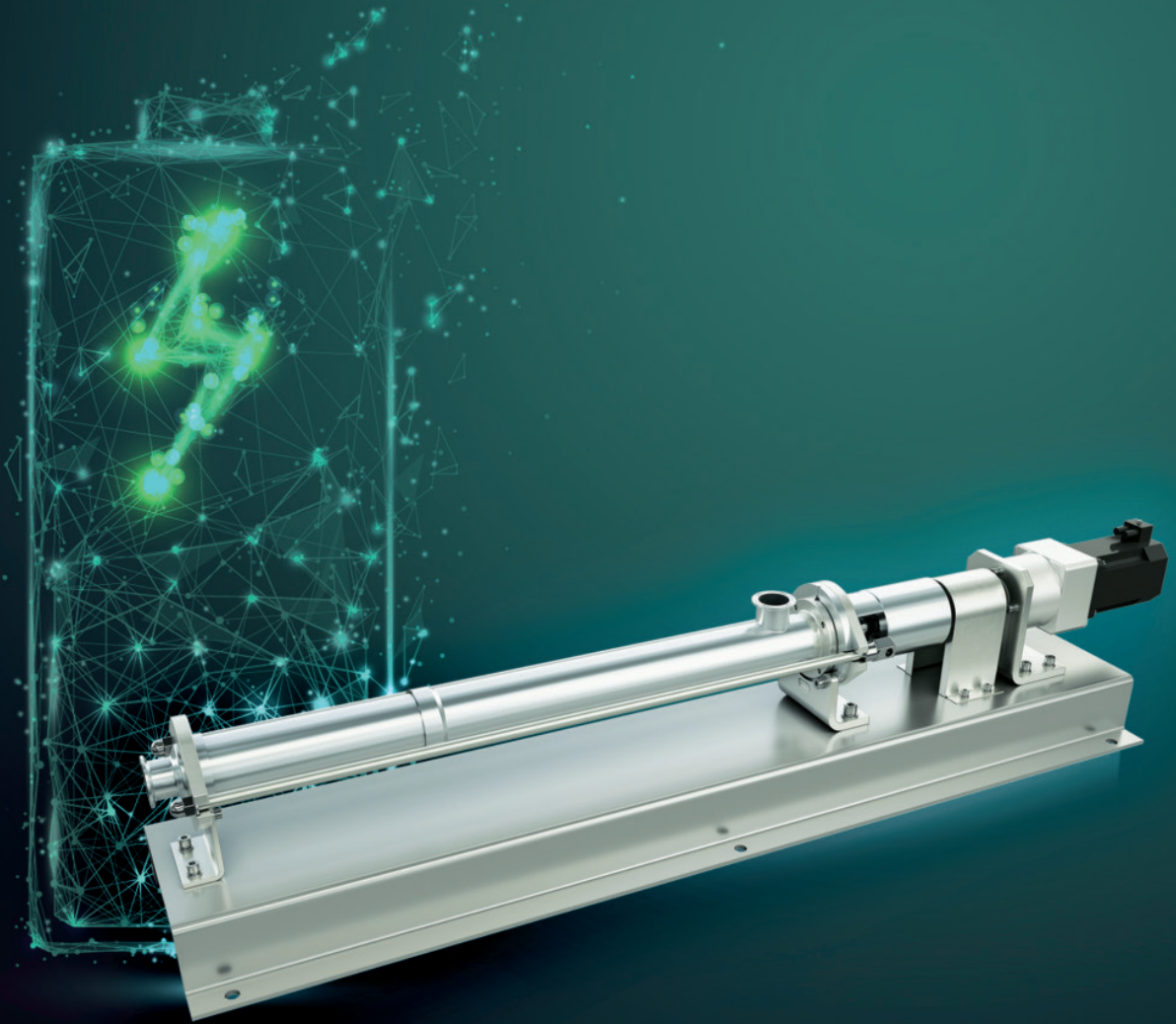


NETZSCH

Proven Excellence.



