

# Assembly, Operation, Maintenance of MAGNUM<sup>®</sup> Membrane Tube Diffusers and Membranes



4-2008

OTT System GmbH & Co.  
Frankenring 21  
D 30855 Langenhagen  
Germany

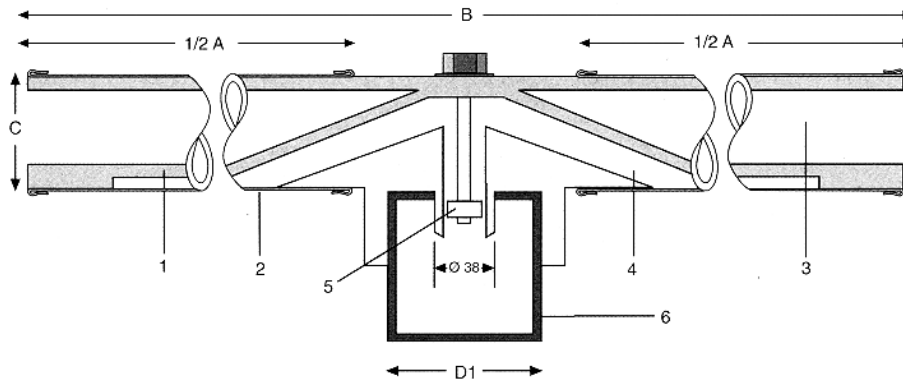
Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: info@ott-system.com  
www.ott-system.com

## Content:

technical data	page 1
assembly of diffusers	page 2
test run	page 3
operation	page 4
assembly (changing) of diffuser membranes	page 5
maintenance and cleaning	page 6

## Technical Data

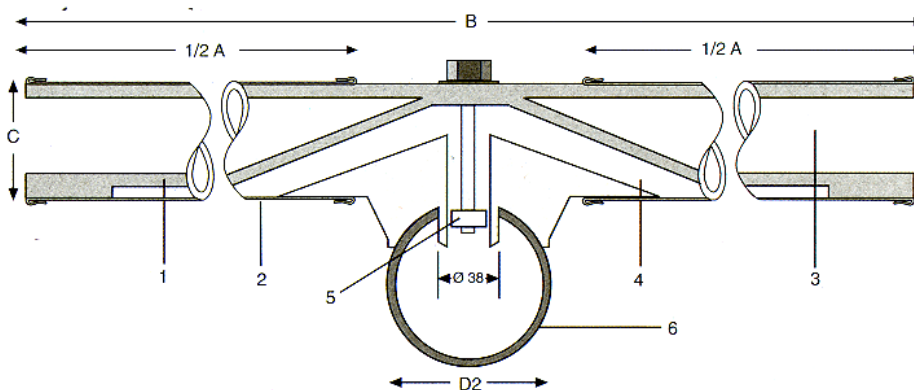
### MAGNUM<sup>®</sup> Membrane Tube Diffuser on square pipe



Membrane Tube Diffuser  
low buoyancy

1. support pipe PP
2. membrane
3. flooded compartment
4. air distribution
5. locking bolt
6. air header

### MAGNUM<sup>®</sup> Membrane Tube Diffuser on round pipe



<b>A</b>	1000	1500	2000	effective membrane length
<b>B</b>	1200	1700	2200	total length of diffuser
<b>C</b>	Ø 67	Ø 67	Ø 67	outer diameter
<b>D1</b>	80 or 100 or 120	outer dimension (width x height)		
<b>D2</b>	88.9 or 114.3 or 139.7	outer diameter (round pipe)		
	= DN80 or DN100 or DN125			
dimension in mm				
all diffuser dimensions are subject to normal fabrication tolerances				
contact OTT if wallthickness of ss pipes is more than 3mm or if plastic pipes shall be used				

# Assembly, Operation, Maintenance of

## MAGNUM<sup>®</sup> Membrane Tube Diffusers and Membranes



4-2008

OTT System GmbH & Co.  
Frankenring 21  
D 30855 Langenhagen  
Germany

Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: info@ott-system.com  
www.ott-system.com

## 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.

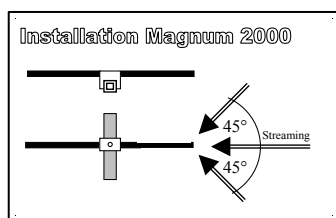
### 1.2 Storage

The MAGNUM<sup>®</sup> 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. Longtime-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 avoid buoyancy, and extreme swinging. Any contact of the diffusers with internals (other diffusers, headers or racks) will damage the membranes and must be avoided.

