TANK CLEANING SYSTEMS

CLEANING WITH HOMA INJECTOR JET SYSTEMS AND AGITATORS

BR | HRS series

FOREWORD

Local authorities and sewage treatment plants have hugely increased their capacities in recent decades. Old plants were refurbished and many new ones were built. At present, most of Germany's sewage treatment plants have been complete and operational for some time. Municipal providers are therefore chiefly concerned with retrofitting and expanding existing plants.

One of the application areas within these municipal settings are stormwater tanks and storage sewers. Over 20,000 of these facilities are currently in operation and more are planned. Sewage treatment plants only have a certain waste water treatment capacity. Stormwater tanks and storage sewers are therefore needed for the intermediate storage of waste water and mixed water that can accumulate during peak times or when there is a sudden influx of rainwater.

Once the sewer system has reached capacity, the stormwater overflow tanks begin to fill with waste water and mixed water, sometimes in sudden bursts. The tanks are drained through gravity flow or with pumps in wet well or dry installation, at the rate at which the sewage treatment plants can process the water inflow.

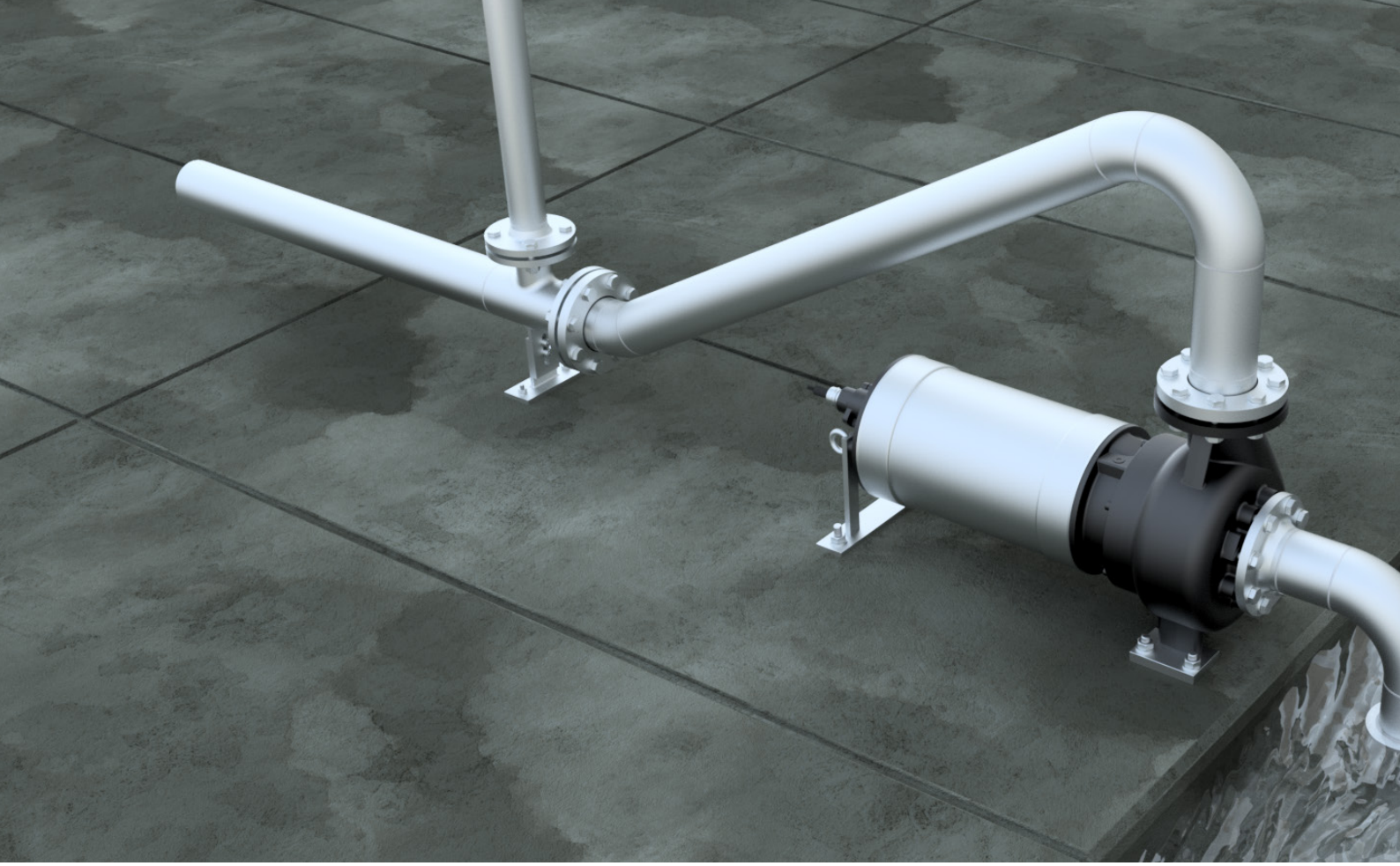
This process of repeated filling and draining of the tanks leads to an accumulation of solids. Over time, these impair the function of the overall plant. HOMA offers a range of systems to provide the right cleaning performance for each specific application and the relevant conditions. Cost and operating efficiency are always paramount when it comes to selecting the right system.

Stormwater tanks can be drained using HOMA submersible waste water pumps with free-flowing impeller, ducted impeller or other hydraulic systems. In combined high water and stormwater applications, submersible well pumps with multi-channel or propeller technology are mainly deployed.

The information brought together in this brochure is based on our long-standing experience in the field of stormwater tank cleaning.

We are happy to provide support and advice, right from the earliest stages of preliminary planning. Our competent field sales team is also on hand to offer on-site assistance.

