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 customer in meeting their needs and solving their process and applications challenges with highly engineered and well-designed pumps.

With all the sizes and models available, 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.

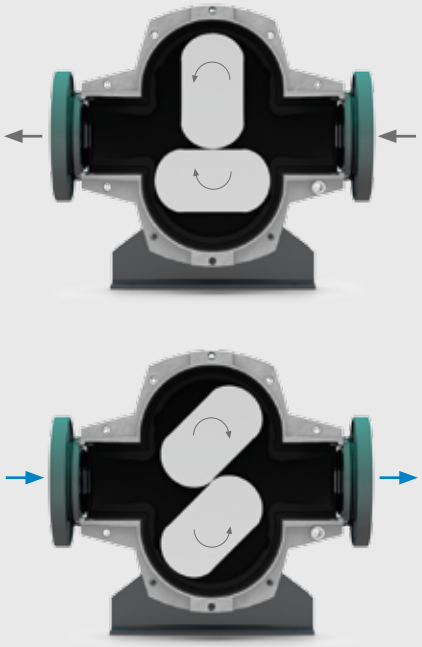
The advantages of the NETZSCH TORNADO® include:

- 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

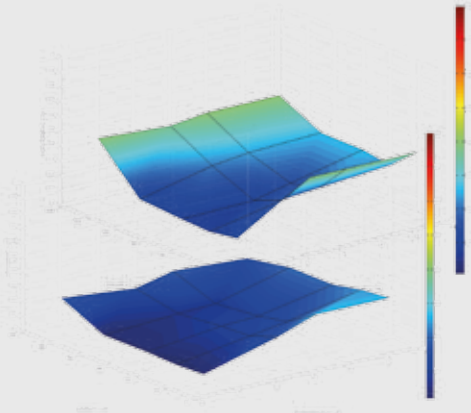
The TORNADO® Rotary Lobe Pump is a positive displacement pump. The pumping action is generated by the contra-rotation of two rotors within the pump chamber, which are synchronized externally. The product enters the pump chamber through the inlet port and is carried around the chamber by the rotors to the outlet port where it is discharged.



Reversible flow

Characteristics of TORNADO® Rotary Lobe Pumps

- Valve free construction.
- Self priming.
- Suitable for any kind of liquid including product 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.
- Tolerance of dry running.



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

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

Reengineered to maximize uptime.

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.

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 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 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.

Enhanced efficiency with the smallest footprint

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

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Operational safety

The design of the NETZSCH Gearbox Security System (GSS) and the Bearing Security System (BSS), the proven physical separation between pump chamber and bearing housing guarantees absolute operational safety.

Highly engineered components make a qualitative difference

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

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.

- The revolutionary design of the TORNADO® T2 pump head extends system lifetime and improves the performance of major components including rotors, the elastomer liners and the mechanical seals.
- By adopting a modular design approach, the T2 reduces the cost of wearing parts, extends operating their operating life and significantly reducing overall life cycle costs.
- Through the choice of materials and innovative component design, the weight of the TORNADO® T2 has been significantly reduced. This translates into a pump that consumes less energy while increasing performance.
- By eliminating the need for oil in the unique tooth belt that drives and synchronizes the pump, NETZSCH is lowering operational costs while demonstrating environmental awareness and sustainability.