Application of NETZSCH Products in Lithium Battery Manufacturing Industry

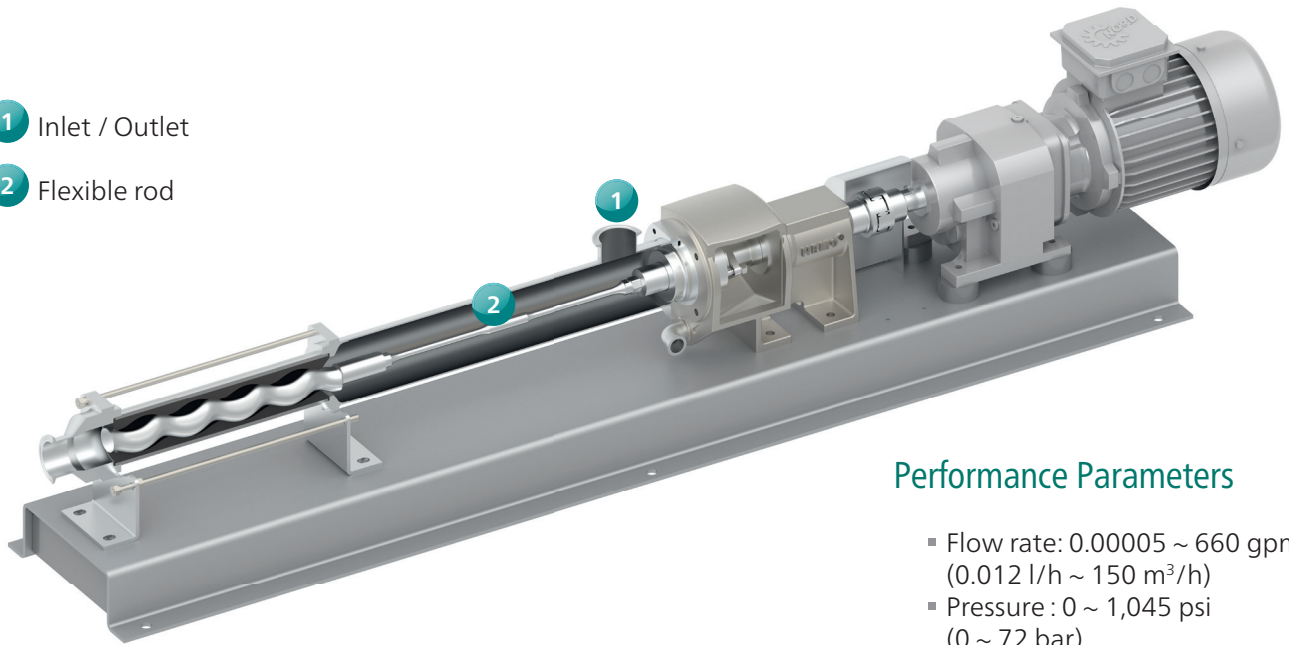
Pulsation-free, high precision metering, corrosion resistance

Pumps & Systems

NEMO® Progressing Cavity Pumps

1 Inlet / Outlet

2 Flexible rod

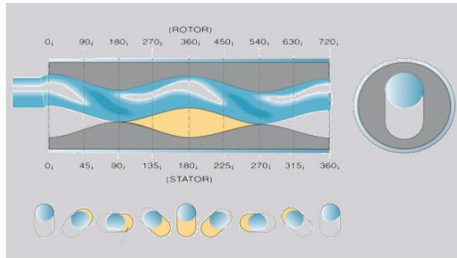


Performance Parameters

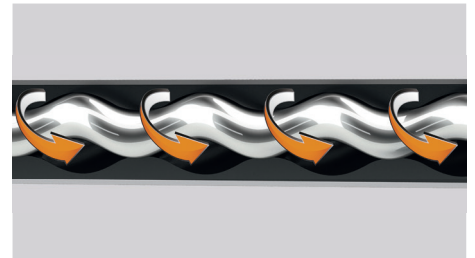
- Flow rate: 0.00005 ~ 660 gpm (0.012 l/h ~ 150 m³/h)
- Pressure : 0 ~ 1,045 psi (0 ~ 72 bar)
- Viscosity: 0 to 3,000,000 cp max.

