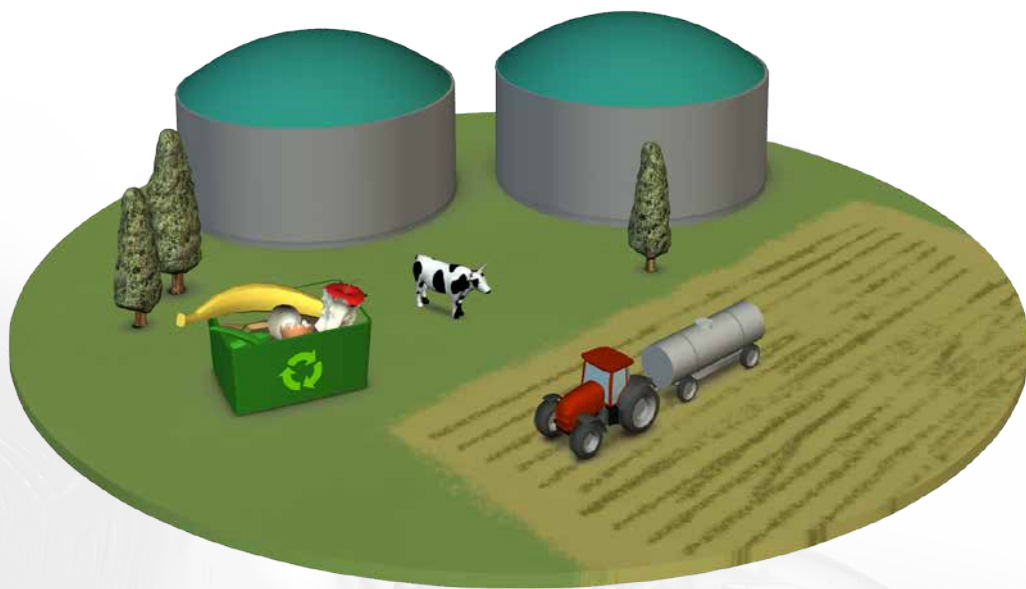


OPTIMISATION OF BIOGAS PRODUCTION WITH special NETZSCH products

INCREASING THE GAS YIELD
NEMO® B.MAX®, PG. 6

HIGH LEVEL OF AVAILABILITY
NEMO® PROGRESSING CAVITY
PUMP, PG. 8

COMPACT, USER-FRIENDLY
TORNADO® T2, PG. 10



LOW ENERGY REQUIREMENT
NETZSCH GRINDING SYSTEMS, PG. 12

ON SITE FAST
SERVICE AND SPARE PARTS, PG. 14

Existing biogas plants work more efficiently with NETZSCH products

Germany is the country with the most biogas plants in the world. There are nearly 8,000 plants spread across federal territory. The majority of these are operated by farmers, some of whom had already started building biogas plants 20 years ago. German

farmers were the pioneers of the energy turnaround and were supported in their efforts for many years by the German government. However, changes in political priorities and the European legal situation mean that, along with building new biogas plants,

it is now necessary to focus on converting and upgrading existing plants, if their operation is to continue to be commercially viable. This is because falling state funding has increased the cost pressure on operators.

A multitude of substrates

Many operators are looking for reasonably priced, ecological alternatives to maize. Grass silage and sugar beet have already been though practical testing in this area, but the range of liquid substrates is also constantly being extended. The reuse of food waste is experiencing progress as the second method of biogas production (cofermentation). This extension of input materials means feeding technology needs to be adjusted. With the NEMO® B.Max® mixing pump, the M-Ovas® cutting plate macerator or a twin shaft macerator, NETZSCH offers appropriate products enabling the use of existing plants for new substrates here.

