



HERMANN TRÄXLER^{GmbH}

**MECHANICAL ENGINEERING AND
LATHE WORKS**

www.h-traexler.de

***Optimal
Digester Sludge
Circulation***



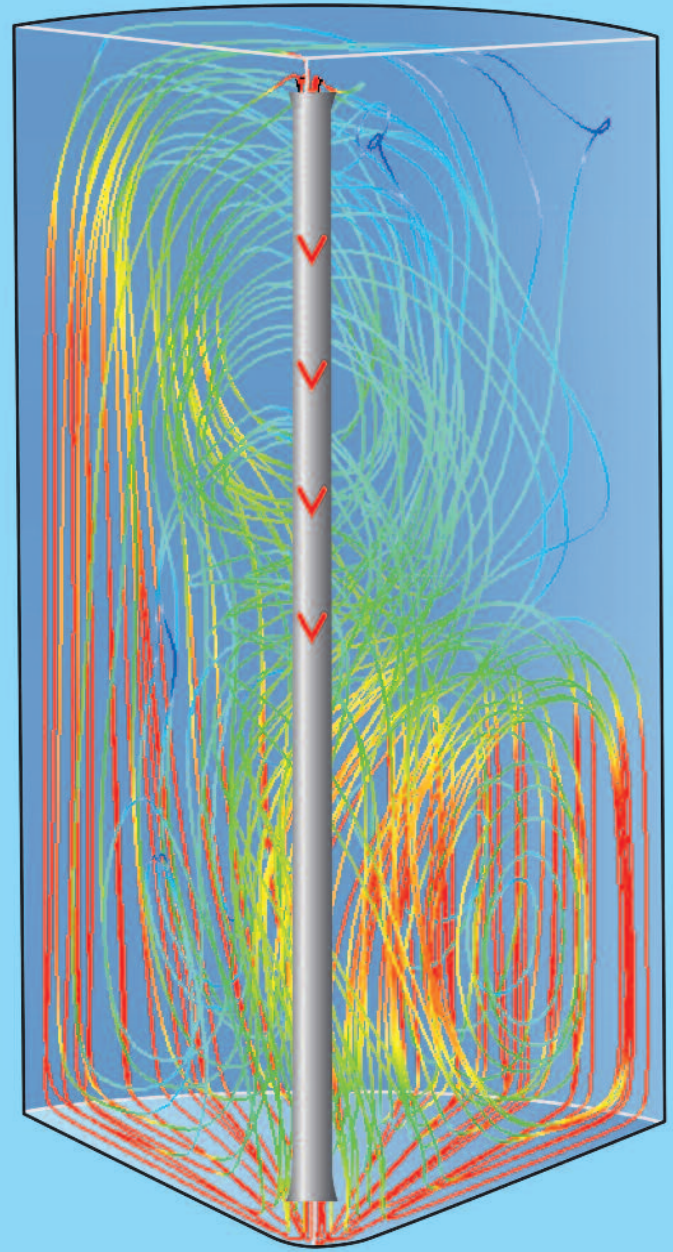
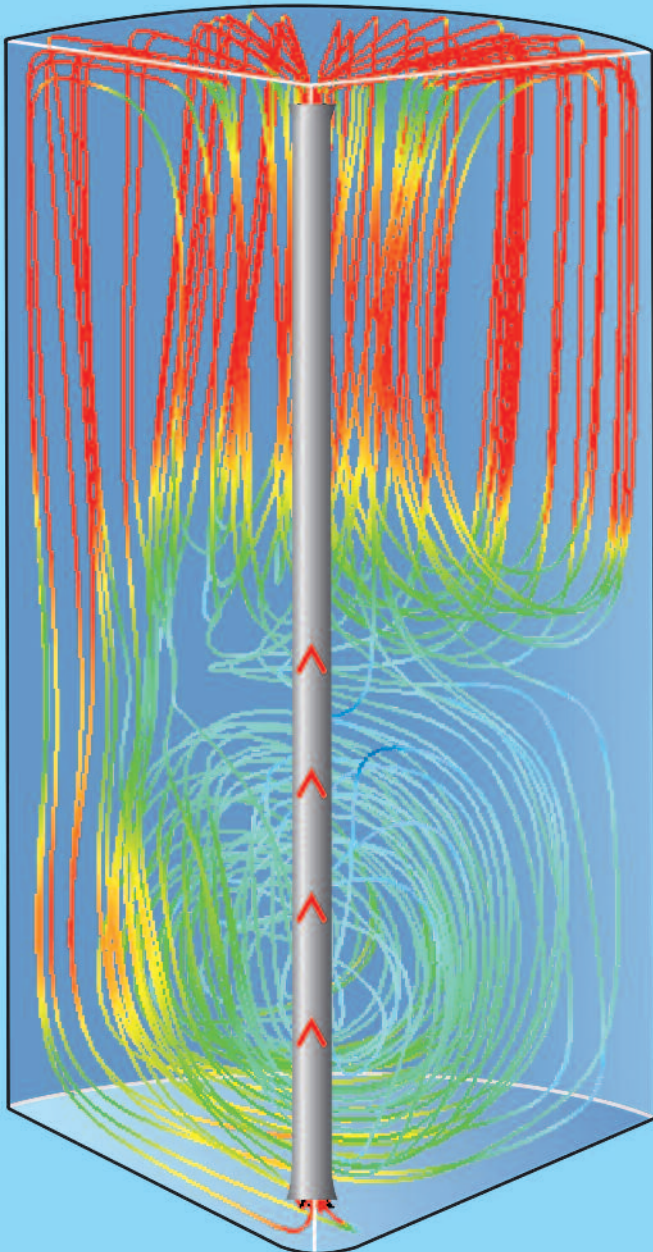
Bottom-up circulation (clockwise rotation)

The mixer moves the sludge upward through the draft tube. The massive, rotating deflector disc above the impeller distributes the sludge across the sludge surface. This prevents a gas-tight foam layer from forming. Heavier sludge ingredients sink to the bottom of the tank by gravity. The digester tank content is thoroughly mixed from the bottom to the top to avoid thermal stratification.

