

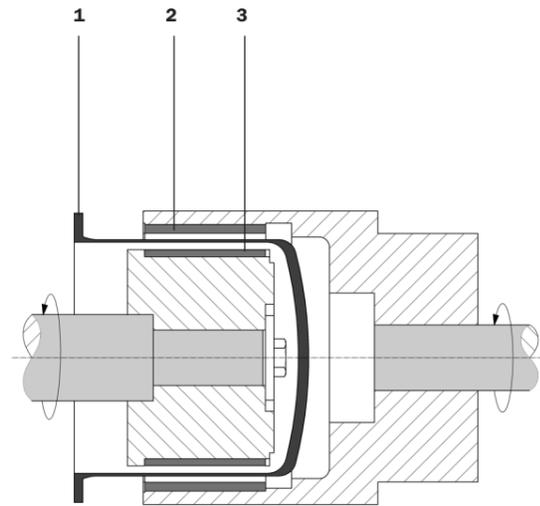
BUNGARTZ
CENTRIFUGAL PUMPS
MAGNETIC PUMPS
FOR CRITICAL
APPLICATIONS

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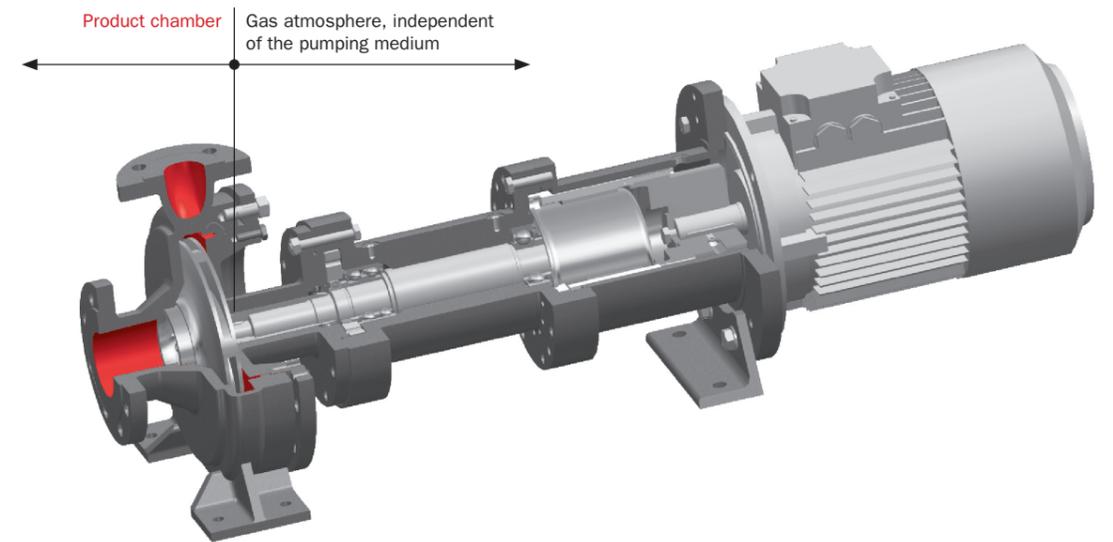
Magnetic coupling

CLEAN SOLUTION. MAGNETIC COUPLING PUMPS WITH A HIGH LEVEL OF INTRINSIC SAFETY.

Hazardous liquids do indeed have their pitfalls. Among others, centrifugal pumps with a magnetic coupling are used for pumping them. In the so-called block design, the motor shaft bears an external magnetic rotor (2). This transmits the magnetic forces through a containment can (1) to the internal magnetic rotor (3). The fluid is hermetically shielded from the surrounding environment by the containment can. So far, so good.

When a conventional magnetic coupling pump is used, the pumping medium flows in the containment can and around the slide bearings. These must never be allowed to run dry under any circumstances. The greatest hazard here is a containment can fracture which causes serious consequences. This is because the liquid is under the delivery pressure and enters the atmosphere in an uncontrolled manner. A risk!

But there are other disadvantages. For example, solids in the medium can block the cooling channels to the containment can or destroy the bearings. This increases the wear on the containment can, like putting sand in the wheels. In the case of gas components, boiling or outgassing substances and low-viscosity liquids, the lubrication of the slide bearings may then be interrupted.