COST-EFFECTIVENESS

EASE OF SERVICE

STABILITY

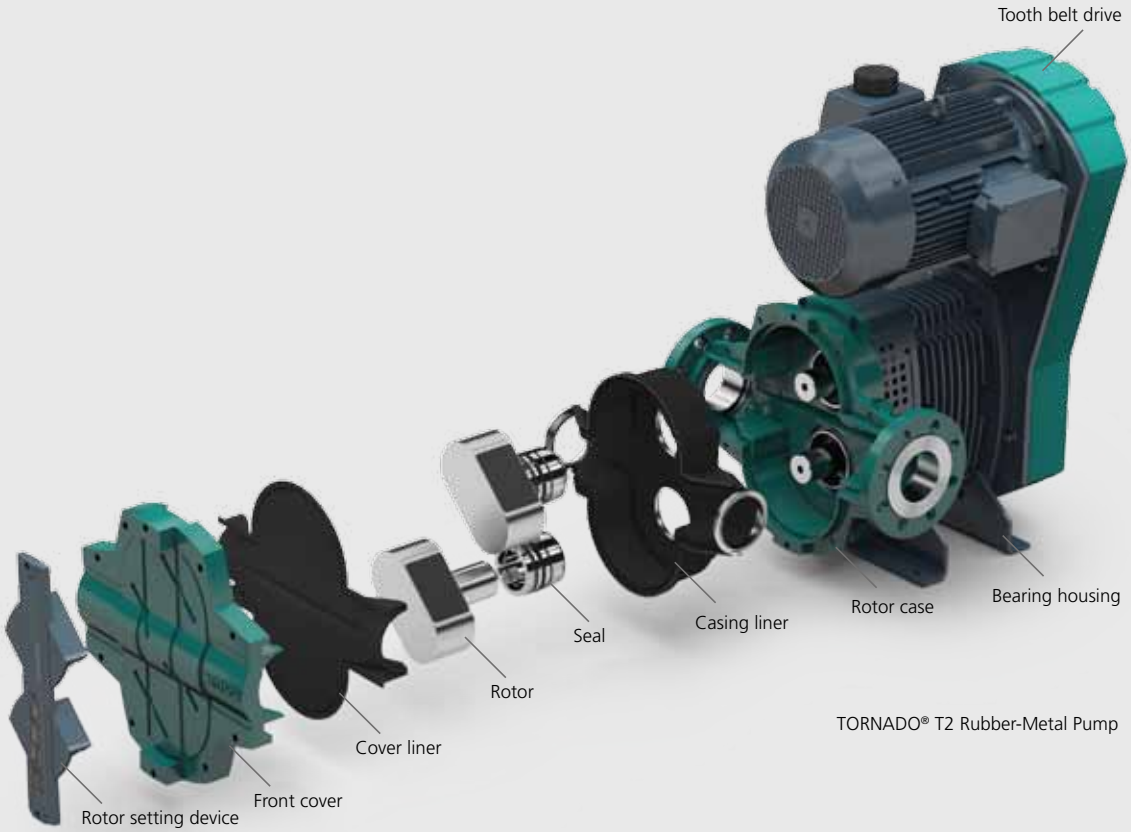
SAFETY

Drive options

A range of drive options are available to suit specific application and process requirements. For more information see page 9.

Optimum choice of material – Your application is the decisive factor

Quickest assembly ever



TORNADO® T2 Rubber-Metal Pump

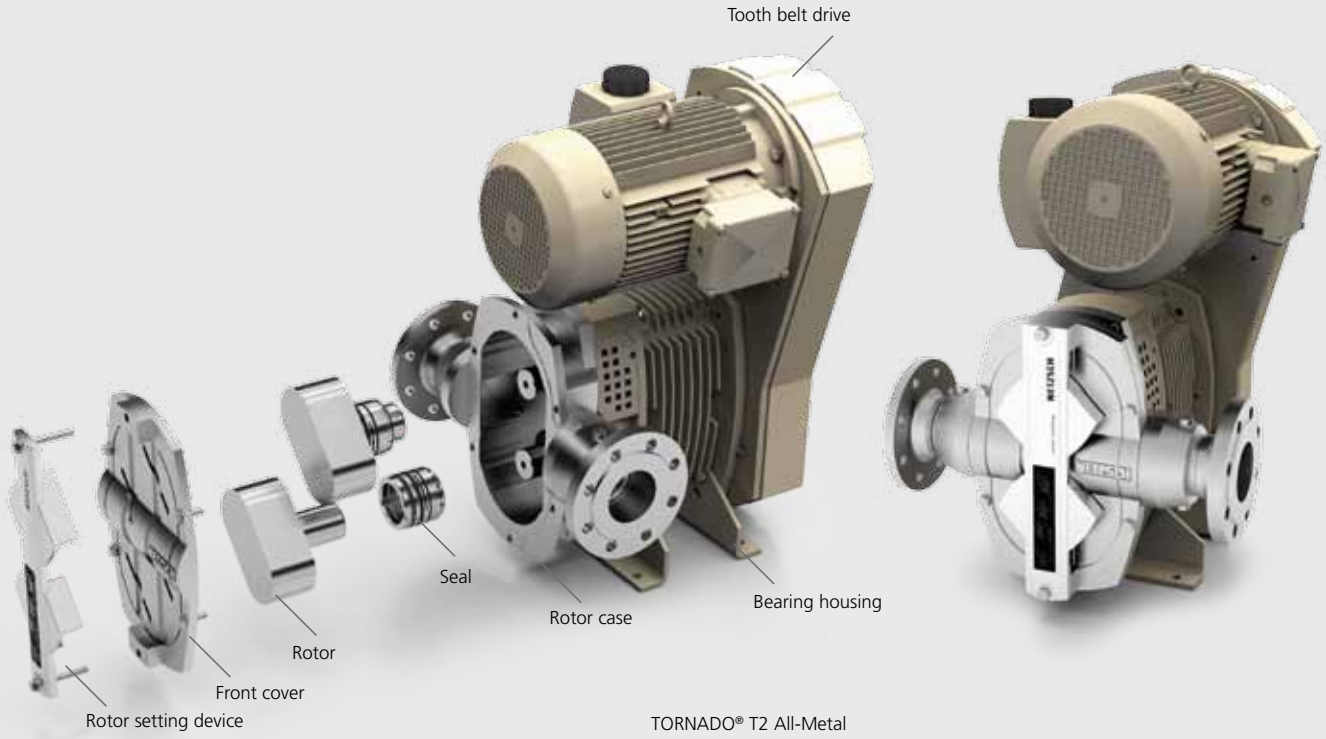
Reduction of maintenance is engineered in

