

Assembly, Operation, Maintenance of

STANDARD® membrane tube diffusers and membranes



4-2008

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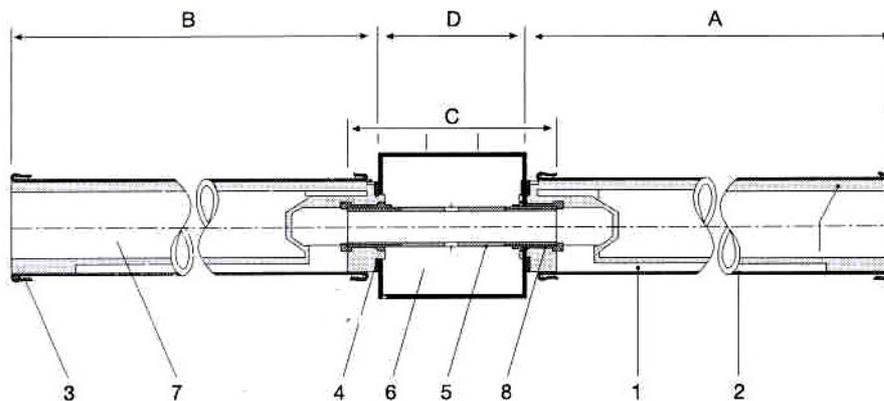
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Technical Data

STANDARD® membrane tube diffuser on square pipe



Membrane tube diffuser
 low buoyancy

1. support pipe PP with air distribution channel
2. membrane
3. clamp
4. gasket
5. connector
6. air header with 2 holes
 \varnothing 45mm or \varnothing 40mm
 depending on diffuser-type
7. flooded compartment
8. thread of inserted bushing
 $\frac{3}{4}$ " female metric or NPT

Assembly on round pipe header is possible as well –
 Call your OTT representative for further information!

A	500	750	1000	effective membrane length	
B	534	784	1034	total length of diffuser	
C	107	127	107	127	length of connection unit
D	80	100	80	100	stainless steel header
E	\varnothing 67	\varnothing 67	\varnothing 67	outer diameter	

Dimensions in mm
 Diffuser-dimensions given are subject to normal fabrication tolerances
 Contact OTT if other header dimensions shall be used or adaptors for other holes are required

1. Introduction

1.1 Control of delivered goods

Each diffuser, particularly the membrane tube, is to be checked for damage that may have occurred during shipping. Damage has to be reported to the freight forwarding company and the seller immediately.

1.2 Storage

The STANDARD[®] diffusers are to be stored in their original packaging in a dry and well-ventilated place in accordance to DIN 7716. Do not store in the open! Measures have to be taken to keep the diffusers away from UV-radiation (sunshine), frost, dust and works (e.g. welding) close to the storage-place. The diffusers should be installed and operated not later than six months after delivery to avoid possibly harmful environmental influences. Long time storage of some spare parts for replacement is possible but due to fast response of our service not necessary in large numbers.

1.3 Layout / flow pattern

The diffusers and the air headers must be arranged as specified in the layout of the plant. The design of the aeration system, e.g. immersion depth, or the distances between the diffusers and the headers must comply with the specifications and the technical presetting of OTT. When using floating or retrievable systems use weights to neutralize buoyancy, and avoid extreme swinging. Any abutting of the diffuser membranes upon internals (other diffusers, headers or racks) will damage the membranes and must be avoided.

For the STANDARD[®] membrane tube diffusers in general, the water flow should be along the longitudinal axis (+/- 45°) of the diffuser. Prevent the diffuser from sidewise oncoming flow. Contact your OTT representative for determining the distance between diffusers and mixers.

2. Assembly of STANDARD diffusers on steel pipes

The air header is to be prepared for installation of the STANDARD[®] diffuser with 45 mm (-0/+1mm) drill holes at opposites sides. The STANDARD is available for replacement or retrofit jobs in a version suitable for 40 mm (-0/+1mm) drill holes at opposites sides, too. Please check the required type of diffuser carefully before you order. The holes must be aligned along one axis (maximum tolerance: +/-0.5mm deviation). The air headers must be height adjustable. Uniform diffuser performance is among other things dependent on an exact setting. In order to avoid clogging from the inside the air supply pipes, drops and header pipes must be cleaned from impurities, such as dust, sand, stones, pieces of wood, etc.

