

# ASSEMBLING AND OPERATING MANUAL

## Tube diffuser Wilo-Sevio ELASTOX®-T



# ASSEMBLING AND OPERATING MANUAL

## Wilo-Sevio ELASTOX®-T



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## **1. General notes**

This installation and operating manual is part of the diffuser supply. Please carefully follow the hints given in order to avoid application, installation and operating faults which might cause damage to the diffusers and/or operating failure of the aeration system.

WILO GVA ensure proper quality and the mechanical strength of their products when used for the application intended. However, in case of defect, if any, warranty is restricted to a repair of the diffusers free of charge or to the replacement of the diffuser and/or individual components which were complained in a justified manner. Unless otherwise agreed in writing, WILO GVA shall not be responsible for the cost of installation and demounting and incidental cost in that connection.

No claims for damage and operating failure shall be accepted which occurred because the operating manual had not been followed. Damage and operating failure due to fouling or scaling effects at the waste and air side shall also be exempted from warranty.

Other claims, on particular for consequential damage, shall be excluded.

In case of question concerning the operating manual or other technical inquiries please contact our office:

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## **2. Wilo-Sevio ELASTOX®-T fine bubble tube diffuser**

### **2.1. Application for the purpose intended**

The Wilo-Sevio ELASTOX®-T fine bubble membrane tube air diffuser is a high-quality product which meets the requirements of fine bubble pressurised aeration systems in modern wastewater treatment installations. Our aeration systems – which have proven their worth since the mid of the 80s – are characterised by high economics and safety in operation, flexibility of the application and operating mode.

The perforated rubber membranes of synthetic rubber are a major component of the rubber membrane diffusers. They come in an EPDM quality which is particularly resistant to ageing and is standard for applications in municipal wastewater installations.

#### **2.1.1. Composition of the wastewater**

The EPDM membrane is characterised by a very good resistance to municipal wastewater the composition of which is in compliance with the requirements of the work sheet No. 115, latest version of “Abwassertechnische Vereinigung” (ATV, Association of Wastewater Treatment Installations). Complete evidence shall be furnished in this connection.

However, a number of chemical compounds may affect the service life of the rubber membrane, which include oils and fats of any kind as well as most of organic solvents and halogenated compounds. Fat contents as occurring in domestic wastewater do not present a risk here.

For applications in the field of industrial wastewater treatment please contact WILO GVA in any case to clarify whether there wastewater content matter or increased oil and fat contents which might affect the EPDM material and whether alternative membrane grades should be used. If detailed information of the composition of the wastewater is not available, it is necessary to carry out preliminary tests under practical conditions.

The rubber membrane diffusers are suitable for intermittent operation for selective nitrification / denitrification. However, application in an anaerobic environment should be avoided as the material has an insufficient resistance to methane. Make sure in any case to prevent anaerobic zone formation, e.g. due to sludge deposits near the diffuser installation.

#### **2.1.2. Mechanical cleaning stage**

Application of fine bubble pressurised aeration systems required appropriate raking, fat and sand traps. If the mechanical cleaning stage is insufficient or not provided, the efficiency and service life of pressurised aeration system will be reduced in general.

#### **2.1.3. UV radiation**

UV radiation will reduce the quality of the rubber membrane after a certain period of time and thus the service life of the latter, thus rubber membrane diffusers should be protect from UV light in any case. During the interruption of operation and/or draining the basins, avoid UV influences, for instance, by filling in water.

#### **2.1.4. Temperature**

The water temperature should be between + 5 °C and + 32 °C. The air temperature at the inlet to the diffusers should not exceed + 60 °C in continuous operation. If – due to the local conditions – higher average temperature must be expected, please contact WILO GVA prior to application.

|  |  |  |  |                                  |   |
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|--|--|--|--|----------------------------------|---|



### 2.1.5. Compressed air quality requirements

Prior to the selection of compressors for the generation of compressed air make sure that absolute oil-free operation is ensured. Dust filters for ambient dust shall be designed in compliance with filter class EU4 of the European Classification acc. to DIN 24185 (old designation: filter class B2), degree of separation larger than 90 %.

