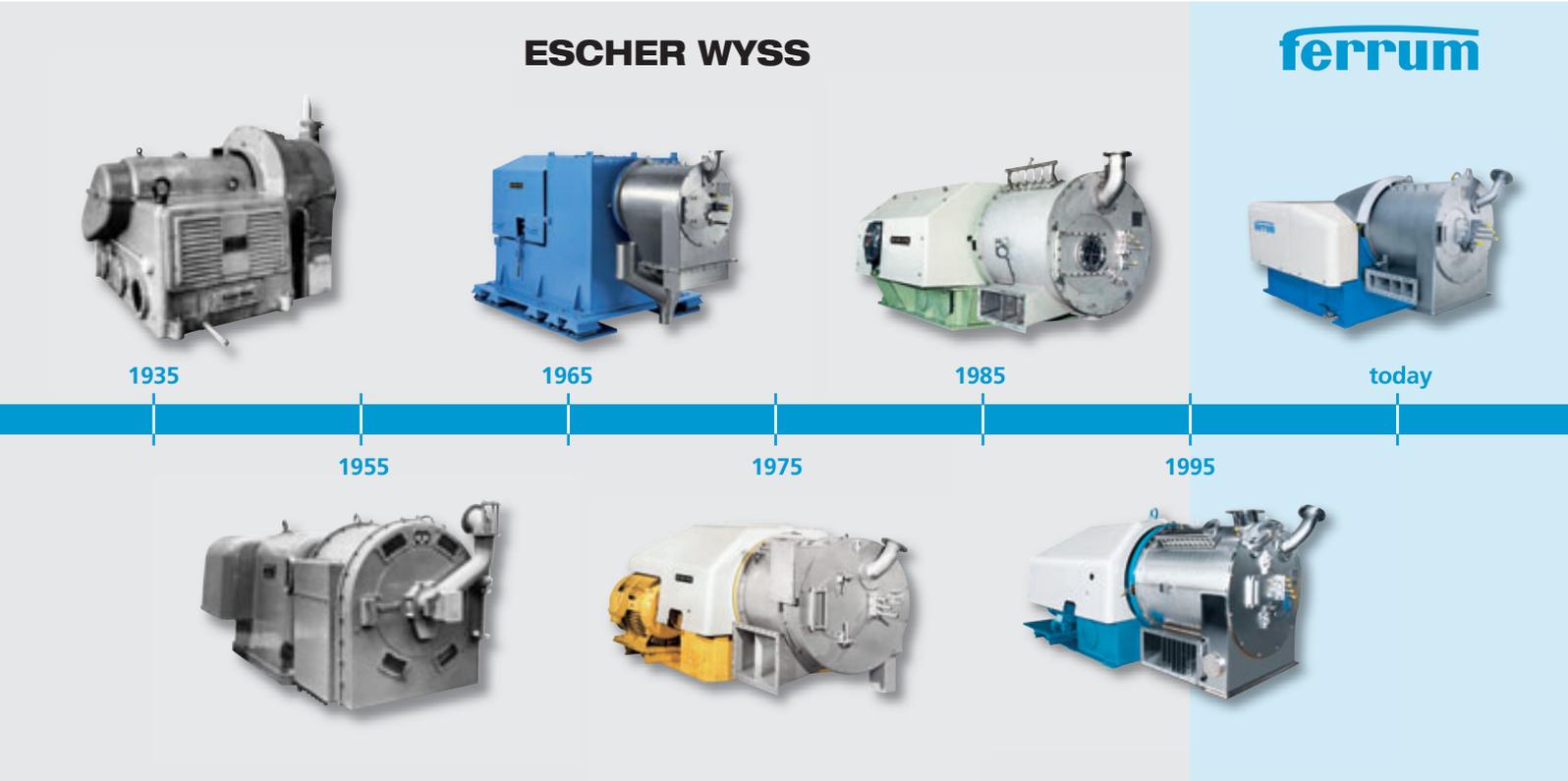
Ferrum offers you customer-specific complete systems from a single source and, with its unique vertical integration, guarantees the highest quality without interface problems. We build our centrifuges and automation systems in-house; we also manufacture most of the mechanical components in our foundry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

75 years of experience flow into our development work: in 1935 Escher Wyss began to build pusher centrifuges, and since the take-over of the related department in 1994, Ferrum has developed the most advanced centrifuges for solid-liquid separation in the basic, agricultural and petrochemical industries.



Pusher centrifuges P-50, sodium sulphate/Glauber's salt



Pusher centrifuges P-80, adipic acid

Custom solutions

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.

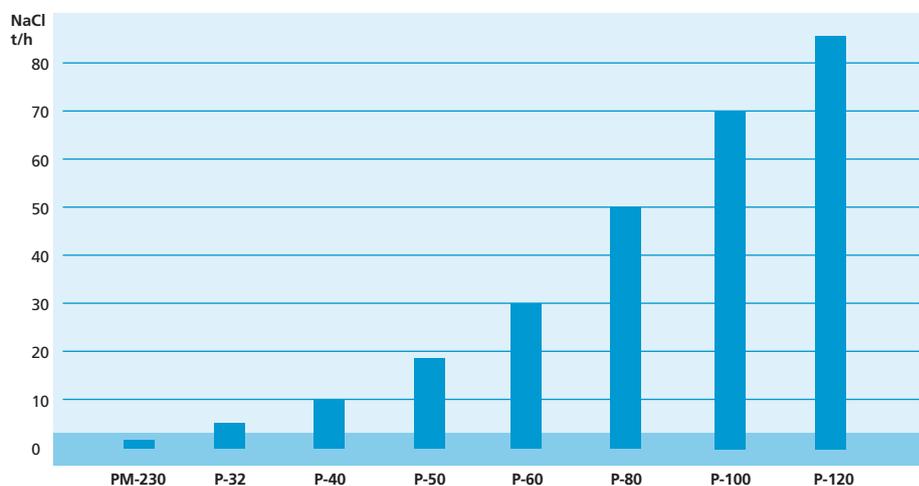


Our centrifuges – your benefits!