Feeding technology

Substrate feeding often caused problems as far as dry feeding was concerned and is time-consuming for the operator, as well as having a high maintenance requirement. Switching to fluid feeding using the NEMO® B.Max® mixing pump can contribute to a significant improvement in the operator's quality of life here. Firstly, it combines the feeding and mixing of the substrates. Secondly, feeding and stirring in the plant is separated timewise and this therefore means greater flexibility in terms of time and the avoidance of power spikes. The additional stone-separation function of the M-Ovas® macerator increases the reliability of the plant and reduces the likelihood of maintenance being needed.

Plant layout and biogas process

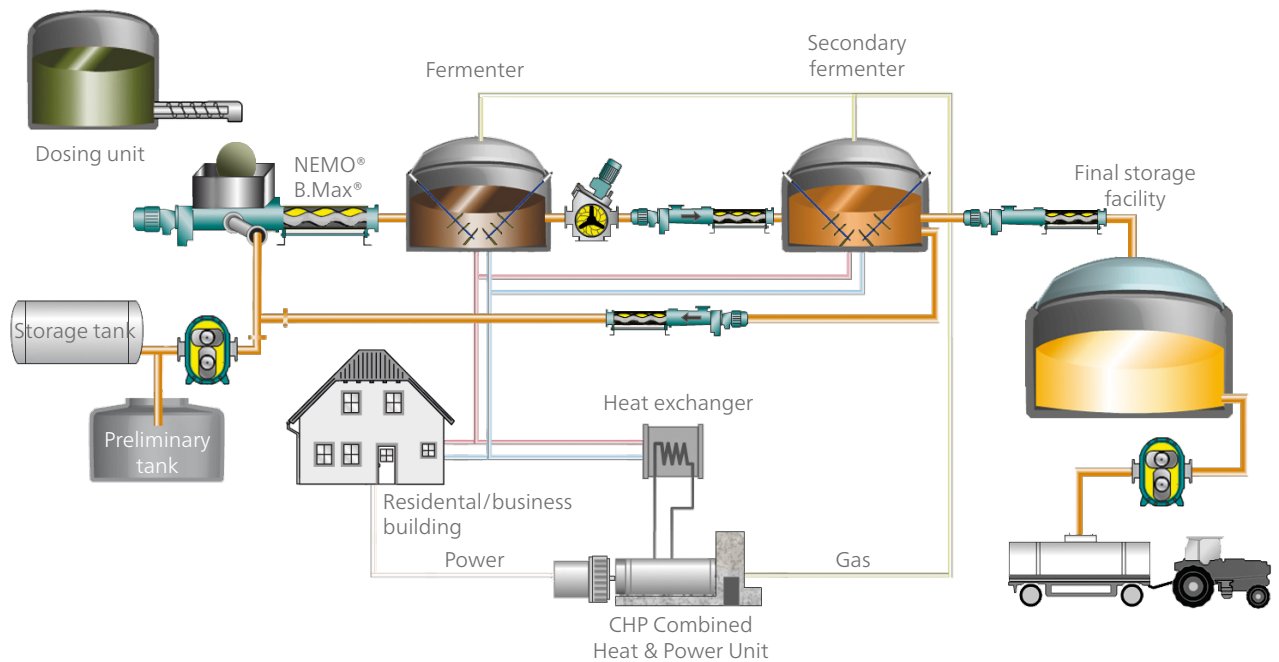
Low methane yields from old plants mean they become uneconomic. Yields have to be increased by enlarging the plant, more concentrated substrates or several stages of fermentation. This can be achieved by higher feed quantities, additional dwell steps or an extension of the dwell time for the substrate in the plant. Flexible adjustment of NETZSCH pumps is possible to achieve this and they can contribute to the reliability of the process.

The NEMO® B.Max® mixing pump prepares the substrate that are fed in to create a homogeneous mass, which produces a higher level of gas yield in fermentation. Use of the M-Ovas® macerator in the process further increases the homogenisation of the mass and so the gas yield. The NEMO® progressing cavity pump and the TORNADO® rotary lobe pump convey recirculated substances for further fermentation in a way that ensures process reliability and they can even do this over greater distances or different levels.