The TORNADO® T2 was completely redesigned to provide pump with the lowest cost of ownership – with 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. With the rotor fixing and drive outside the pump chamber, the rotors have an entirely 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 constant circulation of the media around the faces, eliminating the risk of media entrapment and minimizing compaction.
- The TORNADO® T2 all metal pumps can be manufactured from metals offering higher levels of cleanliness, corrosion or abrasion resistance and can therefore be applied to demanding applications such as in the low sanitary hygienic or chemical markets.

Elastomer liner reduces life cycle costs

An elastomer liner is used for all media wetted surfaces of the TORNADO® T2 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 within the pump head. Instead, they are fixed with quick-fit, non-product wetted taper lock assemblies positioned and accessed outside of the pump head.
- The geometry of the rotors allows them to be removed independently without the need for any 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.
- With "full service in place" features, the service time for the TORNADO® T2 is reduced to significantly less than half the time required for servicing a conventional rotary lobe pump.

Unique engineering achieves 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 release lobe energy and dampen pulsation. The NETZSCH PRS provides an almost pulsation-free flow that outperforms the characteristics of complex multi-lobe helical rotors and meets customer demands for shear sensitive product conveyance and no pulsation downstream.

Synchronizing the TORNADO® T2 - Surprisingly simple with a tooth belt drive

Functioning principle of the 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
Sychronization

Single tooth belt drive

Operationally-, environmentally- and workplace-friendly

Incorporating a tooth belt drive into the T2 provides 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 corresponding reduced energy loss.
- No need for oil - no more filling, changing, leakage or disposal of oil, reducing downtime and providing a cleaner and safer work environment.
- Users benefit from low noise levels and reduced heat in operating areas working areas.

Environmental awareness

TORNADO® T2 – the environment friendly pump

By incorporating a tooth belt drive the pump does not use any oil. There is no chance of any environmental pollution due to spillage or leakage. Our customers benefit from low noise levels and reduced heat in the working area around the pump which corresponds with less energy loss.

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 truck or tractor. Twin shaft extensions are available where reversible 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.