Pusher centrifuges from Ferrum feature the following advantages:

- High solids throughput with low energy consumption
- Low residual moisture content
- High solids yield
- High wash efficiency
- Low particle fracture
- Low-vibration operation
- Absolute reliability and durability
- Low maintenance costs

Typical production quantities for Ferrum pusher centrifuges



*Maximum throughputs of Ferrum pusher centrifuges with NaCl
(throughputs dependent on feed conditions)*

Mechanical design

Based on the very successful Sulzer-Escher Wyss design, Ferrum has consistently developed the centrifuge further, always in accordance with the latest requirements.

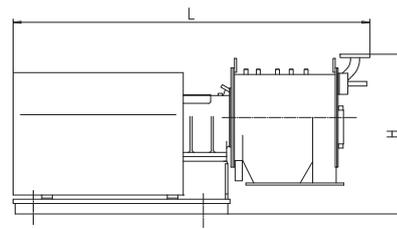
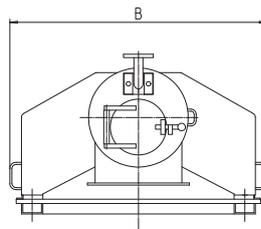
The simple, robust construction is very easy to maintain and permits straightforward commissioning as well as reliable, high performance continuous operation.

The rotary drive and pusher drive for the baskets are provided by two separate electric motors with stepped v-belt pulleys. The rotary movement of the pusher motor is converted into the pusher movement via a gearbox with an extender wheel.

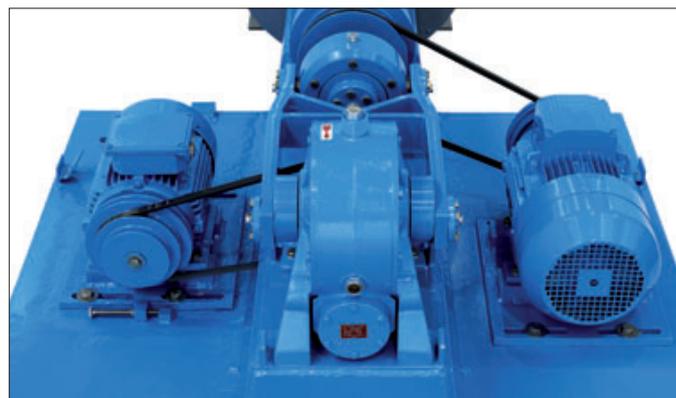


Design features

- Simple, robust design, high reliability
- High throughputs under the toughest conditions
- Purely mechanical pusher drive without any hydraulic system
- Optimally designed inlet section for gentle acceleration of the product
- Adjustable wash nozzles for optimum cake washing
- Flush connections for complete cleaning of the centrifuge process area
- Various discharge systems for gentle discharge of the solids
- Various peripheral components available for the basic model
- Special designs on request (gas-tight, explosion protection, etc.)



Technical data	PM-230	Unit
Basket diameter	230	[mm]
Number of stages	1-2	-
Max. rotor speed	3600	[min ⁻¹]
Max. number of strokes	100	[min ⁻¹]
Max. G force	1666	[g]
El. power required with NaCl, rotation/stroke	2/1	[kW]
Dimensions (L x W x H)	1.7 x 1.2 x 0.8	[m]
Weight	800	[kg]
Maximum NaCl throughput (dependent on feed conditions)	1.5	[t/h]



Drive and control unit PM-230

Pusher centrifuges types P-32 to P-120

Model range P-32 to P-50

The centrifuge types P-32 to P-50 are a new development from Ferrum. Thanks to their high-performance hydraulics, the machines feature compact dimensions and can be operated with small quantities of oil.

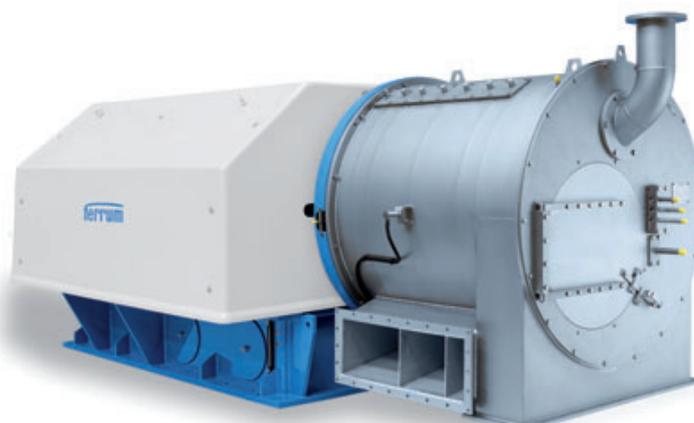
The pusher mechanism is actuated hydraulically, reversal is effected via an external hydraulic control unit. The number of strokes can be continuously adjusted, the stroke length remains constant. The oil pump and the rotor are actuated using two separate electric motors.



