NETZSCH

Pumps & Systems

TORNADO® Rotary Lobe Pumps

Redefining the Rotary Lobe Pump

NETZSCH Pumps & Systems – Solutions you can trust

TORNADO® - Redefining the Rotary Lobe Pump

High-performance Rotary Lobe Pumps from NETZSCH

- **Maximum operational performance**
- **High reliability and durability**
- **Ease of maintenance**
- **Low total life cycle cost**

As an industry leader, NETZSCH knows the vital role that positive displacement pumps play in industrial and municipal applications around the globe. That's because we've been an important partner with customers in meeting their needs and solving their process and application challenges with highly engineered and well-designed pumps.

With T1 series and T2 models NETZSCH TORNADO self-priming, valve-less, positive displacement pumps can meet or be customized for any process and application requirement.

The TORNADO Rotary Lobe Pumps can be used for almost any media on intermittent, continuous or metering applications.

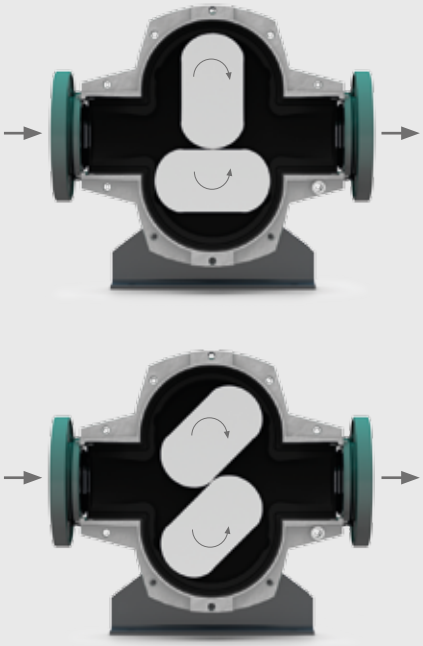
The Advantages of the NETZSCH TORNADO include:

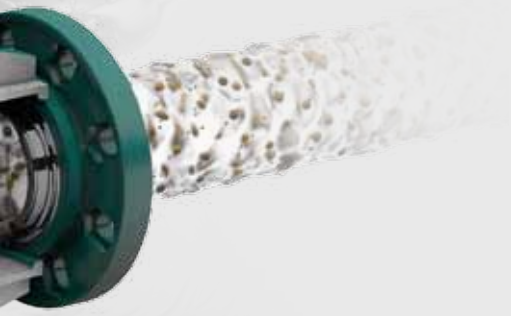
- Service friendliness - no need to dismantle pipework or disconnect the drive for servicing
- Physical separation of the pump head and bearing housing
- Small footprint

Pulsation free pumping

Functioning Principle of a Rotary Lobe Pump

The TORNADO rotary lobe pump is a positive displacement pump. The pumping action is generated by the counter-rotation of two rotors within the pump chamber, which are synchronized externally. The media enters the pump chamber through the inlet port and is carried around the chamber by the rotors to the outlet port where it is discharged.





Characteristics of TORNADO Rotary Lobe Pumps

- Valve free construction
- Self priming
- Suitable for any kind of liquid including media containing gas, solids or fibrous matter
- Suitable for lubricating and non lubricating media
- Pumping media with high or low viscosity
- Handling shear-sensitive fluids
- Operating at temperature up to 212°F / 100°C
- Reversible operation
- Can be serviced without disconnecting pipework
- Dry running capability

The new TORNADO® T2 – A revolutionary design that redefines the Rotary Lobe Pump

It is not only the look of the TORNADO T2 that is different. Challenging conventional wisdom, NETZSCH took the current state-of-the-art rotary lobe pump design and created a new world standard.

In redefining the rotary lobe pump, NETZSCH design engineers carefully considered customer needs relating to reliability, maintenance, performance and total cost of pump ownership.

Reengineered to maximize uptime.

At the center of the new TORNADO T2 are metal lobes running inside a metal housing with an elastomer liner. During the entire pumping cycle only elastomer and metal component surfaces interface within the pump – eliminating the excess wear and heat generated from elastomer-to-elastomer contact as in traditional rotary lobe pumps.

By using dissimilar materials for the static and dynamic pump head components, the elastomeric surfaces are subjected to lower dynamic loading, resulting in less plastic deformation and stress, reducing wear and extending operational life.

The use of high quality sealed-for-life bearings, selected for their load-carrying characteristics and long life, combined with the tooth belt drive result in a drive train that can be considered maintenance-free.

Innovative Design Provides for "Full-Service-In-Place" instead of "Maintenance-In-Place"

Simply removing the cover plate on the TORNADO T2 allows quick and easy access to the pump chamber, including the inlet and outlet ports. This design provides improved access for inspection, cleaning, service and replacing parts.

The service-friendly design of the tooth belt drive means that the belt is easy and quick to replace (in the unlikely event that it should be necessary). The tooth belt drive system also enhances maintenance by providing for greater accuracy of synchronization, eliminating timing gears and oil lubrication, generating less heat and quieter operation.

