

# Krauss-Maffei SZ pusher centrifuge

Continuously operating filtration centrifuge



# Krauss-Maffei SZ pusher centrifuge

## Maximum process reliability

Looking for reliability in performance? Proven, yet innovative separation technology? With a one-of-a-kind maintenance concept? An experienced supplier who thinks outside the box? Combining all these factors with its Krauss-Maffei SZ pusher centrifuge, ANDRITZ SEPARATION offers you a solution that runs as continuously as your process is intended to be.

In continuous solid/liquid separation, Krauss-Maffei pusher centrifuges successfully combine the features of high availability with minimum maintenance and reduced specific space requirement. Especially suited for fast filtering products, demanding for high throughput rates, our pusher centrifuges are the right choice for reliable and effective dewatering. A variety of washing modes and machine sizes are available in order to meet the individual quality requirements for your final product.

Krauss-Maffei pusher centrifuges were launched on the market over 80 years ago and have been applied since then in over 5,000 installations around the globe.

With these numbers comes a wealth of experience gained in industrial applications from food to bulk chemicals, plastics, fiber, or mining and mineral applications, and the track record keeps on running.

### Fields of application

#### Bulk chemicals

- Borax/boric acid
- Ferrous sulphate
- Soda applications
- Sodium chlorate
- Sodium chloride
- Sodium sulphate

#### Agrochemicals

- Ammonium chloride
- Ammonium sulphate
- Phosphates
- Potassium chloride
- Potassium sulphate
- Urea

#### Plastics

- ABS
- Adipic acid
- BPA
- Melamine
- Paraxylene
- POM
- Sodium formiate

#### Foodstuff

- Lysine
- Phosphoric acid
- Sodium
- Hydrogen carbonate

### Processing parameters

Average particle size:	80-2,000 µm
Solids throughput:	up to 150 t/h
Solids recovery:	>98%
Solids concentration of slurry to be separated:	
▪ for crystalline products:	30-75 M%
▪ for fibrous products:	2-12 M%
▪ for plastics:	5-25 M%

### Construction materials

Stainless steel, nickel alloys, titanium

## Processing advantages

### Low energy consumption

More than 25% in energy savings compared to competitors due to optimized design of process area and efficient pusher system.

### Outstanding product quality

- Highly efficient cake washing modes
- Minimum particle breakage with optimized feed system
- Selection of screen configurations designed for your product parameters, for minimized product loss and maximized dewatering properties

### Unmatched capacity

- Integrated prethickening available
- Highest pusher volume
- Different types of patented feed distributors
- Integrated pre-thickening available

### Superior maintenance concept

- Innovative cartridge system patented by ANDRITZ KMPT provides minimum production downtime
- Optimized wear parts offer fast replacement
- Extended lifetime of screens by using efficient, pre-accelerating feed distributor

## Your benefits

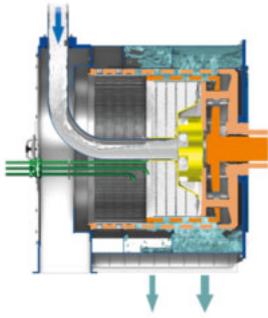
- Unmatched price-performance ratio
- Maintenance-free internal pusher control unit
- Unique pusher shaft design avoids cross contamination
- Integrated prethickener design available
- High availability due to patented cartridge design



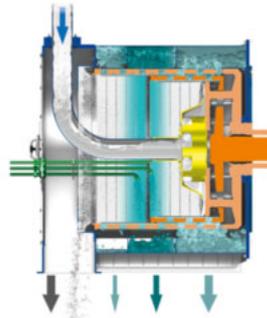
▲ Krauss-Maffei SZ pusher centrifuge

# Krauss-Maffei SZ pusher centrifuge

## Operation



▲ Feeding



▲ Cake washing



▲ Vane-type feed distributor

### Function

Krauss-Maffei pusher centrifuges are continuously operating centrifuges. The product is fed through a feed pipe (or feed screw in the case of products that do not flow freely) into the feed distributor, which rotates with the basket. This accelerates the slurry and feeds it with uniform distribution to the feed zone, where the greater part of the liquid (approx. 80%) is filtered. In the feed zone, the solids grow to form a stable filter cake ring. The filter cake is conveyed in the direction of the solids discharge stroke by stroke due to the relative axial between pusher bottom and screen basket. During this process, an intact filter cake forms over the entire length of the screen. As the filter cake progresses from the feed zone to the solids discharge, it can be washed as required. For this purpose, a wash liquor is applied to the cake surface, displacing the suspension liquid and impurities. Multi-stage washing is also possible with several successive washing zones.

Multi-stage centrifuges with several baskets loosen the filter cake and reshape it by moving it from the inner basket to the next larger basket. As a result of this re-shaping process, moisture that forms between the

particles is exposed and filtered. The solids are discharged at the end of the basket after each pusher movement.