The suction at the bottom of the tank moves heavier ingredients through the draft tube to the top. The entire content of the tank is circulated several times per day. The homogenised sludge produces a maximal amount of digester gas, and the residual sludge volume is minimised. Sedimentation is reliably prevented during operation.

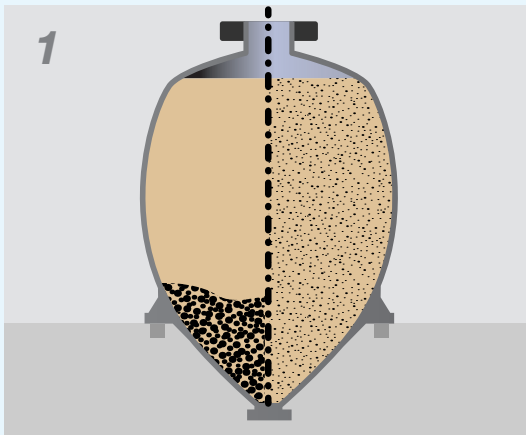
Top-down circulation (counter-clockwise rotation)

Top-down circulation is used to remove foam from the surface and to mix it into the sludge. This prevents foam entering the gas line. This operating mode should only be used if foam formation is imminent or for testing purposes.



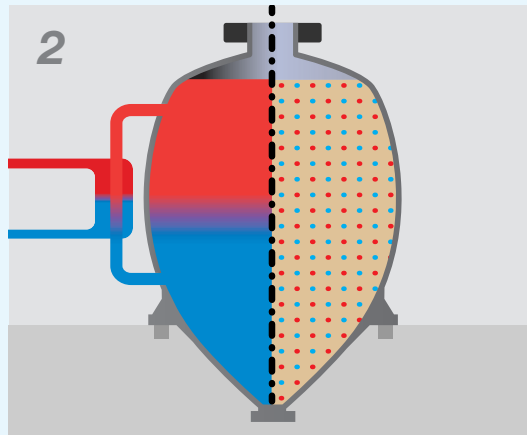
The Draft Tube Mixer

Six Tasks – – – – One Solution



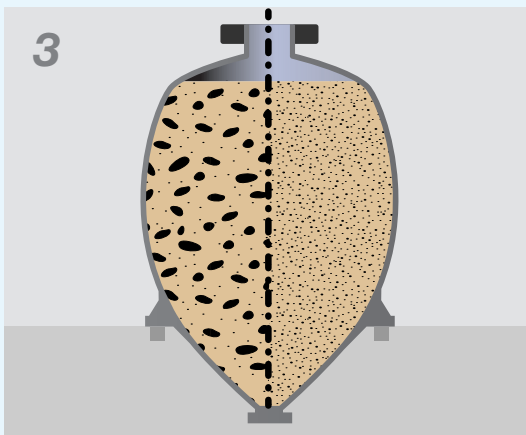
Stirring up sediments

Heavy ingredients sink to the bottom if they are not actively circulated. All areas of the tank are mixed consistently.



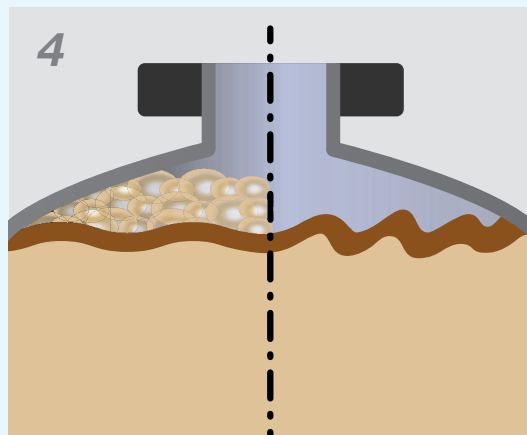
Preventing thermal stratification

Anaerobic bacteria are only effective within an optimal temperature range. The mixer prevents the formation of thermal layers between the top and bottom of the digester tank.



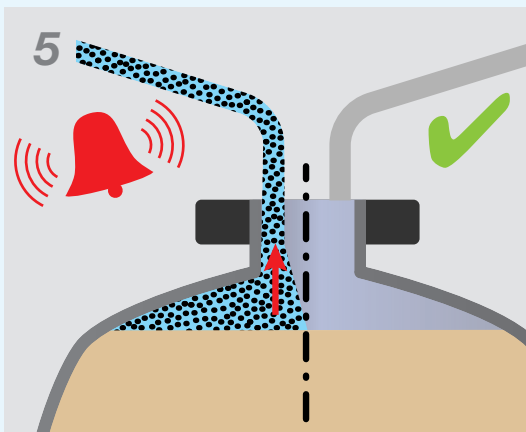
Homogenising sludge

The smaller the solids and the better they are distributed within the digester tank, the better the digester bacteria can decompose the organic components. This makes homogenising effective.



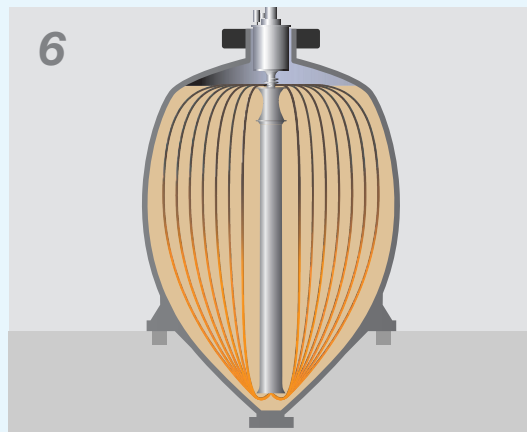
Avoiding scum and foam

Floating ingredients and foam are stirred in continuously.



Keeping the gas line foam-free

Effective stirring and foam control reliably prevent foam from rising into the gas line.



Increasing gas production

The effective distribution of fresh sludge in the digester tank optimises the anaerobic process of the bacteria, boosting gas production.