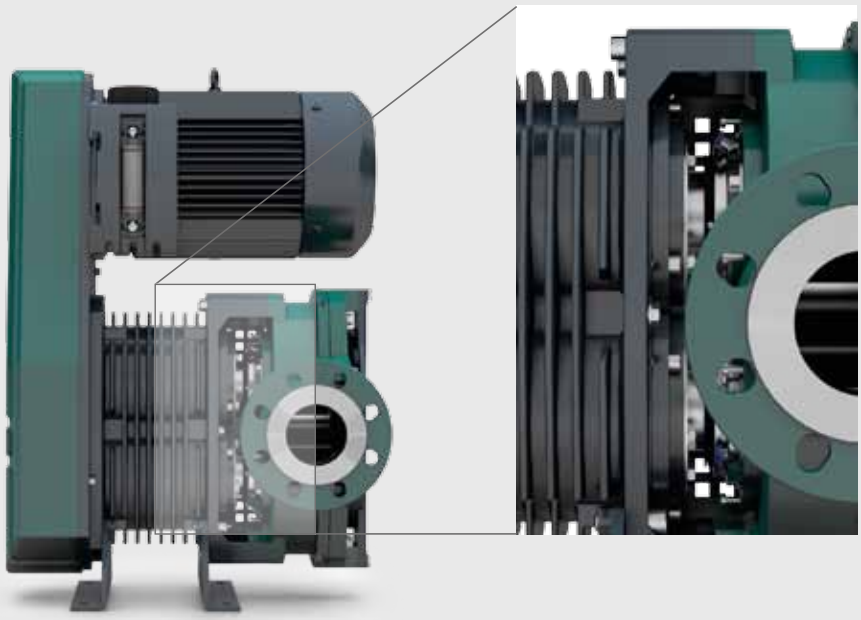
Operational safety and reliability

From GSS[1] to BSS[2]

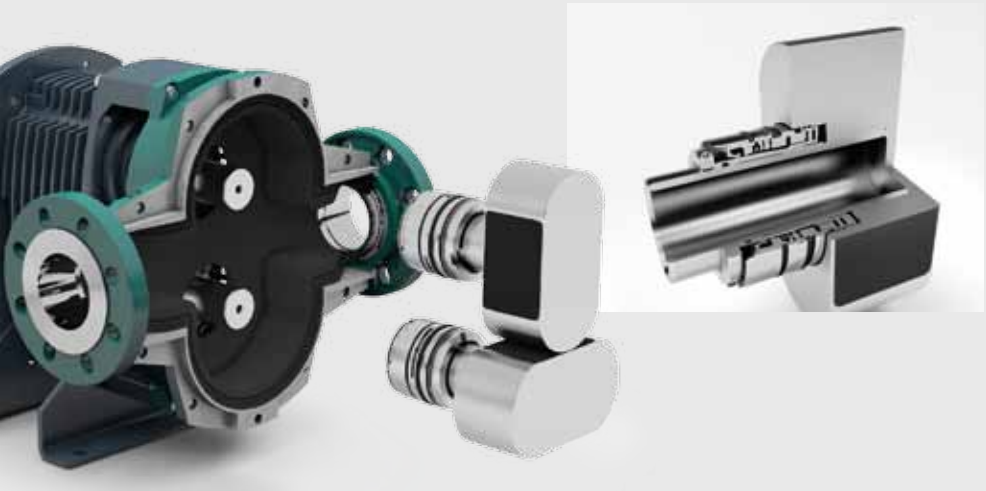
The NETZSCH Gearbox Security System (GSS) and Bearing Security System (BSS) for the TORNADO® T2 provides an additional margin of safety against catastrophic pump failure. The GSS and BSS provide for:

- No ingress of the product into the bearing housing in the event of seal failure.
- Easy access to seal buffer/quench and barrier/flush connections.
- Visual indicator of seal performance.

[1] GSS = Gearbox Security System
[2] BSS = Bearing Security System



The 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 positioned with the seal faces directly in the flowpath through the pump chamber.

Mechanical seal typically used for agricultural and environmental applications

Single

Mechanical seal typically used for industrial and general process applications

Single

Single for buffer or quench

Double for barrier or flush

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

- T1 pump size and specifications are precisely tailored to suit the characteristics of the pumped media and operating requirements.
- Three T1 series with 12 available models provide for flow rates up 4400 gpm / 1,000 m^3/h at discharge pressures up to 90 psi / 6 bar for both intermittent and continuous operation.
- For higher discharge pressures, customized 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 tolerance.
- Short delivery times with all in-house manufacturing with a large stock of components and parts.