Features of NEMO® Progressing Cavity Pumps

- Flow rate is directly proportional to speed



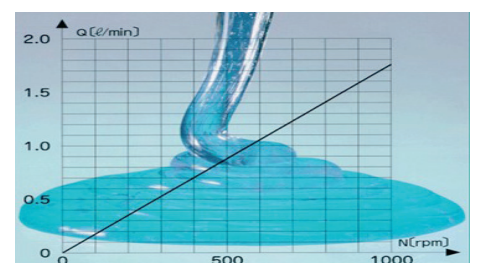
- Stable conveying, very low shear



- High accuracy up to $\pm 0.5\%$



- Suitable for conveying medium and high viscosity materials



NETZSCH Products in the Lithium Battery Industry

Features

- No metal-to-metal contact of wetted parts ensures no contamination of metal into the product
- Elastomeric material with good chemical resistance
- The pump is reversible and can operate on vacuum vessels to remove bubbles from the fluid
- Wide selection of materials for the wetted parts

Application

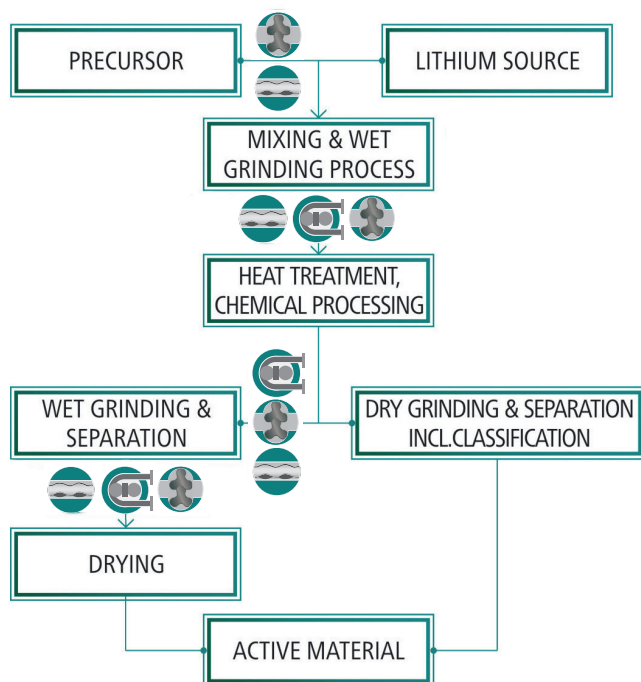
- Transfer electrode slurries, electrolyte conductive material, adhesive, additives, UV resin, coating paste and other functional materials
- In the production of pole pieces, various types of cathode and anode slurries, including solvent-based/water-based product
- Transfer materials such as NMP, CNT, DIW, SBR, etc.
- Pumps for the battery recycling process