Further details are available online at www.homa-pumpen.de



HOMA INJECTOR JET TANK CLEANING SYSTEMS

APPLICATION

Stormwater holding tanks are playing an increasingly significant role in the development of rainwater management. To safeguard effective use of these tanks, it is important to prevent the solids in the water from forming deposits, as this will impair the function of the tanks over time. HOMA tank cleaning systems ensure effective operation in several ways:

Flow generation:

The HOMA injector jet system generates a strong horizontal flow in the tank, which keeps the sludge particles and solids in suspension.

Putrefaction delay:

Enriching the water with air significantly delays putrefaction and odour development in situations where the water remains in the tank over longer periods.

Jet cleaning:

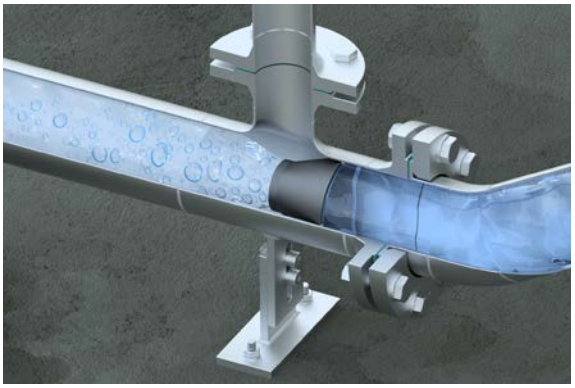
In the final stages before the tank is fully drained, when the water level is correspondingly low, the position of the jet pipe close to the tank floor ensures the water jet efficiently flushes away the dirt and sand particles.

FUNCTION

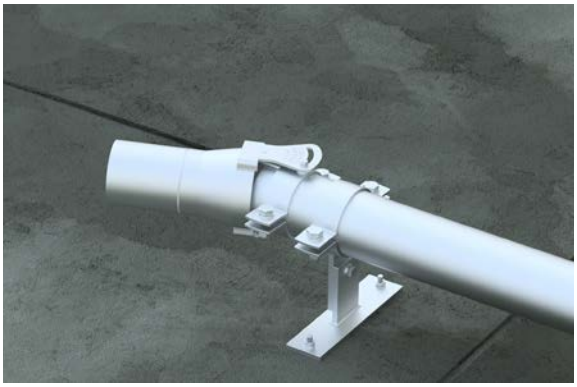
The system consists of a robust submersible waste water pump with anti-block impeller that sucks the water in at the lowest point of the tank.

An injector nozzle, flange mounted to the pump discharge, then compresses the water and accelerates the flow. This creates a suction effect, causing air to be drawn in via a vertical pipe.

The air/water mixture is pushed out through the jet pipe at high speed, parallel to the tank floor. The combined effect of water jet and aeration ensures consistent water movement with high jet intensity and strong turbulence.



Sectional view of the jet pipe of an injector jet system. The injector nozzle accelerates the water flow, which causes air to be sucked in via the vertical pipe.



The AdJET as an attachment at the end of the jet pipe of an injector jet system.

INTELLIGENT ACCESSORIES FOR GREATER CONVENIENCE

THE ADJET ATTACHMENT

For subsequent adjustment of the water jet, HOMA tank cleaning systems can be extended with the AdJET. The attachment allows the angle of the outgoing water jet to be altered by ±20° horizontal to the tank base. Fitting the attachment is simply done by securing it with clamps and an additional support.

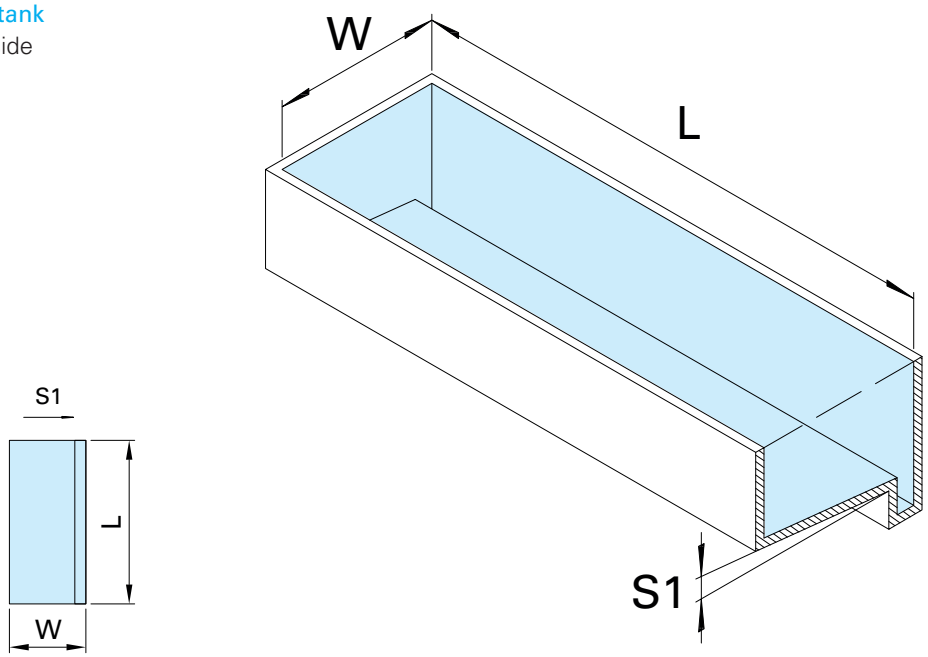
By subsequently adjusting the water jet, areas of the tank can be reached that were previously inaccessible due to the system's installation angle. This means that dead zones and the associated development of deposits can be prevented, while improved circulation and cleaning efficiency in the tank is also achieved without having to reposition the entire unit.

