

**FLOTTWEG CENTRIFUGE TECHNOLOGY
FOR THE MINING INDUSTRY**
Maximize Recovery and Profit



MECHANICAL SEPARATION IN THE MINING INDUSTRY

Enhance Your Success with Centrifuge Technology

Flottweg is one of the world's leading manufacturers of industrial centrifuges for solid-liquid separation. For over 60 years, our technology has supported our clients in maximizing their profit by increasing their yields with highly efficient separation solutions. The heart of every separation process, our Flottweg Decanter Centrifuges, are the optimum choice for a wide range of separation tasks.

Efficient operation, robust design and high purity output make Flottweg Decanters Made in Germany a multi talent in the mining industry. Our separation solutions can be found in nearly all processes in the recovery of mineral raw materials.

Examples of Flottweg Applications in the mining industry are:

HYDROMETALLURGICAL PROCESSING

- Gold and silver
- Lead and zinc
- Nickel and copper
- Platinum
- Rare earth

INDUSTRIAL MINERALS

- Kaolin
- Ground calcium carbonate (GCC)
- Precipitated calcium carbonate (PCC)
- Titanium dioxide
- Barium and zinc sulfate
- Aluminium hydroxide

Are you looking for any other applications? Contact us, we will be happy to answer your questions and find an individual solution!

Our separation technology meets all requirements for the mining industry:

Key success factors

- **Reliable, robust and easy to operate**
 - optimized cost for operation
- **Quality and purity of the final products**
 - quick return on investment
- **Better environmental performance with**
 - reduced supplies and consumables
 - high yield, reduced by-products
 - energy savings(e.g. subsequent drying processes)



DECANTER CENTRIFUGES FOR USE IN MINING APPLICATIONS

Versatile Operation, Efficient, Robust

Are you laying out new facilities or optimizing existing ones? Discover the possibilities of Flottweg Decanter Technology. For decades, the usual separation equipment to perform the different separation tasks in mining processes has comprised static settlers, thickeners, low speed centrifuges and filters.

Our engineers have continuously optimized our centrifuges for the requirements of mining applications. Best wear protection, continuous operation with high g-force and fully automatic systems make our solutions the ideal separation equipment for the mineral tasks. Particular highlights include the impact on cost effectiveness, quality of the final product and the environmental compatibility of decanter centrifuges.

Centrifuge facts

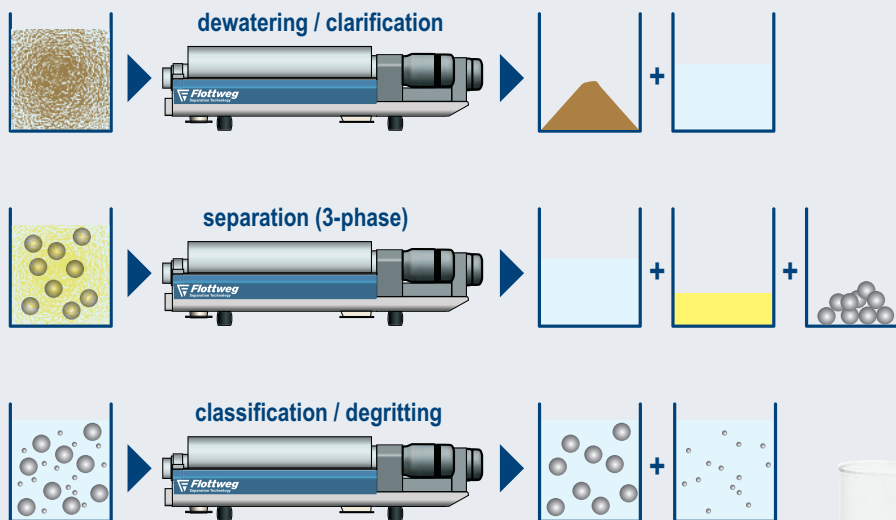
Versatility

- Separation (2-phase and 3-phase)
- Classification / degritting
- Concentration / thickening
- Clarification / dewatering

Key Success Factors:

- Handling large product quantities
- Resistance to wear and corrosion
- Continuous and automatic operation
- Closed design to avoid emissions
- Long service interval
- Brief service downtime

TECHNICAL INFO



OPERATING PRINCIPLE 2-PHASE

The Flottweg Decanter

FEED

The product is fed through a stationary pipe into the feed zone located in the center of the rotating assembly. The product is then accelerated circumferentially and delivered through ports in the scroll into the bowl.

