



Tube Diffuser

Assembly, Operating and Maintenance Instructions



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1. Aeration Systems

This manual describes in detail the installation and operating of tube diffuser JetFlex TD 63/0 with perforation lengths of 500, 750 and 1000 mm, respectively.

2. General

Jäger Umwelt-Technik GmbH & Co. KG (JUT) supplies diffuser for diffused air aeration in residential and industrial waste water treatment plants.

The diffusers deliver fine bubble aeration suitable for the efficient treatment of wastewater treatment plants using the activated sludge process. Specially formulated EPDM compounds with high and durable elasticity allow a long-term intermittent operation needed to apply the de-nitrification process.

The treatment of industrial wastewater (typically a share of more than 10% in residential wastewater is considered to be industrial wastewater) may require the use of different materials like Silicone, Nitrile, Viton® or PUR. Contact JUT for details.

JUT controls every step from compounding to final assembly and documents the conformance of the diffusers to your requirements. All diffusers are factory-assembled and ready to install. Please treat diffusers carefully during transport, storage and assembly.

Our General Conditions of Sale apply to all shipments; the actual issue can be downloaded from our website at any time. www.jaeger-envirotech.com

3. Shipment

We ship diffusers in cardboard boxes. See individual data sheets for packaging details.

4. Incoming Inspection

Upon arrival check packages, equipment and products for structural damage during shipments, particularly the rubber membranes and stainless steel clamps. Any damage must be reported to JUT and/or shipping agent within 5 working days from delivery. JUT reserves the right to inspect damaged shipments. Warranty applies to products in their original and intact packing only!

5. Storage of Equipment

- Store equipment and diffusers as well as all accessories in their original packaging in a dry and aerated room according to DIN 7716 or ISO 2230.
- Prevent products from frost, excessive heat, direct sunlight, UV emitting lamps, dust, mineral oil and hydrocarbons.
- Do not store near electrical motors, especially blowers.
- Avoid work that may damage the diffusers or their packaging.
- Do not store outdoors! Storage time until installation/start up operation should not exceed one year. Consult JUT for precautions otherwise.
- On the construction site all parts must remain in their original packaging and protected from rain, moisture etc. Open crates exposed to direct sunlight must be covered with tarpaulin to protect against UV-radiation.
- Do not use packaging material containing plasticizers.



6. Assembly

6.1 Preparations

- Prior to assembly of the aeration system remove all debris (stones, metal scrap, wooden pieces etc.) from the aeration tank.
- Stainless steel square tubes (80 x 80 mm or 100 x 100 mm) are recommended as laterals for JetFlex TD 63/0 diffusers with SS-connectors.
- Standard round lateral tubing require the use of a special clamp. See TD 65/2 data sheet.
- All laterals must be levelled within ± 6.35 mm ($\pm 1/4$ "") for proper function of diffusers.
- Air outlet holes in lateral for each diffuser must be predrilled and adjusted in accordance to the individual data sheets. Hole diameter ± 0.1 mm, horizontal alignment of holes within ± 0.5 mm.
- Do not drill holes within welded area of tubing.
- Deburr all holes.
- Remove all corroded spots etc.
- Remove all internal debris from within the laterals with a water flush through the laterals.

6.2 Diffuser Alignment

- Align diffusers longitudinal to the water flow.
- Keep enough distance to water accelerators (propellers etc.). Water velocity at diffusers must not exceed 0.5 m/s.
- If water speed is perpendicular to the diffusers use additional fixtures or reduce diffusers length to avoid breaking of the plastic tubes. Contact JUT for details.

6.3 Installation (type 63/0 only)

This type of diffuser is installed in pairs. To ease tightening the gaskets may be wetted with a lubricant. Recommended lubricants are commercial-grade water-based soap (5 - 10%) or regular household detergents (0.01 - 0.1%). Do not use lubricants containing mineral oils or other hydrocarbons.

- Screw the connector into one diffuser and slip one gasket over the connector.
- Slide the free end of the connector through both holes of the lateral and put on the second gasket.
- Thread the second diffuser onto the connector and tighten both diffusers just lightly by hand.
- Tighten both units an additional 1/2 to 3/4 turn with two fork wrenches. Across-flats measure is 55 mm.
- Do not twist the rubber membrane of the diffuser.
- Both gaskets should be equally deformed.
- The non-perforated strips of the diffusers are now on top and bottom.