PROCESS OPTIMIZATION

COMPACTNESS

OPERATIONAL

Enhanced efficiency with the smallest footprint

By incorporating an innovative timing tooth belt to both synchronize and drive the rotating element of the TORNADO T2, a smaller footprint was achieved. This design reduces the space required for pump installation and servicing, improving overall site utilization.

Optimizing total cost of pump ownership

The total cost of ownership of a pump system – reducing maintenance, energy costs and increasing operational uptime – is of critical concern to pump owners and operators.

- The revolutionary design of the TORNADO T2 pump head extends system lifetime and improves the performance of major components: rotors, elastomer liners and mechanical seals.
- The modular design of the TORNADO T2 reduces the cost of wearing parts, extends operating life and significantly reduces overall life cycle costs.
- Although lighter in weight and smaller in foot print, the TORNADO T2 provides heavy-duty performance and lower shipping and handling costs.
- With the tooth belt that drives and synchronizes the pump, NETZSCH eliminated the gearbox and the oil required to run it, lowering operational costs and demonstrating environmental awareness and sustainability.

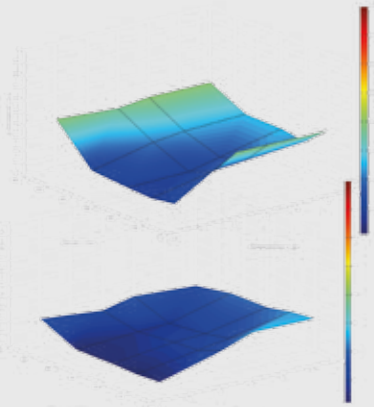
EASE OF SERVICE

STABILITY

SAFETY

Highly engineered components make a qualitative difference

The torsional strength and deflection-resistant, shaft material combined with sealed-for-life, angular contact ball bearings ensure axial and radial shaft stability. This world-class stability maintains tolerances and stabilizes the pump against higher pressures.



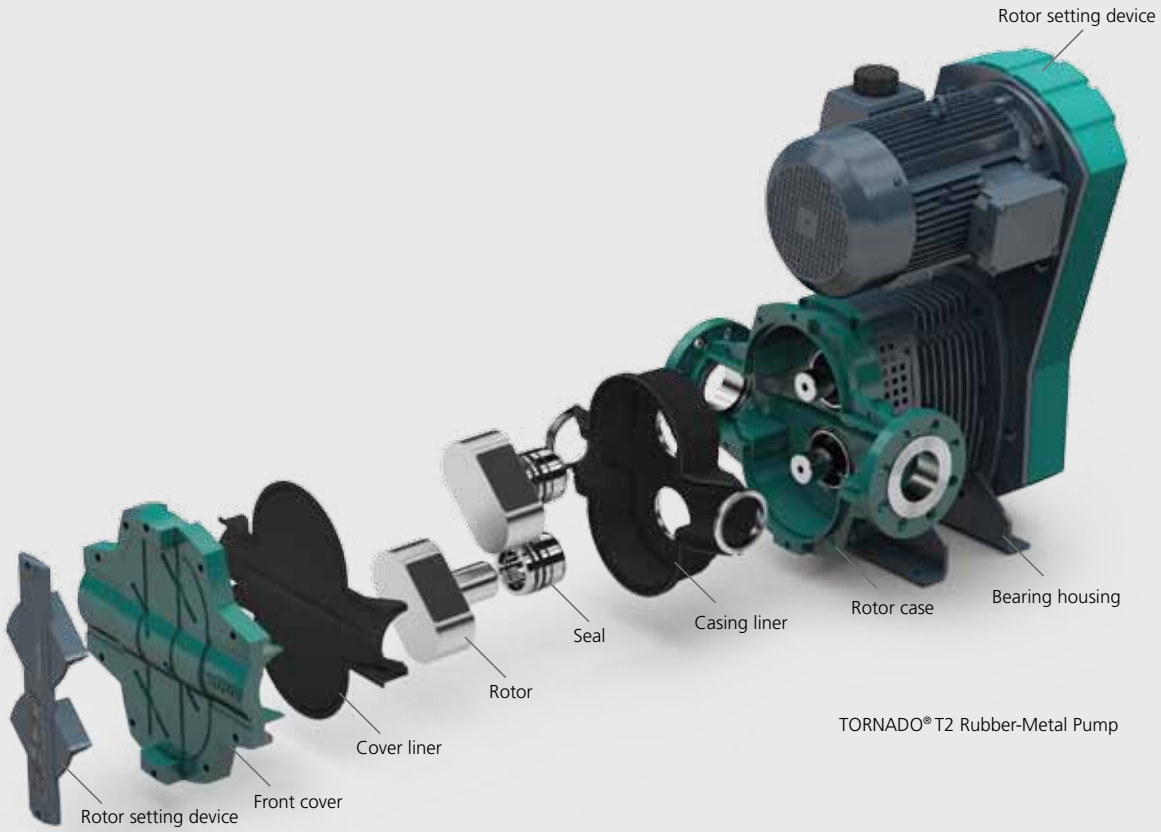
With darker blue indicating optimal performance, the NETZSCH PRS / Bi-lobe design (upper graph) covers 80% of operating conditions with the same performance as quad lobe pumps (lower graph).