Careful Homogenising for Optimal Sludge Stabilisation

The Träxler draft tube mixer (TMA)

Anaerobic sludge stabilisation turns sludge into a form that makes further handling and disposal easier. The amount of sludge is reduced. Dewatering of the residual sludge is easier, and the digester gas yielded can be used for power and heat generation.

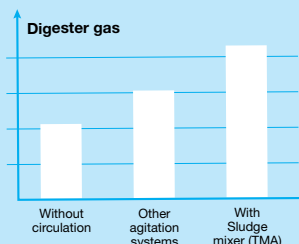
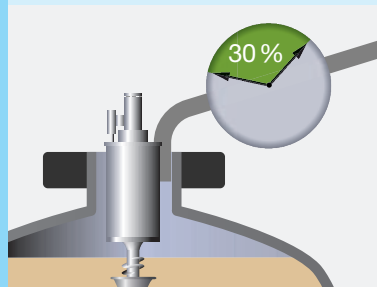
For this reason, we rely on the method of carefully homogenising the sludge in the digester tank. Homogeneous sludge mixing causes a rapid anaerobic digestion with the best yield of digester gas and well-digested residual sludge with a low content of solid matter. This high yield through forced circulation is highly economical when comparing drive effort with digester gas yield.

Optimal homogenisation is enabled by two plant components:

- The reliable mixer and its drive circulate and homogenise the sludge.
- The impeller, located in the draft tube pipe running from near the top to the bottom of the digester tank, moves the sludge vertically from the top to the bottom or vice versa, ensuring effective circulation throughout the entire digester tank.

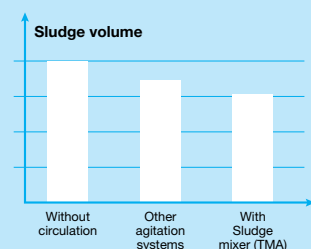
Gas yield
+ 30 %

Improved anaerobic digestion significantly improves gas yield. The gas can be used to generate power and process heat by means of cogeneration, generating a major proportion of the energy drawn by the plant itself.



Residual sludge
- 20 %

The residual sludge produced must be, in accordance with regional or national regulations by means of material-sensitive or thermal recycling. However, only well-digested sludge is reduced in volume and can be dewatered easily because of the degraded organic matter. This reduces those constantly increasing disposal costs.

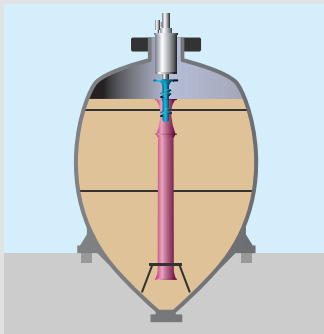


TMA Draft Tube Mixer – Homogenisation Made to Measure

Only careful homogenisation can create the right conditions for optimal sludge stabilisation: We follow the concept of homogenising the sludge consistency and temperature levels throughout the entire tank, preventing sedimentation and reducing the concentration of organic matter. When mixed well, organic matter degrades quickly, methane yield is maximised, and the volume of solid matter is reduced, thereby optimising digestion.

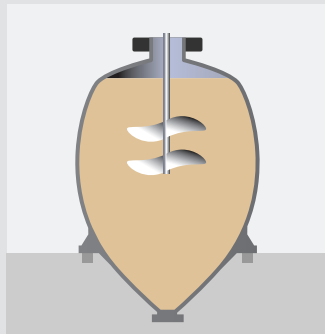
Competing systems

A comparison of the various technical systems used for this purpose shows significantly differing results. They must be analysed in each individual case according to economic considerations.



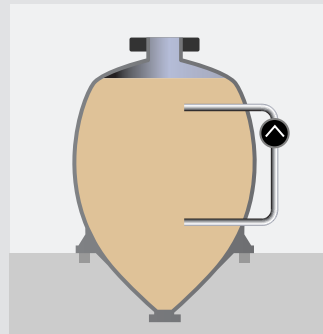
Draft tube mixer

The mixer is mounted on the digester tank head. The impeller located in the draft tube pipe moves the sludge from the bottom to the top or vice versa.



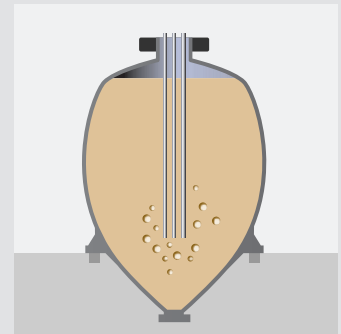
Agitator

The stirrer is suspended from the top into the sludge and has up to three slowly-turning impellers. These stir the sludge, but vertical agitation is limited.



External circulation

External pumps circulate the sludge once or twice per day, but with poor efficiency. Vertical mixing is limited.



Gas injection

Digester gas is injected into the digester tank via gas lances or nozzles to mix the sludge. The compressors required have a high energy demand.