7 Operating Instructions

7.1 Start-Up Instructions

Prior to start-up clean the aeration tank from debris like stones, wooden pieces, metal parts etc. Keep the time between assembly and filling of the basin as short as possible. Otherwise take the following steps:

- Do not perform any work near the diffuser or above the aeration tank, which may damage diffusers; e.g. painting, welding, concrete sealing etc.
- Safeguard diffusers from falling parts.
- Fill tank with clean water approximately 20 cm above diffusers. Start blowers for 5 - 10 minutes and check for obvious leaks. Have blowers stopped and immediately check again for smaller and hidden leaks when airflow ceases. Tiny leaks may be detected now with lower turbulences.
- Start wastewater treatment now or raise water level to 1 m with clean water.
- Operate blowers for 10 minutes at medium speed at least once a day.
- Raise water level even more if temperatures drop below freezing. (~20 cm additional water for each degree Celsius below zero.)
- Prior to SOTE testing allow diffusers to run at maximum design airflow for one week (minimum 3 days).

7.2 Regular Operation

During regular operation adjust airflow of diffusers to maintain the required oxygen level in the aeration tank. Keep airflow within recommended range of diffusers (see data sheets).

Too high an airflow reduces efficiency and may eventually damage the diffuser membrane irreversibly. Very low airflow rates may cause uneven oxygen supply and excessive fouling of the membrane surface. Water temperature should range from 5 °C to 35 °C; air temperature at the diffuser should not exceed 60 °C. Consult JUT in case either temperature is higher.

Air from blowers must not contain oil, dust, or solvents. Use dust filters according to DIN EN 779 (>80%, better >90% dust removal, class G3 or G4, respectively.) Air going into the blowers must correspond to local regulations (see e.g. TA-Luft for Germany).

Diffuser headloss should be monitored continuously. An increase of more than 20 mbar/year may indicate a clogging problem caused by deposits of carbonates, iron-salts, or biological growth. See section 7.4 for details of cleaning. Inspect diffusers visually on a regular basis at least once a year.

7.3 Trouble Shooting

JetFlex Diffusers need very little maintenance even for long-term operation due to their high-performance materials. JUT recommends regular inspection intervals every 12 to 18 months in order to monitor fouling processes. Check pressure loss permanently with accurate pressure gauges, an increase of more than 20 mbar per year may indicate fouling or other problems.

The most common problems and their recommended corrections are:

1. Indication: Large volume of air in localized area

Possible cause: Leakage in lateral piping

Procedure: Drain basin to access area in question, maintain medium air flow, check connectors and pipes for evidence of breakage, repair or exchange

Possible cause: Diffuser membrane is damaged or missing

Procedure: Drain basin to access area in question, maintain medium air flow, inspect visually diffuser, exchange membrane or complete diffuser

2. Indication: Non uniform bubble pattern

Possible cause: Insufficient blower capacity

Procedure: Confirm blower operations, switch on additional blowers

Possible cause: Check valve of drop lines closed or not open enough

Procedure: Inspect position of check valve

Possible cause: Incomplete air distribution to diffusers

Procedure: Drain basin to access area in question, check diffuser horizontal levelling, level within tolerance of $\pm 0,6 \text{ cm} / \pm 1/4''$, inspect piping and joints for internal clogging from debris, air purge or water flush cleaning

Possible cause: Deposits on diffuser membrane

Procedure: Inspect diffuser membranes for deposits and encrustation, clean or exchange membrane or exchange diffuser

3. Indication: Decreasing of dissolved oxygen level, increase of system pressure drop

Possible cause: Deposits on diffuser membrane

Procedure: Inspect diffuser membranes for deposits and encrustation, clean or exchange membrane or exchange diffuser

4. Indication: Non uniform dissolved oxygen profile throughout basin

Possible cause: Insufficient air volume

Procedure: Confirm blower operations, switch on additional blowers, check equipment and operation conditions, see 1-3

Depending on type of waste, individual constructions and operation conditions other causes can lead to disturbances. If necessary contact the contractor or engineering office.