[1] Gearbox Security System

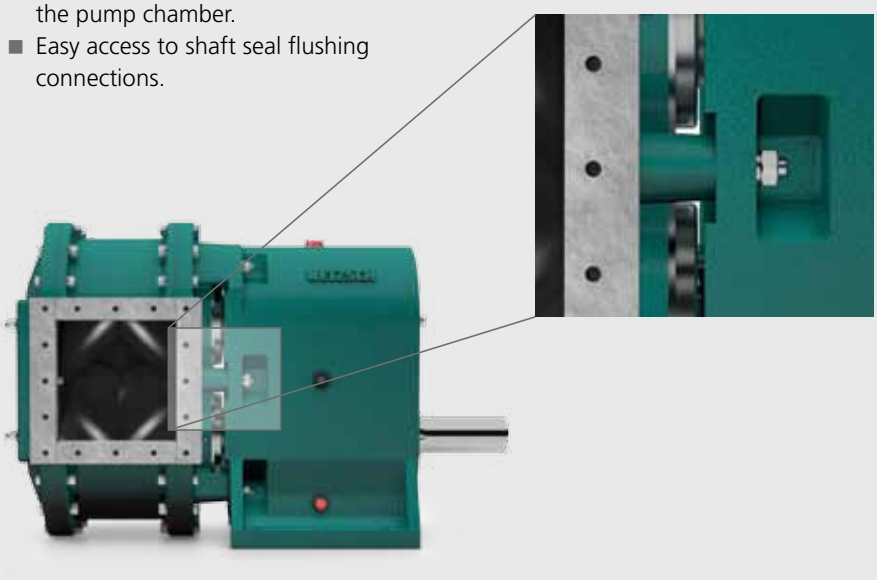
Series TORNADO® XLB | Series TORNADO® XB | Series TORNADO® MB

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

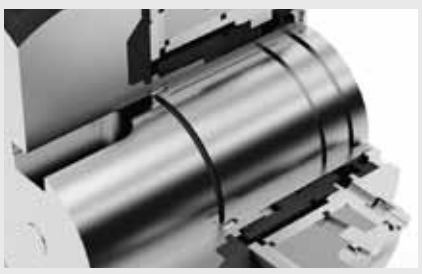
- Extended operational reliability.
- Should product leak, no ingress of pumped product into the gearbox.
- No ingress of pump gearbox oil into the pump chamber.
- Easy access to shaft seal flushing connections.



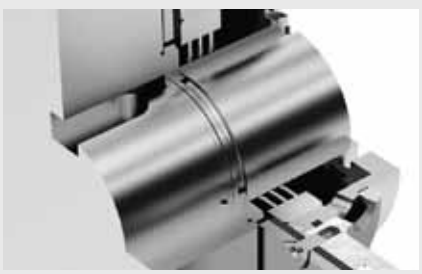
Highly engineered seals

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.

Classic single acting seal

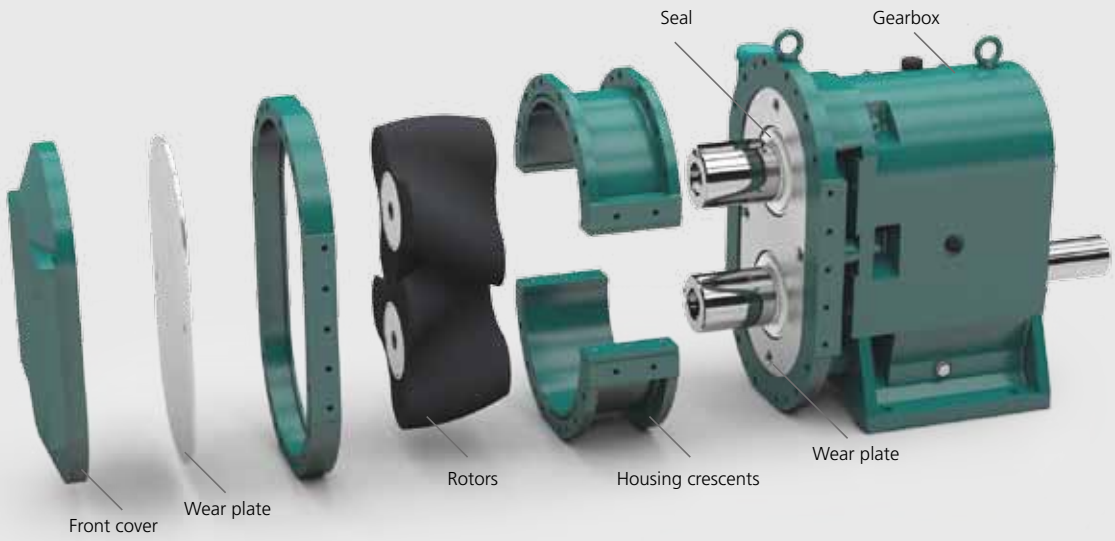


Single for buffer or quench for industrial applications



Special seal for demanding 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 both sides of the rotors.