Model range P-60 to P-120

Based on the very successful Sulzer-Escher Wyss design, Ferrum has consistently further developed the centrifuge types P-60 to P-120, in accordance with the latest requirements.

The pusher mechanism is actuated hydraulically, reversal is effected via a fully internal reversal unit. The number of strokes can be continuously adjusted, the stroke length remains constant. The oil pump and the rotor are actuated using two separate electric motors.



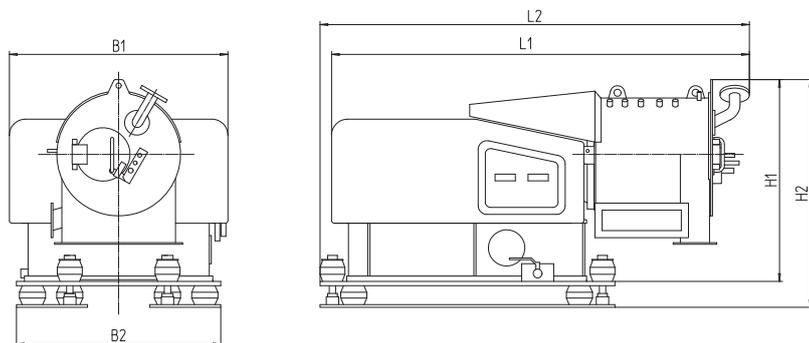
Design features

- Compact, robust and reliable design
- Operated with small quantities of oil
- High throughputs under the toughest conditions
- Hydraulic pusher drive for high pusher forces
- Optimally designed inlet section for gentle acceleration of the product
- Adjustable wash nozzles for optimum cake washing
- Flush connections for complete cleaning of the centrifuge process area
- Various discharge systems for gentle solid discharge
- Various peripheral components available for the basic model
- Special designs on request (gas-tight, explosion protection, etc.)



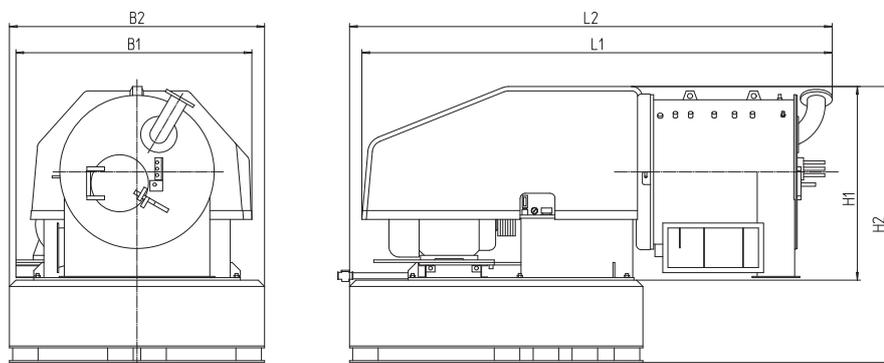
Drive and control unit P-100

Technical data model range P-32 to P-50



Technical data	P-32	P-40	P-50	Unit
Basket diameter	320	400	500	[mm]
Number of stages	1-2	1-2	1-2	–
Max. rotor speed	2900	2400	2100	[min ⁻¹]
Max. number of strokes	80	80	80	[min ⁻¹]
Max. G force	1504	1288	1233	[g]
El. power required with NaCl, rotation/stroke	7/4	11/6	22/12	[kW]
Dimensions				
L1/L2	2300/2400	2350/2450	2750/2800	[mm]
B1/B2	1250/1150	1250/1150	1400/1300	[mm]
H1/H2	1100/1250	1100/1250	1350/1500	[mm]
Operating weight (with oil filling)	2000	2100	3100	[kg]
Maximum NaCl throughput (dependent on feed conditions)	6	10	18	[t/h]