DESIGN OF THE STRUCTURE

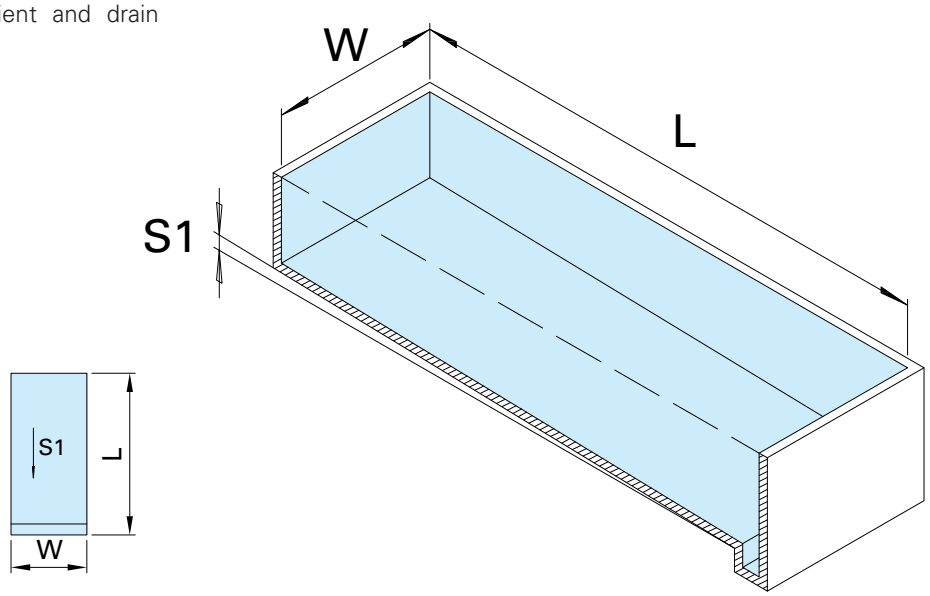
What shape is the structure? The answer to this decides which system to install. Many years of experience have taught us that injector jet systems are ideal for rectangular tanks while submersible motor agitators are best in circular ones. Specified below are the design criteria for rectangular and circular tanks respectively. When assembling a complete cleaning system, all listed systems and pump types with the same nominal diameter can generally be combined. Please indicate the required combination. However, the correct selection and ideal positioning of the cleaning system will depend on the shape and size of the tank.

In general, we differentiate between 3 basic types of tank:

Tank type A: rectangular tank
with drain channel at the side



Tank type A: rectangular tank
with longitudinal gradient and drain channel at the end

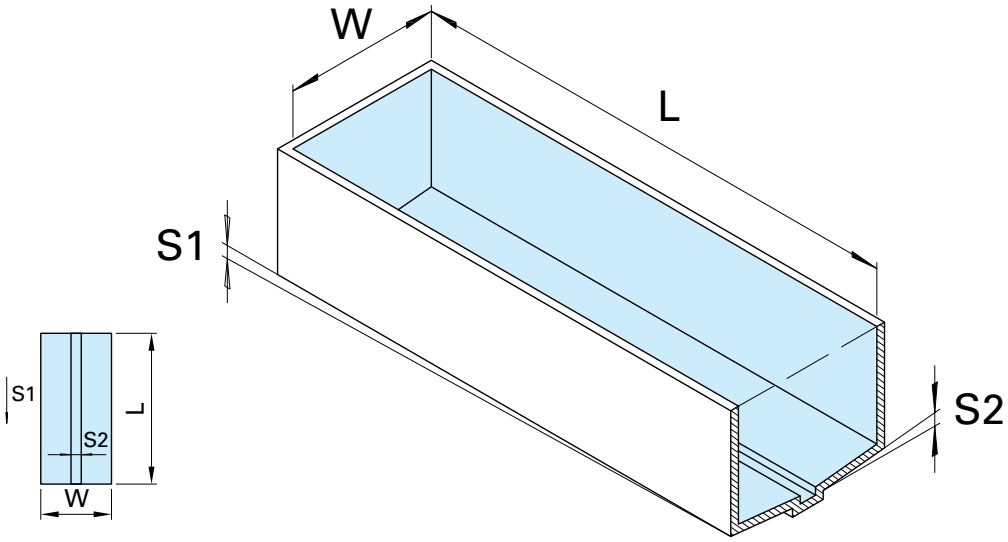


DESIGN OF THE STRUCTURE

We are happy to provide assistance with detailed configuration and positioning for specific applications. If you require information on our range of control systems for water level capture and pump control, please don't hesitate to contact us.