SCROLL

The scroll rotates at a slightly different speed than the bowl and conveys the separated solids toward the conical end of the bowl. This differential speed determines the residence time of the solids in the bowl. Residence time is a critical factor for cake dryness. It can be automatically adjusted by changing the differential speed of the scroll thus providing optimal separation. Depending on the physical properties of the product, Flottweg Decanters can be supplied with a different scroll design or with a modification to the existing scroll. Scroll pitch and single or multiple lead configurations are important design variables.

BOWL

The bowl has a cylindrical and conical section. The rotational speed is pre-set optimally to the application and requirements. The slurry rotates with the bowl at the operating speed and forms a concentric layer on the bowl wall. The solids contained in the product are packed against the bowl wall by centrifugal force. The length of the cylindrical bowl section and the cone angle are selected to meet the specific requirements of an application.

SOLIDS DISCHARGE

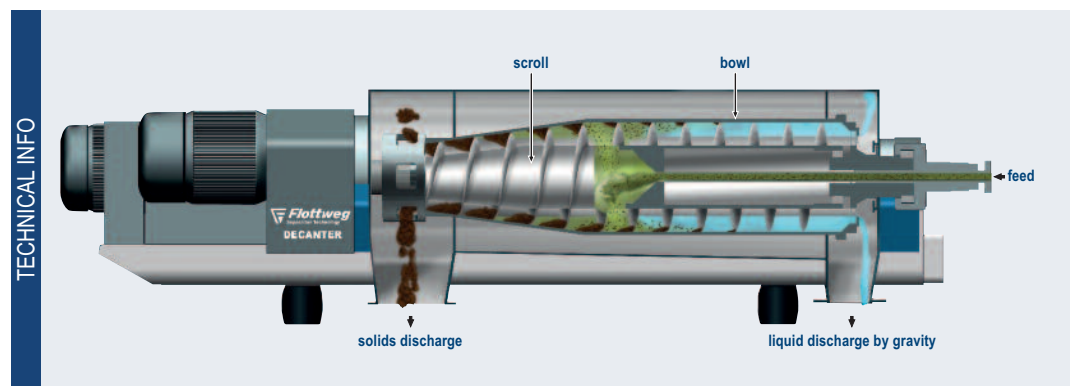
Settled solids are ejected through ports at the conical end of the bowl into the solids housing and fall vertically through the discharge chute.

OVERFLOW WEIRS

The clarified liquids flow to the cylindrical end of the bowl where they exit over weir plates. Easily adjustable weir plates allow for precise adjustment of the pond depth in the bowl. The liquid overflow is then collected in a centrate chamber and discharged by gravity.

OPTION: FULLY ADJUSTABLE IMPELLER (SKIMMER)

The clarified liquid can also be removed with an impeller from the bowl under pressure. The Flottweg Adjustable Impeller is an engineering refinement that permits quick and precise adjustment of the pond depth during operation to accommodate for changing process conditions.