Technical data model range P-60 to P-120

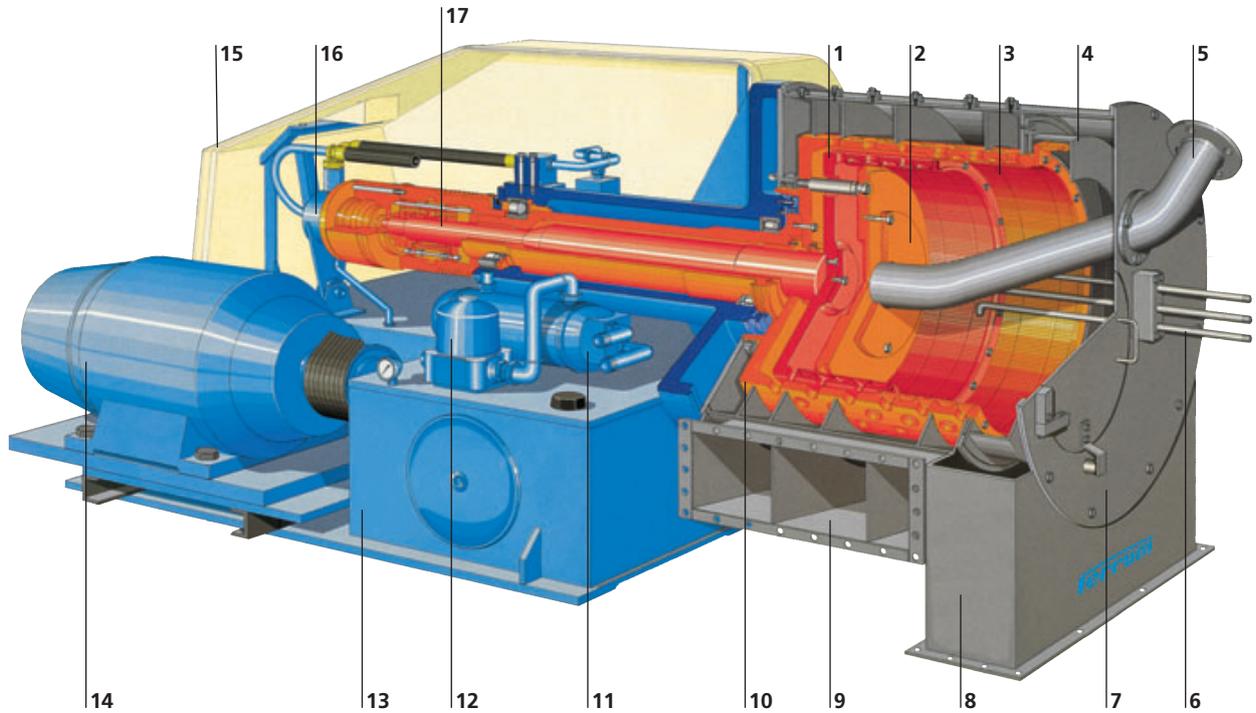


Technical data	P-60	P-80	P-100	P120	Unit
Basket diameter	630	800	1000	1200	[mm]
Number of stages	1-3	1-4	1-4	1-4	–
Max. rotor speed	1900	1500	1200	900	[min ⁻¹]
Max. number of strokes	80	80	80	76	[min ⁻¹]
Max. G force	1271	1006	805	543	[g]
El. power required with NaCl, rotation/stroke	40/20	72/32	113/53	150/60	[kW]
Dimensions					
L1/L2	3150/3200	3700/3800	4300/4350	4300/4350	[mm]
B1/B2	1600/1700	1850/2000	2300/2300	2300/2300	[mm]
H1	1300	1550	1900	1900	[mm]
H2 vibration isolation concrete counterweight	2000	2200	2550	2550	[mm]
H2 vibration isolation steel counterweight	1550	1850	2200	2200	[mm]
H2 vibration isolation without counterweight	1450	1700	–	–	[mm]
Operating weight (with oil filling, without counterweight)	4900	8000	12000	13000	[kg]
Maximum NaCl throughput (dependent on feed conditions)	30	50	70	85	[t/h]

8 Pusher centrifuge design

Layout of Ferrum pusher centrifuge

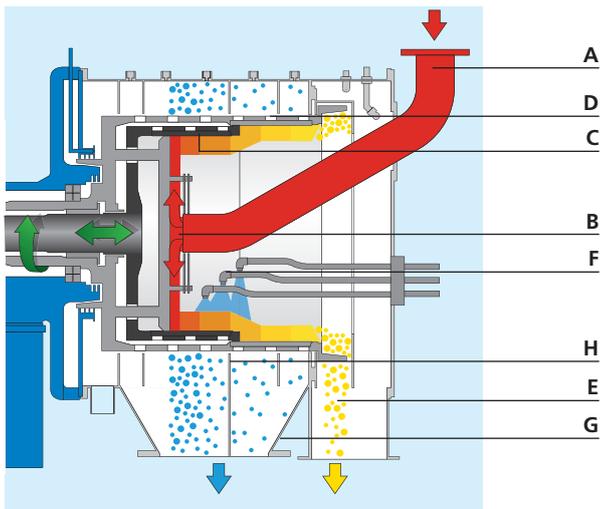
Example model range P-60 to P-120



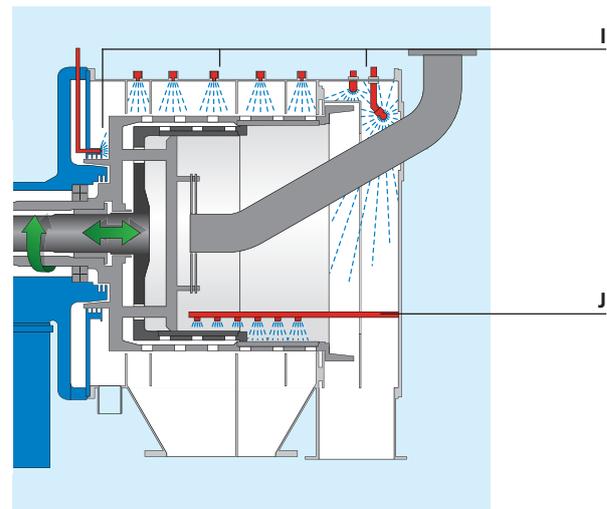
- 1. First stage (rotating, oscillating)
- 2. Suspension distributor
- 3. Sieves
- 4. Solids discharge track
- 5. Suspension inlet pipe
- 6. Wash and clean pipes

- 7. Front plate with door
- 8. Solids discharge housing
- 9. Filtrate housing
- 10. Second stage (rotating)
- 11. Oil cooler
- 12. Oil filter

- 13. Stator with oil tank
- 14. Rotor motor with v-belts
- 15. Cover
- 16. Fluid medium supply
- 17. Pusher control system



Solid-liquid separation



Cleaning the process area

Pusher centrifuges are continuously operating filter centrifuges and can have several basket stages depending on the application. The solid-liquid separation shown here involves a two-stage pusher centrifuge.