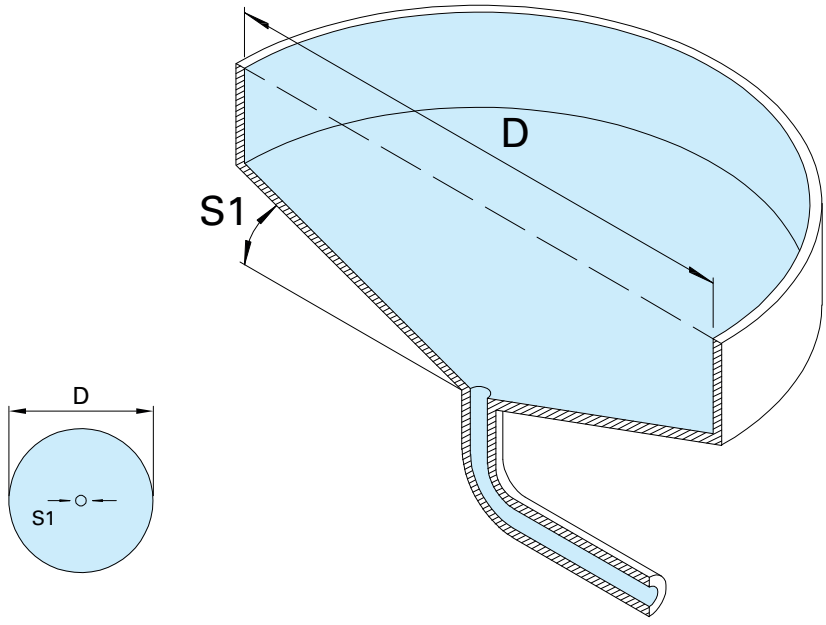
Tank type B: rectangular tank

with central dry weather flow channel

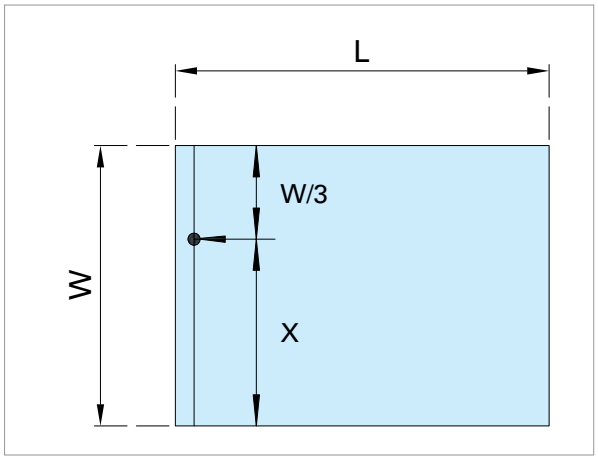


Tank type C: Vortex drop shaft tank

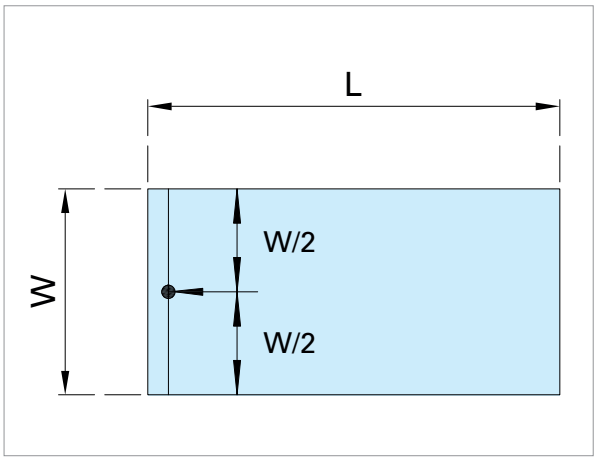
Circular tank with central drain.
Optimum cleaning with agitators.



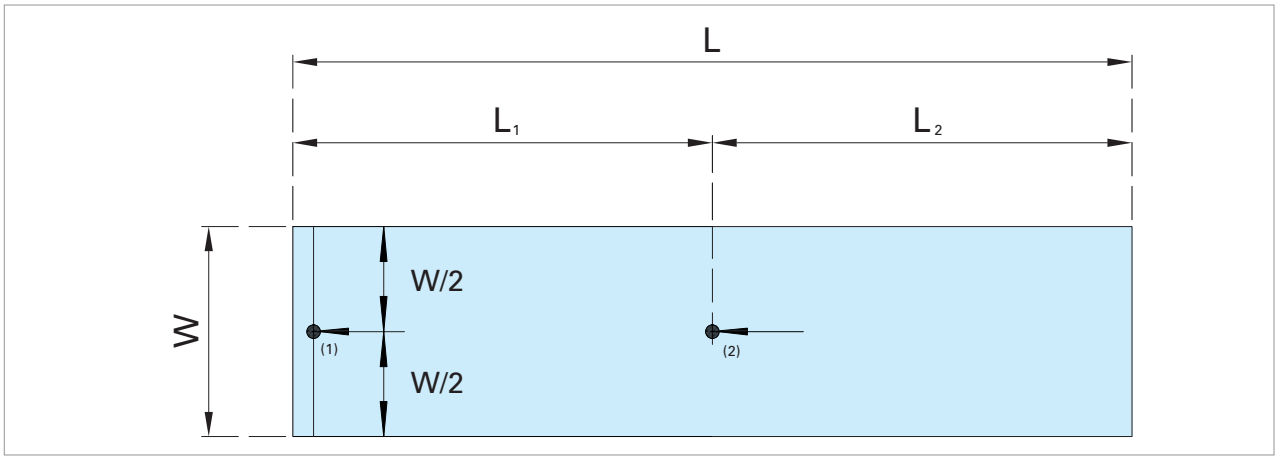
EXAMPLE POSITIONING OF INJECTOR JET SYSTEMS



HOMA injector jet system
Off-centre in stormwater tank



HOMA injector jet system
Centrally positioned in stormwater tank



Two HOMA injector jet systems
Centrally aligned in an elongated stormwater tank

TYPE KEY

Series	Nominal diameter of pressure flange	Nominal diameter of suction flange	Installation type	Stainless steel version
BR	**100**	**150**	**K**	**CR**
	100 = DN100 150 = DN150	100 = DN100 150 = DN150 none = nominal diameter of pressure flange	B = with base support ring K = with coupling system S = lateral installation H = horizontal installation	Standard