### Feed conditions

For machine size optimization and maximum operating reliability, it is important to provide a uniform and concentrated slurry feed. As upstream equipment such as crystallizers or reactors frequently do not meet these requirements satisfactorily, a pre-thickener system is usually applied. This system levels out fluctuations in the feed conditions and minimizes the hydraulic load of the centrifuge, often resulting in a smaller machine size being selected.

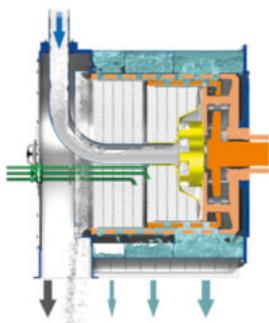
Stationary or dynamic equipment have become established as pre-thickeners, depending on the type of application. Examples of stationary equipment are sedimentation tanks and thickener filters, while examples of dynamic equipment include bent screens, hydro-cyclones, vibration screens, and EC screen thickeners. In stationary thickeners, a metering unit is required to control the feed to the centrifuge and in dynamic thickeners, the feed to the thickener must be monitored. Alternatively, an integrated pre-thickening stage can be offered, which makes the machine less sensitive to

changing feed conditions and opens up a wider field of applications.

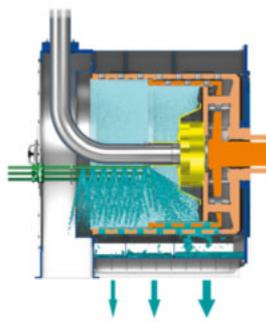
### Feeding

The feed system has the most significant impact on operation of the centrifuge. The patented, vane-type feed distributor from ANDRITZ KMPT diverts the slurry flow in the direction of the rotating basket, pre-accelerating the slurry and distributing it uniformly in the feed zone in order to achieve smooth cake formation. Uniform distribution of the slurry is the basic requirement for trouble-free operation of the centrifuge.

The slurry is pre-accelerated to such an extent that the difference between the speed of the slurry and the screen is practically zero. In this way, particle attrition is reduced markedly in comparison with other feed systems. This results in more uniform formation of the filter cake and higher throughput rates. The machine is filled evenly and runs much more smoothly and quietly as a result. Benefits are obtained from reduced maintenance costs as a result of low wear.



▲ Discharge



▲ Cleaning



▲ Special discharge design

## Filtration

In addition to the pre-acceleration the residual moisture can be influenced by a variable residence time of the product in the centrifuge. The residence time is usually between 10 and 60 seconds. It is mostly dependent on the adhesion factor between the product and the filter media. With different configurations of screens and baskets, the residence time during operation is optimized and adjusted to the actual throughput rates. There is a wide range of screens available, providing the optimum filter media for the variety of separating tasks. The width between the slots and the screen profile are adjusted to the optimum setting for the respective product. The screen slot widths generally range between 0.1 and 0.5 mm.

## Cleaning

With a wide range of CIP nozzles distributed inside the basket and the process housing, the pusher centrifuge can be cleaned automatically. A unique feature in the market is cleaning not only of the basket rear wall, but also of the space between each basket rear wall and the pusher bottom without dismantling.

## Discharge conditions

The two flows of filtrate and solids are discharged separately from the machine. It is important that there is no filtrate build-up during this process. As the baskets have the effect of a fan, filtrate and vapor are frequently mixed, although vapor in the filtrate flow is not desirable in most cases. To avoid this, the filtrate flow is subjected to further separation in a degassing cyclone. The vapor is either fed back to the centrifuge housing or discharged to a ventilation system. During solids discharge, it is important that the product is ejected without product congestion or deposits. The solids discharge must be designed differently depending on the properties of the product.

# Krauss-Maffei SZ pusher centrifuge

## Designs, drives, and applications



▲ Hydraulic drive

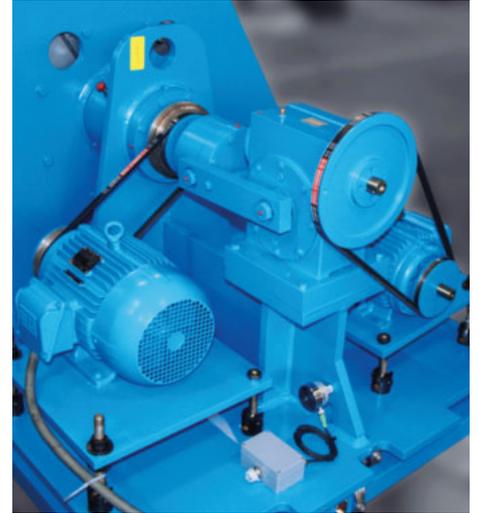
### Drives for rotary and pusher action

Krauss-Maffei pusher centrifuges use two drives: one for the rotary motion and one for the oscillating pusher motion, and both are controlled independently of one another.