Reasons to choose NETZSCH Pumps

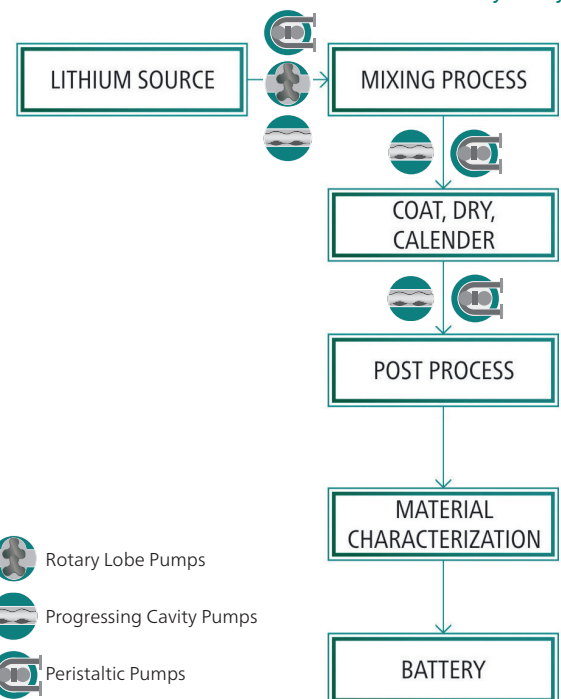
Special requirements, meeting several conditions at the same time:

- Accurate and repeatable metering
- Can handle low to high viscosity fluids
- No metal contamination
- No contamination of the fluid by oil or lubricant
- Can be drained
- Materials of construction compatible with the application (battery-resistant stator, duplex stainless steel rotor and wetted parts)
- Option with no shaft seal and can run dry indefinitely (peristaltic pump)
- Exceptional solids handling capability

PRODUCTION STEP: Raw Materials for Anode & Cathode



PRODUCTION STEP: Conductive Additives & Battery Slurry

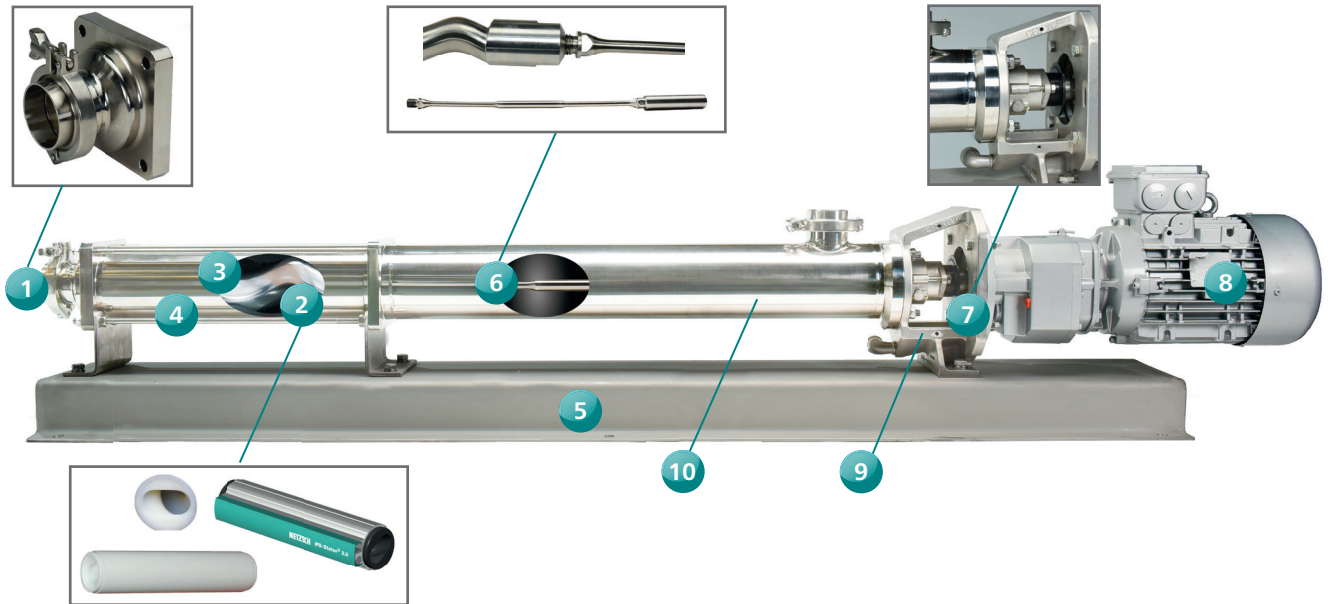


Rotary Lobe Pumps

Progressing Cavity Pumps

Peristaltic Pumps

Design Characteristics



1 Connector

Sanitary Tri-clamp connections are used for inlet and outlet, which is convenient for replacement disassembling and inspecting the pump.