Drive options

A range of drive options are available to suit specific application and process requirements. For more information see page 14.

Optimum choice of material – Your application is the decisive factor

Quickest assembly ever



TORNADO® T2 Rubber-Metal Pump

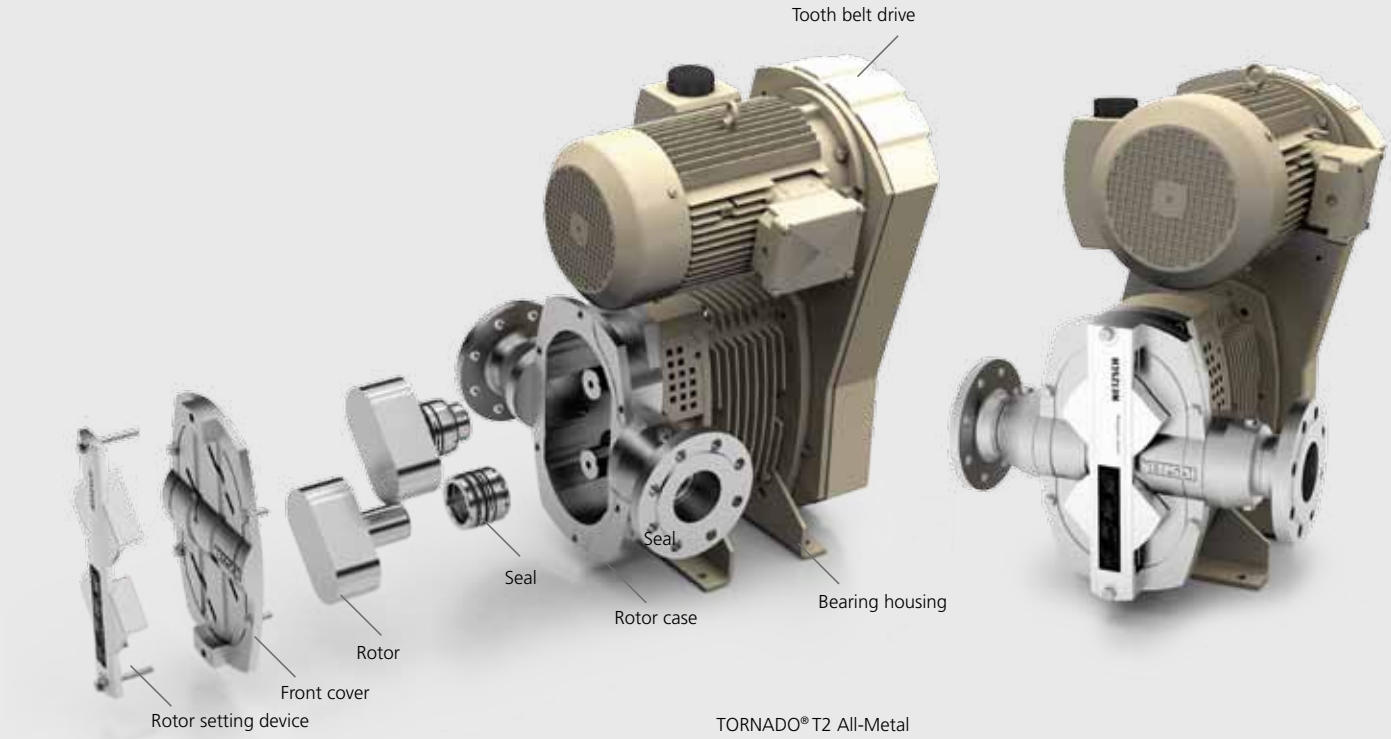
Reduction of maintenance is engineered into the TORNADO T2

The TORNADO T2 has been designed to provide a pump with the lowest cost of ownership and dramatic improvements in maintenance.

- Plastic deformation and heat generation is reduced in the TORNADO T2 by maintaining a uniform elastomeric wall thickness within the pump chamber. Pump head material, bearing selection and seal positioning all combine to minimize dimensional changes due to temperature variation.
- The rotor design and geometry ensures a high level of durability. Since the rotors are fixed from outside the pump head, the pump chamber and the rotors can have a completely flat continuous front and back face with no dead areas where fibrous material can become trapped and compacted.
- The mechanical seal design and seal face position eliminates dead areas and allows for constant circulation of the media around the faces, eliminating the risk of media entrapment and minimizes compaction.
- All TORNADO T2 metal pumps offer higher levels of cleanliness, corrosion or abrasion resistance and so can be employed in demanding applications such as in the low-sanitary, hygienic or chemical services.

Elastomer liner reduces life cycle costs

An elastomer liner is used for all media wetted surfaces of the standard TORNADO T2 pump chamber (the all-metal TORNADO T2 has an all metal pump chamber). The elastomer lining is both easy to replace in the event of servicing and significantly less expensive than replacing wear plates and housing parts in traditional rotary lobe pumps.



TORNADO® T2 All-Metal

"Full Service-In-Place" instead of "Maintenance-In-Place"

With the TORNADO® T2, servicing a rotary lobe pump has never been so easy.