The rotary motor accelerates the empty rotor during the start-up process. During operation, the continuously supplied product is accelerated in radial direction. The rotary drive is an axially parallel motor that drives the rotor via a V-belt. The pusher drive creates an oscillating motion by the pusher element. Its purpose is to generate the axial, alternating pusher force and to control the movement. Both hydraulic and mechanical pusher drives are available.

### Hydraulic pusher drive

Pusher centrifuges with a hydraulic pusher drive offer very high throughput rates as a result of their high pusher force and high G-force. Machine sizes with a basket diameter of 630, 800, 1,000, and 1,250 mm are fitted with a hydraulic drive arrangement, which is optional for the machines with a basket diameter of 400 and 500 mm. The pusher motion is generated in machines with hydraulic drive by alternating admission of hydraulic oil to the rotating pusher cylinder. In this process, the exact quantity of oil required is pre-accelerated. This is a benefit compared to systems with bypass regulating, resulting from distinctly lower energy consumption with reduced cooling and drive outputs. The reciprocating motion is achieved by slide valves, which can be actuated electrically, hydraulically, or mechanically.



▲ Mechanical drive with eccentric

### Mechanical pusher drive

With the mechanical drive, a worm screw is driven by a motor via a V-belt. An eccentric converts the rotary motion of the gear output shaft into a pusher motion. The pusher frequency depends on the ratio of the V-belt drive of the motor to the worm gear.

Pusher centrifuges with a mechanical drive are extremely maintenance-friendly. This is because no significant maintenance work is required apart from recurrent lubrication of the bearings. The individual drive components can be replaced without disassembly of the centrifuge. A major advantage: The machine does not require cooling water. Machines with a basket diameter of 250, 315, 400, and 500 mm are fitted with the mechanical drive system.

The application spectrum of pusher centrifuges ranges from the processing of minerals to the dewatering of highly specialized plastics.

## Soda

In the soda industry, pusher centrifuges are used to dewater a wide range of sodium carbonate compounds. The process engineering requirements vary from product to product: Some products are sticky, with caking tendency, while others require specific temperature control. ANDRITZ KMPT is able to provide tailor-made solutions based on the experience it has gathered. One example is further dewatering of sodium hydrogen carbonate. This product has very specific characteristics. A feed screw ensures gentle and continuous feed of the product. Basket and feed systems are optimally aligned to the process requirements.

## Potash industry

Pusher centrifuges in the potash industry have to meet the following requirements:

- High wear resistance
- High throughput rate
- Low energy consumption

Our experience in processing potash has resulted in a unit with many special wear-resistant features, yielding longer service life with minimal downtime for maintenance by using the cartridge option.

## Adipic acid

The requirements in dewatering of raw, pure, and superpure adipic acid are:

- Protection of the operating personnel and the environment against nitrous gases
- High level of purity in the final product
- Protecting the particles against breakage.

ANDRITZ KMPT pusher centrifuges meet these demands by using a gas-tight housing, two-stage backwashing to achieve product purity, and gentle handling of the feed with our patented, vane-type feed distributor

## ABS

Dewatering of ABS is a major application for Krauss-Maffei centrifuges. In those applications with large particle sizes, pusher centrifuges offer many benefits:

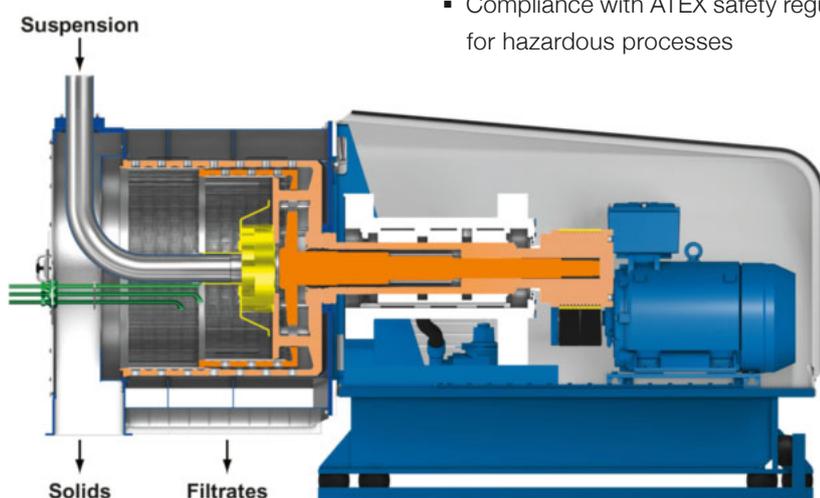
- Gas-tight design and special gas control system minimize the risk of a dust explosion
- High surface quality finishes to avoid plugging and caking of the product
- Compliance with ATEX safety regulations for hazardous processes

## Sodium chloride

High product quality, low costs, and high performance are requirements for processing such bulk products as sodium chloride. Krauss-Maffei pusher centrifuges, with their continuous dewatering operation, meet these requirements right down the line. They are extremely reliable and feature high availability as a result of the unique ANDRITZ KMPT maintenance concept.