2 Stator

Stator materials available for abrasion resistance and chemical compatibility. PTFE and other elastomeric materials are resistant to corrosion by lithium slurry. Optional iFD-Stator® has an aluminum two-part reusable shell and allows for replacement of only the insert, saving cost and maintenance time.

3 Rotor and wetted parts

The rotor and wetted parts are made of duplex stainless steel, which has excellent corrosion and mechanical resistance. In special cases, a ceramic rotor can be used.

4 Thru bolt

Thru bolts are constructed with a quick-change design and are manufactured out of stainless steel.

5 Base plate

The base plate can be made of stainless steel to prevent corrosion and ensure the production site is clean.

6 Flexible rod

A flexible connecting rod is used so there is no joint lubricant required thus preventing the rupture of protective joint sleeves causing lubricant to leak into the product. If joints are used they can also lead to the internal metal parts of the joint grinding during wear and which can get into the battery product when the joint fails thereby affecting battery quality. The flexible rod with threaded connection is also convenient for disassembly, easy to replace the rotor head, and convenient for maintenance.

7 Shaft Seal

A single mechanical seal is used to prevent leakage. Also, gland packing, double mechanical seal or even seal less magnetic couplings are available.

8 Motor reducer

The motor case can be made of aluminum to prevent corrosion of the motor and it is easy to clean. The motor can be a standard motor or an explosion-proof motor according to user requirements. The Mini-pump can use planetary gear reducer+ servo motor.

9 Closed coupled design or with bearing housing design is available.

10 Pump housing

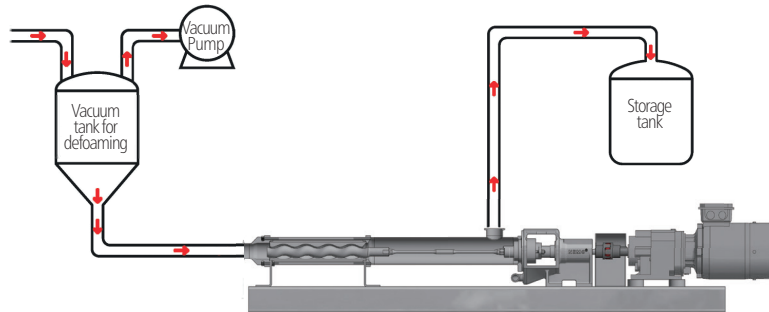
Made of internally and externally polished stainless steel.

NEMO® Progressing Cavity Pumps

Application in Lithium Battery Manufacturing Industry

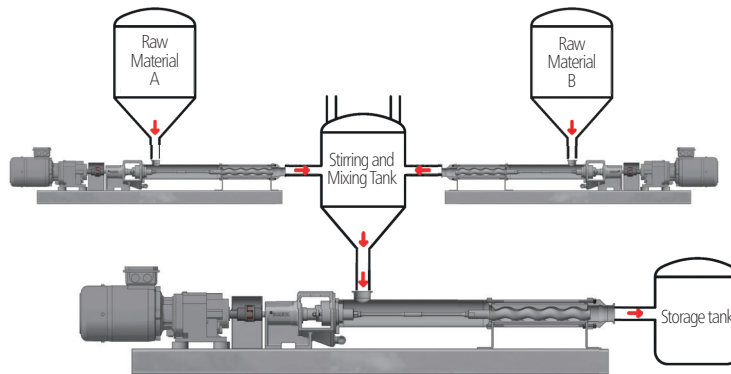
Vacuum defoaming process

Slurries under high vacuum conditions.