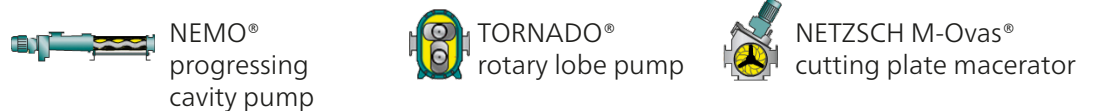
NETZSCH PRODUCTS SUPPORT BIOGAS PROCESSES

Mixing-Conveying-Grinding

Operation using agricultural substrates (renewable raw materials)



Points of use for

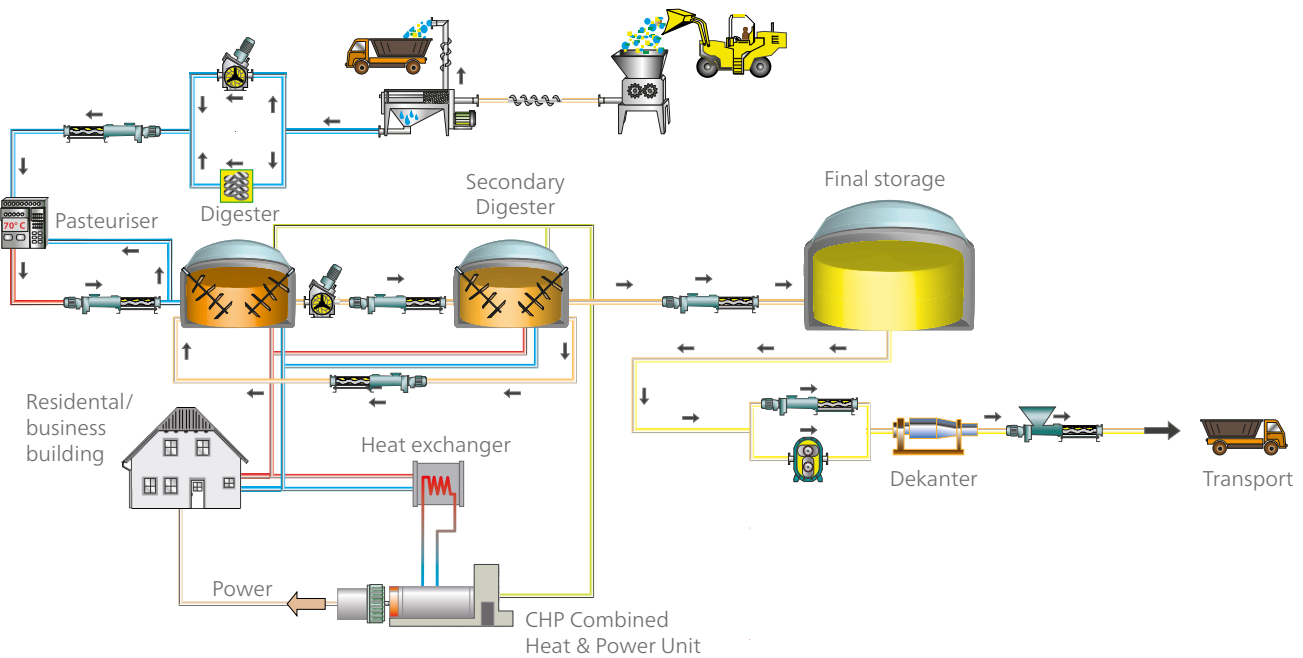


The diagram shows a multi-stage biogas plant. This can be newly designed by the plant manufacturer or be converted to wet fermentation by appropriate retrofitting and upgrading and extended by including secondary fermentation. The possibilities for using NEMO® progressing cavity pumps, TORNADO® rotary lobe pumps and NETZSCH grinding systems range from mixing and conveying to grinding.