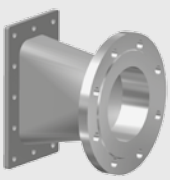
Rotors
- Straight sided or helical rotors are selected to suit individual application requirements.
- Rotors are available as bi-lobe, tri-lobe or four-lobe and a wide range of materials is available.

Housing Crescents
- Modular construction allows for the crescents to be simply replaced should wear occur.
- Pump life time can be further extended with the option of replaceable crescent liners.

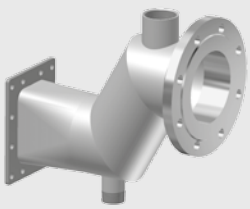
- Seals
  Wide range of product seals and materials are available, which are selected to fit individual application requirements.
- Seal arrangements include easy access connections for seal quench or flush.

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

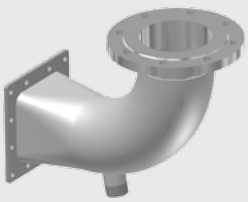
Pump inlet and outlet adaptors for connection to installation pipework are available in various designs



Straight adaptor



S-shaped adaptor



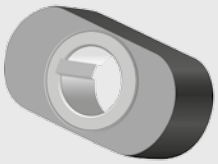
Elbow (90° upwards) adaptor

Connection options

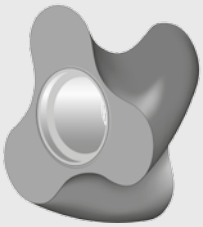
Adaptors designed to fit specific installations. Available on request.

T1 rotors – low-pulsation, smooth pumping of all product

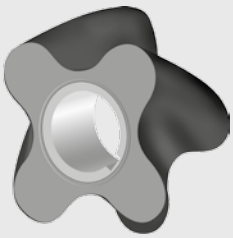
Rotors available in different geometries and materials



2 lobe straight



3 lobe helical

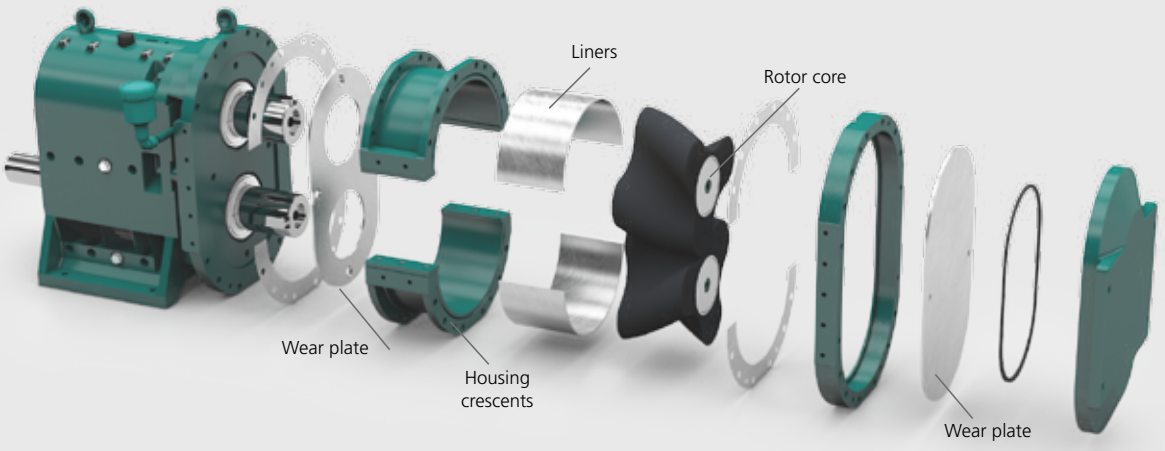


4 lobe helical

- Rotor geometry and material are selected for specific characteristics of substance being pumped.
- Rotor geometries are available for products that are viscous, abrasive or contain solids.
- Rotor materials tailored to substance characteristics increase rotor durability and extend 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 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 flow-rate up to 175 gpm / 40 m³/h at pressures up to 30 psi / 2 bar.

The TORNADO® T1 in use in a paper mill 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 can be used for product that has the following characteristics:

- Abrasive, corrosive and fibrous.
- Containing solids (max. particle size up to 2.76" / 70 mm).
- Low to high viscosity.
- Shear sensitive.
- Non-lubricating and lubricating.