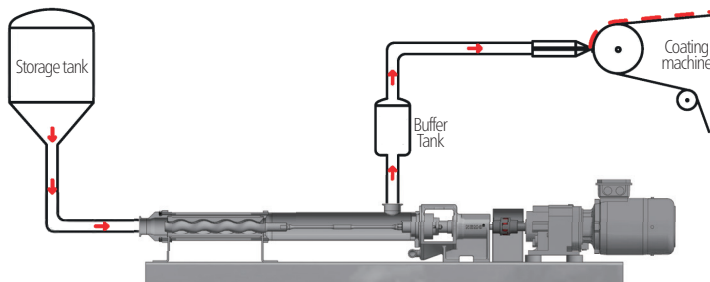
Stirring process

One or more NEMO® pumps can transport a variety of primary raw materials to the stirring tank. After being stirred at a high speed by the stirring tank, the NEMO® pump will transport the product to the storage tank.



Coating process

High viscosity and high-concentration slurries can be steadily supplied without any pulsation to a coater, providing a thin and even film thickness.



NEMO® Mini Pumps & Dispensers

NEMO® Mini Pump

The bearing housing and housing will have duplex stainless steel construction with stainless steel lantern. The pump is capable of being equipped with a servo motor and frequency converter for a perfect flow control.



Performance

- Flow rate: 0 ~ 8.8 gpm / 0 ~ 2 m³/h
- Pressure: 0 ~ 350 psi / 0 ~ 24 bar

Advantages

- Low shear
- Small and compact
- Precise control with control system
- With sanitary quick-change coupling
- For coating feed
- Low pulsation

NEMO® Dispenser Pump

NEMO dispensers provide very accurate metering and extremely high repeatability and accuracy. These dispensers are widely used in the coating process in battery manufacturing.



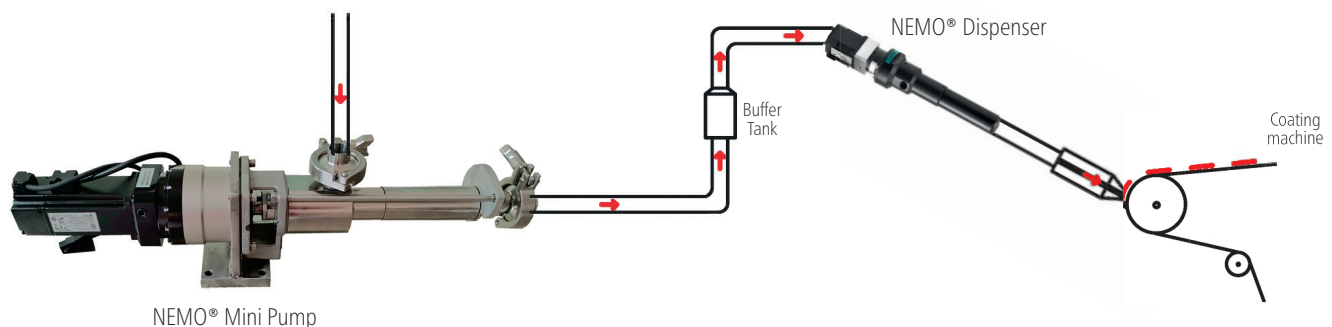
Performance

- Flow rate: 0.001 ~ 0.01 gpm / 5 ~ 50 ml/min
- Accuracy: ±0.5%

Advantages

- Uniform coating
- No accumulation, dripping or breakpoints
- Driven by servo motor for high precision and automated control

Through centralized control of multiple pumps, manual / single adjustment or simultaneous control of all pump flow changes can be achieved, specially developed for battery film coating, the most demanding accuracy and automation conditions during process.