A. Suspension inlet

The centrifuge is continuously fed with the suspension to be separated (solid-liquid mixture) via the inlet pipe. In case of poorly flowing products, the feed is effected via an inlet screw conveyor (not shown).

B. Suspension distributor

The distributor accelerates and distributes the suspension over the entire periphery of the sieves in the filling area of the first basket stage. Ferrum offers various application-specific distribution systems for even and gentle acceleration and distribution of the suspension.

C. First basket stage

The greatest part (approx. 80%) of the liquid is already filtered out in the feed zone of the first basket stage, a stable cake forms. The first basket stage performs, along with a rotary movement, also an axial pusher movement (oscillation movement).

D. Second basket stage

The cake is pushed in annular sections by each pusher movement from the first to the second basket.

E. Solids discharge

After the second basket stage, the solids leave the centrifuge via the discharge track and the solids housing. Depending on the application, different discharge systems are used.

F. Product washing

If necessary, impurities in the mother liquor are washed out. The wash liquid is applied continuously over the cake via several adjustable wash nozzles.

G. Filtrate housing

The filtrate (filtered mother liquor and wash liquid) is collected in the filtrate housing and drawn off. Depending on the application, different filtrate housings and filtrate cyclones are used.

H. Filtrate separation

If necessary, the filtrate can be drawn off separately in each filtrate zone by means of separating plates fitted in the filtrate housing and disposed of or reused (e.g. counterflow washing).

I./J. Flushing

The centrifuge process area is cleaned using flush liquid supplied through optimally arranged cleaning nozzles (I) and a clean pipe (J). Periodic flushing prevents the formation of crystals in the sieves and deposits in the solids housing.

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
- 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

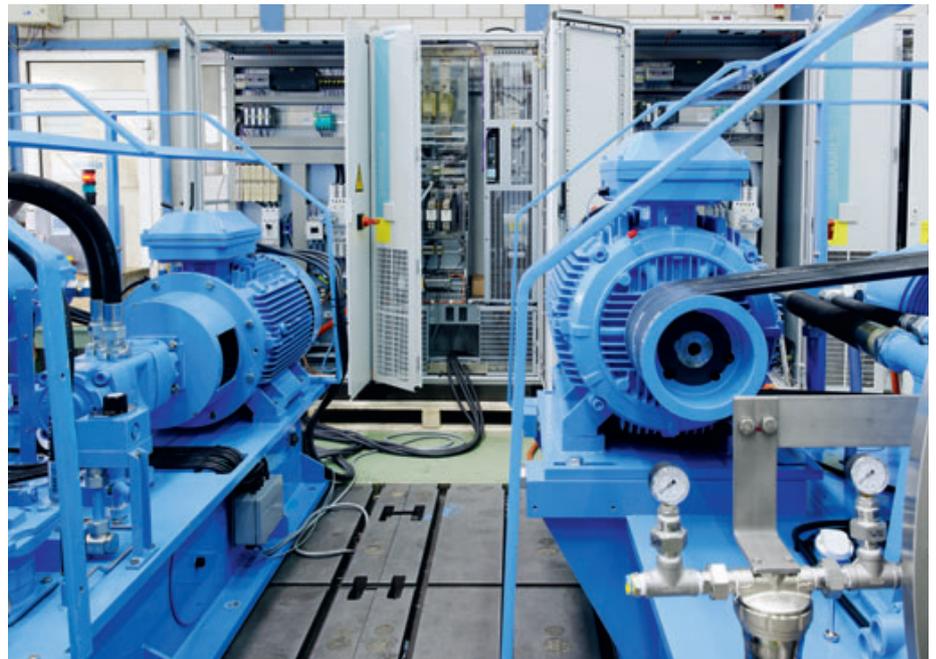
Drive systems and safety control systems

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



Drive systems and safety control systems

Control systems and terminals for the best ease of use

The control and visualisation software permits easy operation and control of the solid-liquid separation process. Thanks 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 automated process control systems with information displays for large systems.