It is obligatory to use our special mounting tool for the STANDARD[®] membrane diffuser and also for counter-holding the opposite Membrane tube diffuser. Do not grab around the membranes; do not install the diffusers by using hands instead of the tool and a torque controlled wrench.

To install a pair of STANDARD[®] diffusers, one STANDARD[®] diffuser (equipped with a connector) is inserted into the air header drill holes and is screwed together with a second diffuser.

The thread of the connector must have a length of 13 to 14 mm on each side of the header! Check the length of the thread carefully, especially if adapters or special headers are used. If the dimensions of the header and the length of the thread of the connector do not fit, the diffusers can not be installed securely.

Tighten to at least 45 Nm using a reliable torque controlled wrench.

Installation against a MNPT threaded pipe (connector): Use a torque of 30 Nm. The length of the thread of the diffuser bushing is 14 mm or 0.55". The diffuser must be mounted against a stop.

Installation with a NPT/metric double nipple (connector): insert the metric thread into the diffuser first. Then use the NPT thread for fastening the diffuser to the pipe. Use a torque of 30 Nm.

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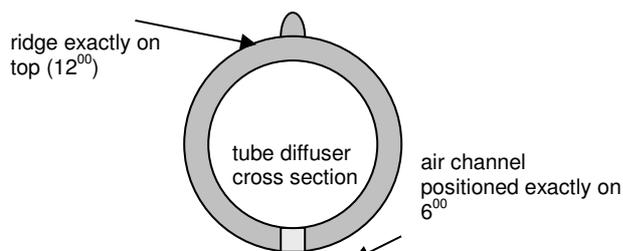
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IMPORTANT:

The installation is correct, if the air channel of the diffuser points towards the basin floor (exact 6 o'clock position).

The ridge on the other side of the air channel must be upturned (exact 12 o'clock position; FLEXSIL membranes have a blue line which indicates the position of the ridge under the membrane). Should the torque react before both tubes reach this position, continue to tighten until the ridge is located in the correct position. It might be necessary to carefully loosen the opposite diffuser before tightening both diffusers in the right position.



The seal should be replaced if unevenly bruised. The tighten down process can be repeated if necessary. Do not lubricate the seal surface!

No work may be done in the basin area after the diffusers have been placed; All works in or at the basin could cause damage to the diffusers (e.g. painting or welding, finishing concrete works and more). Remove all tools and loose objects (even small stones) from the basin floor before filling up the basin with water.

2.1 Test Run

A trial run in the basin using clean water is to be carried out directly after installation. Performance and sealing of each diffuser unit is tested one after the other, using a maximum 20 cm water level over the membrane tube diffusers. The presence of leaks become visible after shutting off the air supply. Due to the lower pressure loss of leaks air bubbles will rise at the leaky places, while the membranes close up.

Before an oxygen transfer testing is conducted, air must be put through the diffuser for at least 24 hours with maximum possible specific airflow rate (see table), in order to guarantee optimum diffuser aeration and to activate the entire perforation of each membrane. Further the rule of the German guideline "Abwassertechnische Vereinigung ATV M209" latest version apply.

2.2 Downtime until start of operation

Should operation not start immediately after the test run, the water level should be increased up to 1 meter. This water level must be maintained until the system is put into operation. Pay attention to water evaporation or ice formation. → During periods of frost, the water level must amount to at least 10% of the frost temperature (in meters). (Example: the water level is 2 m at -20° Celsius) In order to avoid negative environmental influences on the membrane (e.g. UV-light), the period between installation and trial run (water coverage of diffusers) should be as short as possible.