NETZSCH Aftermarket and Service

Support 24/7 in all of North America

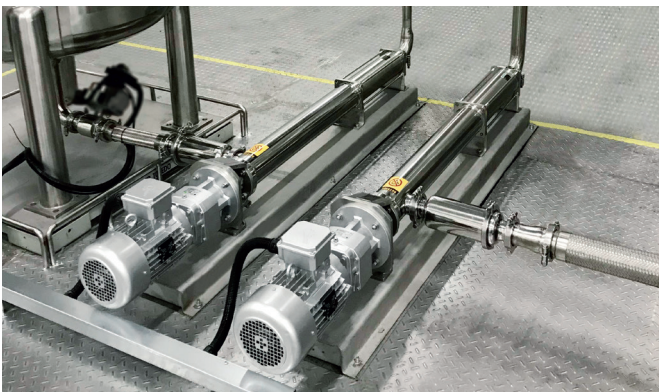
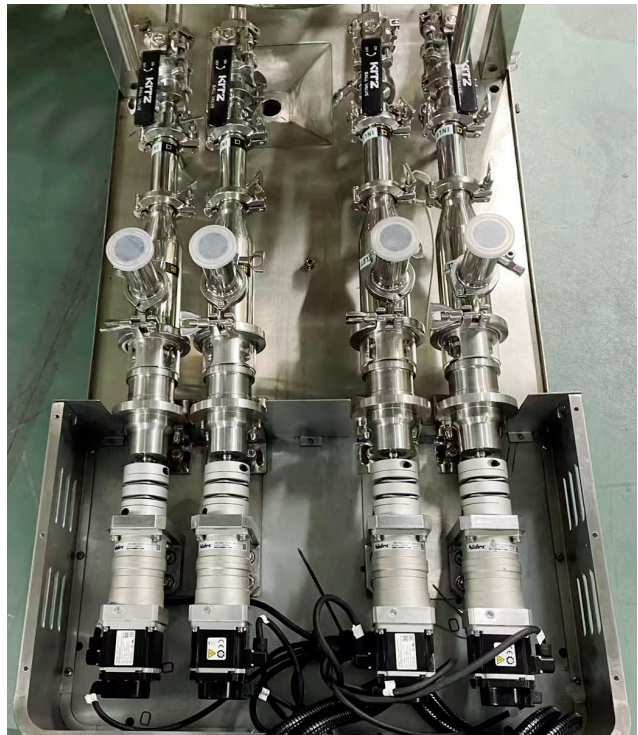
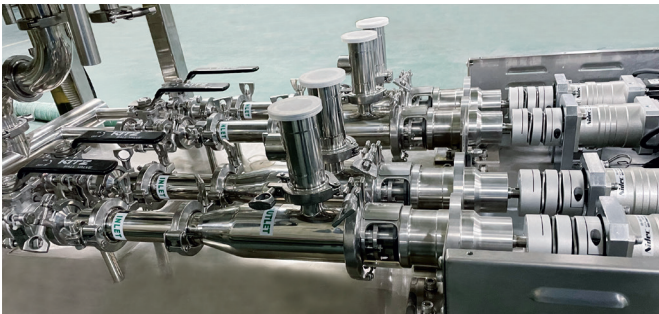
Advice, service and quality are our strengths. Strict manufacturing quality standards, test procedures and certification in accordance with ISO 9000 guarantees the very highest quality without exception. To maintain the performance and quality, we continue to provide support after delivery in all aspects to ensure it operates reliably and continuously. NETZSCH has over 60 years of experience in the pump industry with more than 1,000,000 pump installations.