MPCH DryRun

THE PROBLEM.

So one thing leads to another: The flow breaks off and the process stops. That is not yet all. The partial flow through the coupling can heat up and as a result also the medium – a risky development. Dry-running safety could then only be achieved by complicated and cost-intensive additional measures.

If there is no or hardly any pumping medium in the pump housing during operation or if gas components appear in the pumping process, damage is pre-programmed. The effective antidote: dry-running safety. The dry-running of a magnetic coupling is only possible, however, if the containment can located between the internal and external magnetic rotor permits eddy current-free magnetic field transmission. A metallic containment can, however, would heat up to a high degree very quickly. This would result in the demagnetization – and a few minutes later the total failure – of the coupling and bearings. After all, coated slide bearings or ceramic roller bearings bring about dry running for a short period. However, if this is long-lasting, the situation is different. They cannot withstand the high mechanical loads caused by the hydraulic pump forces.

THE SOLUTION.

The advantage offered by Bungartz is a simple solution with a high degree of intrinsic safety.

> GREASE-LUBRICATED ROLLER BEARINGS

These run within an enclosed gas atmosphere, independently of the pumping medium. Due to the clean environment, they are extremely sturdy and last for five years or longer.

> NON-METALLIC CONTAINMENT CAN

This works without magnetically induced eddy current losses. Therefore no cooling unit is required.

> COMPLETE SEPARATION

The roller bearings and magnetic coupling are completely separated from the section filled with the pumping medium (impeller, pump casing). This means that any type of liquid can be pumped without problems, even heavily contaminated, gaseous, hot and viscous fluids.

> INTELLIGENT COMBINATION

Different designs can be easily combined with this sealing technology. All Bungartz pumps can therefore be used with the magnetic coupling technology: normal-priming, self-regulating, horizontal and vertical pumps, as well as those with submerged hydraulics.

EX-ZONE FOR GASSES	EQUIPMENT CATEGORY	IGNITION SOURCES EVALUATION OF THE MANUFACTURER	EG-DESIGN CHECK	APPEARANCE OF IGNITION SOURCES		
				during normal operation	during foreseeable faults	during rare faults
0 frequent or permanent occurrence of an explosive mix	1	YES deposited at a "notified body"	YES by "notified body"	NOT PERMISSIBLE	NOT PERMISSIBLE	NOT PERMISSIBLE
1 occasional occurrence of an explosive mix	2	YES deposited at a "notified body"	NO	NOT PERMISSIBLE	NOT PERMISSIBLE	PERMISSIBLE
2 rare or brief occurrence of an explosive mix	3	YES not deposited at a "notified body"	NO	NOT PERMISSIBLE	PERMISSIBLE	PERMISSIBLE

**CLEAR SUPERIORITY.
THE EFFECTIVE TYPE
OF MAGNETIC
COUPLING PUMPS.**

MACHINE SAFETY AND ATEX.

Normal is often fatal. With conventional magnetic pumps, the bearings and containment can come into contact with the product to be pumped. Care must be taken if damage then occurs to the bearings or if there is excessive heating due to dry running. Because the result may be that the containment can gets a defect and the product leaks. An example: If a standard MAC runs dry at a speed of 2,900 rpm, the metallic containment can heats up to over 400 °C within less than two minutes.

This makes the use of MAC pumps particularly difficult in the ATEX area. The reason for this is that – depending on the classification of the hazard areas – the individual components of the pump have to undergo separate electrical monitoring.

CONCLUSION.

When a MAC pump with dry-running roller bearings and magnetic coupling from Bungartz is used, thermal monitoring of the containment cans temperature can be dispensed with – even in explosion protection zone 1.

TRIPLE SEALING OF THE MAC.

- **Hydrodynamic released seal and the labyrinth** for the separation of liquids and solids
- **Lip seal** that guarantees that no medium penetrates the bearings and MAC, even in the event of a sealing gas failure
- Inertization of the bearings and magnetic coupling with a suitable sealing gas within the consumption range of commercially available, gas-barrier mechanical seals
- **Containment can without product contact** with low gas pressure load of approx. 3 bar
- Continuous monitoring of the bearing and magnetic coupling area by means of the inertization pressure/ volume flow parameters
- Direct detection of a containment can fracture by drop of the sealing gas pressure and high gas consumption (without there being any product leakage)

CONCLUSION.