- The rotors can be removed and replaced easily and quickly because they are not bolted or keyed to the shafts inside the pump head. Instead, they are fixed with quick-fit, non-media wetted taper lock assemblies positioned and accessed from the outside of the pump head.
- The rotor geometry allows them to be removed independently without the need for special tools. There are no keys dictating a unique rotor position, resulting in faster, easier and cleaner rotor removal and replacement.
- For rotor synchronization a setting device is included as an integral part of the pump front cover.
- The pre-set cartridge mechanical seals are fitted directly into the rotor and mounted on the shafts as one assembly.

The customer benefits from these "full service-in-place" features, with the service time for the TORNADO T2 reduced to significantly less than half the time required for servicing a conventional rotary lobe pump.

Unique engineering reduces bi-lobe pulsation reduction

The revolutionary NETZSCH Pulsation Reduction System (PRS) guarantees an almost pulsation-free discharge - even when used in conjunction with straight bi-lobe rotors, which ensures better solid handling capability and easier maintenance. The unique PRS employs channels molded into the rubber walls of the pumping element that releases lobe energy and dampens pulsation.

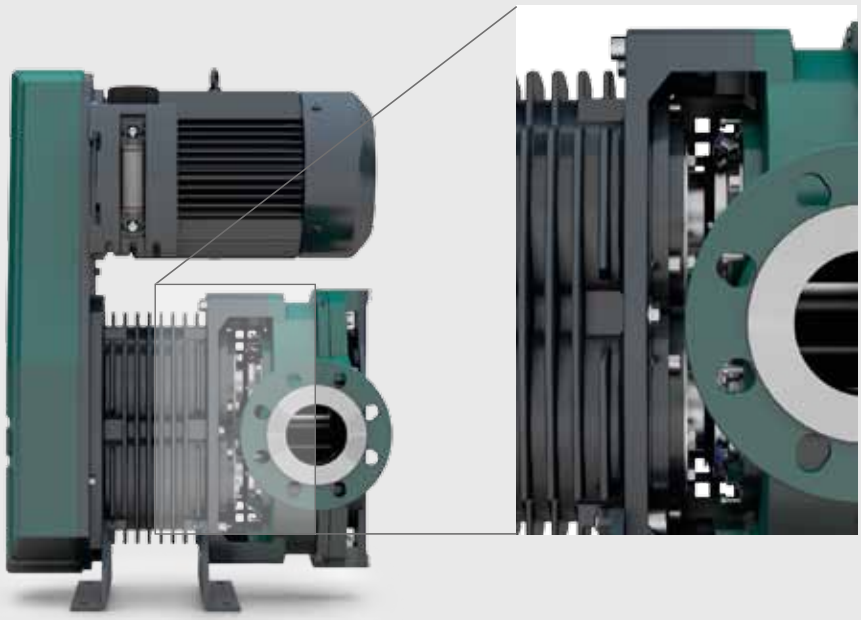
The NETZSCH Pulsation Reduction System provides an almost pulsation-free flow that outperforms the complex multi-lobe helical rotors and meets customer demands for shear sensitive product conveyance and no pulsation downstream.

Operational safety and reliability

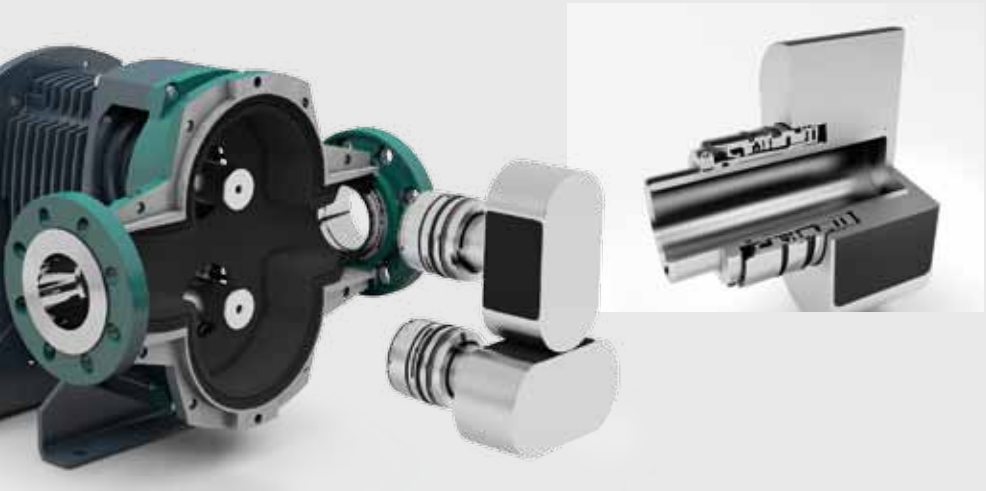
Bearing Security System (BSS)

The NETZSCH Bearing Security System (BSS) for the TORNADO T2 provides an additional margin of safety against catastrophic pump failure. The BSS provides for:

- In the event of seal failure, media cannot enter the bearing housing
- Easy access to seal buffer/quench and barrier/flush connections
- Visual indicator of seal performance



Design and position of the TORNADO T2 mechanical seal includes a cartridge unit integral with rotor



- Uninterrupted and direct flow of media to and around seal faces
- Self draining, no dead areas
- No wear of shafts; the seal is mounted on an integrated rotor sleeve
- Easy assembly and disassembly

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Mechanical seal selection for TORNADO T2

A pump is only as reliable as its seals. A range of seals and seal materials are available for the new TORNADO T2.