Wide capacity and pressure range

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

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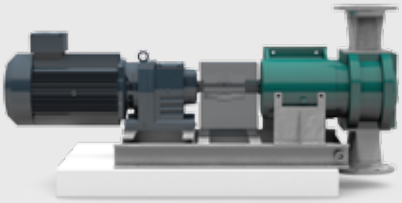
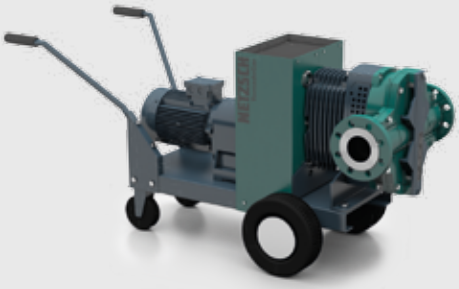
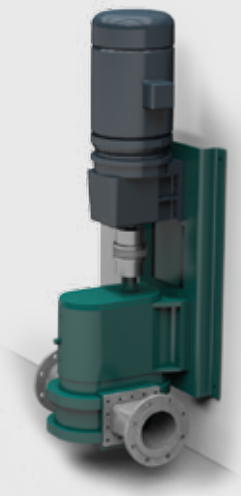
The versatile TORNADO® modular system is the optimum solution for every application requirement

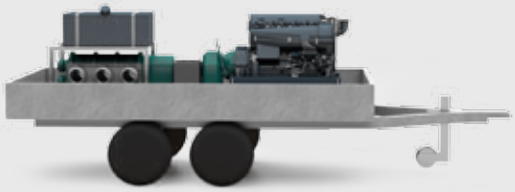
Whatever the process, the TORNADO® range of sizes, specifications and materials allows a customized solution for all process applications.

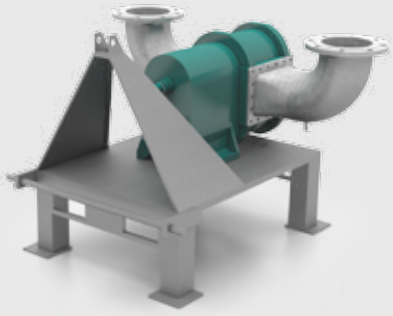
- TORNADO® pumps are able to transfer substances containing solids and fibrous matter.
- Waste water and sludge can be moved quickly and efficiently - whenever and wherever required.
- TORNADO® pumps can be mounted on baseplates, carts or trailers.
- The range of available drives include electric motors, diesel engines and hydraulic motors.

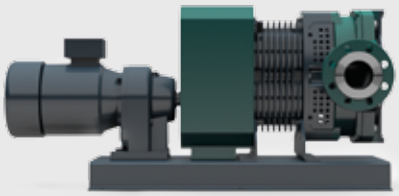












NETZSCH TORNADO® Rotary Lobe Pumps - Available with a combination of accessories that protect your process

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

Dry running protector

The dry running protection units (STP2A, STP2D) for the TORNADO® rotary lobe pumps operate by monitoring the temperature between rotor and rotor case during normal operation. Should operating temperature rise over a predetermined set point due to an increase in friction caused by dry running the unit will shut down the pump, preventing damage to the rotor case liner and rotor.

The unit controller can be set for two different switch temperatures. For example, the first set temperature could be used for pumped product most normally used and the second for product at a different temperature.

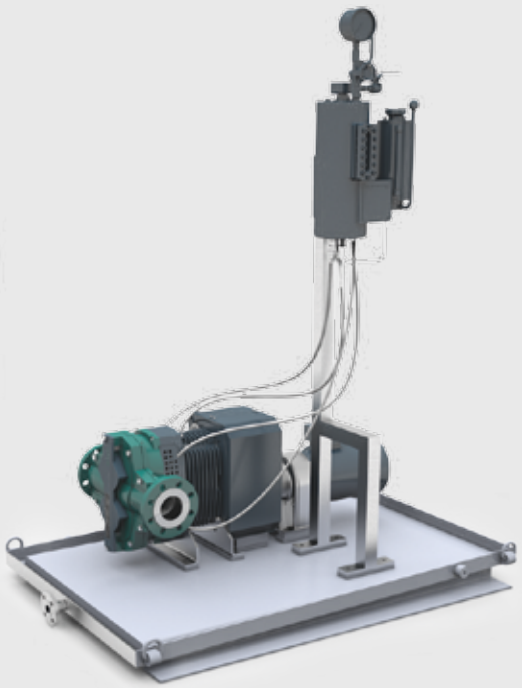
Quench pot for single mechanical seals

A quench pot is required when the shaft seals need to be operated with a quench, but it is not required that the seal is continuously flushed. The quench pot is recommended to prevent dry running of the seals or crystallization of the pumped product.