Even in the case of a containment can fracture, no product escapes into the environment – either during operation or when at a standstill. The MAC pump from Bungartz therefore achieves almost the safety level of a canned motor pump.

ENERGY CONSUMPTION AND HEATING OF THE PUMPING MEDIUM.

In the case of canned motor pumps and magnetic couplings, the slide bearings must be lubricated by the pumping medium. Furthermore, the metallic can and/or magnetic coupling (containment can) must be cooled. The heat that is dissipated in this process heats the pumping medium. With heat-sensitive products this can be a disadvantage or even result in evaporation in the bearing area. With viscous media in particular, friction loss also occurs between the rotating and static parts through which the medium flows.

The DryRun MAC manufactured by Bungartz offers only advantages here.

- no eddy current losses in the containment can due to the consistent use of materials that are free of eddy currents
- no flow losses in the bearings or magnetic coupling
- no heat or hydraulic losses in the bearing and MAC area
- no heating of the medium
- also usable for viscosity levels of up to 300 cp

CONCLUSION.

Even with heat-sensitive pumping media, dry-running MAC pumps made by Bungartz guarantee maximum safety and high efficiency.

DIFFICULT PUMPING MEDIA AND APPLICATIONS.

Thanks to the innovative DryRun technology, the pumping medium does not enter the area of the bearings and magnetic coupling. For this reason, pumps which are equipped with this sealing technology are generally suitable for all media without restriction. They are ideal for solids, viscous, gaseous and boiling products and for the emptying of residues. Due to the smooth combination of different types of hydraulics with the DryRun technology (see selection table), even liquid tar, boiling liquid gas and media with a high gas content can be pumped by these magnetic pumps. This is a genuine advance!

CONCLUSION.

By strictly separating the pumping chamber from the bearing and sealing chamber, MAC pumps made by Bungartz can cope with any pumping medium.

HIGH PRODUCT TEMPERATURES.

Temperatures of up to 400 °C are a challenge. Bungartz MAC pumps can deal with them without any additional measure requirements such as cooling media. Because

the area between the bearings and the hydraulics is used as a natural heat barrier.

CONCLUSION.

A natural thermal barrier between the hydraulic part and the area of the bearings makes additional external or cooling medium superfluous, even at product temperatures of 400 °C.

EXTREMELY AGGRESSIVE PUMPING MEDIA.

As already mentioned, the DryRun MAC is designed such that the pumping medium never comes into contact with the bearings or magnetic coupling. Only the hydraulic part of the pump has to be made of corrosion-resistant material for this purpose. High-alloy stainless steels are used for such applications, as well as for constructions made of silicon carbide (SiC).

CONCLUSION.

Due to the strict separation of the product chamber from the dry-running bearings and magnetic coupling area, the corrosion attack is limited to the hydraulics. Solutions made of highly corrosion-resistant stainless steels and constructions made of silicon carbide (SiC) are the first choice here.

SELECTION GUIDE

PUMP TYPE	MPCH	MPCV	MPCVAN	MPCT	MPCTAN	MPVAN
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PUMP PROPERTIES

Normal-priming	X	X		X		
Self-regulating			X		X	X
Safe to run dry	X	X	X	X	X	
with slide bearings and medium lubrication Safe for zero flow rate						X
with roller bearings and gas cut-off Nitrogen, air etc.	X	X	X	X	X	

MEDIA PROPERTY

Boiling liquid			X		X	X
without solids						X
Solids < 5 – 10%	X	X	X	X	X	
Solids > 10%		X	X	X	X	
Temperature < 200 °C	X	X	X	X	X	X
Temperature > 200 °C to 400 °C	X	X	X	< 260	< 260	
Gas-loaded > 10%			X		X	
Gas-loaded < 10%	X	X	X	X	X	X
Toxic	X	X	X	X	X	X
Melts such as caprolactam	X	X	X	X	X	
liquids which are extremely difficult to pump (polymerizing, sticky, e.g. liquid tar)		X	X	X	X	

APPLICATIONS

Slop tank			X	X	X	
ATEX zone 2	X	X	X	X	X	X
ATEX zone 1	X	X	X	X	X	X
ATEX zone 0			special install.		X	
Unloading of tankers H ₂ SO ₄ , Oleum, HNO ₃ etc.			X			X
Unloading of tankers Liquid gases etc.			X			
Column Sump or overhead product			X			X
Emptying of residues	X		X			X
Pumping from centrifuges, vacuum belt filter			X			

HIGHEST SAFETY LEVEL.