**The air blown into the system must be free from oil, dust and solvents.**

### 2.1.6. Pipeline system requirements

**Material selection** The air distribution piping system shall be dimensioned and arranged according to the dimensioning and design requirements of the aeration system. Select the piping material with due consideration given to their application specific suitability. Check the chemical resistance to the water and/or air side medium. If the application of cleaning chemicals is considered for cleaning the aeration system, material selection of the distribution piping shall also be adapted to the use of cleaning chemicals.

If an existing compressed air distribution piping system is used after the extension or upgrading of an activated sludge plant, check the corrosion resistance. It should be avoided that particles become loose and enter the diffuser via the air flow due to corrosion of the existing pipelines and pipeline installations, e.g. fittings (Refer also to 3.1.3. Cleaning of the pipeline system).

#### **Levelling**

The future level position of all diffusers in one basin should not exceed a difference of 20 mm, if possible, otherwise uniform air distribution cannot be ensured.

If more than one aeration basins are supplied by one air system without automatic regulators for the air supply to the individual basins, the above requirement shall be applicable to the overall system. We will not resume responsibility for any consequential phenomena which might result from uneven air distribution.

**The pipeline distribution system shall be levelled horizontally at the basin bottom.**

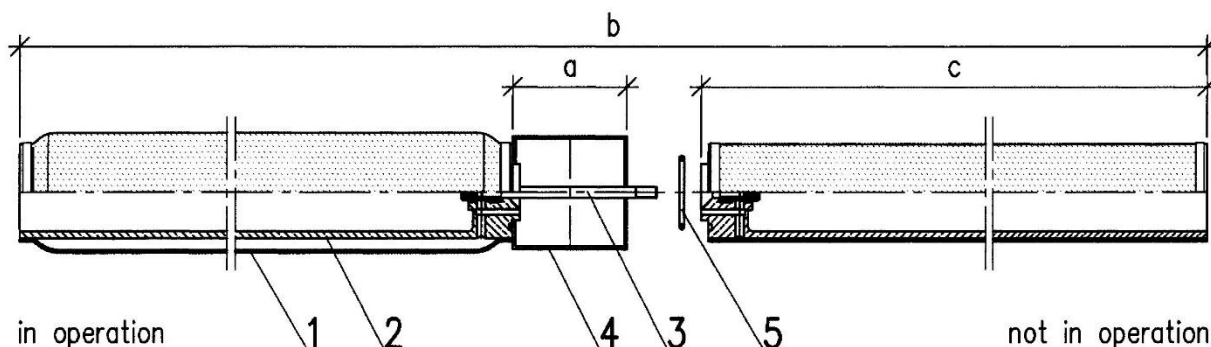
# ASSEMBLING AND OPERATING MANUAL

## Wilo-Sevio ELASTOX®-T



### 2.2. Technical data

#### 2.2.1. Dimensions, material, weight, buoyant forces



| No. | designation     | material                       |
|-----|-----------------|--------------------------------|
| 1   | rubber membrane | special grade rubber / silicon |
| 2   | supporting body | polypropylene                  |
| 3   | tie rod         | stainless steel                |
| 4   | aeration grid   | stainless steel                |
| 5   | O – ring        | NBR                            |

| weight / dimensions / buoyant forces  |      | Wilo-Sevio ELASTOX®-T |          |          |          |
|---|------|-----------------------|----------|----------|----------|
|   |      | ER 400                | ER 500   | ER 750   | ER 1000  |
| perforated length of membrane   | [mm] | 400                   | 500      | 750      | 1.000    |
| total length of diffuser  | [mm] | 445                   | 585      | 831      | 1.082    |
| diametersupporting tube   | [mm] | 65                    |          |          |          |
| weight / pc diffuser  | [kg] | ca. 0,64              | ca. 0,81 | ca. 1,06 | ca. 1,33 |
| The pipeline supports and mounts shall be designed and dimensioned with due consideration given to the buoyant forces mentioned below. The buoyant forces shall be taken into account particularly for removable systems. |      |                       |          |          |          |
| buoyant force / pair  | [N]  |                       |          | 20       | 25       |