CLEANING SYSTEM TYPE OVERVIEW

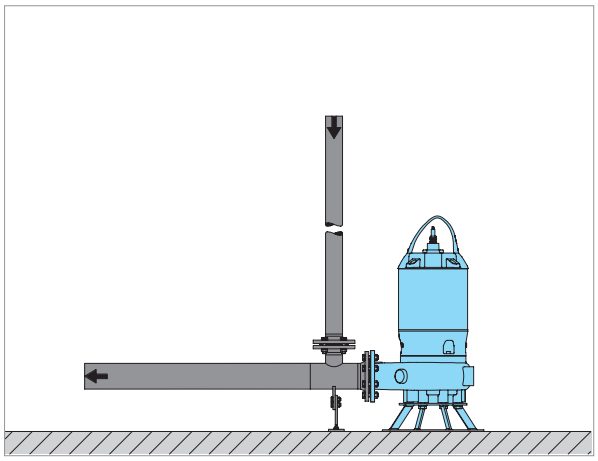
Type	Pressure/ suction flange	Jet pipe	Installation
BR100 B /CR	DN 100/100	DN100	B
BR100/150 B /CR	DN 100/150	DN100	B
BR150 B /CR	DN 150/150	DN125	B
BR100 K /CR	DN 100/100	DN100	K
BR100/150 K /CR	DN 100/150	DN100	K
BR150 K /CR	DN 150/150	DN125	K
BR100 S /CR	DN 100/100	DN100	S
BR100/150 S /CR	DN 100/150	DN100	S
BR150 S /CR	DN 150/150	DN125	S
BR100 H /CR	DN 100/100	DN100	H
BR100/150 H /CR	DN 100/150	DN100	H
BR150 H /CR	DN 150/150	DN125	H

PUMP TYPE OVERVIEW

Series	Pressure/ suction flange	Hydraulics/ impeller design	Motor input (at full load) P2 (kW)
VX24 (36-39)	DN100/100	Vortex	3.2 to 3.7
VX24 (40-46)	DN100/100	Vortex	5.0 to 12.2
VX24 (54-58)	DN100/150	Vortex	14.6 to 19.3
MXS24 (32-38)	DN100/150	Single-channel	2.9 to 3.7
MXS24 (42-46)	DN100/150	Single-channel	5 to 6.5
MXS24 (50-54)	DN100/150	Single-channel	12.2
MXS34 (50-60)	DN150/150	Single-channel	12.2 to 19.3

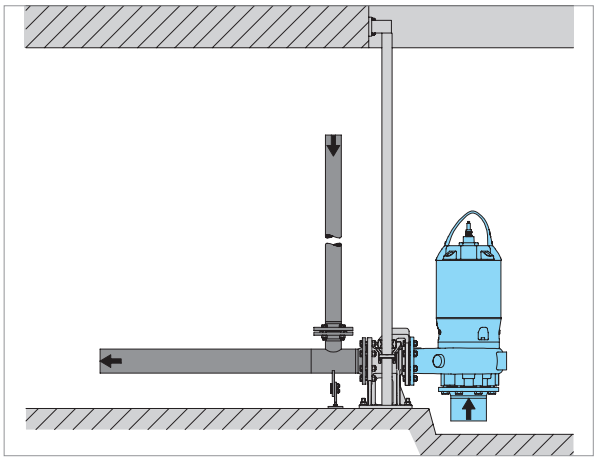
Motor speed: 1450 rpm
Available in standard or ATEX certified version.
Available with current cooling jacket for extended operation with non-submerged motor.
Detailed technical information on the recommended pump series can be found in our corresponding sales brochures.

INSTALLATION TYPES



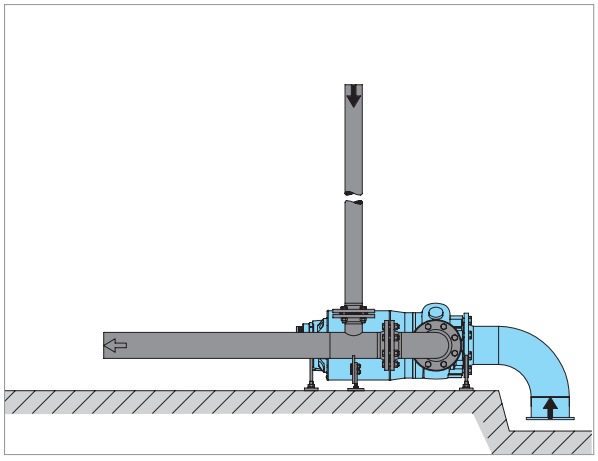
Installation with base support ring (type B)

Simplest type of installation. Can be positioned in any part of the tank. The pump draws water from the base of the tank.



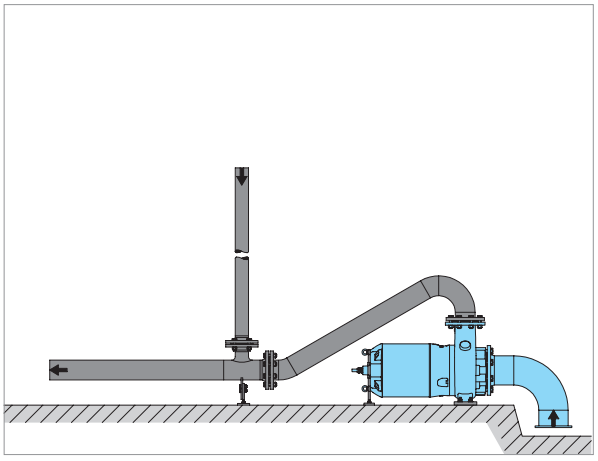
Installation with coupling system (type K)

The screwless connection between pump and jet pipe facilitates pump disconnection for maintenance purposes. Can be supplied as version for drawing water from the base of the tank or with suction pipe for tank base channels.



Lateral horizontal installation (type S)

Especially space saving horizontal orientation. Can be supplied as version for drawing water from the base of the tank or with extended suction pipe for tank base channels.