At the start of the process, the B.Max® mixing pump feeds the fermenter with a mix of dry and liquid substrates. Fermentation takes place with a dry matter content of approx. 5 - 15 %. The pre-fermented substrate is then conveyed to the secondary fermenter which allows the output of additional biogas in the process thanks to the longer dwell time. The NEMO® progressing cavity pump can contribute to the flexibility of the plant here by reversing the direction of conveyance.


It conveys substrates and recirculated substances reliably between the various containers, even with higher solid contents. An upstream grinding system enables an even higher gas yield to be achieved. The methane gas obtained is, for example, fed into a cogeneration plant to generate power or thermal energy. The remaining biomass, which still has a residue of organic contents, is dewatered. The substrates obtained find further reuse in agriculture.

Operation with organic waste



Points of use for

 NEMO® progressing cavity pump

 TORNADO® rotary lobe pump

 NETZSCH M-Ovas® cutting plate macerator

 NETZSCH twin shaft macerator

The diagram shows a biogas plant where the range of processable raw materials has been extended to include waste from the food industry, from meat processing and also from supermarkets, hotels, etc.

Operators of these kinds of plants are more energy generators than farmers, but upgrading their plants for cost reasons or to increase capacity utilisation is possible by extending the feed systems using NETZSCH pumps and macerators. Both NETZSCH grinding systems make a significant contribution here to process reliability and to the protection of both pumps and plants.

The M-Ovas® itself serves both as a cutting tool and a stone separator and makes a positive contribution to the plant's operating performance through better homogenisation of the medium. The biogas production process then runs as previously described. It is only at the end of the process that dewatering of the residues is necessary as an additional step before disposal. NETZSCH pumps and macerators can again make worthwhile contributions here too.

NEMO® B.MAX®

A BENCHMARK IN MIXING TECHNOLOGY

Features and design

The NEMO® B.Max® mixing pump sets new standards through optimum mixing and conveyance of your bio-substrates. It is a perfectly tailored feeding technology for your biogas application.

Broad range of applications

The NEMO® B.Max® is particularly well suited to the following media:

- Fermented, renewable raw materials
- Liquid manure
- Process water
- Macerated bio waste and leftover food
- Pre-processed slaughter waste
- Co-substrates
- Concentrated substrate
- Silage

Large capacity and pressure range

- Capacities up to 70 m³/h
- Pressures up to 48 bar

Additional features

- Optimum feeding and mixing of substrates into the biomass through optimally positioned feed tubes on the hopper housing
- Pump housing with large, rectangular feed hopper with inspection opening
- Coupling rod with patented, horizontally positioned conveying screw for optimum product feed into the conveying elements and for mixing
- Removable, conically shaped compression chamber with inspection openings

Advantages

- Maximum homogenisation of the substrates
- Increased gas production
- Continuous, low-pulsation conveyance irrespective of pressure and viscosity
- High pressure capacity
- Robust shaft sealing
- Low investment and operating costs
- High operational reliability



The length of the hopper depends on the installation situation.