### Further applications

ABS, adipic acid, ammonium chloride, ammonium sulphate, BPA, urea, borax, calcium nitrate, ferrous sulphate, lithium salts, lysine, melamine, nickel sulphate, paraxylene, PE, phosphate, POM, potassium chloride, potassium nitrate, potassium residue, potassium sulphate, sodium carbonate monohydrate, sodium chlorate, sodium chloride, sodium cyanide, sodium formate, sodium sulfate



▲ Soda production

# Krauss-Maffei SZ pusher centrifuge

## Peripheral equipment

A pusher centrifuge requires stable feed conditions with solids concentrations in the feed slurry in the range of 30-65% (by wt.) for crystalline products.

Crystallization and evaporation systems are subject to operational variability. In order to stabilize the feed slurry from such systems, ANDRITZ KMPT offers several solutions for pre-concentrating this slurry.

This is mainly achieved with an additional, external unit, providing the most economical and safest solution.

### ANDRITZ KMPT can offer different systems:

#### EC prethickener (1)

A dynamic prethickener uses a filter element to remove liquid and improve the feeding conditions to the centrifuge. This is an ANDRITZ KMPT development and is used for crystal and plastic material (e.g. ammonium sulphate, PE).

#### Bent screen (2)

ANDRITZ KMPT bent screens are designed for gas-tight requirements (e.g. adipic acid).

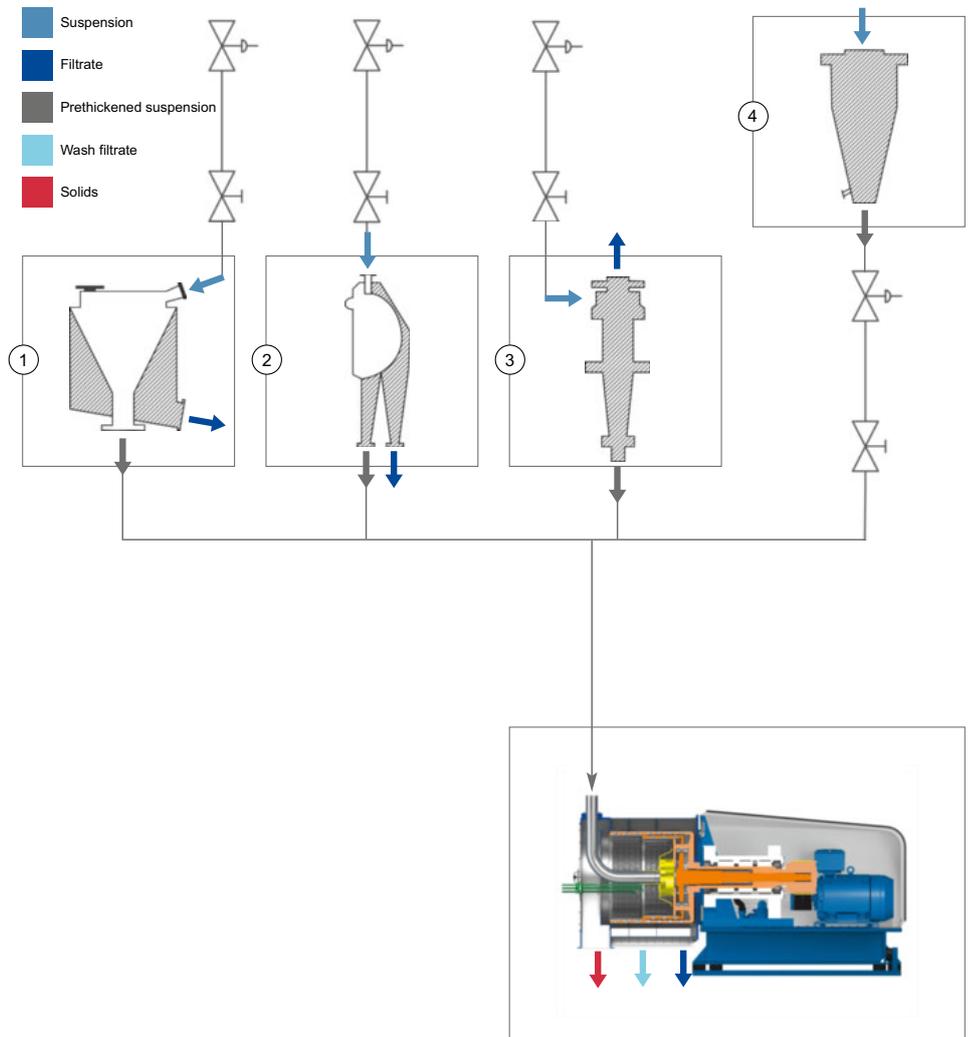
This is mainly achieved with an additional, external unit, providing the most economical and safest solution.