Economic benefits of the TMA draft tube mixer

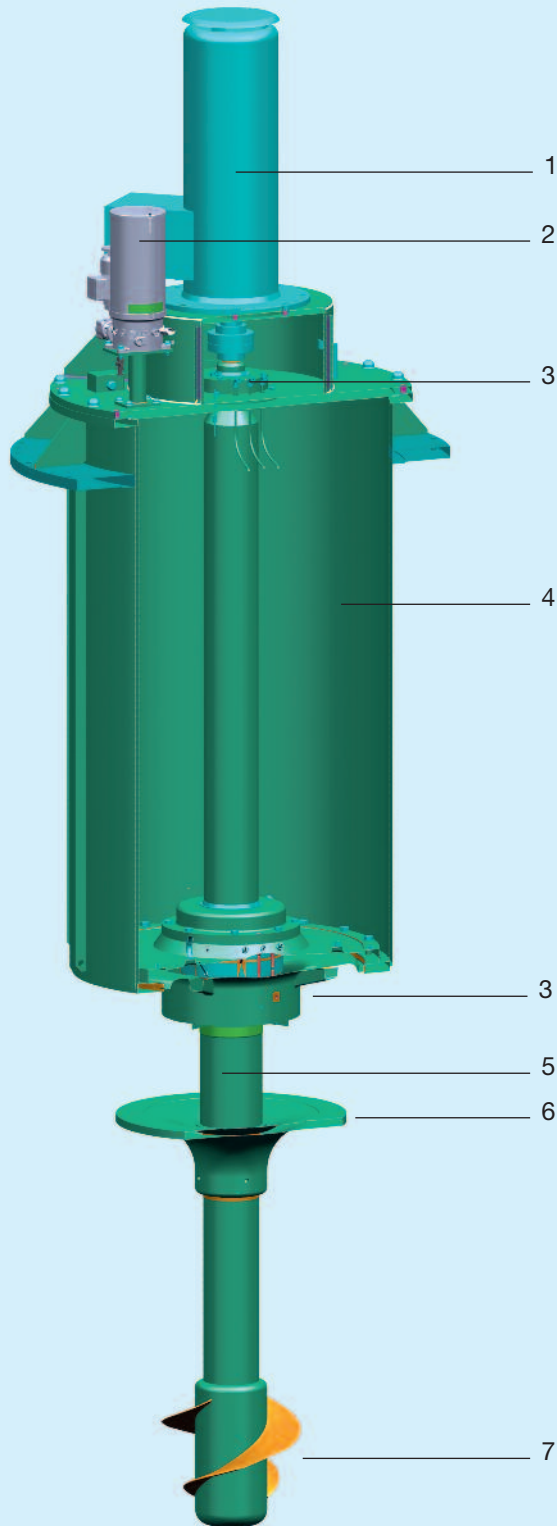
- Robust design, high reliability and long service life
- Up to 80,000 operating hours between recommended revisions
- Minimal energy input per m³ due to the effect of gravity
- Direct drive, no gearbox required
- No reduction of digester tank volume by sedimentation

	Draft tube mixer	Stirrer	External circulation	Gas injection
Defined flow in entire tank	++	+	-	--
Sludge homogenisation	++	+	--	++
Prevention of sedimentation during operation	++	+	--	--
Prevention of thermal stratification	++	++	-	-
Gas yield	++	++	--	+
Energy efficiency*) W/m ³	+	+	-	-
Active anti-foaming	++	+	--	--

*) Gas-to-power conversion considered



Mixer Components



1. Drive

The drive features an ATEX-approved three-phase motor designed for clockwise and counter-clockwise rotation. The motor is mounted on a motor lantern. An elastic coupling connects the motor to the mixer shaft. The direct-drive design eliminates the need for a gearbox. Exception: mixer type TMA8.

2. Lubrication

An electric grease pump supplies lubricant to the mixer bearings and to the cap sleeves facilitating gas tightness. Using the correct type of lubricant prevents bearing damage.

3. Guide and mixer grease

The guide bearing at the top stabilises the shaft. The support bearing at the bottom supports the weight of the impeller and is designed with a large spherical roller bearing.

4. Seating ring

The seating ring maintains the spacing between the upper guide bearing underneath the motor lantern and the bottom support bearing. A precisely fitted flange secures the lower support bearing housing. The upper flange serves as support and for levelling, allowing the mixer to be removed and installed without having to realign the impeller.

5. Shaft

The shaft is the central component as it connects the drive to the impeller. Together with the bearing seats, the shaft ensures the smooth running of the mixer. Vibration caused by dynamic flow and impulses created by solid matter in the sludge are transferred from the impeller and the deflector disc into the bearings.

6. Deflector disc

The deflector disc is located directly above the impeller. Acting like a rotating baffle, it diverts the upward-moving sludge dynamically across the sludge surface. This prevents the formation of scum and foam that would inhibit gassing.

7. Impeller

The impeller is designed with worm-shaped multiple blades. They are made of wear-resistant hardened steel for optimal resistance against abrasive sludge.

... with ATEX approval



- The units are approved and meet all requirements of the ATEX directive up to zone 0.
- Integrated Pt100 sensors monitor bearing temperature to identify critical operating situations.
- The fill level monitoring in the grease pump ensures the availability of sufficient lubricant for the bearings and the tightness of the seal against explosive digester gas.
- Not mandatory, but highly recommended: vibration sensors for additional monitoring of safe mixer operation.



TMA size	Speed min ⁻¹	Flow rate m ³ /h	Digester tank* Volume up to m ³	P _{Ma} kW	P _{Mo} kW
2 reinforced**	1450	220	< 1000	4,5	6,8
3 special	734	340	600 – 1280	5,0	9,7
3	975	480	approx. 1920	6,0	9,7
4	730	1160	approx. 4650	9,0	13,2
5	585	1880	approx. 6500	12,5	16,0
6	475	2750	approx. 9000	18,0	22,0
7	475	3680	approx. 12000	37,0	45,0
8	423	6840	> 12000	44,0	58,0

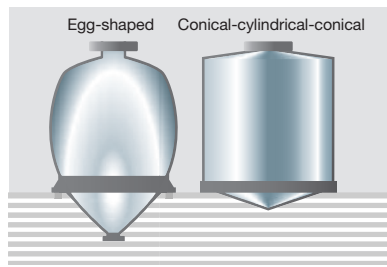
** Manufactured for replacement supply only

*Based on 6 circulation cycles/day

TMA Draft Tube Pipe: Targeted Circulation Throughout the Entire Tank

The mixer's key function is to thoroughly mix the sludge in the digester tank: to distribute fresh sludge quickly within the tank, to homogenise the sludge, to ensure uniform temperature distribution, and to avoid sedimentation. For this purpose, Hermann Träxler GmbH uses powerful mixers with an impeller running in a central draft tube pipe, effectively moving the sludge upward or downward.

The central draft tube ensures that the contents of the entire tank are mixed. It creates an annular flow inside the tank, circulating the sludge at least six times per day, depending on system configuration.