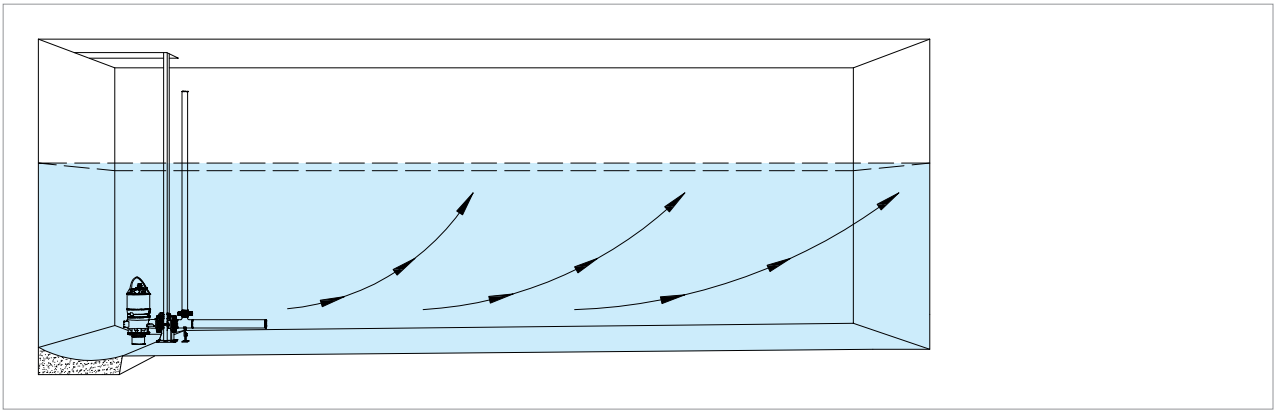


Horizontal installation (type H)

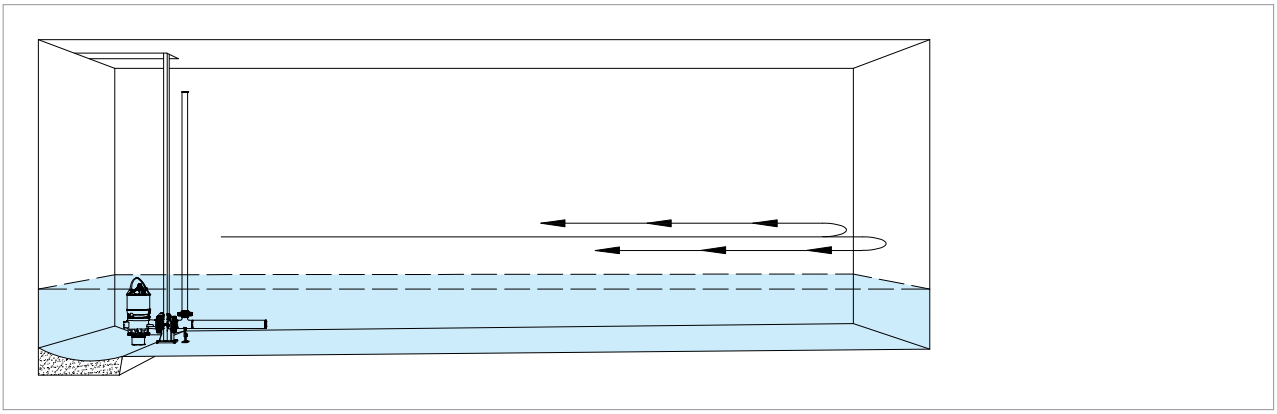
The horizontal orientation ensures continued cooling of the pump motor even when the water level in the tank is low. Can be supplied as version for drawing water from the base of the tank or with extended suction pipe for tank base channels.

OPERATING PHASES OF A HOMA INJECTOR JET SYSTEM

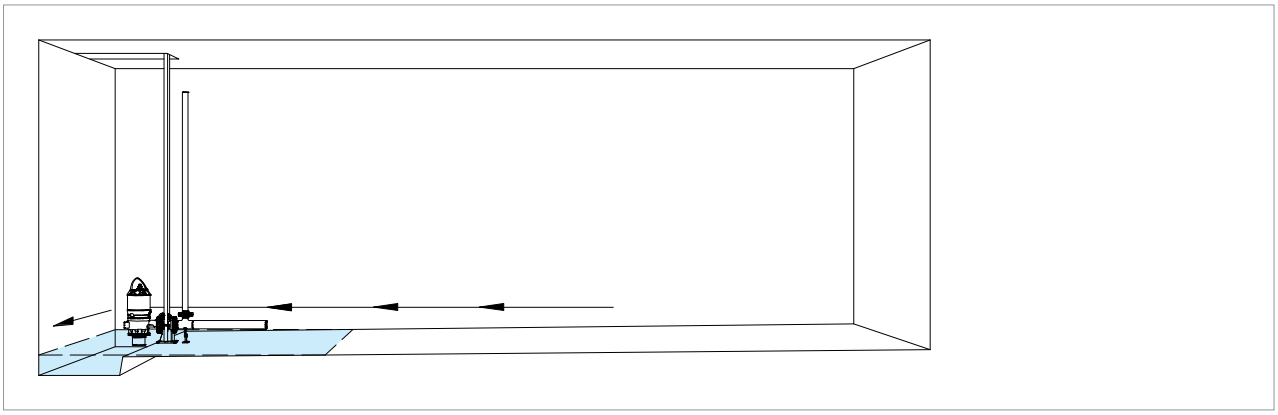
The flushing action of the jet on the base of the tank loosens and stirs up unwanted deposits of solids in the tank. The suspended solids can then be pumped out of the tank. This flushing action is at its most effective in rectangular tanks with longitudinal gradient and without transverse gradient. The process of cleaning rectangular tanks with injector jet systems consists of three operating phases.



Phase 1: The tank is full. The units are only activated when the water level begins to fall, at which point intermittent operation starts. The immersed cleaning unit generates a current, which loosens the deposits on the base of the tank.