#### Hydrocyclone (3)

Suitable for all products with density differences (e.g. soda application, salts).

#### Static thickener (4)

The static thickener is used to improve feed conditions and achieve maximum feed solids concentration. This system uses the sedimentation effect. Liquid is removed by overflow and/or filtration elements (e.g. adipic acid, salts).



# Krauss-Maffei SZ pusher centrifuge

## Foundation and installation

### Arrangement and foundation

The centrifugal forces produced by rotation of the basket are used to separate the solids from the liquid. If the product is not distributed uniformly in the centrifuge basket, an imbalance may develop. Vibration-isolated mountings are used to keep the dynamic loads exerted on a building to a minimum. This is achieved by installing the centrifuge on a concrete or steel block mounted on spring damper elements.

### Important guidelines

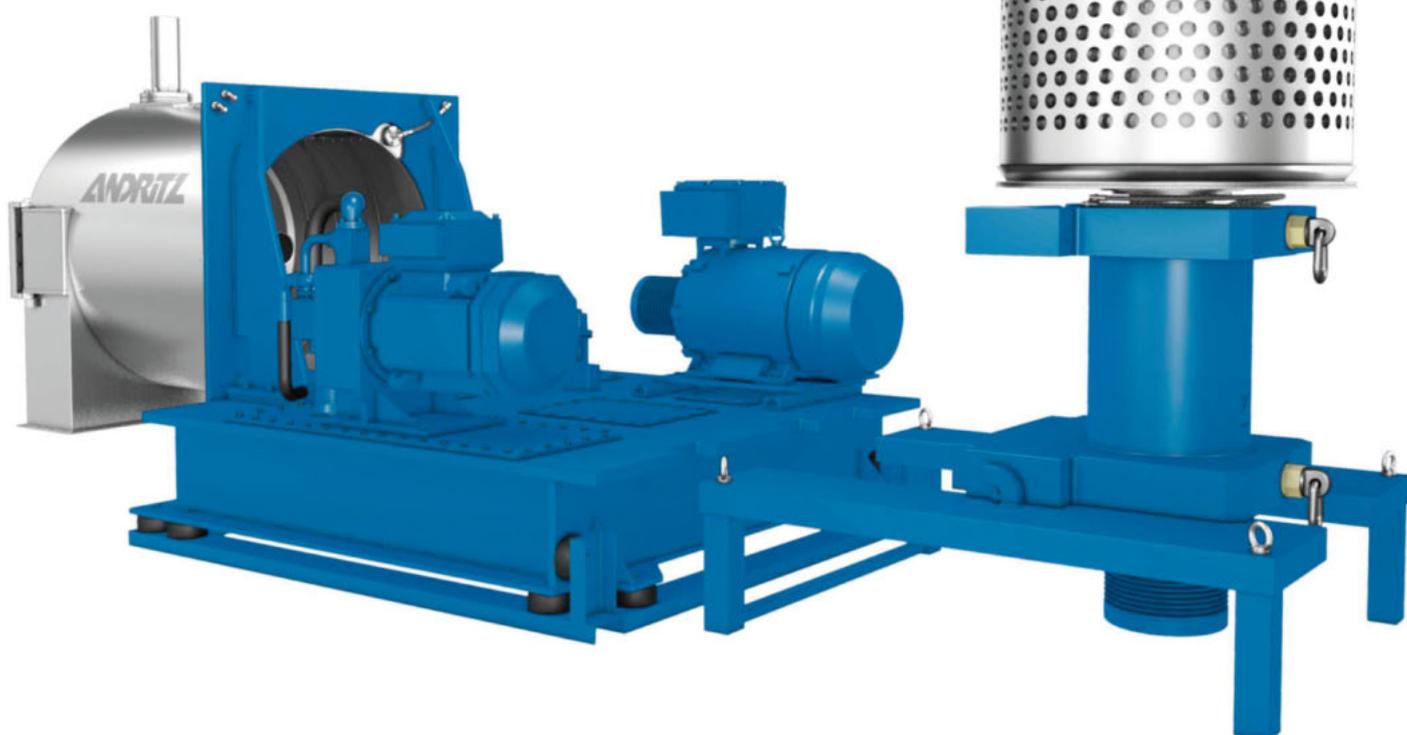
- Feed pressure should be ~0.5 bar
- Supply pipes as short as possible
- Install all supply and discharge pipes with a maximum gradient
- All connections to the centrifuge must be flexible

### Maintenance concept

#### Maximum availability

In pusher centrifuges with a hydraulic pusher drive, the basket, shaft, bearing, pusher drive, and a part of the rear wall combine to form one unit – referred to as the KMPT patented cartridge. This cartridge can be removed in one piece with very little effort. After reinstalling a spare cartridge, all maintenance work on the rotating elements can be carried out in the

workshop area without any time pressure. In this way, downtimes are reduced to a minimum. All connections are available on the process housing and do not have to be removed for maintenance work. For pusher centrifuges with mechanical drives, no significant maintenance is required apart from regular lubrication of the bearings. Large inspection openings and a large door to the process area facilitate access for inspection, maintenance, and cleaning work.