Strong waterflow can cause diffuser vibrations, especially with the MAGNUM<sup>®</sup> 2000. This could be harmful to the whole diffuser unit. Therefore, the water flow should be along the longitudinal axis (+/- 45°) of the diffuser. Please do not install diffusers under or very close to mixers. Contact your OTT representative for detailed installation advice with regard to the flow regime and mixers.



## 2. Assembly of diffusers

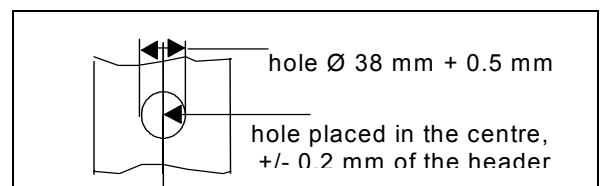
### 2.1 General instructions

The installation of the diffusers should be the final step of all necessary installation works in the area of the basin. Avoid damages by finishing concrete works, welding, painting, or any other activities before you take the diffusers out of their boxes. Remove all impurities or loose parts from the basin floor, walkways and side walls.

Before installing the diffuser, all impurities, such as dust, stones, pieces of wood, etc. must be removed from the inside of the pipes and headers.

For the correct installation of the diffuser the following requirement must be fulfilled:

- diameter of connection hole: 38 +0.5 mm
- the hole must be exactly centred on top of the air header.
- the holes must not be located in the welded area of the air header
- the holes must be free of burrs, particularly on the inner edge
- the surface of the header has to be free of buckles. Deformations in the area of the holes cause leakages.
- the air headers must be height adjustable.



- For a proper installation the diffuser and header have to be dry. Wet parts falsify the required torque.
- The ambient temperature should be above 0°C.
- Change both gaskets (spare parts) if the diffuser is installed for a second time (e.g. after changing the membranes).
- If a (cordless) drill is used, the drill must not exceed 60 rpm. The assembly has to be finished using a reliable torque controlled wrench as described above.

# Assembly, Operation, Maintenance of

## MAGNUM<sup>®</sup> Membrane Tube Diffusers and Membranes



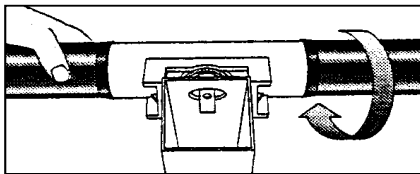
4-2008

OTT System GmbH & Co.  
Frankenring 21  
D 30855 Langenhagen  
Germany

Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: [info@ott-system.com](mailto:info@ott-system.com)  
[www.ott-system.com](http://www.ott-system.com)

### 2.2 Diffuser installation in 3 steps

1. Insert the diffuser into the bore hole using the fastening bolt (Clip-In<sup>®</sup> system). The symbol (recycling/material PP) on the middle part of the diffuser must point towards the installing person. The locking bolt is turned in line with the pipe (see picture below).
2. Insert the bolt into the bore hole, away from the body of the mechanic.



3. After the diffuser is clipped into the hole tighten down the connection ONCE by using a torque wrench, with a torque of **27 Nm!** Do not retighten the diffuser after the torque once has been reached!

You can watch an online installation movie on our website at [www.ott-system.com](http://www.ott-system.com) in the category products and the sub-category MAGNUM.

### 2.3 Test Run

In order to avoid any kind of negative impact on the installed diffusers, keep the period between installation and trial run (water coverage of diffusers) as short as possible.

Fill up the basin carefully with clean water (e.g. from the clarifiers) until the diffusers are covered with 10 inch of water. Make sure that the inflowing water does not fall directly on the diffusers or damages them!

The trial run in the basin should be carried out directly after installation. The water tightness of the installed diffusers can be tested, by shutting off the aeration. While the membranes close up, leaks would keep putting air through.

Use the test run for starting up the diffusers.

**For an optimum performance the diffusers must have been in operation for at least 24 hours at a maximum possible specific airflow (see table). This is especially important before oxygen transfer tests.**

### 2.4 Downtime until start of operation

After the trial run and start up phase the system can be operated. If the operation cannot be started directly, the water level should be increased up to 1 meter minimum, and maintained until the system is put into operation. Pay attention to water evaporation or ice formation. During periods of frost, the basin should be filled up to a swd of 3 m (10 ft).