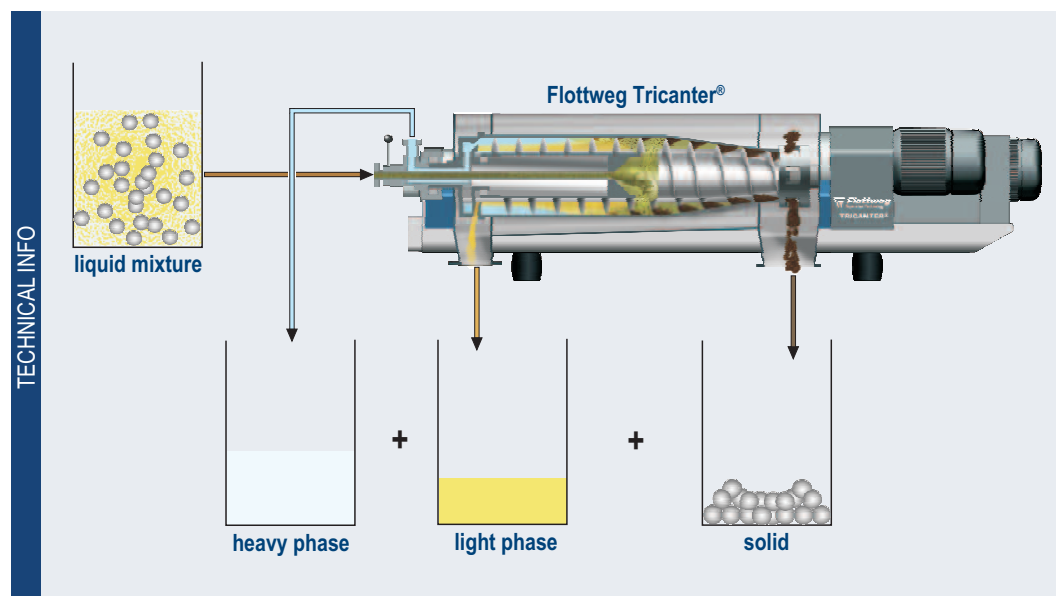
Flottweg Decanter for the separation of solids from liquids with discharge of the liquid phase (centrate) by gravity

TECHNICAL INFO

OPERATING PRINCIPLE 3-PHASE

The Flottweg Tricanter®

The Flottweg Tricanter® performs a three-phase separation, i.e. simultaneous separation of two immiscible liquids with different densities and one solid phase, provided that the solid phase is the heaviest phase. The main difference from a decanter is the separate discharge of the two liquid phases.



Principle of the Flottweg Tricanter® (three-phase decanter)
Discharge of the centrate: heavy liquid phase under pressure, light phase by gravity

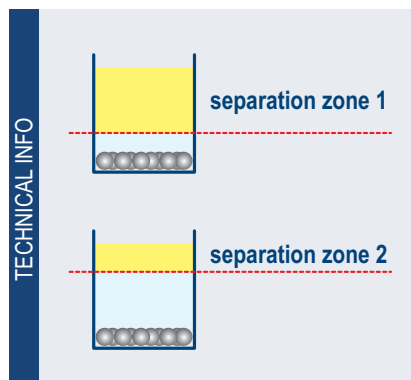
NO MATTER IF FEED CONCENTRATION VARIES

The Flottweg Tricanter® discharges the heavy liquid through an adjustable impeller under pressure and the light phase by gravity. The variable impeller allows for precise on-the-fly adjustment of the pond

depth and liquid-liquid separation zone. This optimizes the purity of the liquids and may eliminate further downstream equipment.



Feed and discharge devices with control lever for the adjustable impeller of the Flottweg Tricanter®



DECANTER CENTRIFUGES IN HYDROMETALLURGICAL PROCESSING

Hydrometallurgical processing of ores is highly varied and has become an increasingly important technology in the production of today's precious and base metals. Processing plants in the form of flotation or leaching installations selectively enrich the specific metallic components. Flottweg Decanters perform this separation in a continuous and most efficient operation.

From an environmental standpoint, waste products such as leaching residues and tailings are also separated via centrifuges. Flottweg Decanters achieve the highest cake dryness and optimum concentrate clarity.

