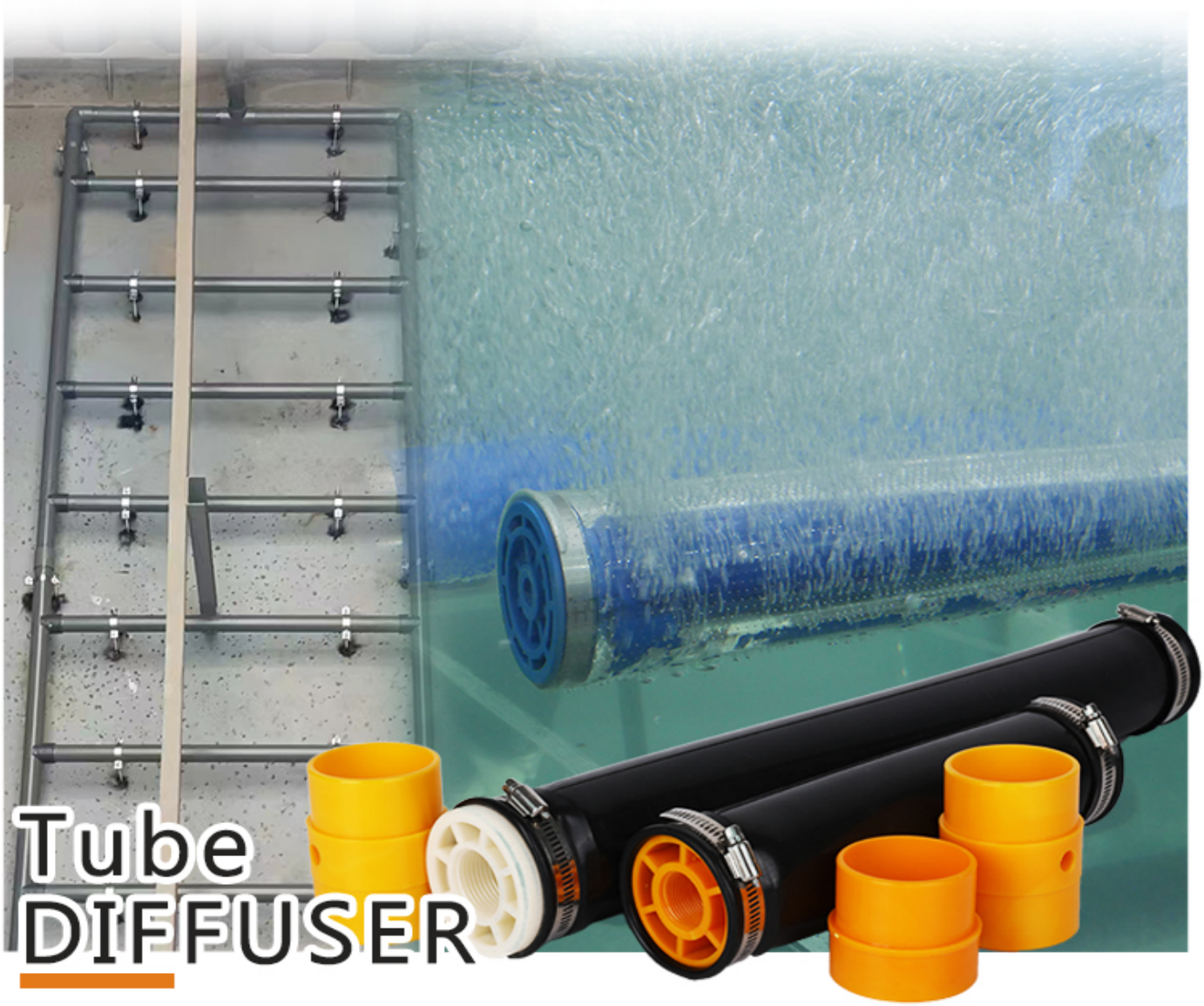
JUNTAI PLASTIC



Juntai Tube Diffuser

Installation Operation & Maintenance Manual

Applicable tube diffuser model

TD65 TD93 TD113

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1. Overview

This manual provides detailed instructions for the installation, operation, and maintenance requirements of the Juntai tube diffusers (TD65, TD93, and TD113). Juntai strictly controls every step from raw materials to the final assembly of the product, with detailed records of the aeration tube production process. All aeration tubes are assembled at the Juntai factory. Care should be taken to protect the tube diffusers during transportation, storage , and assembly to avoid any damage.