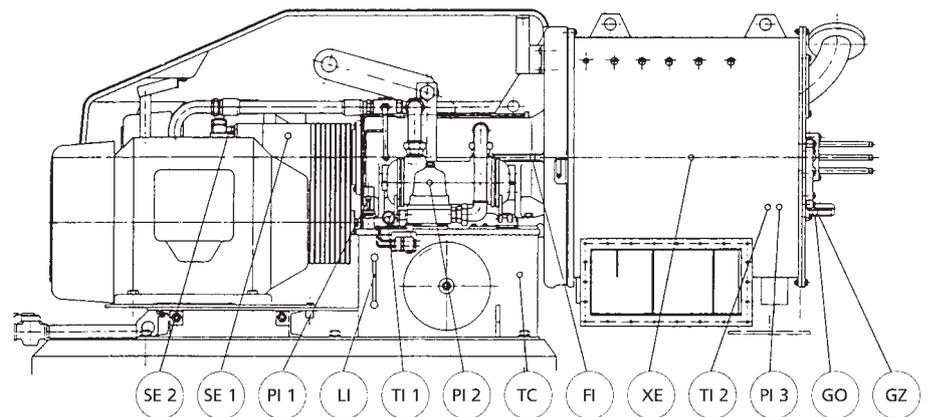
Terminal with pushbuttons



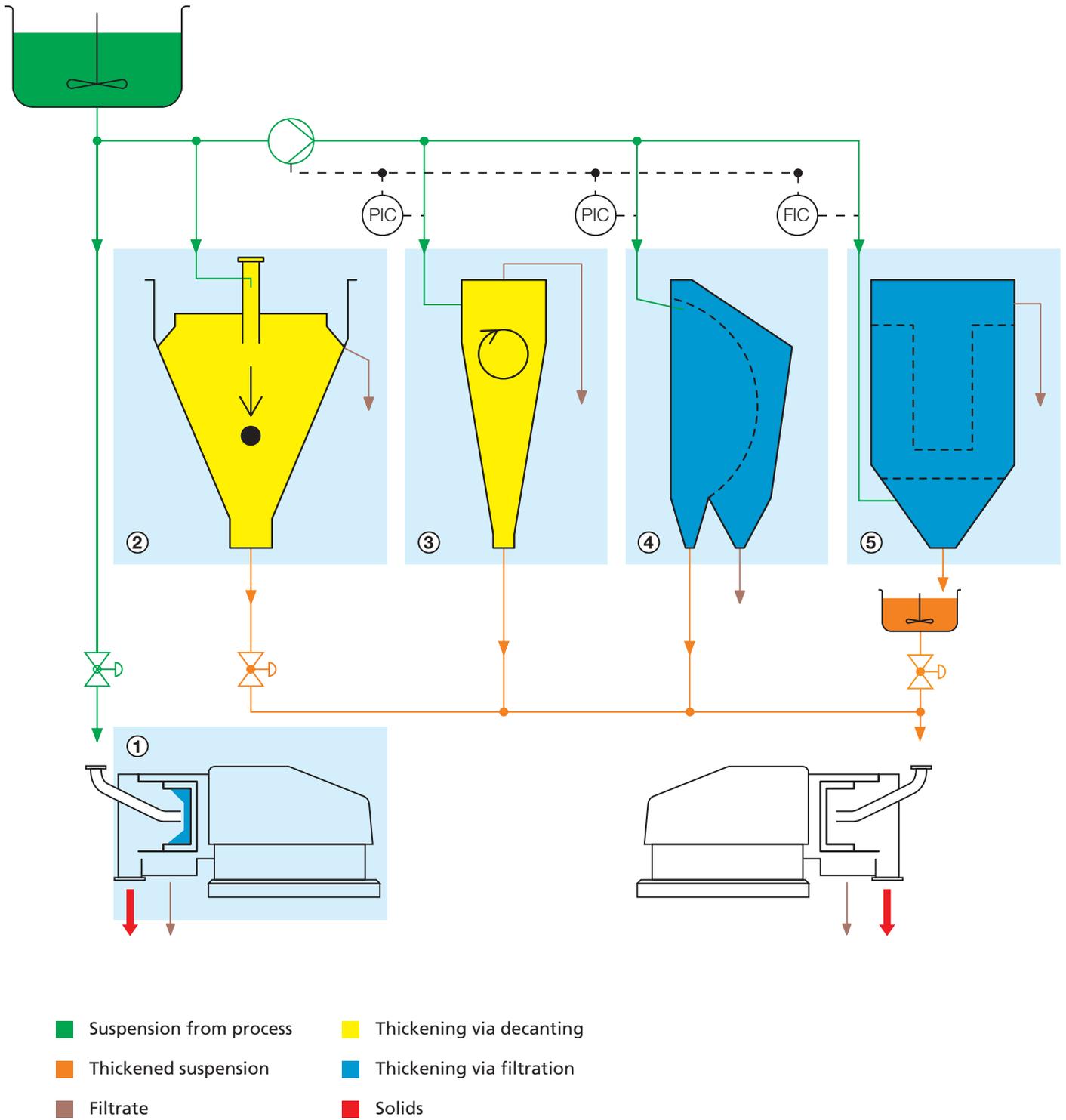
Terminal with visualisation

Modern automation concepts

Ferrum offers various centrifuge monitoring and diagnostic options. We individually combine instruments as well as monitoring and automation concepts to suit the applications and customer needs.



XE	Centrifuge vibration	TC	Oil heating
SE 1	Basket speed	FI/FT	Bearing lubrication
SE 2	Basket stroke	TI 2/TT 2	Process temperature
TI 1/TT 1	Oil temperature	PI 3/PT 3	Process pressure
PI 1/PT 1	Oil pressure	GZ	Door interlock
LI/LT	Oil level	GO	Door monitoring
PI 2/PS 2	Oil filter soiling		



As a continuously operating machine, the pusher centrifuge requires process conditions and solids concentrations as constant as possible to ensure optimum operation and consistent product quality.

For process and plant-related reasons, the necessary feed conditions are often not achieved. As a solution for this problem, Ferrum therefore offers various pre-thickening systems and dosing devices.

Depending on requirements, Ferrum supplies the design, production and automation of the related system.