## 2.3. Mounting and sealing accessories

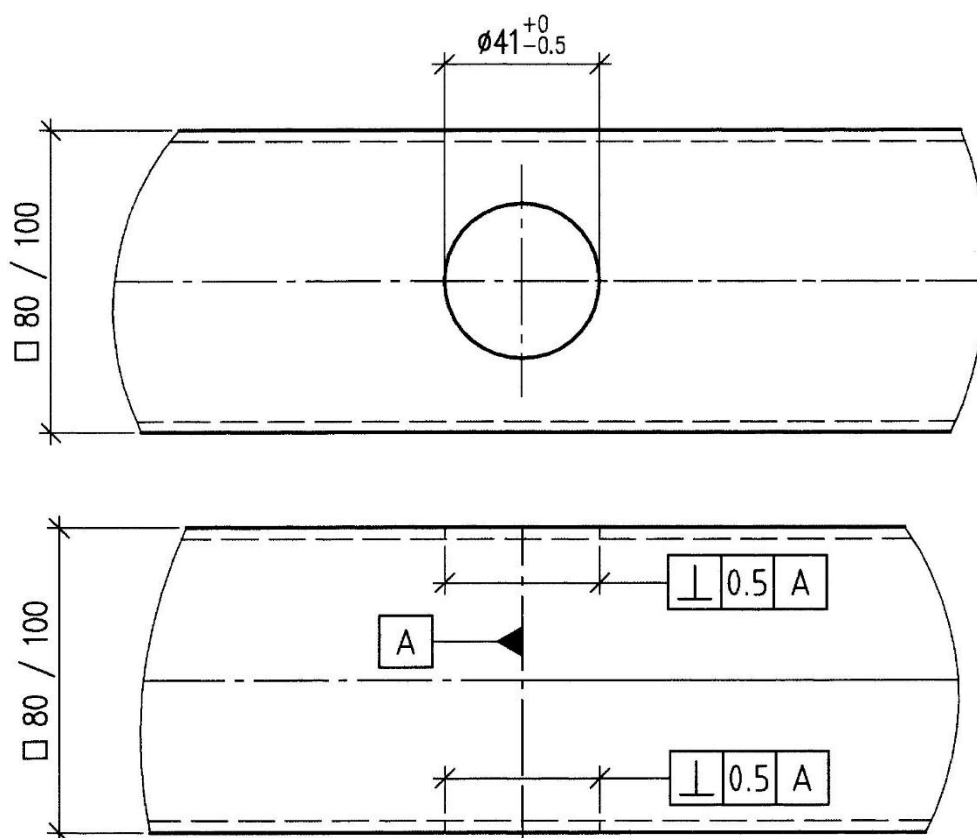
### 2.3.1. Mounting to square and / or rectangular pipe

The supporting body of the tube air diffuser Wilo-Sevio ELASTOX®-T is a continuous injection moulded piece with integrated air injection and a stainless steel threaded bush M 8 for installation. Galvanized steel or stainless steel pipes with square or rectangular section give the most favourable conditions for the arrangement of hose diffusers. The tolerances of straightness and parallelism of the pipes have to obeyed absolutely.

The preferred mounting of the diffusers to square or rectangular pipes is in pairs. The diffuser pairs are fastened by a tie rod. The outside size of the pipes, in axial direction of the bores determines the length of the tie rods and must be known at latest when ordering the diffusers. The diffusers are sealed easily against the pipe by means of appropriate O-rings.

| dimensions / pair   |      | Wilo-Sevio ELASTOX®-T |           |           |           |
|---------------------|------|-----------------------|-----------|-----------|-----------|
|                     |      | ER 400                | ER 500    | ER 750    | ER 1000   |
| total length / pair | [mm] | a + 890               | a + 1.170 | a + 1.662 | a + 2.164 |
| length of tie rod   | [mm] | a + 42                |           |           |           |

The pipes get opposite bores  $\varnothing 41^{+0}_{-0.5}$  mm, which serve as air supply and centring for the diffusers. The size of the pipes should be 70 mm at least in the region of the bores, in order to guarantee the well sit of the diffusers.