Phase 2: The tank is partially full and the units are now in continuous operation. This is when the jet of the injector jet system achieves the greatest cleaning performance. The propulsion jet oscillates from one side of the tank to the other. The medium carries along the solids on the base of the tank as it flows back to the tank's drain channel.



Phase 3: Tank is nearly empty. The remaining solids are flushed out of the tank.

In addition to our regular product range, we also implement tailor-made project solutions on request. Simply get in touch with us concerning your individual requirements.

FUNCTION DESCRIPTION AND SWITCHING BEHAVIOUR

APPLICATION

When the overflow tank starts to fill and the water level rises, the injector jet system remains non-operational. The cleaning unit is only activated when the water level begins to fall, at which point the system switches to intermittent or cyclic operation. Once a certain water level has been reached, the injector jet system changes over to continuous operation. The stop point can be set as required, depending on whether the flushing pump has been equipped with a suction pipe or not.

CRITERIA FOR CONFIGURING A HOMA INJECTOR JET SYSTEM IN A RECTANGULAR TANK WITH LONGITUDINAL GRADIENT

When configuring injector jet systems in rectangular tanks the following points should be observed:

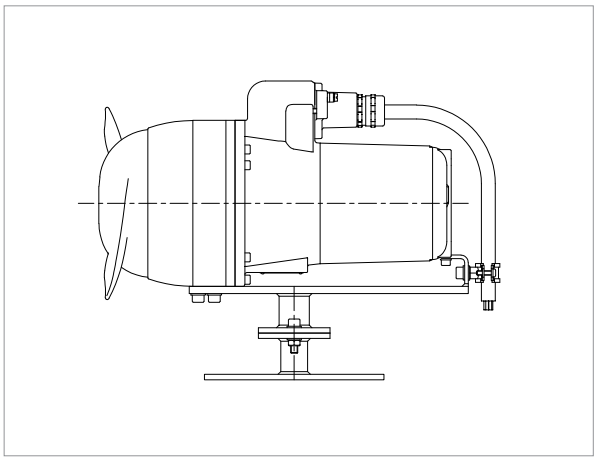
- A longitudinal gradient between 1.2 and 1.5 %.
- A length/width ratio of approx. 3:1 (L/W).
- Always observe the length/width ratio, even when planning for large tanks where several injector jet systems will be in operation.
- Guide plates improve the cleaning performance if stormwater tanks have pillars that lead to cleaning problems.
- Provide a channel on the drain side so that the pump runtime can be extended through the use of a suction pipe.

HOMA AGITATOR TANK CLEANING SYSTEM

By generating flow, HOMA submersible motor agitators stir up settled solids and keep them in suspension. This ensures a consistent removal of solids during the draining of the tank. The base and walls of the tank thus remain free from deposits and the dirt particles are evenly mixed in throughout. With its optimised propeller hub, the (C)HRS series minimises any areas of weak flow, making it the ideal cleaning unit.

AGITATOR FUNCTION

Customised positioning of the agitator according to tank characteristics results in a strong, optimised flow. The propellers generate a rotating stream in the horizontally widening cone of flow, creating horizontal as well as vertical flow components. This results in an almost homogeneous mixing of the entire tank content. The aim is to prevent solids from settling and forming a sediment. This requires a certain horizontal flow velocity in the tank, which counteracts the natural tendency for sedimentation.



HRS11 RB51 with floor mounting

HOMA AGITATOR MODE OF OPERATION

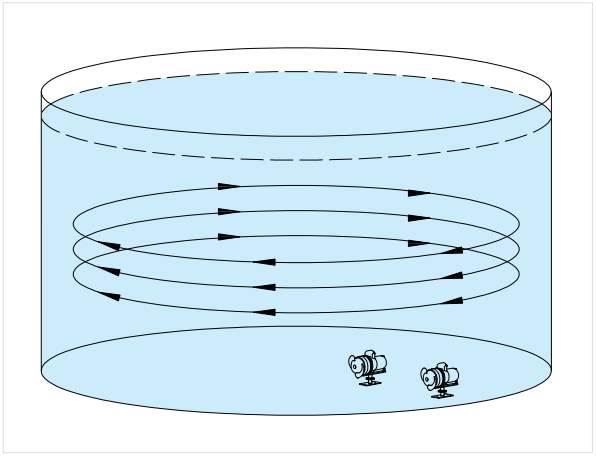
APPLICATION

In circular tanks with central drain the agitators cause the medium to rotate, which results in the pollution load being carried towards the drain in the tank centre. This is referred to as the tea cup effect. Physical flow parameters dictate that this rotational effect is most effectively achieved with submersible motor agitators.

If they are to be used in stormwater tanks, such flow generators must meet certain requirements. Agitators with small propeller diameters (continued operation in low water levels) and high rotational speed (excellent thrust power) are ideal. The submersible motor agitators should also achieve good cleaning performance when water levels are high, so that the homogenisation process sets in early. This has the benefit that solids are transported to the sewage treatment plant in an even concentration.

FUNCTION DESCRIPTION AND SWITCHING BEHAVIOUR OF THE CLEANING UNIT

When water levels are rising in the stormwater tank, the cleaning unit initially remains switched off. The unit is only activated when the water level begins to fall, at which point it switches to intermittent or cyclic operation. When a previously determined water level has been reached, the unit changes over to continuous operation.



Generating the so-called teacup effect

CRITERIA FOR HOMA AGITATOR CONFIGURATION

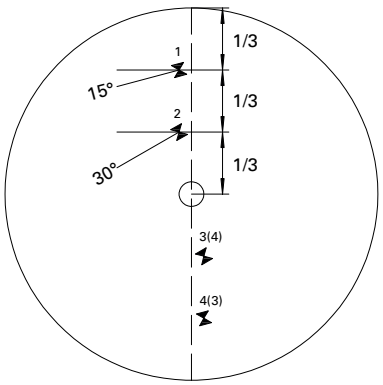
COMPACT VERSATILITY

Please observe the following points:

- Tangential inlet into the stormwater overflow tank.
- Central drain (sump pit or funnel drain).
- If pillars are necessary, these should be positioned near the funnel drain.
- In closed tanks with central inlet, the medium cannot freely drain into the funnel or sump. These should therefore be avoided.
- Install several agitators, even in small tanks, in structures with pillars and those with central inlet.