For all tank types

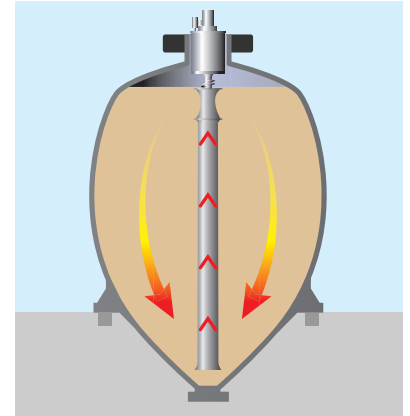
The HT concept is compatible with any type of sludge tank. The components are tailored to individual requirements.

For all tank sizes

Sludge mixers with corresponding draft tube pipes are available for volumes from 600 m³ to approx. 12,000 m³.

Top-down or bottom-up circulation

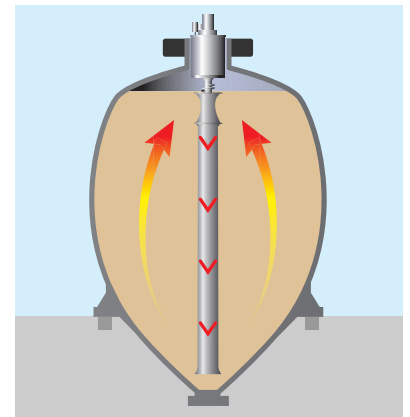
TMA mixers operate continuously. The flow direction is set according to operating requirements.



Clockwise rotation:

bottom-up sludge circulation

A strong draft at the tank bottom moves the sediments upward through the draft tube. The massive deflector disc above the impeller distributes the sludge across the surface, preventing the formation of foam and scum.



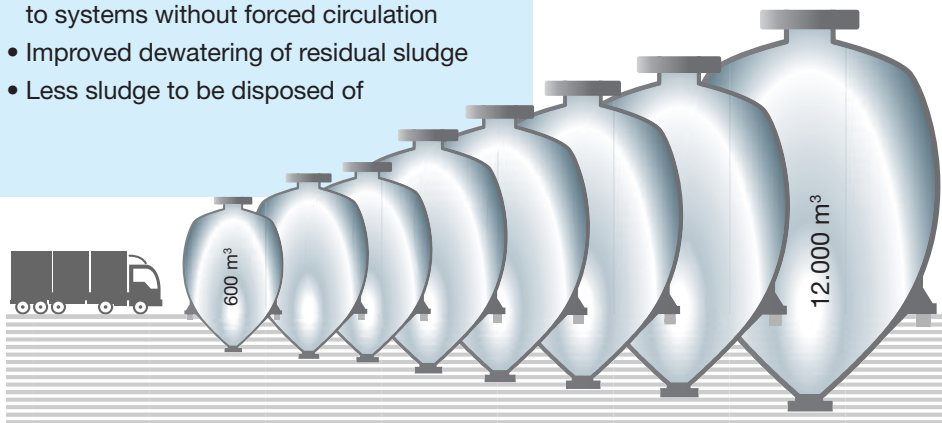
Counter-clockwise rotation:

top-down sludge circulation

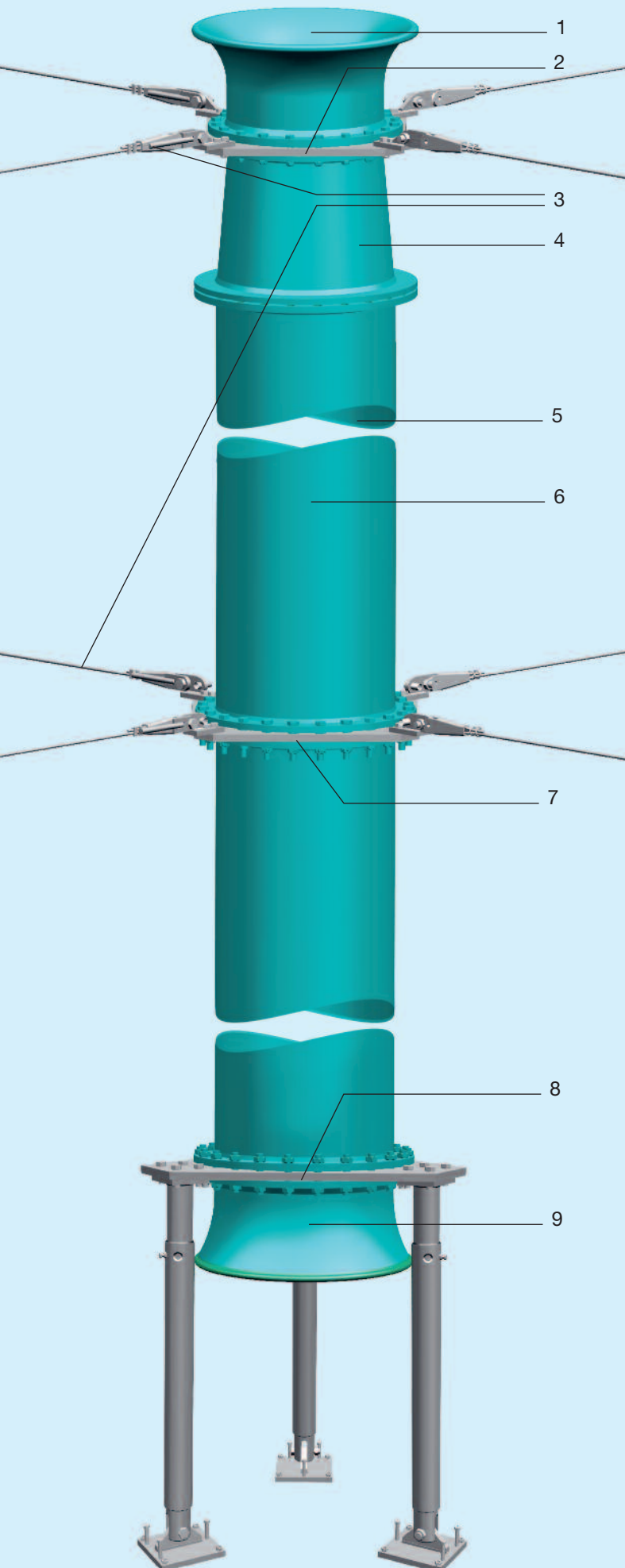
The foam floating on the surface is sucked downward together with the sludge through the draft tube to the bottom of the tank, where it is mixed into the bottom sludge. This mode should be used if foam formation is excessive or for system testing purposes.