- All seals are of a cartridge design and fit into a common housing, allowing for seal upgrades without modification.
- Seals are front loaded, providing fast and easy removal.
- Seals are positioned with the seal faces directly in the flowpath through the pump chamber. The benefit is improved seal functionality and lifetime.
- The cartridge seal design is simple requiring no special tools so it can be serviced easily and quickly.

Mechanical seal typically used for agricultural and environmental applications

Single

Mechanical seal typically used for industrial and general process applications

Single seal

Single seal with quench

Double seal or flush

The surprisingly simplicity of a tooth belt drive

Functioning principle of the TORNADO T2 tooth belt drive

The drive motor transmits power via a double-sided tooth belt. This belt both drives and synchronizes the pump shafts. If required, the drive can be used in conjunction with a frequency converter to achieve a specific flowrate or range of flowrates.

Drive and
Synchronization

Single tooth belt drive

Operationally, environmentally and workplace-friendly design

Incorporating a tooth belt drive into the TORNADO T2 provides users with numerous benefits:

- By replacing traditional maintenance-heavy timing gears with a robust and durable synchronizing tooth belt drive the possibility of an accident causing a catastrophic pump failure is greatly reduced.
- Smooth operation and load dampening with a corresponding reduced energy loss.
- Oil Free Design. No filling, changing or disposing of oil reduces downtime and provides a cleaner and safer work environment.
- Lower noise levels and reduced heat in operating areas working areas.

Flexible installation and consistent pumping capacity – a versatile combination

Both single and double tooth belt drive arrangements are available, providing a wide range of speed reduction ratios.

If required, a shaft extension for direct in-line coupling to electric motor or diesel engine drives is available.

Power Take Off (PTO) shaft extension for drive from a truck or a tractor. Twin shaft extensions are available where reverse operation is required.

Drive and design options

A range of drive and design options are available to suit specific application and process requirements.
For more information see page 17.

The *CLASSIC* TORNADO® T1 - Proven quality and reliability

For more than a decade NETZSCH has been supplying the classic TORNADO T1 rotary lobe pumps.

The TORNADO T1 demonstrates high performance in a wide range of process applications including the environmental and energy, chemical, pulp and paper and oil and gas sectors.

- TORNADO T1 pump size and specifications are precisely tailored to suit the characteristics of the pumped media and operating requirements.
- Three TORNADO T1 series with 12 available models provide for flow rates up 4400 gpm / 1,000 m³/h at discharge pressures up to 90 psi / 6 bar for both intermittent and continuous operation.
- For higher discharge pressures, customized TORNADO T1 solutions are available.

TORNADO T1 benefits

- Gearbox Security System (GSS) technology for long-term reliability.
- Maintenance without the need to disconnect inlet and outlet pipework.
- Quick and easy access to lobes and shaft seals.
- Dry running capability.

Series TORNADO® XLB | Series TORNADO® XB | Series TORNADO® MB

NETZSCH Gearbox Security System (GSS) = Long-term reliability

This experience NETZSCH has gained over decades of producing positive displacement pumps for a wide range of industries and applications has led to the development of Gearbox Security System (GSS). The GSS significantly extends operational reliability by physically separating the pump chamber and gearbox.

GSS benefits

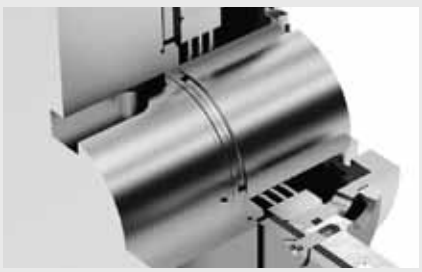
- Extended operational reliability
- In the event of seal failure, pumped substances cannot enter the gearbox
- Pump gearbox oil cannot enter the pump chamber
- Easy access to shaft seal flushing connections

Highly engineered seals

Seals are critical to optimal pump performance and the TORNADO T1 is available with a range of highly engineered sealing solutions that are designed and selected to extend pump operating life.