2. Juntai Tube Fine Bubble Diffusers

2.1 Application Scope

Juntai Corporation provides fine bubble diffusers for wastewater treatment plant aeration processes. In wastewater treatment plants utilizing the activated sludge process, Juntai's fine bubble diffusers significantly enhance the efficiency of sewage treatment. The EPDM membranes used in Juntai's diffusers are synthesized with a special formula, providing excellent elasticity and durability, allowing the diffusers to support long-term intermittent operation in sequencing batch processes.

2.2 Composition of Wastewater

The EPDM membranes produced by Juntai are primarily intended for conventional municipal wastewater as defined in DWA-M115. Wastewater plant personnel must continuously monitor and ensure the consistency of recorded water quality parameters. Certain chemicals may impact the performance of the aeration diffusers: particularly, solvents and halogen components may damage the EPDM. Other hydrocarbons such as petroleum, oils, and fats can cause damage to EPDM membranes if present at concentrations exceeding normal levels (25 ppm). Industrial wastewater treatment (typically, industrial wastewater comprising over 10% of the treated wastewater is considered industrial wastewater) may require alternative materials such as silicone, fluororubber, etc. Most membranes required for industrial wastewater treatment may need to be tested in advance, and specific quality assurance terms need special confirmation.

2.3 Pretreatment

The proper installation of mechanical screens, sedimentation tanks, and oil separators plays a crucial role in optimizing the performance of aeration diffusers in subsequent biological ponds. Inadequate or absent pretreatment will lower aeration efficiency. Regularly inspecting whether the aeration tubes in the aeration pond have accumulated filamentous material and cleaning them as needed, especially for lift units that require maintenance, is essential. When aeration units with attached filamentous material are lifted to the water surface, the EPDM membrane of the aeration tubes is prone to rupture.

2.4. Sunlight and Ultraviolet Radiation

Generally, EPDM membranes are not affected by climate and can resist ultraviolet radiation. However, direct sunlight on aeration tubes should be avoided because intense sunlight can raise the temperature of black membranes to 80-100 degrees Celsius, accelerating membrane aging. When emptying the aeration pond, rinse the aeration tubes and keep the membranes as moist as possible. Once the sludge attached to the aeration tubes dries and hardens, the micropores on the membranes will be permanently blocked. Therefore, when the aeration system cannot operate normally, inject clear water into the aeration pond and maintain the liquid level above the aeration tubes.

2.5. Temperature

The water temperature should be maintained between +5°C and +30°C. Freezing of aeration tubes at low temperatures should be avoided to prevent permanent damage. The operating air temperature of aeration tubes should not exceed +60°C, and stainless steel air risers typically significantly reduce air temperature. If in doubt, please confirm with Juntai.

2.6. Air

Under all circumstances, it must be ensured that the air provided by the blower is oil-free. A malfunctioning blower may discharge oil into the air main, and the remaining blowers will continue to push oil into the aeration tubes. Dust filters that comply with DIN EN779 standards should be used: dust removal efficiency of 90%, Grade G4. The air entering the blower should also comply with local regulatory requirements.