Optimal sludge circulation

- Homogeneous sludge
- Uniform temperature
- No sedimentation
- 30 to 50% more gas yield compared to systems without forced circulation
- Improved dewatering of residual sludge
- Less sludge to be disposed of



Draft Tube Components



1. Outlet

The outlet is made of grey cast iron or ductile cast iron.

2. Upper anchor plate / impeller position

The anchor plate is located between the bottom of the outlet and the conical tube section. It connects the four guying rods or steel cables by means of massive joints. The anchor plate also marks the position of the impeller rotating within its uniform gap. The diameter at this position defines the mixer size (e. g. DN 300 = TMA 3).

3. Guying

The anchor plate holds the guying used to align and locate the draft tube pipe. The four guying rods or steel ropes are attached to plates set in concrete or to the digester tank wall using bonded anchors.

4. Conical tube section

The conical shape of the tube section increases the diameter of the draft tube pipe, reducing the flow velocity directly below the impeller. This counteracts velocity loss in the system.

5. Draft tube pipe

The vertical draft tube consists of flanged, ductile cast iron pipes. The ductile cast iron dampens the vibrations caused by the dynamic flow

6. Coating

Parts exposed to air and sludge are provided with long-term corrosion protection. Components made of non-corrosive materials are stained and neutralised.

7. Lower anchor plate

In high digester tanks, draft tube pipes may exceed 20 metres in length, making an additional support necessary. In such cases, an additional anchor plate with guying is fitted in the centre area.

8. Supporting frame

The supporting frame sits on three robust support props transferring the entire weight of the draft tube into the sludge tank bottom. The legs are attached to the ground with bonded anchors.

9. Inlet

The inlet is made of grey cast iron or ductile cast iron.



The TMA draft tube yields economic benefits from gravity

- The draft tube technology applies the mixer's cycling performance to the entire tank volume.
- The mixer moves the head of liquid in the draft tube upward, with gravity feeding the liquid downward to the inlet at the bottom. This ensures the reliable circulation of the sludge sitting at the bottom of the tank.
- Propellers and impellers operating in a pipe housing are significantly more efficient than free-running propellers.



Gas Hood – the Smart and Compact Solution

HT gas hoods are reliable

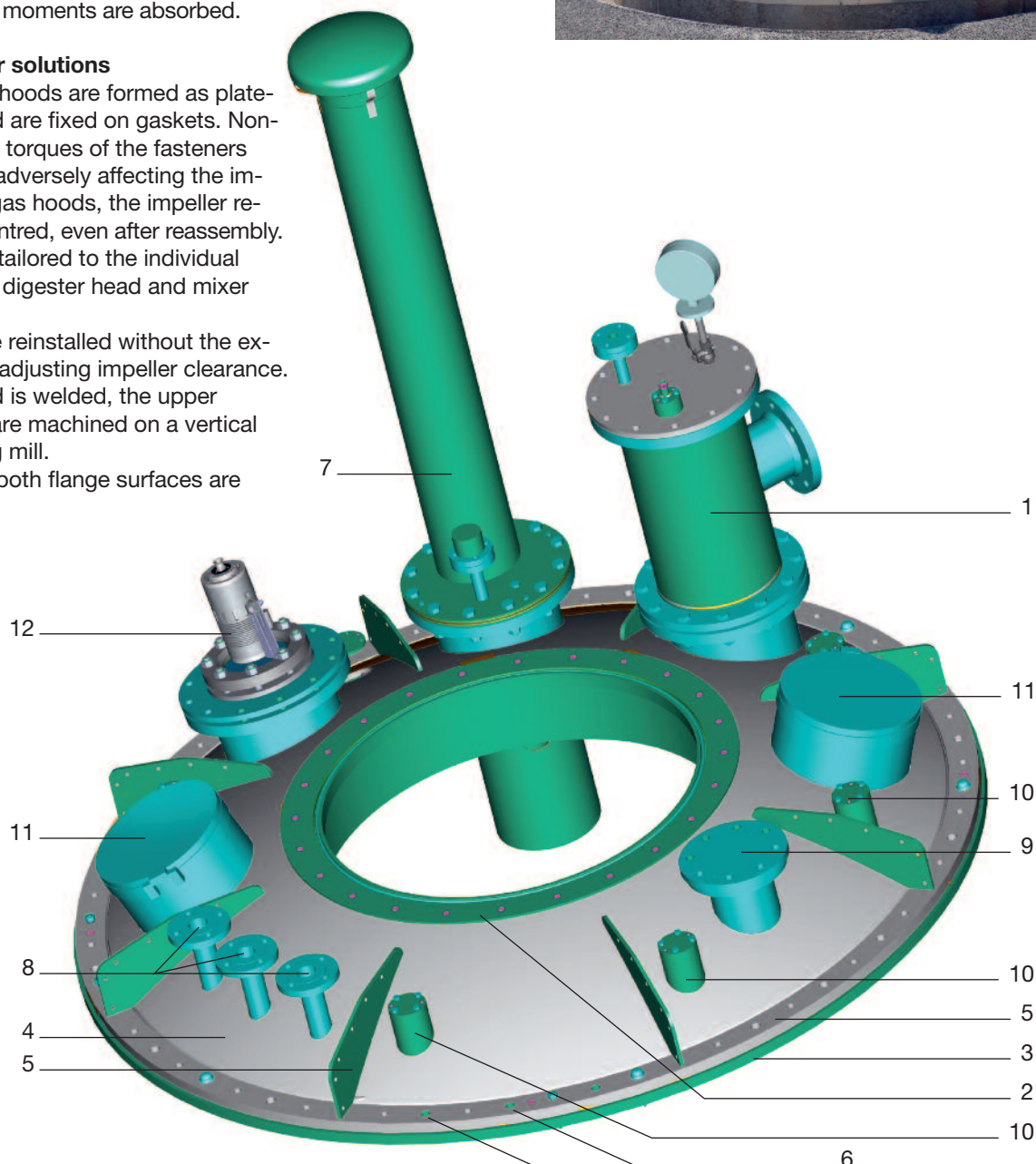
Gas hoods cover the openings on digester tank heads with diameters of up to 3 metres. They hold the mixer and transfer all forces to the sub-structure of the digester tank. Gas hoods are specifically designed for the respective mixer type and digester tank head. All plant components, drives and add-on parts are arranged to customer specifications: gas extraction dome, over/underpressure safety relief valve, foam elimination, inspection glasses, measuring probes, etc.