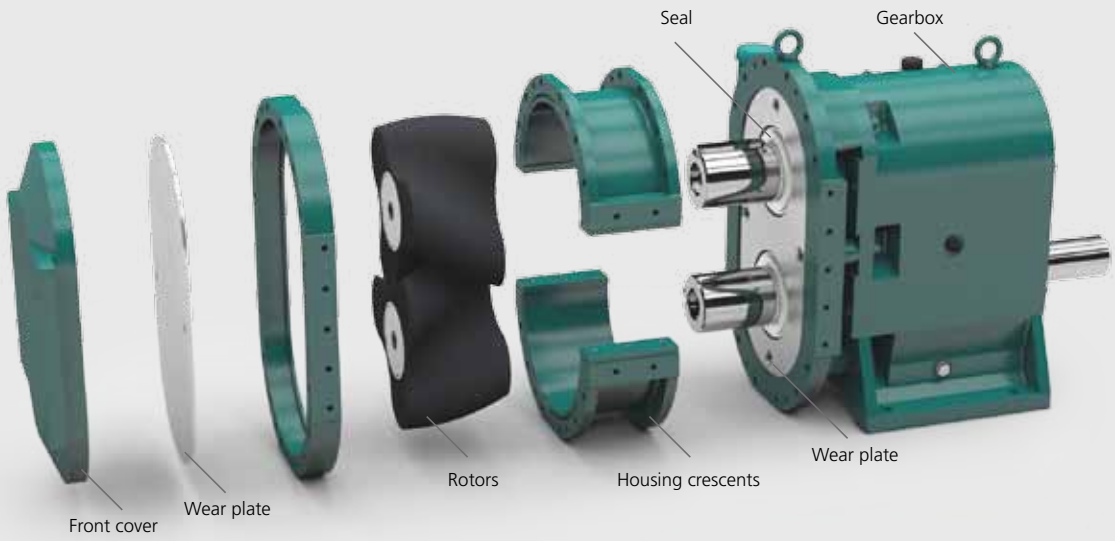
Single mechanical seal

Single mechanical seal with quench



Engineered seals for heavier duty applications

The TORNADO® T1 – A classic design



Front Cover
- Rotors, cover seal and product seals can be accessed for inspection, service or replacement by simply removing the front cover.
- Disassembly of the inlet and outlet pipework and pump housing is not necessary.

Wear Plates
- Abrasion and chemically resistant, replaceable wear plates are fitted on both sides of the rotors.

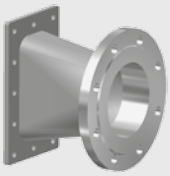
Rotors
- Straight sided or helical rotors selected to suit individual application requirements.

Gearbox
- The patented GSS technology separates the pump head from the gearbox, eliminating cross contamination between pump media and gearbox lubricant.

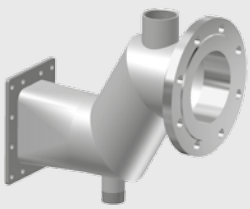
Housing Crescents
- Modular construction allows for housing crescents to be simply replaced should wear occur.
- With the option of replaceable crescent liners, pump life can be further extended.

Seals
- Wide range of product seals and materials are available, selected to suit individual application requirements.
- Seal arrangements include easy access connections for quenching or flushing.

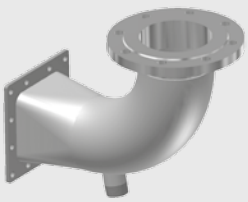
Pump inlet and outlet adaptors for connection to installation pipework are available in various designs



Straight adaptor



S-shaped adaptor



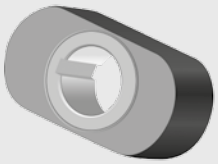
Elbow (90° upwards) adaptor

Connection options

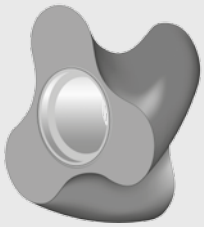
Adaptors designed to suit specific installations available on request

TORNADO T1 rotors – low-pulsation and smooth pumping of all media

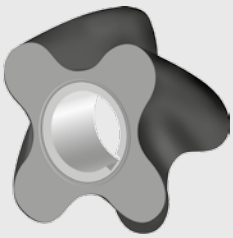
Rotors available in different geometries and materials



2 lobe straight



3 lobe helical

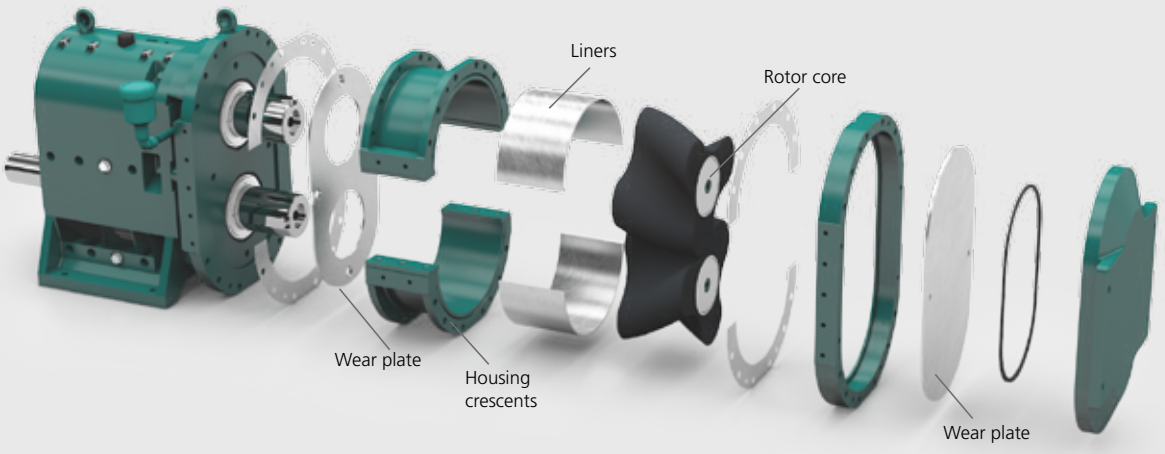


4 lobe helical

- Rotor geometry and material are selected for specific characteristics of media being pumped.
- Rotor geometries are available for products that are viscous, abrasive or have high solids content.
- Broad range of materials of construction ensures extended service life