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3. Operation

3.1 General instructions

Oil, dust and solvent free air quality as well as air filtration is required. The intake air must correspond to the requirements laid out in TA (Technische Arbeitsanweisungen). Dust filters for environmental dust are to be designed for a “by count efficiency” of at least 81% in accordance with EN 779 (BS 6540, Ashrae 52-76) filter grade F7 or higher.

The air temperature at diffuser entry may not exceed 80° C for FLEXNORM® or 120°C for FLEXSIL® membranes respectively. Water temperature should be between 5° and 35 ° Celsius. Higher temperatures are possible but please consult your OTT representative in this case for additional information.

3.2 Operational airflow rates for OTT diffusers

perforation types	Diffuser Throughput Rates				
	HE [m ³ /hr/m]	micro [m ³ /hr/m]	fine [m ³ /hr/m]	normal [m ³ /hr/m]	medium [m ³ /hr/m]
min	0,5	1	1	1,5	2
norm	4	7	8	9	12
max	6	12	16	18	24
daily stretching up to	12	16	18	24	30
flushing up to	18	24	27	36	40
shutt off possible:	Yes	Yes	Yes	Yes	Yes

slot size	0.6 mm	1 mm	1.2 mm	1.4 mm	2 mm
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1 m³/hr/m = 0.589 scfm

The operational airflow is depending on the membrane perforation. Bigger membrane pores allow higher air flow rates.

The diffusers should be operated at the maximum possible air flow rate once a week for about 20 minutes. This way biological and chemical precipitations can be kept away from the pores sufficiently.

Do not exceed the above mentioned maximum air flow rates.

3.3 Downtime after operation

After pumping out the basin or taking racks out of the water, take care that deposits and sludge do not begin to dry on the membrane tubes. The diffusers should not be placed in the sun. Dried mineral deposits stick to the membrane, so that cleaning might become impossible.

In case that the basin is drained for a longer time, the diffusers have to be covered with water (see “Downtime until start of operation”). Further: see maintenance instructions.

4. Assembly / Change of membrane-tubes

4.1 Preparation / Cleaning

The polypropylene support pipes have to be cleaned and dried carefully after removing the old membranes and before starting to assemble the new membranes. Do not reuse damaged support pipes.

The entire aeration system has to be checked for dirt in the air headers or racks. All impurities, even dust and sand, have to be taken (washed or blown) out of the headers completely.

Depending on the type of aeration system and local conditions, it could be useful to let air flow through the system during the works. This might avoid sludge to enter the open racks / pipes or air headers. Please contact your OTT representative for additional information.

OTT recommends taking the diffusers out of the basin and conduct the replacement at an appropriate work place.

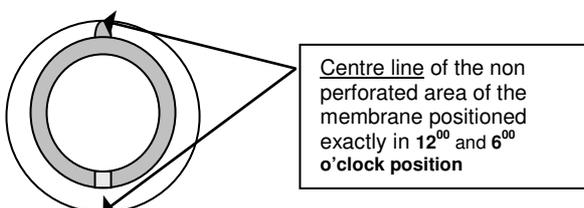
4.2 Assembly of membrane tube

Dry the support pipe of the diffuser.
Push membrane onto the support pipe (away from your body). Avoid using too much force when assembling the membrane tube.
In case of difficulties, use "support air" by carefully inserting the blowpipe of a compressor between sleeve and support pipe.

Never use any lubricant!

Attention, important information relevant for function and guarantee:

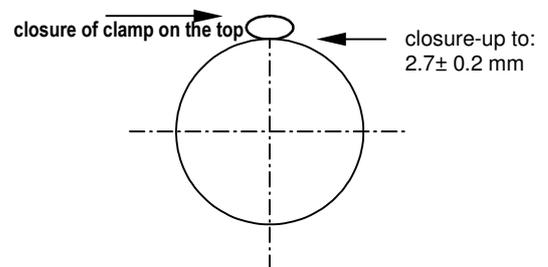
The centre line of the non perforated area of the membrane has to be adjusted exactly on top of the ridge. FLEXSIL[®] membranes do have a blue line in the midst of the non perforated area. This blue line has to be positioned exactly on top of the ridge.