The Träxler benefits

- The gas hood and support flange are stacked on parallel and level contact surfaces. It is accurately held in position by form-fit and can be re-installed without any adjustments. The gas hood transfers the mixer's dynamic forces and vibrations directly into the substructure.
- When a gas hood with the mixer in place is removed, the impeller clearance in the draft tube pipe remains unchanged during reinstallation.
- Dynamic loads are directly transferred from the gas hood to the structure. Static calculation and load analyses by means of FEM ensure that all forces and load moments are absorbed.

HT gas hoods offer solutions

- Conventional gas hoods are formed as plate-shaped heads and are fixed on gaskets. Non-uniform tightening torques of the fasteners can tilt the mixer, adversely affecting the impeller gap. In HT gas hoods, the impeller remains perfectly centred, even after reassembly.
- Each gas hood is tailored to the individual dimensions of the digester head and mixer type.
- Gas hoods can be reinstalled without the extensive effort of readjusting impeller clearance.
- After the gas hood is welded, the upper and lower flange are machined on a vertical turning and boring mill. This ensures that both flange surfaces are perfectly parallel.





1. Gas extraction dome

For the extraction of digester gas and the connection to the gas line.

2. Mixer connection flange

Turned flange with groove and O-ring seal forming the contact surface for the mixer, and reliably maintaining its centred alignment. This ensures that the impeller remains centred in the draft tube, making mixer removal and installation significantly easier.

3. Adjustment flange

Turned flange with integrated O-ring groove facilitating adjustment for a perfect fit on the tank head and a gas-tight seal of the gas hood.

4. Gas hood construction

For maximum stability, the hood is shaped as a curved disc, similar to a spherical segment, with two welded flanges with parallel contact surfaces.

5. Reinforcement ribs

Internal and external reinforcement ribs stabilise the structure and absorb dynamic forces.

6. Compound anchors

The gas hood is secured to the digester tank by specific compound anchors that create a non-positive connection with the concrete structure and that transfer forces.

7. Over/underpressure safety relief valve

The valve prevents hazardous pressure situations in the digester tank. Its layout can be adjusted to the specified over- and underpressures.

8. Flanges for foam detection probes

The flanges are used to insert probes of different lengths for the early detection of foam formation and remote monitoring of the mixer operation.

9. Flange for height level monitoring

A casing duct under the flange protects the pressure probe determining the required sludge level. The level measurement values are used to monitor the mixer.

10. Flange for anti-foaming lances

The foam surface can be sprayed using up to six lances. The associated pipework is routed inside the system and does not require line heating. The water supply must be controlled by an explosion-proof solenoid valve.

11. Sight glass

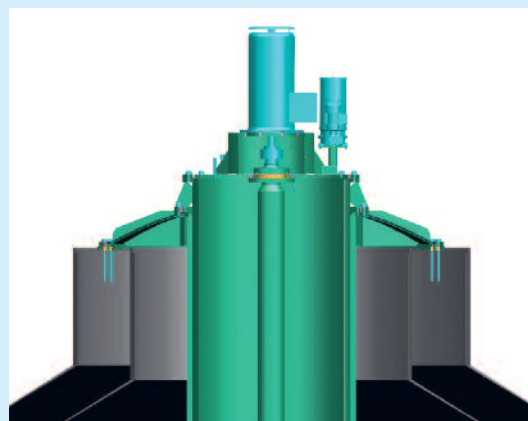
Tanks are usually equipped with two opening sight glasses with wipers to allow visual inspection of the digester tank's interior.

12. Observation light

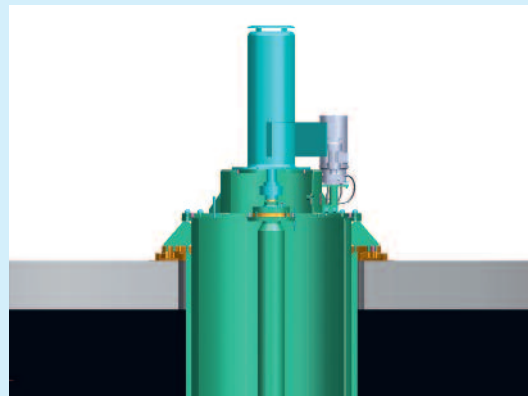
LED light (explosion-proof) for observing flow and fill level in the digester tank

Installation Variants for TMA Sludge Mixers

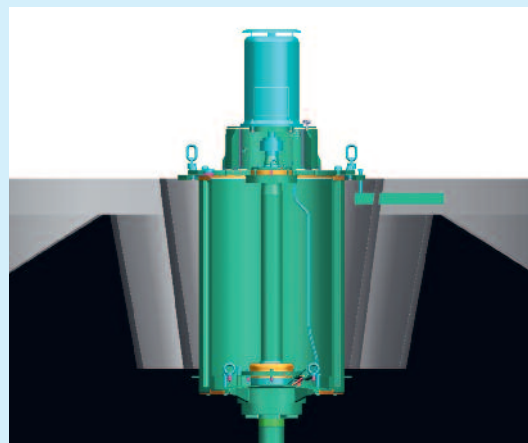
Träxler offers matching solutions for the following three installation situations:



Gas hood installation



Support plate installation



Previously used concrete seat

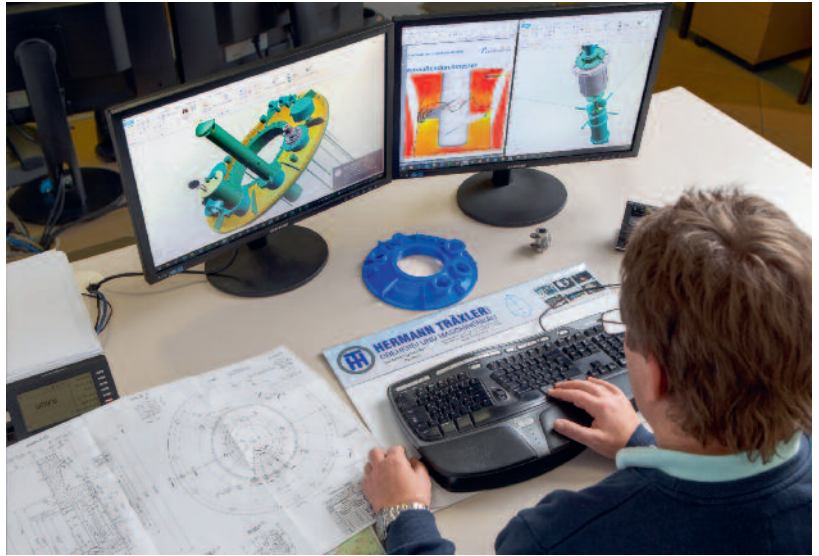
All Services and Solutions Produced In-House

Hermann Träxler GmbH performs all work in-house to ensure that our customers receive only the best products and services without delay: from our in-house CAD design department developing tailor-made solutions, production of large components, mechanical engineering as well as on-site assembly to maintenance and plant optimisation. All spare parts required are either procured or manufactured in-house.



ATEX approval

Since sludge mixers are always operated in explosion-hazard zones, our mixers comply with ATEX stipulations. The current ATEX directive specifies the production of equipment and its placement on the market. All monitoring arrangements are in place, accordingly. The measures related to production, repair, assembly and commissioning are audited and certified by TÜV Rheinland every year.



Continuous development is a characteristic feature of our performance when manufacturing new products or repairing existing mixers. Our quality management system monitors the entire process from design draft to commissioning.

This system meets the requirements of the current ATEX directive, assuring our customers that our products meet the highest safety standards.



In-house production

Hermann Träxler GmbH offers the complete manufacturing and supply of all components. This includes our conversion and repair service that is supported by its own internal CAD design department.

Rapid-action service

Our rapid-action service performs revisions of sludge mixers from all manufacturers on short notice.



Revisions and overhauls

Sludge mixers are operated in explosion-hazard areas. For this reason, our operating and maintenance procedures specify regular revisions. These measures ensure reliable operation for the subsequent maintenance interval.





Service and maintenance

Maintaining sewage treatment plants and wastewater plants requires special skills when it comes to mixers in digester tanks. The on-site service offered by Hermann Träxler GmbH proves our competence in mixers on a daily basis.

More than 250 customers in Germany and Europe rely on our expertise, and we also provide consulting services concerning mixing equipment of third-party manufacturers such as Halberg, MAN, SIHI, Sterling and vonRoll.



In-house logistics and assembly

Sludge mixers and accessories manufactured or repaired by us are assembled exclusively by our own employees. Our own vehicle pool and corresponding logistics, comprising heavy-haulage trucks, workshop vehicles and service vans, effectively support this approach.



Repair service

Any sludge mixer may show a malfunction at some point. Based on our extensive experience, we can support you by telephone or help on site, if required. Please do not hesitate to contact us.



Repair of Archimedean screw pumps

We can assist you with the reconditioning and repair of Archimedean screw pumps and take care of assembly, transport or repair. We can also replace the entire screw.



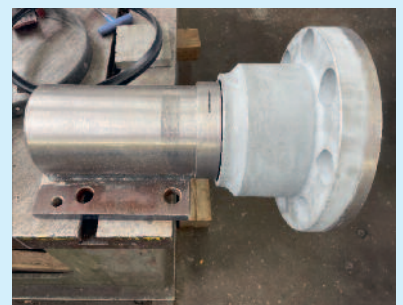
Spare parts service

Hermann Träxler GmbH maintains a comprehensive stock of spare and wear parts. Missing parts can be manufactured or adjusted for third-party equipment as well.



Sight glasses

We can fix defective sight glass seals or wipers that are out of operation.



Head/bottom bearing

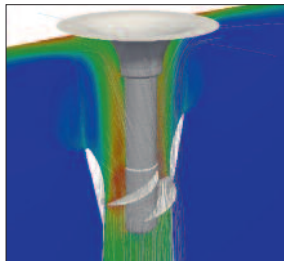
We repair worn bushings and bearings and manufacture replacement parts. We also offer solutions for the replacement of the side profile of the trough.



Our family-run company celebrates its 50th anniversary. Since 1972, the Hermann Träxler company has been a reliable partner for municipal wastewater plants.

In 1972, the family business Hermann Träxler GmbH was established in the heart of the Rhine-Main area as a turning shop. Today, 50 years later, the company has evolved into a mechanical engineering specialist with a complex machine park covering an area of approximately 15,000 m².

Establishing a workshop area for pump overhauling in relation to M.A.N, at that time located in Gustavsburg, and countless revisions of large propeller pumps, marked the starting point for developing our sludge mixer production. Our services include all tasks related to digester tanks, sludge mixers, gas hoods and draft tube pipes. We can take care of all the work involved as a complete package from a single source.



Scientific cooperation

In close cooperation with the University of Kaiserslautern, we conducted flow measurements and subsequently extensive CFD simulations as part of a research project funded by the German federal government. The objective was to verify and optimise the mixers' flow rates and increase their efficiency and effectiveness.



We regularly exhibit at the IFAT trade fair where we are available for in-depth discussions. We display a transparent mixer model to demonstrate the operating circulation. We are looking forward to your visit!



Hermann Träxler GmbH, a family business in the truest sense. Left to right: Christoph Träxler, Janina Träxler, Helga Träxler, Michael Träxler and Anja Träxler.



Our mixer units are Ex-approved up to zone 0. All processes for the production, repair and assembly are audited and certified by TÜV Rheinland on a yearly basis.



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