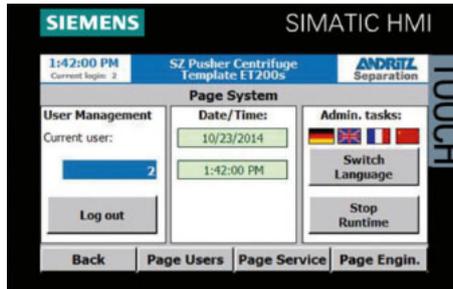
▲ Krauss-Maffei pusher centrifuge SZ 1000 with disassembled cartridge

# Krauss-Maffei SZ pusher centrifuge

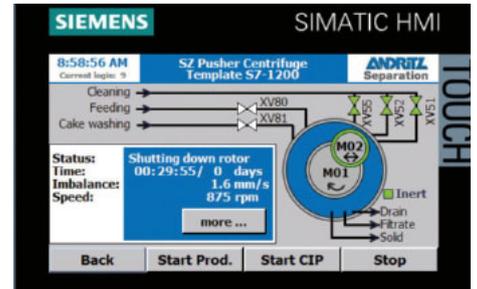
## Process automation



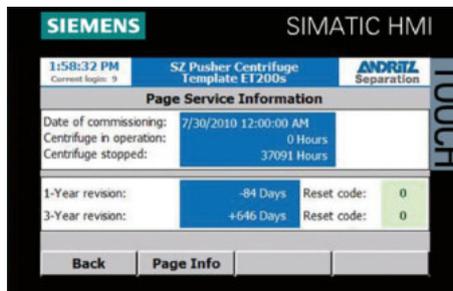
▲ Operation panel



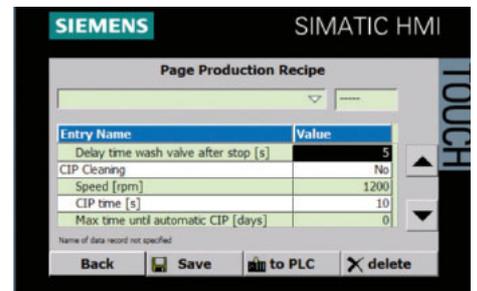
▲ Main screen



▲ Operation screen



▲ Service screen



▲ Recipe screen

Perfection in process engineering requires perfection in process automation.

The superior performance of our process equipment is based on perfecting the interface between equipment hardware, electrical components, electronics, informatics, and process know-how to create an all-encompassing, custom-tailored solution for each application. Using intelligent sensors and state-of-the-art communication systems, we control and monitor our machines on a result-oriented basis.

The benefits of our process automation are:

- Enhanced equipment performance
- Consistently high product quality
- Reduced consumption of utilities
- Optional condition diagnostics

ANDRITZ can provide a package consisting of PLC, HMI, and MCC, which guarantees easy commissioning. Simply connect up all the equipment mentioned, connect these items to the pusher centrifuge, and then start up the complete system.

### Automation of machines

Individual adaptation – we can incorporate the automation concepts for our machine into your existing control system. A modular control concept enables the automation of single units and complex control systems in existing plants. PLC, PLC-Failsafe, and discrete technologies, including the required visualization, are used to display important information on plant and machinery. State-of-the-art technology enables ANDRITZ KMPT to conduct remote maintenance on your automation equipment – subject to your approval.

ANDRITZ KMPT offers variable drive systems, which provide the following benefits:

- Optimized adjustment of machine to process
- Reduced operating costs due to energy-saving drives

### Safety features and equipment

A reliable machine protects operating personnel and equipment. Machinery directives, ATEX, hazardous location regulations – there are many rules to be obeyed at the plant site. ANDRITZ KMPT acts as a knowledgeable advisor for your plant. Of particular importance are safe actual speed values, deadlock and overspeed monitoring, door locking, belt slippage, and safe inertization.