Range of pump head wetted materials broadens application coverage

- For handling chemically corrosive or aggressive media the TORNADO T1 pump housing, wear plates, liners and rotor cores are available in suitably corrosion and wear-resistant materials.



TORNADO Rotary Lobe Pumps – Total reliability and versatility in any process application

TORNADO T1 used as a feed pump for substrate in a biogas plant with a flowrate up to 175 gpm / 40 m³/h at pressures up to 30 psi / 2 bar.

TORNADO T1 in use in a paper mill for unloading kaolin tankers at 330 gpm / 75 m³/h against a pressure of up to 60 psi / 4 bar.

TORNADO T2 pumps sludge in a wastewater treatment plant with 2% solid content at a capacity up to 80 gpm / 18 m³/h against a pressure up to 30 psi / 2 bar.

Broad application spectrum

TORNADO rotary lobe pumps are used in applications with a broad range of media:

- Abrasive, corrosive and fibrous
- Containing solids (max. particle size up to 2.75" / 70 mm)
- Low to high viscosity
- Shear sensitive
- Non-lubricating and lubricating

Wide capacity and pressure range

- Flowrates up to 4,400 gpm / 1,000 m³/h
- Pressures up to 150 psi / 10 bar

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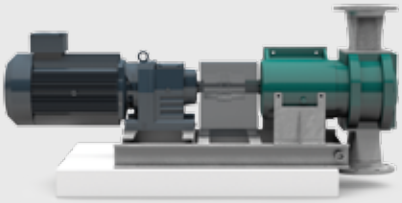
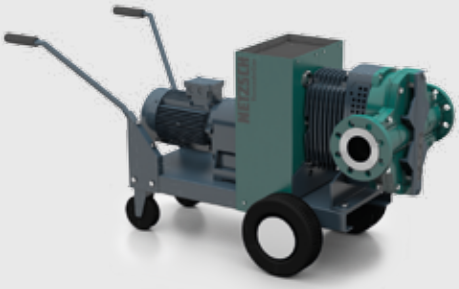
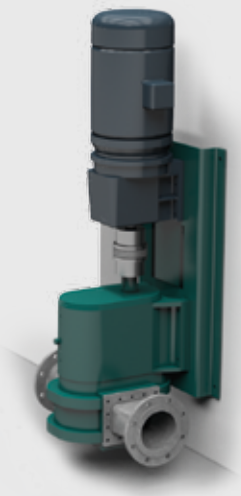
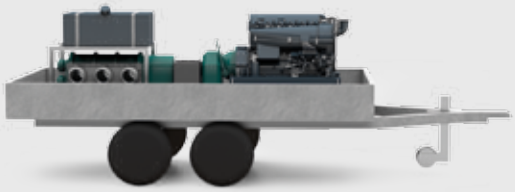
The versatile TORNADO® modular system is the optimum solution for every application requirement

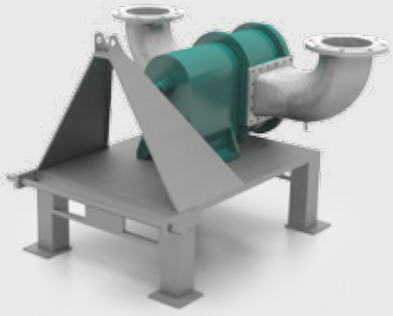
- Whatever the process, the TORNADO range of sizes, specifications and materials allows a customized solution for all process applications.
- TORNADO pumps can be mounted on baseplates, trollies or trailers.
- Wastewater and sludge can be moved quickly and efficiently - whenever and wherever required.
- The range of available drives include electric motors, diesel engines and hydraulic motors.

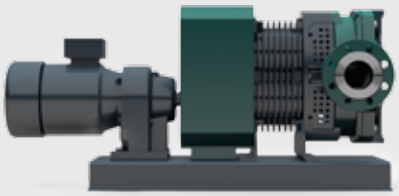












NETZSCH TORNADO Rotary Lobe Pumps – Available with a combination of accessories that protect your process

Accessories to increase the operational safety of both pump and plant and to prevent downtime