### 3. General installation hints

#### 3.1. Preparation of installation

##### 3.1.1. Weather conditions

No installation should be carried out at temperatures below + 5 °C. If installation work is carried out under adverse weather conditions such as heavy rain or snow or at temperature below 5 °C, cover the basins by means of a tent, if necessary, and heat them. In any case protect the diffusers from any mechanical load (e.g. snow and ice masses) at low temperatures.

##### 3.1.2. Cleaning of basins

Unless otherwise agreed, prior to the installation of the diffusers, all construction and mechanical work (e.g. welding, drilling, cutting and grinding) at the activated sludge basin must be completed. The basin must be pointed and ready to accept a water filling. Clean the basin prior to installing the diffusers, remove any object (e.g. sharp stones, broken glass, nails, etc.) which might mechanically damage the diffuser membrane.

##### 3.1.3. Initial cleaning of the piping system

The compressed air supplying system must be ready for operation and inspected for proper functioning. When installing the rubber membrane diffusers make sure that the piping system is absolutely clean. Blow out the compressed air piping system with the maximum possible quantity of compressed air. If the pipelines are not cleaned carefully, contaminants such as sand, earth, slag and other foreign bodies entrapped during installation may collect between the rubber membrane and the supporting structure.

The proper functioning of the diffuser and in particular its tightness to penetrating water and sludge is affected, mechanical damage to the diffuser is possible and no guarantee claims will be accepted by the manufacturer.

To achieve efficient air scavenging it is necessary to reach a high flow rate in the aeration grids. Thus we recommend to carry out air scavenging for isolated aeration grids/areas one after the other or in small groups.

The period of scavenging depends on the air rate, the length of the aeration grids and/or the number of grids per aeration field and in particular on the degree of pollution. If heavily polluted, clean additionally by means of a high-pressure cleaning unit prior to installing the diffusers. In any case, careful removal of all pollutants shall be ensured.

Blow the pipelines free at a high air flow rate.

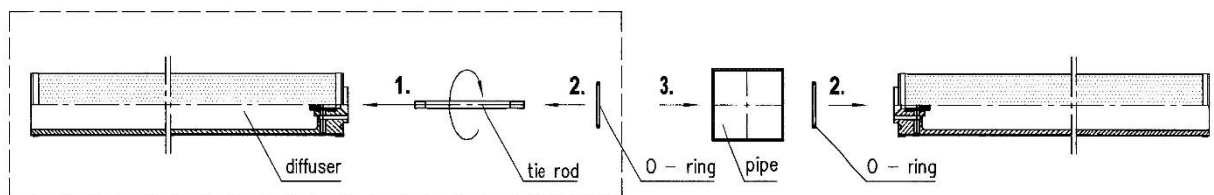
**Blow the pipelines free at a high air flow rate.**

### 3.2. Installation instructions for Wilo-Sevio ELASTOX®-T

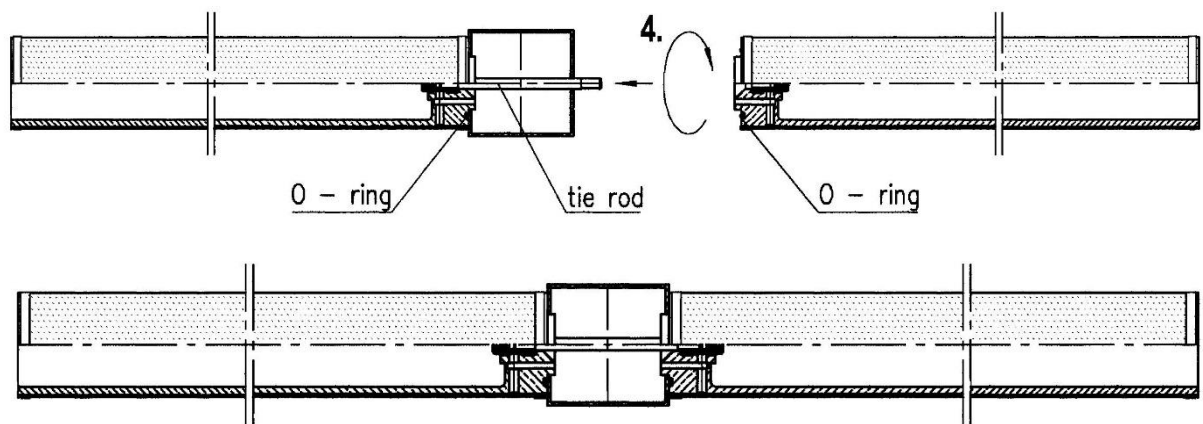
- Mount the diffusers only prior to starting the system in order to avoid adverse influences during longer standstills.
- Check each diffuser for damage prior to installation.
- Seal the diffusers by means of the appropriate O – rings.
- Do not enter the diffusers. Do not place materials onto the diffusers. Protect the diffusers and the membranes from damage. Excessive force application and the use of tools which might damage the diffusers must be avoided.