Benefits

- High cake dryness
- High separation efficiency
- Continuous operation
- Automated operation reduces labor costs
- Small footprint
- Short payback period

TYPICAL PROPERTIES OF PRODUCTS ARE

- Density of the solids above 2 g/cm³
- pH – conditions which require special materials
- Temperatures up to 100°C
- High hardness of the solids which require adequate wear protection
- High salinity which affects the liquid density and liquid viscosity
- Requirement for corrosion resistant materials
- Small particle sizes in the range of 5 – 100 µm

TYPICAL PRODUCTS

- Gold and silver
- Lead and zinc
- Nickel and copper
- Platinum
- Further rare earth elements
- Many other hydrometallurgical mining applications

Flottweg provides decanters specifically designed on basis of extensive knowledge in ore processing. The state-of-the-art Flottweg Decanter Technology offers the highest separation efficiency and operational reliability even in case of challenging applications.

High cake dryness, highest yields



TAKE ADVANTAGE OF OUR EXPERTISE and Many Years of Experience in the Mining Industry!



Flottweg System including a decanter Z92 in the gold mine tailings process



Flottweg System including a decanter Z92 in the diamond mine tailings process



Flottweg Decanters Z92 in the nickel extraction process

... and many more.
Ask our sales agents for references!

Reduce Organic Loss by More than 50 %

Traditional processing equipment for crud separation results in very high organic loss and high operating costs. The Flottweg Tricanter® can

Furthermore, using a Flottweg Tricanter® has a stabilizing effect on the downstream electro-winning (SX-EW) operation. The possibility to treat crud rapidly and reliably allows plant operators to keep crud build up in the SX plant under control.



LEADING IN 3-PHASE-DECANTER SEPARATION

Benefits of the SX Crud Tricanter®

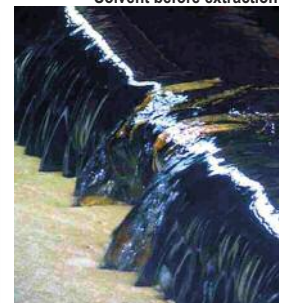
The Flottweg Tricanter® can also be used to recover organic material after clay treatment in a two-phase separation.

Benefits

- Reduction of organic loss by more than 50%
- Maximum organic recovery rate
- Enhanced settler efficiency
- Elimination of crud runs
- No more shut downs of settlers to de-crud
- Minimized entrainment losses
- Payback period within one year



Solvent before extraction



Copper-based solution



INDUSTRIAL MINERALS – PIGMENTS AND FILLERS

Increase Yields – Decrease Required Energy

There is a broad variety of applications for industrial minerals to be used as pigments or fillers. It ranges from the ceramic industry to the materials industry and from the cosmetic or food industry to the paper and paint industry.

Typical processes are purely mechanical operations such as milling, grinding, separating and degrading while other processes include chemical operations such as crystallization or precipitation. In general, the final products must be of the highest purity and must have a well defined particle size distribution.

Benefits

- Very accurate separation cuts classifying stages
- High solids recovery of ultrafine particles in dewatering stages
- High cake dryness
- Continuous operation
- Small footprint
- Low energy demand compared to filters or spray dryers

Flottweg Decanters operate with the best separation efficiency, thus minimizing product losses and producing the highest cake dryness to minimize the required energy in subsequent drying processes.

APPLICATIONS

- Kaolin
- Ground calcium carbonate (GCC)
- Precipitated calcium carbonate (PCC)
- Titanium dioxide
- Barium sulfate
- Zinc sulfide
- Aluminum hydroxide
- Many others