Dry running protector

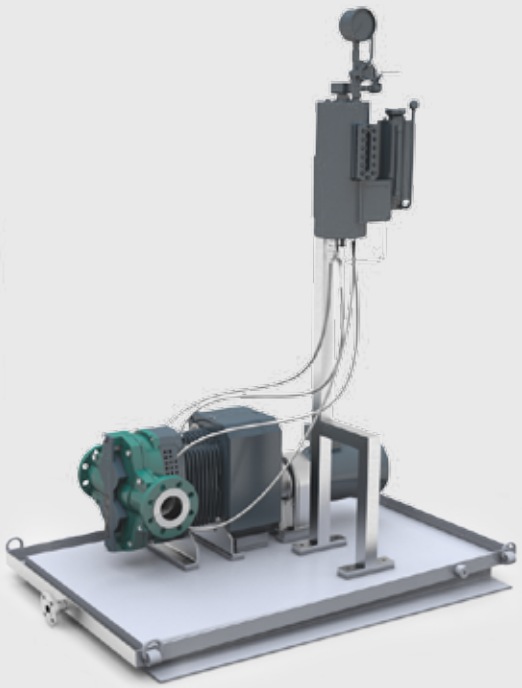
Dry Run Protectors model STP2A and STP2D for the TORNADO rotary lobe pumps operate by monitoring the temperature between the rotor and rotor casing liner during normal operations. Should operating temperature rise above a predetermined set point, due to increase of friction cause by running dry, the unit shuts down the pump, preventing damage to the rotor casing liner and rotor.
The unit controller can be set for two different switch temperatures, one for normal operation and a second for higher alternate process temperatures

Quench pot for single mechanical seals

A seal quench system with gravity quench pot or grease cup, is available for flushing and sealing the single mechanical seals with grease, oil, clean seal water, or other buffer fluid compatible with the pumped media. The buffer fluid cools the mechanical seal faces, prevents the seals from running dry, and prevents solids build-up from the pumped media. The quench chamber is then sealed with a backing lip seal, ahead of the BSS (Bearing Safety System) air gap.

Pressurized flush for double mechanical seals

Similar to the quench pot, a pressurized seal flush system with flow regulator is also available for double mechanical seals, for more extreme and higher pressure applications, where pumped media should be precluded from contact with the seal faces, or allowed into the environment



Additional accessories

Available upon request

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Variable frequency driver

VFD's are available to control speed and flowrates.
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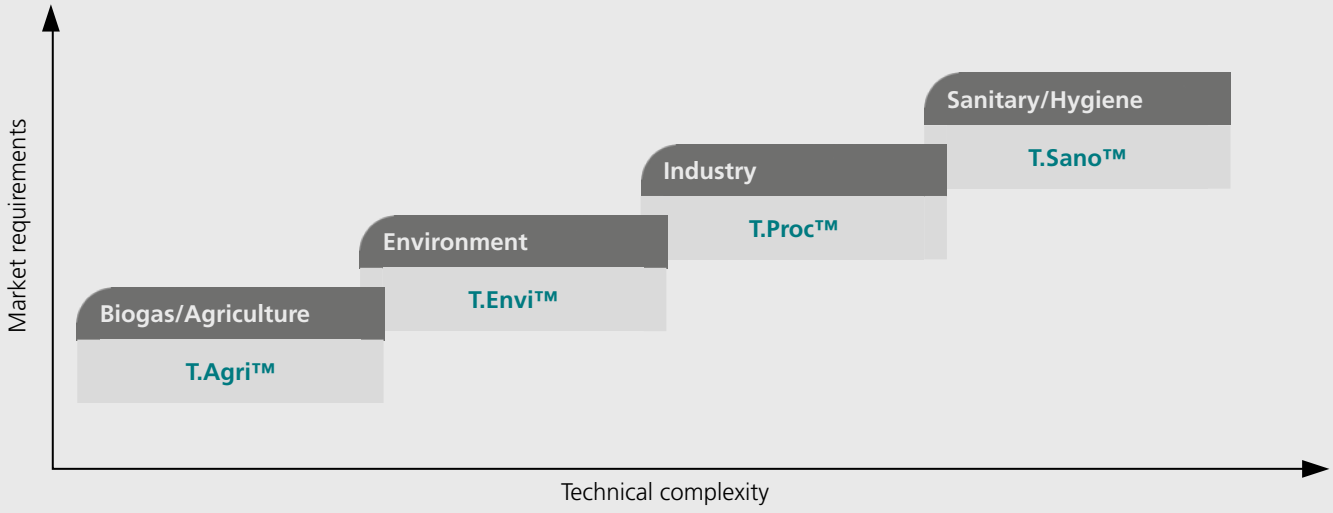
Over-pressure protection

Over-pressurization protection, through a bypass line with relief valve is available.

Your benefit is our product philosophy – Always the best and most suitable pump for your application

The TORNADO® rotary lobe pump is available in four series with 12 models. Each series offers features and specifications that meet specific customer needs, providing benefits of reliability, durability and performance.



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The NETZSCH Group is an owner-managed, internationally operating technology company headquartered in Germany.

The three Business Units – Analyzing & Testing, Grinding & Dispersing and Pumps & Systems – provide tailored solutions for highest-level needs. Over 2,500 employees at 130 sales and production centers in 23 countries across the globe guarantee that expert service is never far from our customers.

The NETZSCH Business Unit Pumps & Systems offers NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps, screw pumps, macerators/grinders, dosing systems and equipment custom built and challenging solutions for different applications on a global base.

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