For installation proceed as follows:

1. Screw one thread end of the tie rod completely into a diffuser.
2. Put the O – rings into the designed round grooves of the both diffusers. Please spread a little bit of soft soap on the O – rings in order to increase the sliding and improve the tightness. (Do not use any mineral grease, because this can have an effect on the quality of the membrane).
3. Put the diffuser with screwed tie rod through the boreholes of the aeration grid.



4. Screw on the other diffuser. Please take care for the right position of the diffuser in the boreholes of the grid.
  - Please screw on the diffuser by hand with normal power. A torque of approx. 20 Nm corresponds to the normal force applied by a fitter and ensures the tight seat of the diffuser. Avoid leaks in any case.



### **3.3. Blowing the piping system free**

Prior to the final installation of all diffusers and starting the aeration system again clean the piping system carefully. Place only some of the diffusers onto the aeration grids. Depending on the position of air supply leave the last diffuser position at the end of each aeration grid free in the direction of air flow. If a larger number of diffusers (> 10 pieces) are mounted per aeration grid, leave free the two last diffuser connections at the supply point.

### **3.4. Shutting down between diffuser installation and test operation / start – up**

If no test operation or start-up can be carried out immediately on completion of diffuser assembly, ensure sufficient water coverage of the diffusers to avoid external environmental influences (e.g. UV radiation, frost, algae growth). If necessary, clean the diffusers again prior to test operation or start – up.

## **4. Test operation and leakage test**

Immediately on completion of diffuser assembly it is necessary to carry out an operation test and a leakage test of the whole aeration system with the diffusers slightly covered by water. This requirement is applicable in particular if intermittent operation of the aeration system is planned for the future. If leakage was found, correct and check again. Freedom from leakage shall be confirmed by the client in the installation report. No guarantee claims will be accepted in case of a missing leakage test or insufficient improper leakage test. We do not resume any responsibility for consequential damage in that connection.

Carry out the operation test and leakage test with the diffusers slightly covered by water (approx. 5 cm). Higher covers make the detection of minor damage or leaks difficult. Use clean water for water filling. The effluent of secondary sedimentation basins is not suited due to its foaming tendency.

Enter the basin for inspection, because damage and leaks cannot be surely detected from the basin edge. Wear appropriate protective clothing.

Do apply as low volume of air as possible to the aeration system during inspection. Leaks can be detected better in this way. Check the gassing pattern when applying the nominal air volume.

- **Low water coverage of the diffusers (approx. 5 cm)**
- **Use clean water without foaming tendency**
- **Enter the basin for inspection**
- **Select a low air volume for the leakage test**
- **Select the nominal air volume to check the gassing pattern**



#### **4.1. Pipelines and aeration grids**

- **Check for leaks, in particular at welding seams and connection points (flanges, pipe clips, screwed joints, saddle clamps))**

#### **4.2. Diffusers**

- **Check the mounting of the diffusers for leaks and/or improperly mounted gaskets or defective threaded connections. Leaks can be detected by big air bubbles emerging immediately around the diffusers**
- **Check the rubber membrane for damage, if any, seen as clearly bigger air bubbles.**
- **After having inspected a clear section, shut off the air for this section to carry out a second inspection.**

If leaks were not found during the inspection, they become visible as intensive after-gassing with the air supply shut down. Minor fine bubble after-gassing at the diffuser membrane is normal and not an indication of leaks.

If a striking uneven air distribution is observed when applying the nominal air volume to the diffusers, check the diffusers again for exact levelling, correct, if necessary. Initial minor uneven distribution of the air may be due to a different hydrophobic behaviour of the membranes depending on the product which will be compensated after approx. 2 weeks within the period of working in.