MPCH-TYPE HORIZONTAL CENTRIFUGAL PUMPS.

They are as powerful as they are clever: MPCH-type horizontal pumps with standard hydraulics. Here no medium reaches the bearing or sealing area. The liquid-solid separation in the front labyrinth area makes it possible. Magnetic coupling and bearings therefore run in a clean gas atmosphere independently of the pumping medium. The low sealing gas input is similar to the consumption of the gas-sealed double mechanical seal.

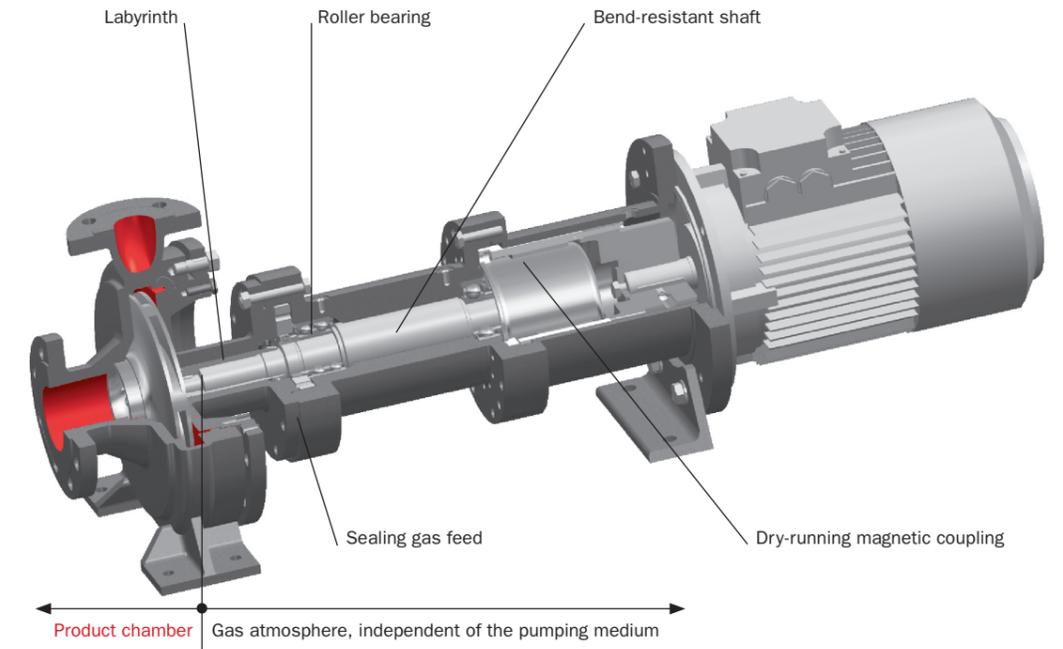
APPLICATION AREAS.

- for toxic media with special shaft seal requirements
- for liquids containing solid matter
- for viscous liquids
- for hot liquids

PUMPING MEDIA.

Typical media such as:

- TDI
- ODB
- acrylic acid
- caprolactam
- thermal oils



PRODUCT TEMPERATURES.

Between the rear of the impeller and the shaft bearings there is a product-free labyrinth area through which the sealing gas flows. This barrier ensures a high temperature gradient and a low bearing temperature. Product temperatures of up to 400 °C can therefore be handled without cooling medium. A heated pump casing is used for liquid melts.

PERFORMANCE RANGE.

The design is single-stage. As a result, this pump is limited to a maximum delivery head of 150 m. Due to the pump design the standard roll bearings and magnetic couplings are adaptable. The performance range is wide open.

ADVANTAGES.