Tank Ø	Quantity	Unit
10 m	1	HRS11/4-230-203 EX
10 – 15 m	2	HRS11/4-230-203 EX
15 – 20 m	3	HRS11/4-230-203 EX
20 – 25 m	4	HRS11/4-230-203 EX

Positioning in circular tank



Larger or rectangular tanks on request. Can be adapted to allow for specific tank features (steep gradient, interfering fixtures, poor drainage performance)

HOMA TANK CLEANING SYSTEMS – TRIED AND TESTED

ULMEN MUNICIPAL WORKS

Two problems seemed unresolvable at the Ulmen municipal works: strong odour development and a disproportionately high energy demand. HOMA was able to find a solution to both issues with an innovative concept.

INITIAL SITUATION

Two injector jets had been installed in the 24 x 7 m stormwater overflow tank at the Schmitt sewage treatment plant for the municipality of Ulmen in Germany. These repeatedly caused problems, resulting in an increasing number of emergency interventions in the entire sewage treatment plant.

LOW RISK TRIAL SYSTEM

The task was clear. An energy efficient tank cleaning system less susceptible to failure needed to be found. "The idea of installing four HOMA agitators sounded risky at first. To be honest, if HOMA hadn't given us the opportunity to install this as a trial system, we wouldn't have agreed," commented Torsten Steffgen, works manager at the Ulmen municipal waste water works. Since the installation in January 2019, the employees responsible at the sewage treatment plant can once again relax at the weekends. Not one single fault has been reported since the agitators were installed. "We are extremely satisfied with the new solution and glad the experiment was a definite success," said Robert Schüller of Ulmen municipal waste water works.

Challenge:

To sufficiently stir up the pollution load introduced after every rainfall event so that residual biomass is reliably removed.

Components installed:

4x HRS11/4-230-204 EX

HOMA TANK CLEANING SYSTEMS – TRIED AND TESTED

NASTÄTTEN TANK 1

In 2018, the tank cleaning system in the Nastätten stormwater holding tank was due for renovation and modernisation.

INITIAL SITUATION

Tank 1, a 37.5 x 5 x 2 m (LxWxD) "holding tank", was not being sufficiently cleaned by two injector jets provided by a competitor. The pumps were excessively prone to blockages.

COMBINED EFFECT OF WATER JET AND AERATION

A solution with two injector jets was devised. The new system in Nastätten consists of two robust MXS waste water submersible pumps with single-channel impeller to prevent blockages. The pumps were additionally equipped with the Perma-Cool system, to enable continued operation of the jets when the motor is above the water surface. The water is pushed and accelerated through an injector nozzle which is flange mounted to the pump discharge. This creates a suction effect, causing air to be drawn in via a vertical pipe.The combined effect of water jet and aeration ensures consistent water movement with high jet intensity and strong turbulence. The HOMA tank cleaning system thus safeguards effective operation in several ways.

Challenge:

Implementation of a tank cleaning system that keeps the tank as free of deposits as possible throughout its operation

Components installed:

2x BR100/150S-A/CR
2x MXS2446-ET64 EX

HOMA TANK CLEANING SYSTEMS – TRIED AND TESTED

NASTÄTTEN TANK 2

The excellent cleaning performance of our tank cleaning systems installed in the Nastätten stormwater holding tank in 2018 (tank 1), led to a commission to provide a new system for tank 2.

INITIAL SITUATION

Tank 2, measuring 37.5 x 15 x 2 m (LxWxD), was not being sufficiently cleaned by two injector jets provided by a competitor. This led to thick deposits in the tank.

EASY ADJUSTMENT OF JET DIRECTION WITH HALFEN® CAST-IN CHANNEL

Due to the unfavourable shape of the tank, we devised a cleaning system that allows the jet direction to be adjusted with ease. This was implemented with the help of various components, including a lap joint flange, pipe clamps, Halfen® cast-in channel and threaded bolts. Alongside the adaptability of the jet direction, the position of the units is extremely important. Based on experience gained across a variety of projects, we specifically aligned our units to ensure that every point in the tank could be thoroughly cleaned. The injector jets were commissioned on 14 May 2019 and have been running perfectly ever since.

Challenge:

Implementation of a tank cleaning system that keeps the tank as free of deposits as possible throughout its operation

Components installed:

2x BR150H/CR
2x MXS3450-PU84 EX

The HOMA product range

- Submersible drainage pumps
- Construction pumps
- Submersible fire pumps
- Submersible deep well pumps
- Submersible waste water pumps
- Submersible pumps with cutter systems
- Domestic waste water disposal units
- Waste water disposal units
- Pre-assembled pump stations
- Agitators
- Tank cleaning systems
- Garden pumps and automatic domestic water systems
- Propeller pumps
- Pump control and automation systems

In operation worldwide

HOMA pumps and systems are employed in over 100 countries worldwide – in a myriad of projects, large and small, including the Palm Islands in Dubai. They meet all international safety and production standards and are certified by the relevant state or private bodies for waste water disposal.
It is one of our main objectives to maintain and extend this high standard at all times.

Sales and service network

HOMA supports its customers through a comprehensive network of professional sales and service agencies. HOMA also makes selecting and designing pump systems as straightforward as possible through HOP.SEL, its specially developed software, available free of charge online or on CD-ROM.

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