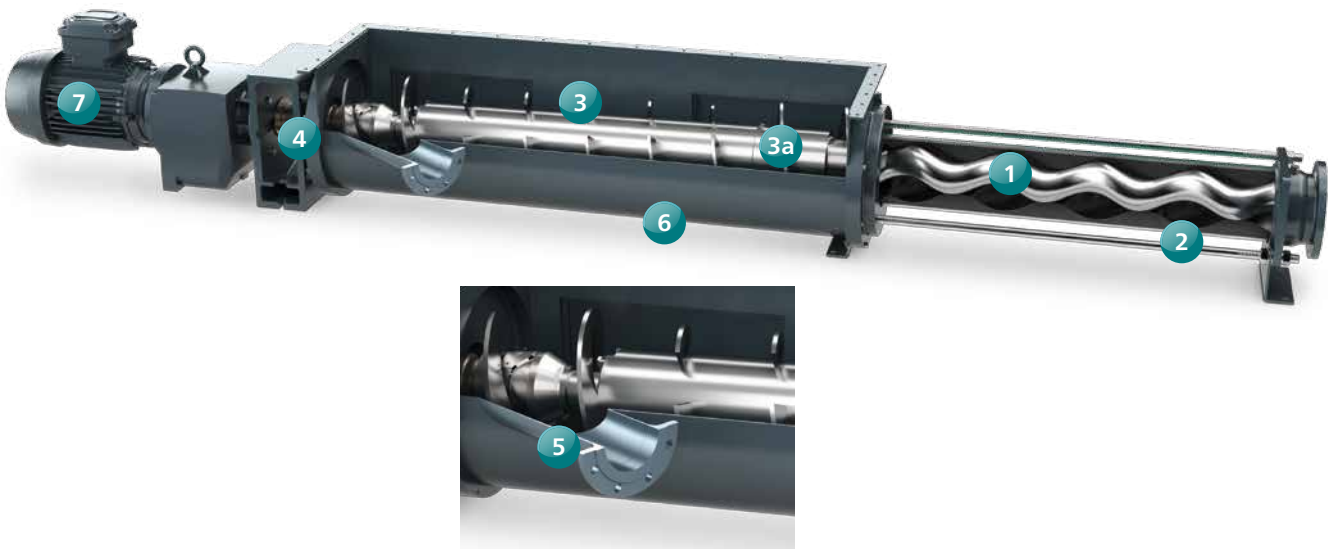
For improved substrate mixing the supply of the liquid is opposite to the direction of pumping.



Easy maintenance through large inspection cover.

NEMO® B.Max®

in block design with directly flanged drive or with bearing housing and free shaft end



1 Rotor

In wear and corrosion-resistant models.

2 Stator

Vulcanised into the tubes with seals on both sides in a wide variety of elastomers. Stator inlet with funnel-shaped opening to improve product infeed into the conveying chamber.

3 Mixing and screw conveyor

The reinforced and offset spiral lobes of the mixing and screw conveyor ensure maximum mixing and homogenisation of the media. The patented, horizontally

positioned feeding screw guarantees an optimum fill level for the conveying chamber. As an option, metal protection sleeves and joints provide further safeguards.

3a Two-part screw conveyor

The feeding screw is in two parts to be able to replace the part on the pressure side, which is exposed to the most stress, separately. This saves costs and facilitates the service work.

4 Wellenabdichtung

Use of a single-acting, robust mechanical face seal for the highest operational reliability requirements.

5 Feed tube

Optimum positioning of the feed tube contra to the direction of conveyance means maximum mixing of the substrates.

6 Inspection openings

Large, easily accessible inspection openings for easy cleaning and maintenance.

7 Drive

The compact block design with directly flanged drive make it stand out due to low investment, operating and maintenance costs.

NEMO[®] progressing cavity pumps

FOR TRANSFERRING BETWEEN ALL TYPES OF CONTAINER

Reliable technology – Flexible direction of rotation – Robust design

NEMO[®] BY progressing cavity pump

in block design, and with joint protection sleeves as an option, or NEMO[®] SY with bearing housing and free shaft end



FSIP[®] design

Compact design with directly flanged drive. Its low investment, operating and maintenance costs really make it stand out. Four rotor/stator geometries for optimum performance with every kind of application.

The FSIP[®] design

The FSIP[®] design enables a particularly service-friendly maintenance without dis-assembling of the pump from the pipeline. By easier access to all rotating parts through cartridge joint and mechanical seals the maintenance is reduced. The

downtimes and the associated costs are reduced. In addition, reduces the required installation space, since the stator is removed laterally. The FSIP[®] design is offered in modification sets. So you can also upgrade existing pumps with lower costs.