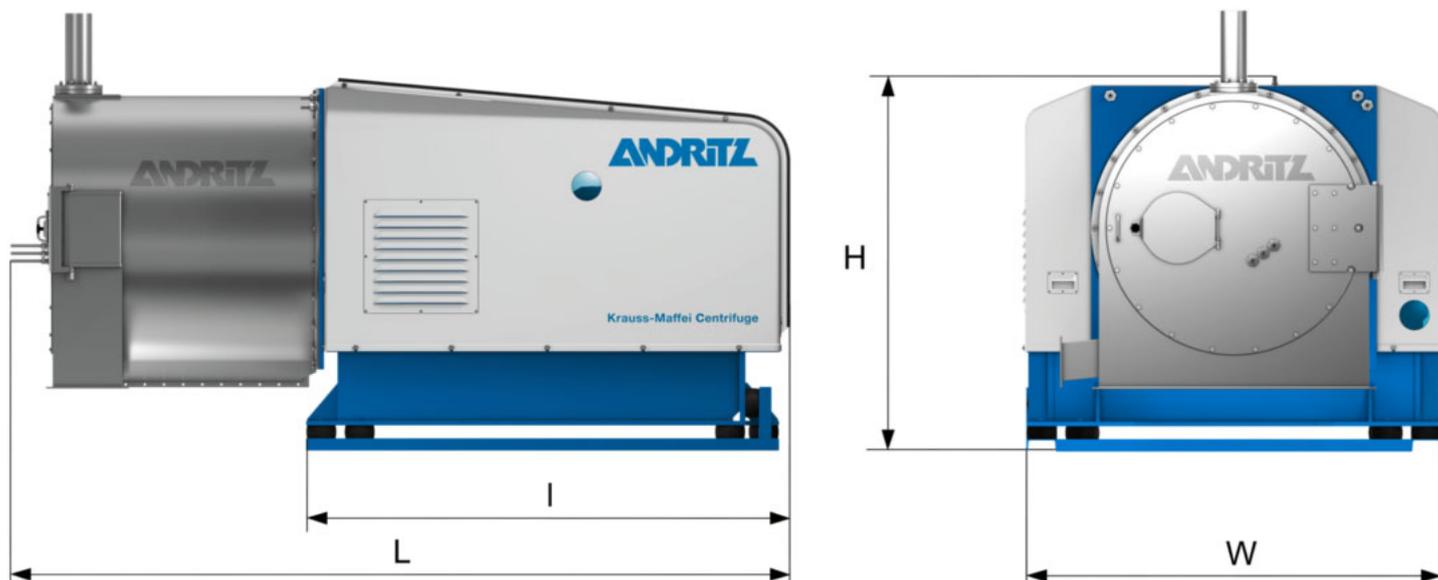
ANDRITZ KMPT process automation reduces investment, operating, and maintenance costs.

# Krauss-Maffei SZ pusher centrifuge

## Technical data

Model	Nominal diameter [mm]	L [mm]	I [mm]	W [mm]	H [mm]	Operating weight [kg]	Pusher drive
SZ 250	250	1,750	1,000	1,150	970	1,000	Eccentric
SZ 315	315	1,910	1,100	1,250	1,000	1,350	Eccentric
SZ 400	400	2,350	1,400	1,440	1,340	2,300	Eccentric
SZ 500	500	2,870	1,770	1,530	1,130	3,350	Eccentric
SZ 400	400	2,380	1,570	1,470	1,350	3,500	Hydraulic
SZ 500	500	2,530	1,570	1,470	1,350	3,700	Hydraulic
SZ 630	630	3,000	1,780	1,620	1,530	5,300	Hydraulic
SZ 800	800	3,410	2,070	1,950	1,770	8,400	Hydraulic
SZ 1000	1,000	4,060	2,530	2,190	1,950	13,300	Hydraulic
SZ 1250	1,250	4,950	4,000	2,490	2,060	19,500	Hydraulic

Machines are designed with 1, 2, or multiple stages, depending on the application.