4.3 Assembly of clamps

After the membrane tube is assembled and adjusted on the support pipe, the clamps must be installed on both ends of the membrane. Use only original OTT GmbH clamps, and fasten the clamps with the special pincer tool provided by OTT.

Attention, important information: Clamps have to be closed in a way that there is an opening of 2.7 ± 0.2 mm (see sketch). This way a tight and close fit is ensured.



Closed clamps point exactly to the top (12:00 position). The clamps should be covered by folding up the excess length of the membranes.

4.4 Start up

The membrane tube diffusers are ready for getting reinstalled now. Please read the installation and operating instructions of OTT diffusers carefully and perform a new bubble pattern test before filling up the basin.

Both gaskets of the diffuser have to be changed before the diffuser with the new membrane is assembled again. See the assembly instructions of the complete diffusers for further information.

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5. Maintenance and cleaning of membrane tube diffusers

OTT membrane tube diffusers operate reliable and do not ask for intensive maintenance. Still regular control and maintenance is strongly recommended.

Wastewater contains various components which to a certain extend do settle on the membrane. Some are mentioned below:

- carbonate (water hardness),
- precipitants
- polymeres (sludge conditioning)

Deposits on the diffuser are usually not harmful to the membrane but might affect the pressure loss and bubble pattern.

Certain solvents and oils can have a negative impact on the membrane. In case of questions address to you OTT representative.

Biological films are known to reduce the life time on EPDM rubber membranes. If problems related to biological films must be expected OTT recommends using FLEXSIL membranes.

5.1 Lifetime

The lifetime of a diffuser is mainly depending on the actual process and waste water conditions. Therefore the suitability and quality of the chosen membrane material is important. Please discuss the given situation at the WWTP with the supplier or your OTT representative to make a sustainable choice.

OTT membranes are suitable for a waste water quality as defined in the German „ATV Arbeitsblattes A 115“ latest edition. This means the amount of industrial wastewater may not exceed 20 % of the total wastewater flow. In case of questions please contact your OTT representative. In order to maintain an economic operation and a satisfactory life cycle follow the assembly, operation and maintenance instructions for OTT diffusers.

5.2 Performance control

The best indication for layers and crusts on the membrane is the pressure loss. Monitor the development of your blower pressure over time. Define a critical pressure where measures should be taken.

5.2.1 Flushing with air

First measure should be the flushing with air. This should be done if possible preemptively on a daily basis as described in chapter 3.4.

5.2.2 Cleaning

The diffusers membrane can be cleaned with water and a high pressure cleaner. The distance between the membrane and nozzle of the high pressure cleaner should be at least 0.5 meters.

Alternatively a brush can be used to clean smaller numbers of membranes. If possible put air through the diffusers during the cleaning process.

Important: Mechanical or chemical impact can cause serious damage of the membranes, handle the diffusers and the cleaning equipment with care! The membrane may not be damaged, folded or wrenched while cleaning the diffuser.

Do not use any detergents, solvents, alcohol or acids for cleaning without having discussed the case with your OTT representative.

5.2.3 Flushing formic acid

From a certain point on flushing with air may not be sufficient. The reason can be calcium in the perforation holes of the diffuser. In this case OTT recommends flushing with formic acid. Do not use other acids. The formic acid should be injected into the air supply or drop pipe. Use an acid concentration of 80% and 250 ml/hr per meter installed diffuser length.

Handling acids is dangerous. Wear appropriate protective clothing. Choose a dosing mechanism that does not imperil your health. Contact the acid supplier and follow the prescribed directions for handling acids.

6. Service

It is possible to send a sample diffuser / membrane to OTT GmbH. Deposits and the quality of the membrane will be analysed and an appropriate advise for cleaning and further measures will be worked out. Please clean the diffuser before sending it. Use water (especially clean the flooded pipe) but do NOT brush or clean away the deposits on the membrane. Please take care that the membrane does not dry during transportation - that would affect the test.