- easy exchange of standard pumps according to DIN EN22858
- closed and open impeller shape is possible
- high degree of intrinsic safety
- no thermal monitoring of the containment can be required
- maintenance-free bearing and coupling unit for at least 3 years
- suitable for almost all pumping media due to the clear separation of the product and bearing area
- no requirement of cooling or lubricating liquids even with hot media containing solids
- simple check of the condition of the magnetic coupling (sealing gas pressure) and bearings (vibrations)
- can be used for ATEX Zone 2 and Zone 1 as standard
- secure against operating errors

DIFFICULT CONDITIONS.

VERTICAL PUMPS WITH ROLLER BEARINGS OF THE TYPE MPCV / MPCVAN.

They are robust as well as clever: the models of type MPCV. Before the development of a product comes the concept. The idea here: a hermetic pump in which the pump bearings and magnetic coupling work on a purely physical basis independently of the hydraulics and therefore the pumping liquid.

The fact is that gas trapped in a vertical vessel cannot escape as long as the upper space is sealed with a sufficient degree of tightness against the environment. In the case of the MPCV/MPCVAN design, this is achieved by means of a hermetically sealed containment can.

Equipped in this way, there is only one gas atmosphere in front of the bearing and sealing unit, both during operation and when the pump is at a standstill. This – in combination with the self-regulating version (AN) – means that the pump can be used for all applications.

MPCV.

Vertical and dry installation, normal-priming and safe to run dry.

MPCVAN.

Vertical and dry installation, self-regulating, cavitation-free and safe to run dry.

APPLICATION AREAS.

- for toxic media with special shaft seal requirements
- for liquids containing gas
- for liquids containing solid matter
- for viscous liquids
- for hot liquids
- for boiling liquids

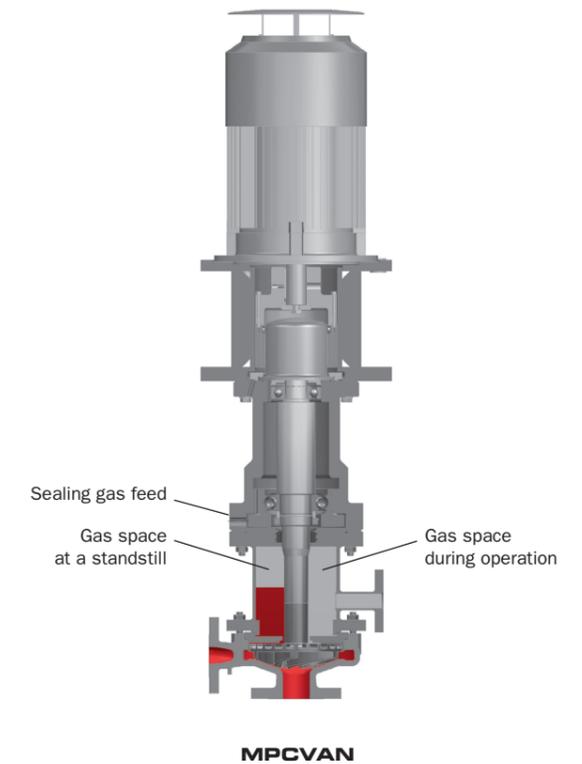
PUMPING MEDIA.

Typical media such as:

- titanium tetrachloride
- liquid tar
- liquid gas
- those with a high solids content

PRODUCT TEMPERATURES.

There is a product-free gas space between the rear of the impeller and the shaft bearings. A high temperature gradient and a low bearings temperature are the consequences. Product temperatures of up to 400 °C are therefore no problem even without cooling medium. A heated pump housing is used for liquid melts.



PERFORMANCE RANGE.

The single-stage design limits the delivery head range. Due to the adaptive design of standard roller bearings and magnetic couplings, the performance range can be designed to be flexible.

ADVANTAGES.

- semi-open impeller which is insensitive to solids
- high degree of intrinsic safety
- maintenance-free bearing and coupling unit for at least 3 years
- suitable for almost all pumping media due to the clear separation of the product and bearing area
- can be used for ATEX Zone 2 and Zone 1 as standard
- due to special installation also suitable for Zone 0
- secure against operating errors
- low-pulsation pumping
- no minimum flow rate required
- 3-phase compatible
- no NPSH_R (NPSH_R = < 0.1m)
- self-regulating pumping behavior
- simplified commissioning

EXTREME CHALLENGES.

SUBMERSIBLE PUMPS WITH ROLLER BEARINGS OF THE TYPE MPCT / MPCTAN.