### **5. Start – up**

Proper assembly including cleaning the pipeline system by blowing, operation test and leakage test are requirements for the start-up of the aeration system. The customer shall confirm proper implementation in the enclosed industrial acceptance certificate (Refer to 10. Appendix). Regulation and control of compressed air generation and distribution, including pressure monitoring, must have been subject to functional tests.

New rubber membranes may have a different hydrophobic behaviour depending on the product which will be compensated in normal cases during a 2 week operating phase. The typical bubble pattern is generated and the full oxygen supply capacity is reached only after the phase of working in.

The diffusers must be filled during this period in accordance with the normal operating conditions specified. In case of intermittent operation, ensure a daily minimum operation period of 15 minutes. After the working in phase, the switching on frequency can be reduced to 1 x per week.

## **6. Operation of the Wilo-Sevio ELASTOX®-T tube diffuser**

### **6.1. Continuous operation**

In continuous operating mode, operate the ELASTOX membrane tube air diffusers in the air application range specified in the following. Ensure by suitable regulation and control systems of the compressed air supply system that the diffusers are operated in the specified air application range. Make sure not to exceed maximum application to avoid damage to the diffuser due to overload.

| Diffuser type         | airflow [Nm <sup>3</sup> /h m] |               |                    |
|-----------------------|--------------------------------|---------------|--------------------|
|                       | nominal airflow                | range airflow | scavenging airflow |
| Wilo-Sevio ELASTOX®-T | 8                              | 0 – 10        | 15                 |

For more details on air application, oxygen utilisation and pressure losses refer to the relevant technical information.

### **6.2. Intermittent mode**

The intermittent air application feature is one of the outstanding characteristics of the ELASTOX® membrane tube air diffuser.

If the intermittent mode is applied during a selective nitrification / denitrification process, no special precautions are necessary except the absolute tightness of the installation system. If, however, the diffusers are very seldom filled with air (e.g. during the season only), some additional measures should be noted:

- Deposits at the base near the diffusers must be avoided by using suitable recirculation systems.
- It cannot be excluded after longer shut-downs that water penetrated the aeration grids. To avoid overload, do not fill in the air abruptly but increase the volume gradually when re-connecting the aeration system.
- Scavenge the diffusers once a week under normal operating conditions, at the max. air rate (Refer to 7.3 Scavenging mode). It may be convenient to provide automatic scavenging at regular intervals (e.g. daily for 10 minutes) also for continuous operation.

### **6.3. Diffuser assignment**

When using an inclined flow aeration process (aeration by separate recirculation, e.g. in intermittent mode), take into account the specifications of the mixer manufacturer when arranging the mixers at the diffusers in order to prevent mixer damage.

For safety reasons make sure to avoid the initiation of flows at a rate of > 1 m/s near the diffusers due to external influences (e.g. recirculation pumps, supply lines, mixers and / or wastewater accelerators). No guarantee claims will be accepted for damage to the diffuser caused by unforeseen flow conditions.



## 7. Maintenance

### 7.1. General notes

The economics and service life of the aeration system depends, among other things, on the high elasticity, fine bubbles and low pressure loss of the high-quality rubber membrane. Maintenance and care measures are required to ensure these characteristics on the long term.

The proper functioning of the aeration system can be monitored optically by means of the gassing pattern or the operating pressure. In case of irregularities, find out and eliminate the cause immediately, if necessary, to avoid consequential damage.

- **Any pressure increase in the aeration system must be checked in any case if it exceeds 100 % of the initial value (recorded at the time of start-up) under the same situation of operation.**
- **Subject the diffusers to a visual check in any case.**
- **Avoid pressure losses exceeding 120 mbar in any case and in any situation of operation, because permanent damage to the diffuser cannot be excluded.**

### 7.2. List of possible failures

#### Occurrence of individual coarse air bubbles:

|                      |  |
|----------------------|--|
| Possible cause       | Clogging around individual diffusers may occur, in particular if coarse matter is eliminated insufficiently only.  |
| Recommended measures | Increased clogging does not damage the rubber membranes, however, may reduce the efficiency of the aeration system. Extreme loads due to pigtail formation may cause mechanical damage (break off). Subject the diffusers to a visual check, replace, if necessary, or clean them. |