PROCESSING HAZARDOUS MATERIALS

SEALING

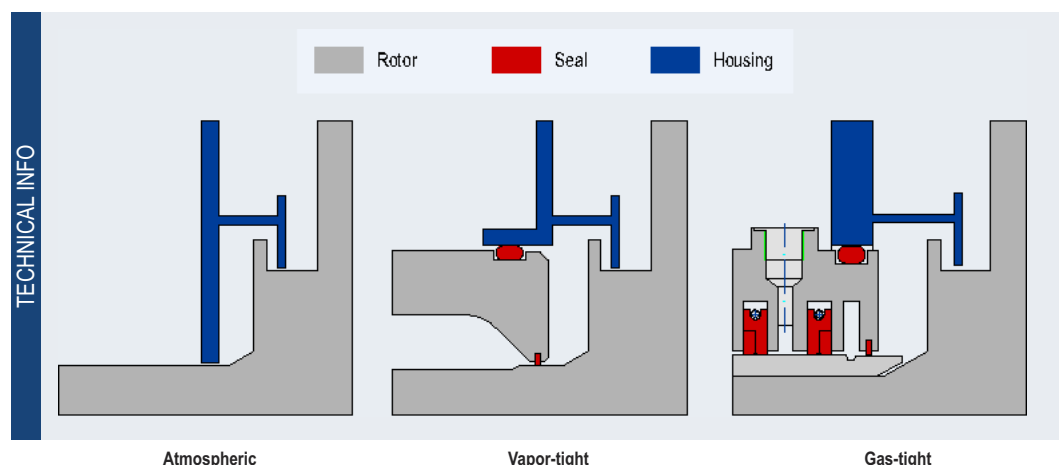
Most sizes and models of Flottweg Centrifuges are available in a variety of rotor and housing seal designs for the following operating conditions:

- Atmospheric
- Vapor-tight
- Gas-tight

Flottweg Centrifuges can also be adapted for operating in closed-loop systems.

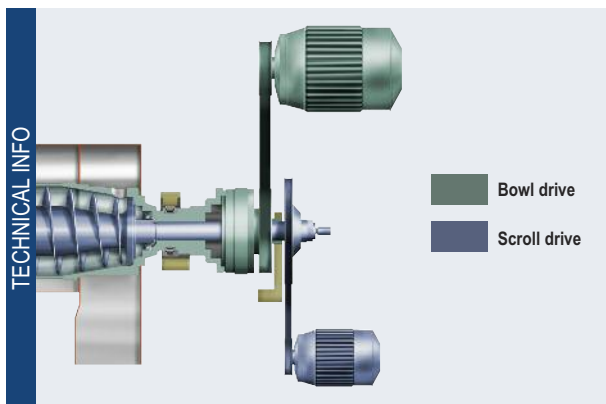
EXPLOSION-PROOF

All Flottweg Centrifuges are available for installation in hazardous areas. Flottweg Decanters and Tricanters® are available in gas-tight versions and comply with the established health, safety and environment regulations or are suitable for explosive or hazardous atmospheres.



FLOTTWEG SIMP DRIVE®

The bowl is driven via a motor controlled by a frequency inverter (VFD). The Flottweg Simp Drive® - an intelligent system consisting of a multi-stage planetary gear and control system including a frequency inverter - controls the differential speed depending on the torque that is generated when transporting the solids cake through the centrifuge bowl. When processing products generating high torques, the Flottweg Simp Drive® is also an intelligent protection for the gearbox and the drive in case of torque overload.