They are clever as well as intelligent: the MPCT submersible pumps for difficult cases. They are perfectly suited for slop applications. Namely, exactly when toxic, hot, partially boiling and gaseous products are generated in different quantities and are to be collected and pumped on without a control systems.

The robust bearings and sealing unit operates independently of the product in a clean gas atmosphere. The hydraulic system is permanently vented to the gas chamber of the container.

MPCT.

Submersible pump, normal-priming, safe to run dry.

MPCTAN.

Submersible pump, self-regulating, cavitation-free, safe to run dry, also suitable for Zone 0.

APPLICATION AREAS.

- submersible pump for slop tanks
- for boiling liquids
- for liquids containing gas
- for liquids containing solid matter
- for hot liquids

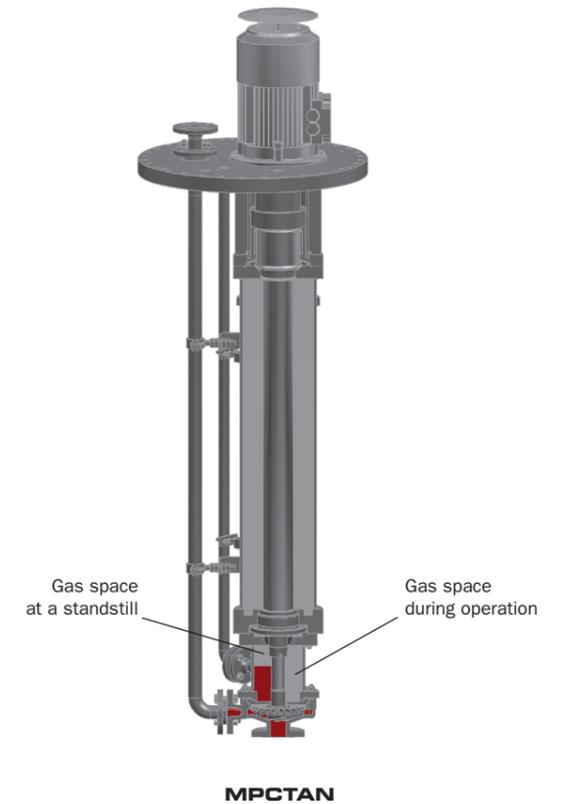
PUMPING MEDIA.

Typical media such as:

- toxic, solid-contained, boiling, explosive slop media
- hydrocarbon slops with water content
- highly flammable media in a Zone 0 atmosphere

PRODUCT TEMPERATURES.

- up to approx. 260 °C



PERFORMANCE RANGE.

The performance range is limited by the single-stage design only in the delivery head range. Otherwise it can be of an open design. The reason for this is that the design of standard roller bearings and the magnetic couplings can easily be adapted.

ADVANTAGES.

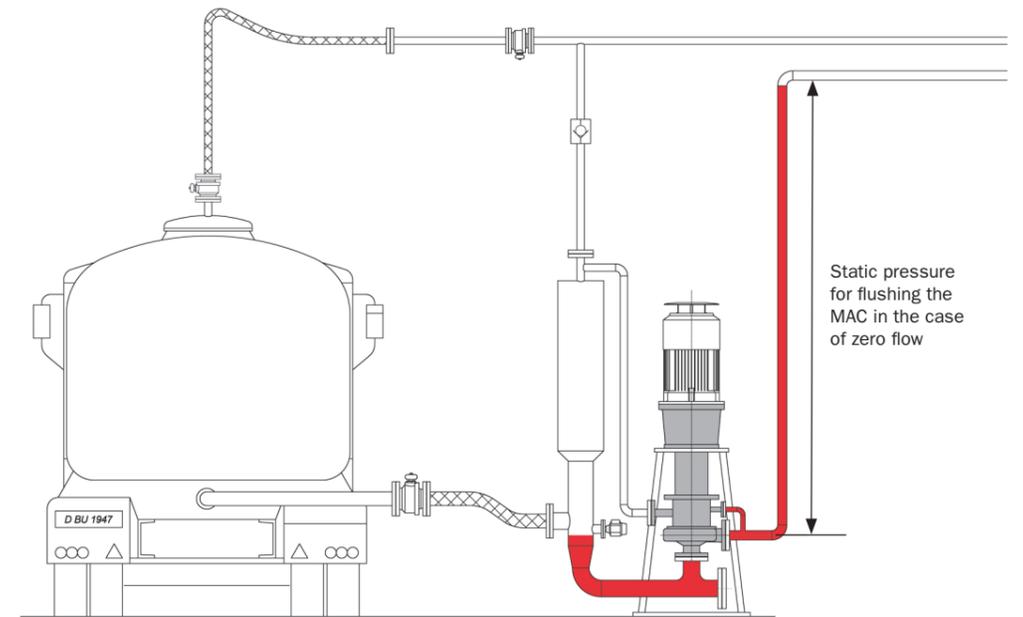
- semi-open impeller which is insensitive to solids
- high degree of intrinsic safety
- maintenance-free bearing and coupling unit for at least 3 years
- suitable for almost all pumping media due to the clear separation of the product and bearing area
- can be used for ATEX Zone 2 and Zone 1 as standard
- ATEX Zone 0 version is available
- no electrical signals in the slop tank (only two signals requiring monitoring in order to achieve ATEX category 1 outside the slop tank)
- maintenance of the electrical signals (for Zone 0) is possible without removing the pump from the slop tank
- 3-phase compatible
- no NPSH_R (NPSH_R = < 0.1m)
- self-regulating pumping behavior
- simplified commissioning