1. Integrated thickener – a Ferrum innovation

The integrated thickener for pusher centrifuges was developed and patented by Ferrum. Separate, external pre-thickening is therefore not required, depending on the application. Fluctuating feed concentrations are compensated, the cake formation is improved and the product accelerated more gently. The integrated thickener is today our standard for certain applications.



2. Static thickener

The static thickener is used if the sedimentation behaviour of the solids and the space available permit. The thickened suspension can be supplied to several centrifuges at the same time via the Ferrum dosing unit.



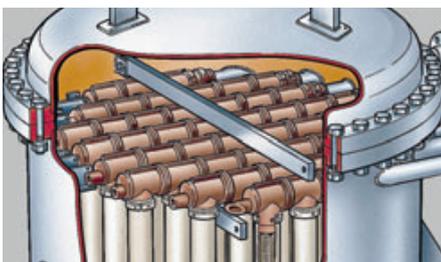
3. Hydrocyclone

Solids and liquid are separated by centrifugal acceleration. The thickened suspension in the outlet of solids at the base is supplied to the centrifuge. The usage of the hydrocyclone requires higher density solids than for the mother liquor (as with the static thickener).



4. Curved sieve

The thickened suspension is output onto the curved sieve surface under pressure. During this process a part of the liquid is separated via the sieve slots. The thickened suspension is collected at the end of the sieve and supplied to the centrifuge.



5. Cartridge filter

The pre-thickening is performed by the pressure difference at the cartridge filters (normally by overpressure) which are in a closed container. Cartridge filters operate discontinuously. To achieve a continuous process, the thickened suspension is collected in a collection tank.

Dosing units (DAU)

The dosing units and agitators designed by Ferrum are installed at the discharge opening on the static thickening tank. Depending on the model, max. four suspension outlets can be realised per dosing unit to permit simultaneous feeds to up to four centrifuges.

The integrated dosing valves can be actuated manually, electrically or pneumatically.

An agitator integrated into the dosing unit prevents solids deposits as well as blockages in the suspension outlets. Agitators and dosing valves are cleaned with liquid via flush connections.

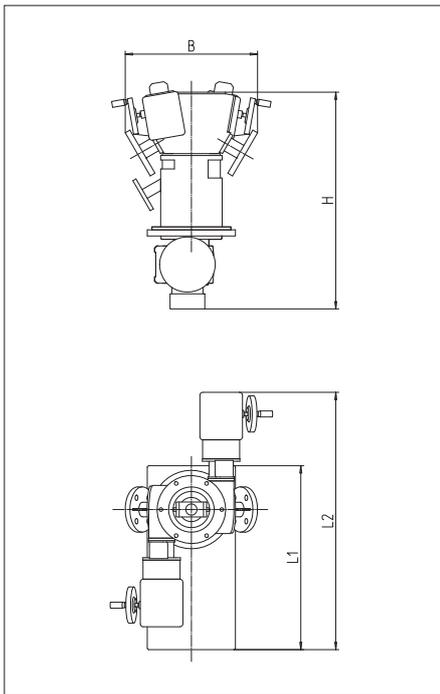
Interface to the customer's or Ferrum's control system permits optimally matched control of the units.

Agitator (RW)

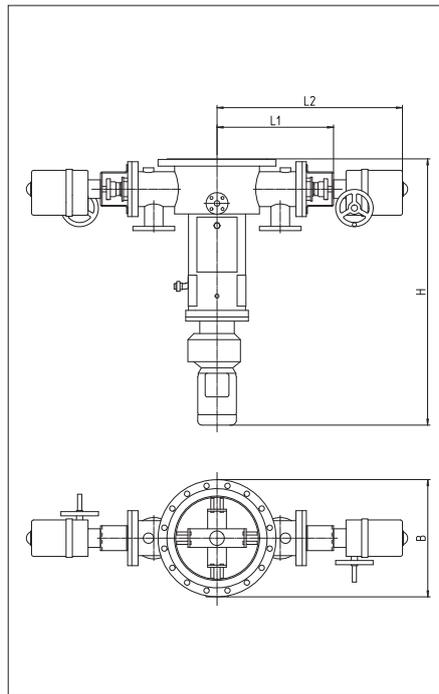
The agitator has a similar layout to the dosing unit, however it is not equipped with integrated dosing valves. Suitable standard dosing valves can be fitted to the suspension outlets and controlled by the customer's or Ferrum's control system.



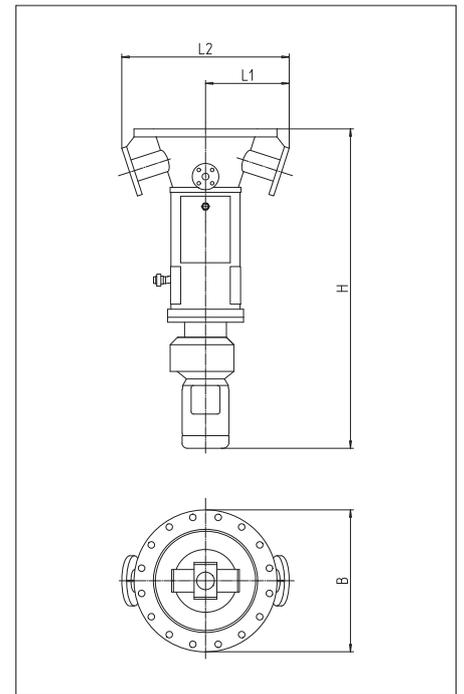
Dosing unit DAU 400



Dosing unit DAU 120



Dosing unit DAU 400



Agitator RW 400

Technical data	DAU 120	DAU 400	RW 400	Unit
Dimensions				
L 1	610	560	340	[mm]
L 2 (depending on the type of drive)	Approx. 850	Approx. 890	680	[mm]
B	440	600	600	[mm]
H	750	1300	1300	[mm]
Max. number of suspension outlets	2	4	4	-
Power for agitator drive motor	1.1	1.1	1.1	kW