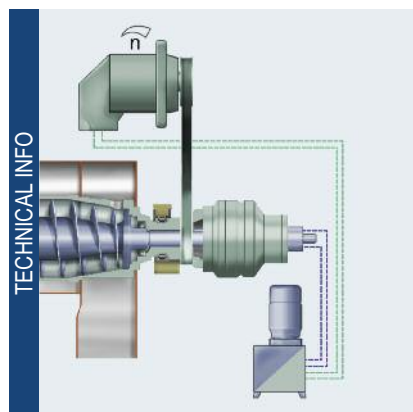
Flottweg Simp Drive®

Benefits

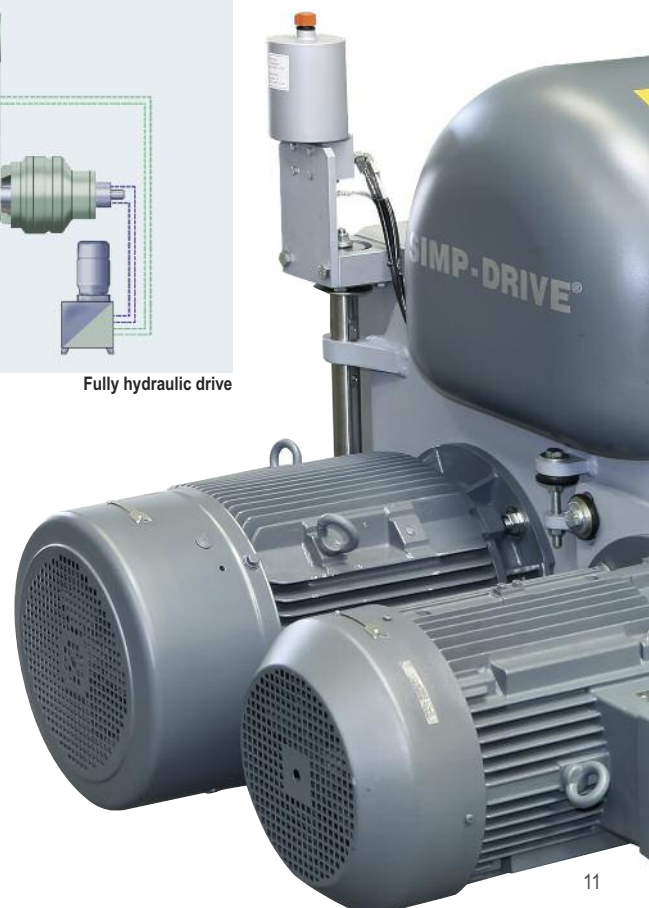
- High efficiency and low energy demand
- A simple drive system not requiring linkage
- Constant drive, constant torque
- Simple integration into process control systems
- Smallest possible inverter size
- Frequency inverters which are standard designs
- High flexibility in the selection of the operating speed
- Discharge of the bowl even at standstill
- Applicable for small to medium differential speeds

OPTION FULLY HYDRAULIC DRIVE

The bowl and the scroll are driven by separate hydraulic motors. A characteristic feature is the hydraulic motor which rotates together with the bowl and directly powers the scroll, with the bowl driven by V-belts. A compact hydraulic unit with two variable pumps feeds two separate oil circuits. The volume flow rate of the oil determines the bowl speed and the differential speed of the scroll, with the oil supply pressure directly proportional to the torque output and thus to the load. The drive's design enables independent rotation of the scroll even when the bowl is shut down.



Fully hydraulic drive



QUALITY MADE IN GERMANY

Features of Our Machines – Rugged, Robust, Reliable!



MATERIALS OF CONSTRUCTION

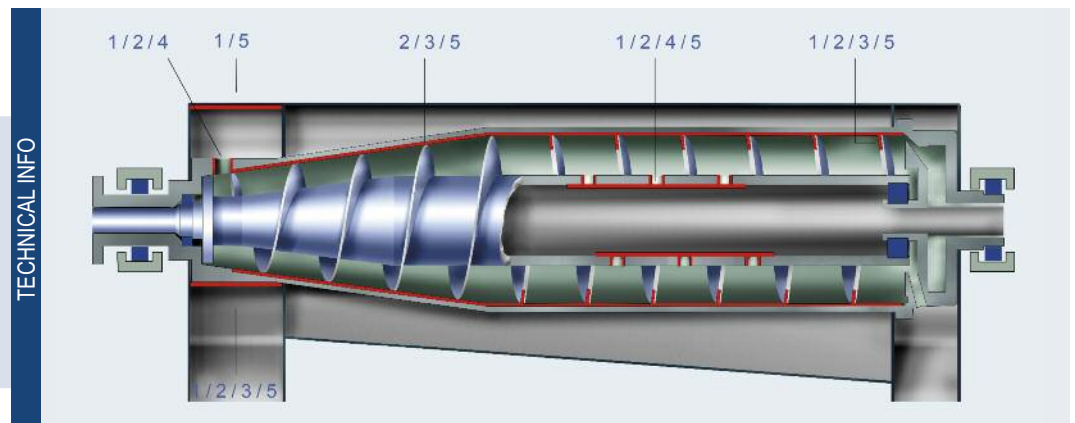
Flottweg exclusively uses high-quality Duplex stainless steels for all parts that come into contact with the product. On request, Flottweg Centrifuges are also available in more corrosion resistant materials such as super duplex steels or high nickel alloys e.g. Hastelloy.