#### Increased operating pressure:

|                |  |
|----------------|--|
| Possible cause | Increased water level, defective pressure gauge indication, wrongly throttles regulation fittings, wrongly set oxygen values, deposits in the pipelines. |
|----------------|--|

#### Increased pressure loss and/or worsening of the gassing pattern:

|                      |  |
|----------------------|--|
| Possible cause       | The rubber membranes are subject to a normal ageing process which results in a gradual hardening of the membranes and causes an increase in the gassing resistance of the membrane and worsening of the gassing pattern. Content matter from the wastewater or air side may reduce the quality of the rubber membrane. Clogging of the diffuser membrane may be due to process dependent deposits (e.g. scaling or fouling processes). |
| Recommended measures | Operating period of more than 10 years can be achieved in municipal wastewater treatment applications. The ageing process of the membranes depends on the local operating conditions. After a service  |

life of more than 5 years, we recommend to have the diffuser membranes inspected by WILO GVA.

The frequency of inspection should be increased if information is available that the wastewater contains substances critical to the rubber quality, or if wastewater is treated (in particular industrial waste) the exact composition of which is not known. Inspection of the diffuser membranes by WILO GVA is recommended, replacement of the diffuser cannot be avoided under certain circumstances.

Avoid process dependent deposits by process optimisation (e.g. pH regulation, optimisation of the precipitant dose). Carry out prophylactic scavenging at regular intervals.

- Refer to Scavenging mode
- Clean the diffusers, if necessary

If no correction is made in due time, the membrane slots may be clogged so that cleaning is not successful or the diffuser membrane has been permanently damaged due to overload. The membranes must be replaced in such cases (Refer to Replacement 7.5.).

### **7.3. Scavenging mode**

Wastewater cleaning in the activated sludge stage comprises quite a number of biological, chemical and physical-chemical processes and reactions. Depending on the composition of the wastewater, loading and process control of the plant, more or less striking biological deposits (fouling) and scaling effects (mineral deposits) may occur. Deposits at the membrane and in particular in the membrane slots must be avoided in any case because they will result in a reduction of pressure loss and service life of the diffuser on the long term. Depending on the air application, the flexible rubber membrane is subject to alternating expansion and relief which effects self cleaning and may “blow off” mineral deposits. If this self cleaning effect is not sufficient scavenge in addition at regular intervals.

Process dependent deposits at the membrane can be removed easily at the beginning, thus we recommend scavenging immediately after start-up at regular intervals. To prevent deposits at the membrane we recommend to switch off aeration at least once per week for a short period and to operate the diffusers then for approx. 10 minutes with max. air application. In any case, scavenge in intermittent mode after longer standstills (e.g. operation during the season) and in continuous operation with low air application volumes (below 2 Nm<sup>3</sup>/h·m).

If increased process dependent deposits are expected (e.g. simultaneous precipitation, dairy waste, increased hardness), we recommend an appropriately adapted scavenging process for prophylactic reasons. However, this precaution does not fully prevent the formation of process dependent clogging phenomena.

### **7.4. Cleaning**

Depending on the degree of fouling, biological deposits cannot be avoided by scavenging and self cleaning effect. In this case, high-pressure cleaning after having drained the basin or removal of the aeration fields at certain intervals should be planned. One or two cleaning operations per year should be carried out for wastewater with a high industrial waste portion.

The diffusers can be cleaned from outside by spraying with a high-pressure cleaner. The spray nozzle should be used here and a sufficient distance to the diffuser should be kept (at least approx. 50 cm). Use of fine nozzles is not permitted because damage to the membrane cannot be avoided.

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|--|--|--|--|----------------------------------|---|

The water temperature should be between 5 and 50 °C. Follow the hints of the manufacturer of the equipment.

Pollution, if any, in the gassing slots can be removed by injecting a suitable cleaning liquid into the air flow. Please contact our after-sales service for suitable cleansing chemicals.