Pressurized flush for double mechanical seals

A double mechanical seal must be used in conjunction with a system providing a pressurized flush or thermo-syphon system. The pressurized flush is required to lubricate and cool the seals and seal area and flush contaminants from the seal chamber.

The flush liquid should be compatible with the pumped product, lubricating and have a high specific heat capacity. The pressure of the flush should be 30 psi / 2 bar above the pressure acting on the inboard seal from the pump chamber and flow rate of the flush must also be controlled.



Accessories

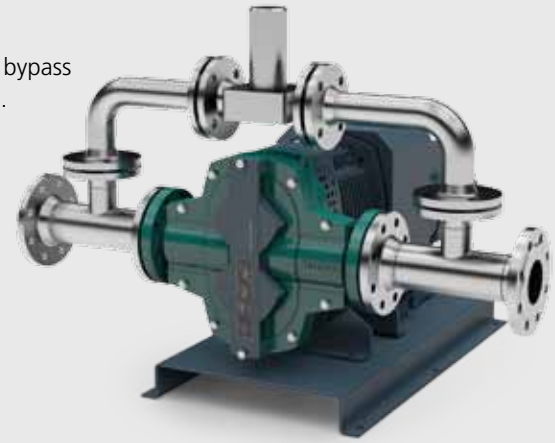
Available on request.

Frequency converter

For varying speed and flowrates a frequency converter is available.

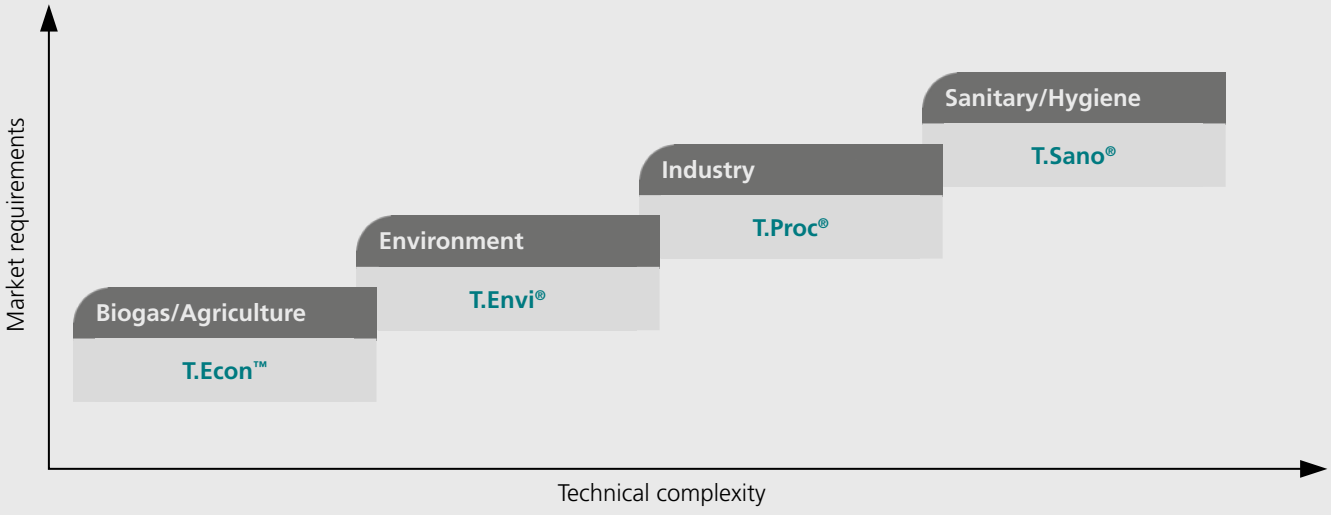
Over pressure protection

For over-pressure protection, a bypass line with relief valve is required.



Your benefit is our product philosophy – the best 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 3,000 employees at 140 sales and production centers in 30 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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