Application

During the operation of pusher centrifuges, «flooding» is a problem that often occurs. In this situation the pusher centrifuge does not adequately remove the liquid from the suspension. A suspension channel forms that propagates axially over the product cake and can reach as far as the solids discharge. The consequences are pusher centrifuge unbalance, increased residual moisture content and impurity of the solids.

A possible solution is, by changing the process parameters, to influence the characteristics of the suspension in the upstream area such that flooding no longer occurs at the required solids throughput. If this option is not possible, the only way to prevent flooding is with reduced throughput performance.

A new solution for such cases is the use of the pulsed feeding patented by Ferrum.

Function

The pulsed feeding is synchronised with the pusher frequency of the centrifuge and feeds the centrifuge with an increased suspension throughput, however only in the optimum, non-critical basket pusher position.

The system comprises a specially manufactured suspension inlet device, a gate valve with drive motor, a sensor on the stator to determine the stroke position as well as a small control unit. For products with small particle size distribution and/or high viscosity, the throughput can be increased by up to 100% without causing flooding.

Advantages of the pulsed feeding

- Higher throughput (product-dependent, up to a factor of 2 without flooding)
- Switching between pulsing and continuous feed without process interruption
- Easy to upgrade existing centrifuges



Application-specific solutions

Innovative designs

Ferrum supplies appropriately modified, innovative designs and custom designs for a very wide range of applications and processes:

- Various material qualities for parts in contact with product
- Product inlet and product distribution systems
- Solids and filtrate discharge systems
- Gas-tight designs
- Explosion-protected designs (according to directive 94/9/EC)
- Special designs for explosive products
- Heated, insulated centrifuge housings
- Special protection against wear from abrasive products
- Various other special designs on request

Peripheral components

For the pusher centrifuges 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:

- Flush flaps: Solids flush liquid gate
- Sight glasses, flexible connections, collectors
- Feed, wash and flush valves
- Suspension cone at the solids discharge
- Various other components upon request



Pusher centrifuge P-100, cellulose

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
- Internal sieve manufacture for delivery of customer-specific sieve segments

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.

Maintenance contracts based on BGR 500

For regular maintenance work we offer individual maintenance contracts with special conditions. We undertake all maintenance work at defined intervals and as a result guarantee the highest possible plant availability.

Customer-specific training

We will put together individual training courses for you related to, e.g. the function of the centrifuge, its maintenance and operation as well as inspections, control and troubleshooting.

Maintenance P-100, NaCl



Large stock of spare parts



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.



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), data sheets, operating manuals as well as a clear spare parts catalogue.



Application areas in international markets

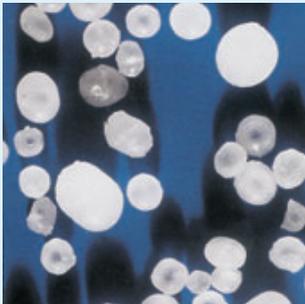
Application areas

Ferrum pusher centrifuges feature a wide spectrum of applications in the basic, agricultural and petro chemical industries.

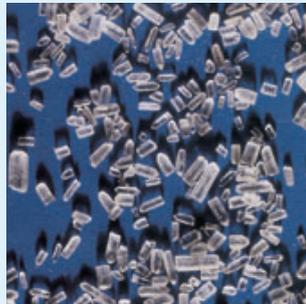
Specific process and inlet conditions are required for the use of pusher centrifuges. Key parameters are the particle size distribution and the solids concentration.

Some application examples

Adipic acid, ammonium chloride, ammonium sulphate, borax, boric acid, calcium tartrate, iron sulphate, Glauber's salt, urea, potassium chlorate, potassium chloride, potassium nitrate, potassium sulphate, plastics, linters, lysine, sea salt, sodium carbonate, sodium chlorate, sodium chloride, sodium cyanide, sodium bicarbonate, sodium nitrate, sodium sulphate, nickel sulphate, nitrocellulose, oxalic acid, phosphate, zinc sulphate



Sodium chloride



Ammonium sulphate



Plastic granulate



Nitrocellulose

Excellent references

With more than 3500 pusher centrifuges delivered Ferrum is a world-leading centrifuge manufacturer.

Pusher centrifuges P-80, adipic acid



Pusher centrifuge P-60, ammonium sulphate





*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*



Subsidiaries

Ferrum Inc.
Houston, TX 77084 USA
Phone 877 WE FERRUM
877 93 337786

Fax 877 711 2FAX
877 711 2329

sales@ferrumus.com
www.ferrumus.com

Head office

Ferrum Ltd.
CH-5102 Rapperswil
Phone +41 62 889 14 11
Fax +41 62 889 15 13
zentrifugen@ferrum.ch
www.ferrum.ch

Ferrum India
Mumbai, 400016
Phone +91 22 243 14299
Fax +91 22 243 22276
ferrumindia@gmail.com