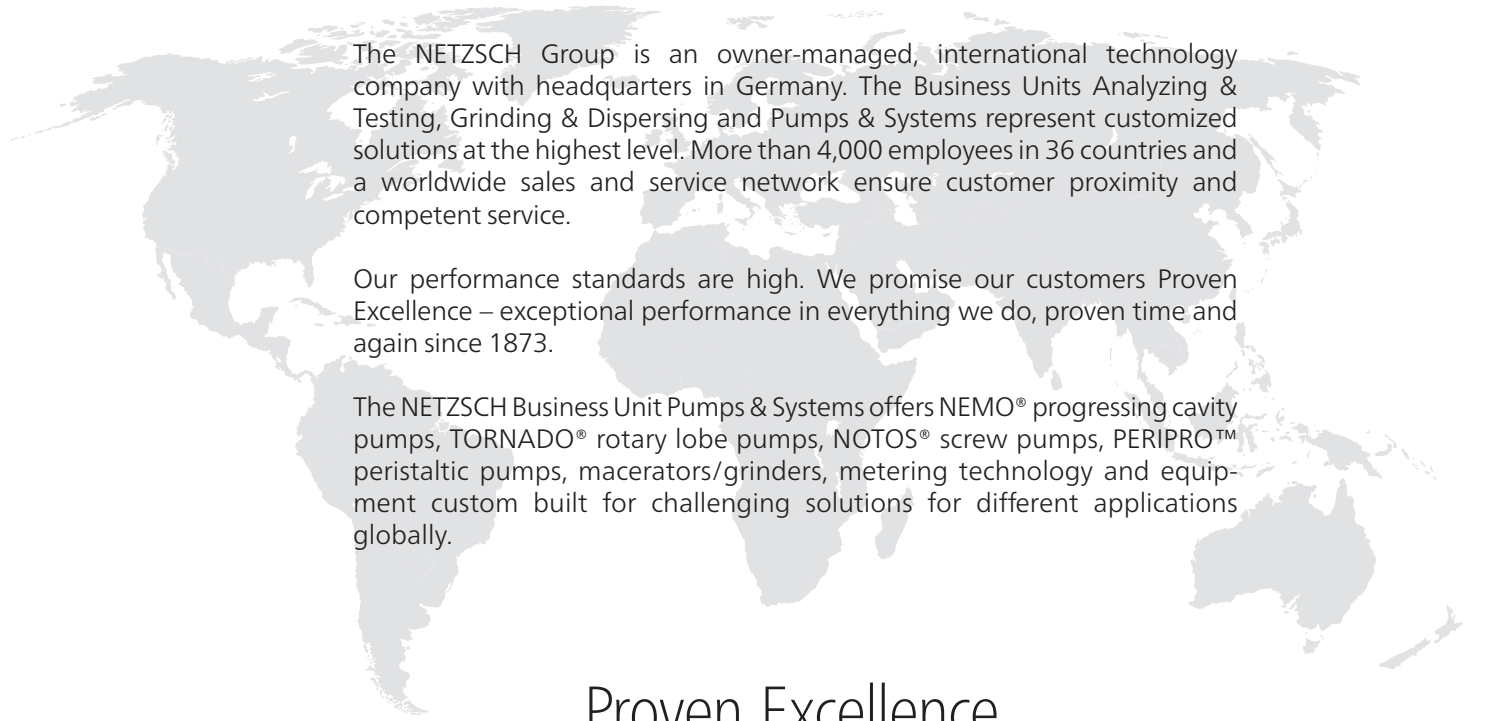


Spare Parts and Service

Call our Customer Service teams at:
1-610 363-8010 Exton, PA USA
1-346 445-2400 Houston, TX USA
1-705 797-8426 Barrie, ON Canada

Customized Designs





The NETZSCH Group is an owner-managed, international technology company with headquarters in Germany. The Business Units Analyzing & Testing, Grinding & Dispersing and Pumps & Systems represent customized solutions at the highest level. More than 4,000 employees in 36 countries and a worldwide sales and service network ensure customer proximity and competent service.

Our performance standards are high. We promise our customers Proven Excellence – exceptional performance in everything we do, proven time and again since 1873.

The NETZSCH Business Unit Pumps & Systems offers NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, NOTOS® screw pumps, PERIPRO™ peristaltic pumps, macerators/grinders, metering technology and equipment custom built for challenging solutions for different applications globally.

Proven Excellence.■

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