- 1) Welded hard facing or spray coating
- 2) Ceramic
- 3) Tungsten carbide tiles
- 4) Chilled hard metal portcastings
- 5) Plastic liners

WEAR PROTECTION

Flottweg offers a wide range of wear protection to meet the particular material requirements of the mining applications:

In order to minimize maintenance costs for applications involving highly abrasive products, all wear protection elements, except welded hard facings or spray coatings, are field replaceable.



Replaceable wear protection elements



Protection of the scroll with hard metal tiles



Cake discharge port protected with replaceable bushings



The picture shows a Flottweg System.

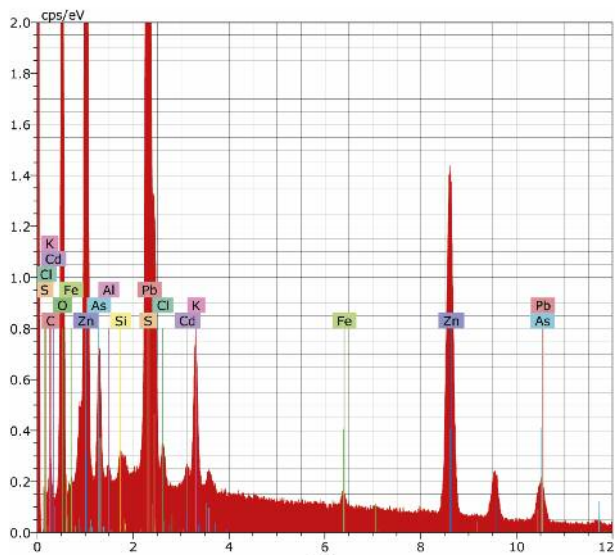
Every process is different. The various parameters have a significant influence on the separation efficiency. To know those parameters means increasing the efficiency and yield of your separation process.

We support our customers along the entire process chain from R&D raw material analyses to approval tests. Flottweg offers all necessary methods for analyzing your products and evaluating new potential.

Our worldwide locations and networks guarantee support and service for our customers. With the help of our experience and testing capability we develop made-to-measure solutions to meet your individual requirements.

Our services

- Laboratory analysis – discover new options and performance parameters
- Processing department – performance optimization of our separation solutions
- Project planning department – customized systems and solutions



Sample analysis with EDX (Energy-Dispersive X-ray Spectroscopy)



Keep a close eye on your product quality –
Zinc sludge SEM analysis (Scanning Electron Microscope)



GLOBAL AFTERMARKET SUPPORT NETWORK

No Matter Where You Are in the World

CUSTOMER SERVICE IS OUR STRENGTH

Application-based project planning, high-quality manufacturing and professional after-sales service are prerequisites for a trouble-free operation. Experienced and reliable service engineers from our customer service department are ready to respond quickly if needed. The Flottweg Service Group is also available to perform preventive maintenance in order to avoid interruptions in production.

QUALITY “MADE IN GERMANY”

Flottweg is ISO 9001 certified and manufactures its products in compliance with all the latest technical standards.



Flottweg Services include

- Experienced advice on separation processes
- Pilot tests on-site or at the Flottweg Laboratory and test center
- Selection and sizing of appropriate equipment
- Customer-specific automation/control systems and process integration
- Design and construction of complete process systems
- Installation, commissioning, maintenance, repair and spare parts service worldwide

FLOTTWEG AFTER-SALES CUSTOMER SERVICE

Even the best machinery needs to be maintained and serviced. Flottweg has established a worldwide service network consisting of its own subsidiaries, branch offices, and representatives to provide our customers with localized service and spare parts. Our service

engineers and technicians are qualified for any kind of installation, commissioning, repair and maintenance.