Media characteristics

- High dry matter content
- Highly abrasive
- Low to high viscosity
- Lubricating and non-lubricating
- Corrosive (pH 0 -14)
- Heated and unheated
- Dilatant, thixotropic or shear thinning
- Toxic

Additional features

- Great suction capacity – up to 9 metre water column
- Direction of rotation and therefore of conveyance reversible
- Can be installed anywhere
- Quiet, low-noise running
- Temperatures from - 20 °C to + 200 °C

Advantages

- Continuous, low-pulsation conveyance irrespective of pressure and viscosity
- High suction and pressure capacity
- Low investment and operating costs
- High operational reliability
- Various installation options

Broad range of applications

The pumps should preferably be used for conveying:

- Fermented, renewable raw materials
- Liquid manure
- Process water
- Macerated and fermented bio waste, leftover food and slaughter waste
- Co-substrates
- Condensed substrate
- Stillage

Large capacity and pressure range

- Capacities up to 400 m³/h
- Pressures up to 48 bar

Options

- With protective sleeve
- With inspection opening



The NEMO® progressing cavity pump: an energy-efficient solution for high pressure ranges too



B.Max® liquid feeding for reliable and flexible substrate supply



A strong team offers process reliability and efficiency: M-Ovas® and NEMO® progressing cavity pump

TORNADO® rotary lobe pumps

FOR ALL LIQUID SUBSTRATES

High-performance technology – Robust when handling solids – Compact design



TORNADO® T2



TORNADO® T1

NETZSCH TORNADO® self priming, valveless positive displacement pumps are high performance and are optimally tailored to individual requirements. They are used for continuous and smooth conveyance of almost all media, along with their dosing in proportion to speed.

Broad range of applications

The pumps are primarily used with media that have the following features:

- With and without solids
- Low to high viscosity
- Thixotropic and dilatant
- Shear sensitive
- Abrasive
- Non-lubricating and lubricating

Large capacity and pressure range

- Capacities up to 1,000 m³/h
- Pressures up to 8 bar

Further information

TORNADO®
Brochure NPS · 084

Guaranteed customer benefit thanks to state-of-the-art technology

Their major advantages are limited space requirements due to their compact design, high power and maximum operational reliability. Thanks to the unique physical separation between pump and gear chambers. TORNADO® rotary lobe pumps are particularly service and maintenance friendly; all wetted parts are immediately accessible without dismantling any pipework or the drive.

TORNADO® T2 rotary lobe pump: “Full Service in Place” (FSIP) instead of “Maintenance in Place”

Servicing is easy, because no special tools are required. You have quick and easy access to the pump chamber right up to the flange mounting, because you can open the whole front on the TORNADO® T2. The rotary lobes can be replaced in no time at all

because the lobes are fixed with easily accessible taper lock ringsets. The simple geometry of the rotary lobes means that all the lobes can be fitted and removed independently of one another. It is child’s play to do this with our setting and installation gauge for positioning the rotary lobes, which is integrated into the front cover. The preset mechanical seals (cartridge design) are fitted onto the shaft, along with the rotary lobes. For the first time, different seal designs can be fitted without changing the mechanical seal housing: “Plug and Play”

The service-friendly design of the belt drive means the belt is easy to replace in no time at all. Premium-quality features of both the belt and pulleys ensure the best accuracy of fit and synchronisation of the belt drive, along with exceptionally smooth running.

Advantages

- Great suction capacity – up to 8 mWC
- Highly resistant to dry running
- Direction of rotation and of conveyance reversible
- Can be installed in any position
- Quiet, low-noise running
- Low life cycle costs
- Service without pump removal
- Particular features of the TORNADO® T2 rotary lobe pump:
 - Full Service in Place,
 - Oil-free gear box,
 - Drive synchronisation via the belt drive



Substrate conveyance to the final storage facility



Emptying a final storage facility at a capacity of 20m³/h



Pumping liquid manure in a biogas plant

Grinding systems

TO BE ABLE TO PUMP EVERY TYPE OF COARSE SUBSTANCE

NETZSCH M-Ovas® cutting plate macerator

The NETZSCH M-Ovas® macerator for coarse materials is ideally suited for use in biogas plants where impurities in the medium reduce process reliability. The solids in the medium are reliably macerated or separated from the medium (e.g. stones), to prevent pipes getting blocked or damage to downstream equipment.