#### **7.5. Replacement of diffusers and / or diffuser membranes**

A used diffuser has a higher pressure loss as compared with a new one, thus we recommend – when diffusers and/or diffuser membranes must be replaced – to replace all diffuser units of an isolated diffuser line, even if only some of the diffusers are defective. Mixing old and new diffusers should be avoided, if possible in order to prevent uneven air distribution. Prior to re-installation, clean the aeration grids and remove all sludge. After having installed the diffusers carry out an operating test and a leakage test (Refer to 4. Test operation and leakage test).

#### **7.6. Differential pressure measuring unit to monitor the pressure loss of the diffusers**

Use the pressure loss at the diffuser as a parameter to monitor the diffusers. Normally, the functioning of the diffuser is monitored by the pressure in the piping system. However, the standard pressure gauges used here have to insufficient a measuring accuracy in most cases.

We recommend installation of differential pressure measuring systems with a 10-fold higher measuring accuracy. For further details please contact our after-sales service at any time. For further details please refer also to the relevant technical information.

#### **7.7. Test lances to visually monitor the diffusers**

In case of irregularities (changing gassing pattern, changing pressure conditions) the diffusers should be subject to a visual inspection. This is possible without difficulty with systems which can be removed from the water during operation. For aeration systems which are fixed at the basin base, in most cases several basin units are available from which one can be drained then. Another possibility is to install a so-called test lance with a few diffusers which can be easily removed from the basin without draining the latter.

If diffusers are replaced, do also replace the diffusers of the test lances.

#### **7.8. Maintenance**

Follow the relevant safety instructions when the basins are drained or aeration grids are lifted from the basin by means of lifting tackles for maintenance work, Make also sure that the deposits at the diffusers will not dry during maintenance.

### **8. Determination of the oxygen transfer efficiency in pure water**

Oxygen efficiency transfer tests in pure water in order to check the efficiency of the aeration units should be carried out with due consideration given to ATV sheet M 209.

The conditions of testing shall in any case co-ordinated with WILO GVA otherwise no claims for guarantee can be accepted.

Oxygen efficiency transfer tests should be carried out only after a working in phase of at least two weeks, otherwise reduction in the oxygen efficiency cannot be excluded (Refer to 5. Start - up).

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Water with potable water quality shall be used for the pure water tests, biologically cleaned waste or water with algae growth is not suitable (for more details refer to the ATV hints). If algae are in the water during the working in phase under adverse conditions, clean the diffuser and the basin and re-fill the basin in any case.

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## **9. Packing, transport and storage**

### **9.1. General hints**

Adverse influences which may result in a change of the physical properties of rubber and plastic components will occur when the latter are stored and handled improperly and result in a reduced service life. Excessive hardening, softening, permanent deformation, cracks and other surface damage are the consequence. Store the products according to DIN 7716.

Protect the ELASTOX® rubber membrane diffusers from weather influences such as frost, hail, direct sun radiation and other mechanical damage.

### **9.2. Packing and transport**

Transport and store the diffusers and their spare parts in their original packing only. A guarantee for ELASTOX® rubber membrane diffusers is granted only in case of original and undamaged packing. Do not stack originally packed pallets one above the other!

### **9.3. Storage**

#### **9.3.1. Store room and temperature**

Do not store the diffusers in the open! The store rooms shall be cool, dry, gently ventilated, dark and free of dust. The room should have a temperature between + 5 °C and + 25 °C. Higher temperature alter the physical properties while all rubber grades and plastic components become stiff at low temperatures.

#### **9.3.2. Heating and humidity**

If it is necessary to heat the store room, screen the radiator and keep the material to be stored at a distance of approx. 1 m. The store room should have a low humidity, max. 65 %. Please make sure not to use moist rooms.

#### **9.3.3. Lighting and ozone generation**

Light and lighting is of utmost importance. Any rubber product must be protected from light with a high UV portion, in particular from direct sun radiation.

In addition to the UV radiation coming from open fluorescent lamps also the ozone generated is harmful. Similar effects come from electric motors and other spark generating equipment. This equipment should not be kept in the store room. The same is applicable to solvents, oils, chemicals or acids which attack the rubber by vapours and exhaust gases and result in hardening, softening or excessive volumetric changes.

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## NOTIZEN

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