# Assembly, Operation, Maintenance of

## MAGNUM<sup>®</sup> Membrane Tube Diffusers and Membranes



OTT GROUP

4-2008

OTT System GmbH & Co.  
Frankenring 21  
D 30855 Langenhagen  
Germany

Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: info@ott-system.com  
www.ott-system.com

### 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. The 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 of the diffusers

perforation types	Diffuser Throughput Rates				
	HE	micro	fine	normal	medium
	[m <sup>3</sup> /hr/m]	[m <sup>3</sup> /hr/m]	[m <sup>3</sup> /hr/m]	[m <sup>3</sup> /hr/m]	[m <sup>3</sup> /hr/m]
<b>min</b>	<b>0,5</b>	<b>1</b>	<b>1</b>	<b>1,5</b>	<b>2</b>
norm	4	7	8	9	12
<b>max</b>	<b>6</b>	<b>12</b>	<b>16</b>	<b>18</b>	<b>24</b>
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
-----------	--------	------	--------	--------	------

$$1 \text{ m}^3/\text{hr}/\text{m} = 0.589 \text{ scfm}/\text{min}/\text{m}$$

The operational airflow is depending on the membrane perforation: Bigger membrane pores allow higher air flow rates as shown in the table above.

The diffusers should be operated at the maximum possible air flow rate once a week for about 20 minutes. This way scaling and fouling can be minimized sufficiently.

Do not exceed the above mentioned maximum air flow rates.

#### 3.3 Downtime after operation

In case a basin is taken out of operation, and cannot be drained, it must be avoided that the diffusers get covered by anaerobic sludge. Either the active biomass must be flushed out or kept in suspension by mixers.

After pumping out the basin or taking aeration grids / racks out of the water, take care that deposits and sludge do not 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 emptied for a longer time, the diffusers have to be covered with water (see "Downtime until start of operation"). Further: see maintenance instructions.

OTT System GmbH & Co.  
Frankenring 21  
D 30855 Langenhagen  
Germany

Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: info@ott-system.com  
www.ott-system.com

## 4. Assembly / Change of membrane-tubes

### 4.1 Preparation / Cleaning

The polypropylene support pipes (bodies) of the diffusers 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.

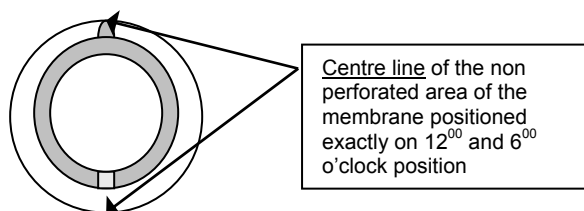
### 4.2 Assembly of membrane-tube

Dry the support pipe (body) 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<sup>®</sup> 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.

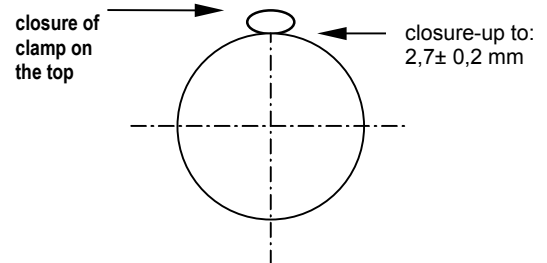


### 4.3 Assembly of clamps

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  $2,7 \pm 0,2$  mm (see sketch), this ensures tight, close fit on the membrane sleeve.



**Closed clamps point exactly to the top (12:00 position).** The clamps are covered with the excess length of the membranes by folding it back.

Both sealings 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.

### 4.4 Start up

The membrane tube diffusers are ready for start-up now. Please read the installation- and operating- instructions for the completed diffusers carefully and perform a new bubble pattern test.

OTT System GmbH & Co.  
Frankenring 21  
D 30855 Langenhagen  
Germany

Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: info@ott-system.com  
www.ott-system.com

## 5. Maintenance and cleaning of membrane tube diffusers

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

Wastewater contains various components which to a certain extent 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 economically operation and a long 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.

### 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

# Assembly, Operation, Maintenance of MAGNUM<sup>®</sup> Membrane Tube Diffusers and Membranes

4-2008

---

**OTT System GmbH & Co.**  
Frankenring 21  
D 30855 Langenhagen  
Germany

Tel: +49 (0)511 / 78631 0  
Fax: +49 (0)511 / 78631 40  
Email: [info@ott-system.com](mailto:info@ott-system.com)  
[www.ott-system.com](http://www.ott-system.com)

---



membrane does not dry during transportation - that  
would affect the test.