Broad range of applications

The NETZSCH M-Ovas® should preferably be used to macerate the following media:

- Fermented, renewable raw materials
- Slurry
- Bio waste
- Slaughter waste
- Manure

High flow rates

- Throughput rates of up to 70 m³/h for substrates of up to 12 % dry solid content

Advantages

- Compact design with high throughput rate
- Simple, easy disassembly of the cutting plate
- Low energy requirement with high throughput rate
- Integrated separator vessel with separate cleaning and drainage aperture
- Effortless disposal of the sedimented materials through easy access
- Shaft sealing using mechanical seal with lubrication
- Particularly maintenance friendly
- Cutting plate usable on both sides
- Different perforated plates depending on the application



NETZSCH twin shaft macerator

The NETZSCH twin shaft macerator is used for applications with particularly coarse and solid substrates. The twin shaft macerators impress with their robust design, simple operation and high performance. They offer the optimum solution, even in the most extreme conditions. The twin shaft macerators ensure free flow and so preserve or protect the downstream pump units and system parts.



Depending on the application, five different NETZSCH twin shaft macerators can be used in various designs. The very slow, variable speed of the shafts means the NETZSCH twin shaft macerator offers the option of self-cleaning. The low drive power with particularly high flow rate enables cost-effective use.

Broad range of applications

The NETZSCH twin shaft macerator should preferably be used with media in the following industries:

- Biogas plants
- Agriculture
- Slaughterhouses and recycling plants
- Canning factories
- Industrial kitchens
- Sugar factories

Advantages

- Robust design, simple operation and high performance
- High operational reliability thanks to simple maintenance due to the knife-cartridge technology
- Very low operating costs due to optimum efficiency level
- Optimised price-performance ratio

High flow rates

Flow rates up to 300 m³/h with a solid content of up to 10 %.

Further information

NETZSCH Grinding Systems
Brochure NPS · 040



Service on-site, training and short delivery times for spares

NETZSCH – the right partner for biogas

With production sites and branches in many countries we are the ideal partner for biogas plant operators. We ensure global spare parts availability.

Our specialists are happy to provide consultation and support with troubleshooting and part identification for all our pump and grinder models. It is in our interest to service or repair your pump as quickly as possible.

The benefit for you

- High warehouse availability
- Specific appointments for repairs and maintenance work
- Shorter time for repairs and maintenance
- Original spare parts with NETZSCH manufacturing quality
- Ensuring warranty claims
- Procuring spare parts for old pumps

Spare parts service for parts orders

Mon.–Thu.: 08:00 – 17:00 Uhr
Friday: 08:00 – 15:00 Uhr

If you order by 12:00 o'clock, your spare parts will be ready for shipment on the same day! We have the standard parts in stock at our central warehouse in Waldkraiburg. If possible we pass your order to your nearest NETZSCH partner for even quicker delivery. A highly-motivated team of experienced experts is available to answer your queries and deal with your spare parts orders.

Fast delivery of spare parts

Standard spare parts can be delivered in Germany within 24 hours. It is in our interests to service or repair your pump as quickly as possible. We have the standard parts in stock at our central warehouse in Waldkraiburg.

Emergency service for spare parts

In urgent cases you can order spare parts and have them shipped immediately, even outside business hours.



Customer advice on site

Spare parts service

You can contact our spare parts service on the telephone number you know already or under +49 8638 63-1050

Spare parts emergency service

At the weekend, 24 hours a day and on workdays from 17:00 to 08:00, we can be contacted under +49 8638 63-6363