Flottweg Service technicians are always available for you

FLOTTWEG WORLDWIDE

Flottweg is headquartered in Vilsbiburg (near Munich), Germany, and has branch offices in Cologne and Leipzig as well as subsidiaries in Australia, Brazil, Canada, China, France, Italy, Mexico, Peru, Poland, Russia, and the United States plus representatives in nearly every country in the world.

Check out our website at www.flottweg.com to find a competent contact person.

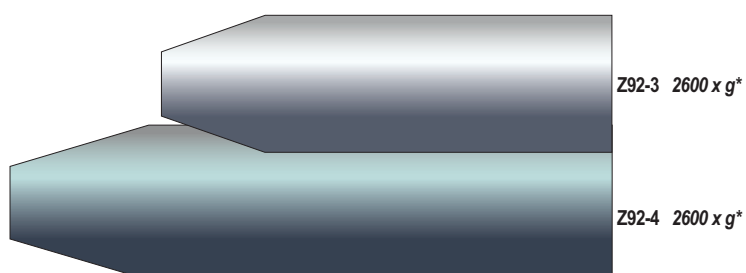
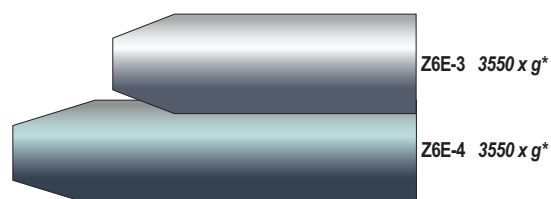
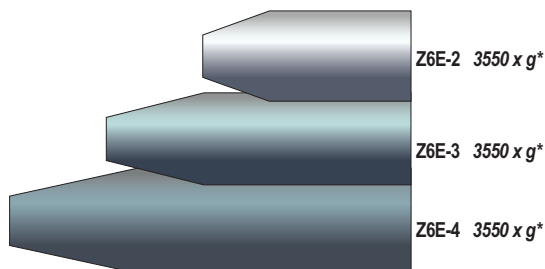
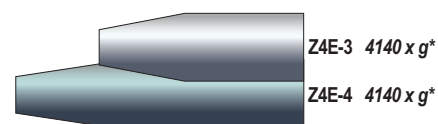
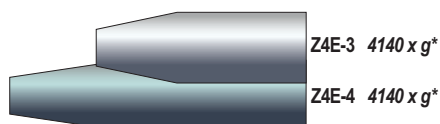
TECHNICAL DATA

Decanter Z-Series and Tricanter®

Decanter



Tricanter®



*Acceleration in g, depending on the temperature and the density of the product

TECHNICAL DATA OF FLOTTWEG DECANTERS AND TRICANTERS®						
Model	Z3E	Z4E	Z5E	Z6E	Z8E	Z92
Dimensions* (L x W x H)	2950 x 840 x 800 mm 116 x 33 x 32 inch	3500 x 1000 x 1200 mm 138 x 39 x 47 inch	4200 x 1300 x 1150 mm 165 x 51 x 45 inch	4800 x 1800 x 1250 mm 189 x 70 x 49 inch	6200 x 2000 x 1500 mm 244 x 78 x 59 inch	5900 x 2800 x 1750 mm 232 x 110 x 69 inch
Gross weight*	1760 kg / 3880 lb	3000 kg / 6600 lb	6200 kg / 13600 lb	9750 kg / 21500 lb	14150 kg / 31200 lb	18000 kg / 39700 lb
Motor for bowl drive	18.5 kW	45 kW	90 kW	132 kW	160 kW	250 kW
Motor for scroll drive Flottweg Simp Drive®	7.5 kW	15 kW	55 kW	110 kW	110 kW	110 kW
Max. hydraulic capacity**	10 m³/h	35 m³/h	60 m³/h	80 m³/h	160 m³/h	180 m³/h

* The listed figures are to be understood as guidelines. Actual capacity will depend on the individual characteristics of the feed product.

** Data based on water, g-force depending on temperature, special material and product density. Data to be understood as guidelines.

Flottweg Separation Technology – Engineered For Your Success



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