7.4 Maintenance and Cleaning

7.4.1 Maintenance

Check aeration continuously during regular operation for non-uniform bubble pattern and higher than expected headloss. Depending on the type of wastewater, treatment process, and operating conditions fouling of membranes may occur, thus reducing oxygen transfer. Remove deposits from membrane regularly, at least once a year. Sludge must not dry on the surface of the membrane, once hardened the sludge sticks to the membrane and will clog diffusers permanently.

7.4.2 Mechanical Cleaning

Deposits on membranes can be removed just with the use of a good household scrubber, brush gently and flush generously with a water hose. If necessary use a pressure-washer¹ instead, but keep a minimum distance of about 50 cm to the membrane and set the nozzle to a broad spray and not to a sharp jet.

Pressure washer are recommended to remove fouling from aluminium- and/or iron-salts used for precipitation of phosphor from the wastewater. The chemicals themselves do not attack the surface of the membrane but may sometimes cause additional fouling.

7.4.3 Chemical Cleaning²

Certain deposits (CaCO_3) can be removed during regular operation – without stopping the treatment process – by adding formic acid (HCOOH) into the air-stream. Depending on the degree of fouling spray 10 cm^3 of HCOOH (50% to 85% concentration) into each m^3_{N} of air (at normal conditions) for about 30 to 60 minutes. Set airflow to maximum design airflow for diffusers used; see individual data sheets for details. Keep airflow high for another two hours in order to remove any condensed³ HCOOH from the laterals and diffusers.

The exact amount of acid and details of the cleaning process must be determined beforehand by appropriate tests.

8 Replacements

8.1 Replacing Membrane

Either the membrane only or the entire diffusers should be replaced whenever necessary. Exchange of membrane typically takes more time, so usually installing new diffuses makes economic sense.

- Remove sludge from diffusers with pressure-washer¹.
- Grab ear of clamps with a pair of nippers and twist, turn, and bend back ear until clamp opens.
- Remove both clamps and pull off sleeve. If sleeve sticks to the plastic tube, cut-off sleeve with a sharp knife⁴. Do not over-bend the tube, maximum bend $6^\circ - 8^\circ$, i.e. about 10 cm at the end of a 1 m diffuser tube.
- Clean support tube with pressure washer.

¹) Follow safety guidelines of manufacturer of pressure-washer.

²) Formic acid is dangerous and can cause severe injuries and death. Professional equipment and specially trained personel required. Follow all safety instructions and MSDS recommondations with the use of formic acid.

³) HCOOH has a vapour point of 106°C , so even a fine mist will not vaporize entirely. It is therefore advised to remove most of the condensed water in laterals before starting the acid-cleaning process.

⁴) Wear protective gloves with appropriate protective layers.



- Check if air outlets of diffuser tube are pointing up/downwards. Adjust position if necessary, see chapter 6.3 for details. Use new gaskets!
- Push membrane over tube. Compare both non-perforated ends, and slide the longer zone first onto the plastic tube, it should cover the coloured zone of the tube. Both non-perforated strips along the membrane must face exactly up/downwards.
- Pull new clamps over the sleeve and adjust them at the proper position on both ends of the diffuser. Use spare diffusers from JUT to locate the optimum position of clamps.
- Use special pair of nippers (JUT # 12001) to close the clamp. The gap of the ear should not exceed 2 mm after closure (recommended are 1.0 to 1.5 mm).
- Fold ends of sleeves over clamp.
- Run leak-test as described in chapter 7.1.

8.2. Replacing Tube Diffuser

- Remove sludge from diffusers with pressure-washer.
- Unscrew diffuser with two fork-wrenches of 55 mm width.
- Clean sealing area and connector, use new gaskets.
- Mount new diffusers as described in chapter 6.3.
- Run leak-test as described in chapter 7.1.

9. Recycling

Observe all local and federal regulations for waste deposit at time of disposal. Clamps may be disposed of as scrap metal. In case of contamination check with authorities and/or a certified waste management consultant.

10. Disclaimer

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should not therefore be construed as guaranteeing specific properties of the products described or their suitability for a particular application. US units are for convenience only. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our General Conditions of Sale.

11. Reference

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