PERFECT REGULATION. SELF-VENTING MPVAN VERTICAL CENTRIFUGAL PUMP.

They are as simple as they are effective: the operating principle of magnetic coupling pumps of the MPVAN type. Various components are combined here: self-regulating hydraulics such as for the type AN self-regulating pump (automatic level control, see the V-AN brochure) and a standard magnetic coupling. This has product-lubricated slide bearings and a containment can that is in contact with the product.

If boiling but solid free liquids have to be pumped or tanker trucks have to be completely emptied, the MPVAN is ideally suitable for this application. The special advantage of this pump: complete safety even in the case of zero flow delivery.

If, for example, the tanker truck is almost empty, the flow rate automatically decreases with the intake level. The pump continues to run smoothly even in the case of zero pumping delivery. The precondition for this operation is sufficient filling of the pressure line. Its pressure difference guarantees the lubrication of the slide bearings.



MPVAN
after tanker truck emptying with zero pumping delivery

APPLICATION AREAS.

- for media at the boiling point
- for extraction from columns and evaporators
- for extraction from a vacuum
- for the residue-free emptying of tanker trucks and railway tank cars

PUMPING MEDIA.

Typical media such as:

- sulfuric acid
- oleum
- nitric acid

PRODUCT TEMPERATURES.

Limited to 200 °C by magnetic materials.

PERFORMANCE RANGE.

Due to the fluid-flushed magnetic coupling, the performance range is limited to approx. 90 m³/h. If the performance level has to be higher, a solution is also available for this on request.

ADVANTAGES.

- no dry-running even in the case of a product shortage (zero flow rate safe)
- no evaporation in the bearing area even with boiling liquids
- conveyance out of the vacuum by pressure compensation
- self-sufficient installation, as no sealing gas system is necessary
- self-regulating
- self-venting
- no minimum flow rate
- low-pulsation pumping

PRODUCT RANGE.**Horizontal pumps**

with hydrodynamic shaft seal
up to the dry-running magnetic drive

Vertical pumps

- for dry installations, short design
- for wet installations,
without bearings in the liquid
- for wet installations,
with rolling bearings independent of product
- with feeder propeller
for space-saving installation

Tank pumps

with intake from above

Horizontal- and Vertical pumps

- with semi-open impellers
- with closed impellers
- with torque flow impellers

Downstream seals

for pumps with hydrodynamic relief of the shaft gap

- gland packing
- mechanical seal
- magnetic drive
- particular solution for problem cases
- lip seal

Comprehensive information about each type of pumps is featured in individual product brochures.

MATERIALS.

- all castable and weldable stainless steel qualities
- castable and weldable special alloys
- grey cast iron, rubber lined
- special materials such as titanium, zirconium, SiC etc.

**REAL SPECIALISTS.
THE CENTRIFUGAL
PUMPS AT A GLANCE.**