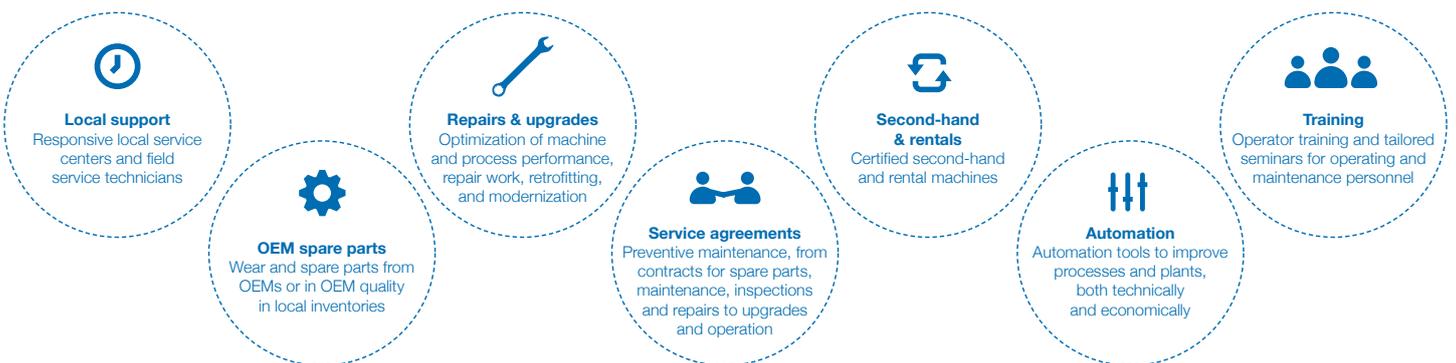
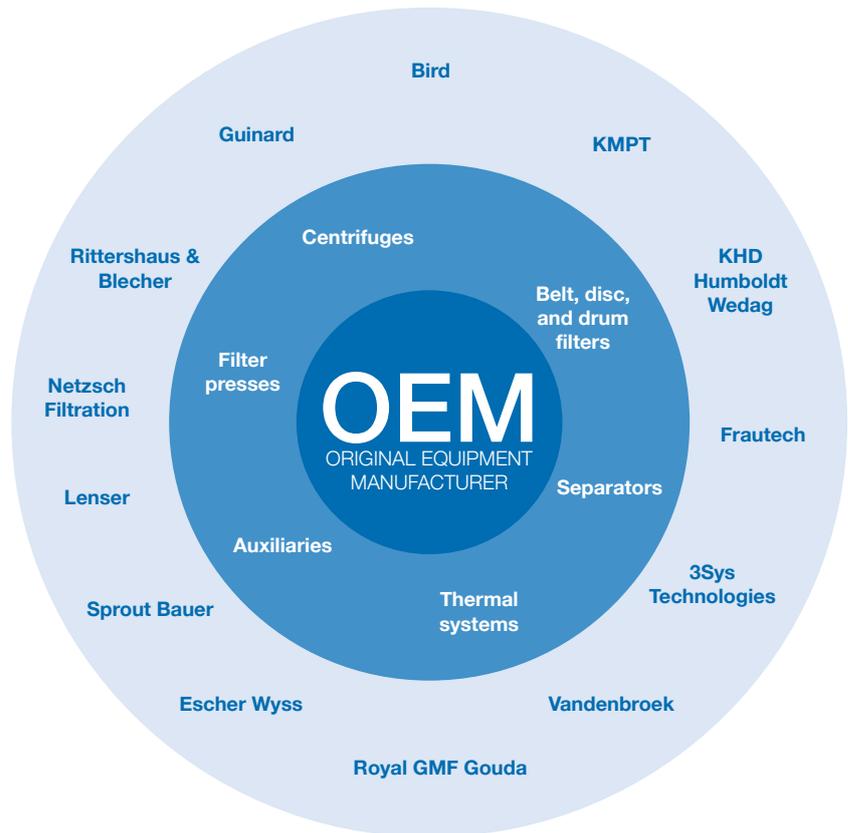


▲ All technical data are approximate and subject to change without notice.

# A world of service

## Put our 150 years of OEM experience to work for you

With ANDRITZ SEPARATION, you gain access to one of the world's largest OEM manufacturers for solid/liquid separation, including such well-known names as Bird, KHD, Guinard, and more. From initial consulting through to service agreements, plant optimization, automation, and training programs, we are always looking for ways to minimize downtime and increase predictability in operations, while raising your overall production efficiency. Wherever you operate, our network of 550 service specialists and global service centers ensures we'll always be there to support you for many life cycles to come. Let's sit down and see how we could take your operations to the next level.



**AFRICA**  
**ANDRITZ Delkor (Pty) Ltd.**  
 Kyalami, South Africa  
 Phone: +27 (11) 012 7300  
 separation.za@andritz.com

**AUSTRALIA**  
**ANDRITZ Pty. Ltd.**  
 Carrum Downs, VIC, Australia  
 Phone: +61 (3) 8773 4888  
 separation.au@andritz.com

**ASIA**  
**ANDRITZ Singapore Pte. Ltd.**  
 Singapore, Singapore  
 Phone: +65 (6512) 1800  
 separation.sg@andritz.com

**PRODUCT HOME**  
**ANDRITZ KMPT GmbH**  
 Industriestrasse 1-3  
 85256 Vierkirchen, Germany  
 Phone: +49 (8139) 80 299 0  
 Fax: +49 (8139) 80 299 952  
 kmpt@andritz.com

**CHINA**  
**ANDRITZ (China) Ltd.**  
 Foshan, Guangdong, P.R. China  
 Phone: +86 (757) 8258 6802  
 separation.cn@andritz.com

**NORTH AMERICA**  
**ANDRITZ SEPARATION Inc.**  
 Arlington, TX, USA  
 Phone: +1 (817) 465 5611  
 separation.us@andritz.com

**SOUTH AMERICA**  
**ANDRITZ SEPARATION Ltda.**  
 Pomerode, Brazil  
 Phone: +55 (47) 3387 9100  
 separation.bra@andritz.com

[www.andritz.com](http://www.andritz.com)