2.7. Air Risers, Main Distribution Pipes, and Branch Pipes

The dimensions and arrangement of the piping system must comply with the calculation and design requirements, and the piping materials must meet the environmental requirements. The resistance of the pipes to chemicals should consider all possible aspects from sewage to air, including but not limited to acids or other chemicals injected into the airstream and water flow impacts from external sources. For the expansion or upgrade of existing pipelines, the applicability of all existing pipes, valves, fittings, etc., to new requirements should be checked. Any corrosion will eventually cause aeration tube failure and may even disable the entire aeration system. All air distribution pipes connected to the aeration tubes must be adjusted horizontally, with a tolerance range of +10mm, to ensure aeration uniformity. By controlling the total air volume, the airflow is automatically distributed to each pool. If this cannot be achieved, at least ensure that all air distribution pipes in the aeration pond are leveled to the same immersion depth.

2.8. Diffuser Tube Size, Material, Weight, Buoyancy, and Resistance

For detailed parameters related to the diffuser tube, please refer to the data sheet within our product sample. The buoyancy experienced by the diffuser tube is related to the airflow.

2.9. Air Piping for Diffuser Tube Installation

Diffuser tubes are generally installed on round or square pipes and can use UPVC/ABS/SS304 pipes.

2.10. Aeration Pipe Layout Density

For general situations, please refer to the aeration layout diagram provided by Juntai. If a third party has provided a layout diagram, check whether the layout density of the diffuser tube is within the range listed in the table below. This empirical data is for reference only, and specific situations should be verified with the design team.

Table 1: Recommended minimum and maximum layout density of diffuser tubes in the aeration tank.

Diffuser Tube Model	Minimum Layout Density (m^2)	Maximum Layout Density (m^2)
TD65	0.5	2.5
TD93	0.5	3.5
TD113	0.5	4.5

3. Installation Requirements

3.1 Weather Conditions

Generally, diffuser tubes should not be installed when the temperature is below +5°C. If installation is necessary under such conditions, the tanks should be covered at the top and forced ventilation and heating should be applied (following all safety guidelines for heating). Diffuser tubes should be heated to above +5°C before being taken out of the warehouse.

3.2 Operation Sequence and Cleaning

Before installation, all operations inside and above the aeration tank must be completed, especially welding, drilling, cutting, grinding, spraying, concrete casting, sealing, caulking, etc. Remove all debris from the tank bottom, including stones, glass, nails, wood, and other sharp fragments. Check the upper edge of the tank and all beams and columns to prevent objects from falling into the tank. The aeration tank should be in a state of readiness for water intake operation before diffuser tube installation.

3.3. Blowing the Pipeline System (First Blow)

Check the blower to ensure its readiness to deliver air at the maximum flow to the aeration tank. Blow all pipelines with the maximum airflow, and if necessary, close the intake flaps of all remaining air units and blow each unit/area one by one to remove all debris from the pipes. Any remaining debris in the pipes could eventually clog or damage the diffuser tubes, and such cases are not covered by our warranty.

3.4. Installing Diffuser Tubes

3.4.1 Installation of Saddle-Type Diffuser for TD65,TD93 and TD113

· The diffuser support pipe should have symmetrically placed holes, with a diameter of 28mm +0.5/-0mm (for TD65 diffuser tubes) or 30mm +0.5/-0mm (for TD93 diffuser tubes) or 32mm +0.5/-0mm (for TD113 diffuser tubes), and the hole centers on the same side should be on the same straight line.

· It is prohibited to open holes in the welding area of the pipeline.

· Remove all burrs from the holes in the pipeline.

· After blowing the pipes according to section 3.3, install the gaskets on the two diffuser tubes, then align them directly with the symmetrical holes in the pipeline. The two notches at the head of the diffuser tube will locate and secure.

· Install stainless steel bolts and nuts in the upper and lower bolt holes, and tighten with a torque wrench to 15N·m. The upper and lower parts of the saddle head should be evenly stressed during the tightening process.

3.4.2 Installation of TD65, TD93 and TD113 Threaded Pipe Diffusers

· The threaded pipe diffuser with threaded head is recommended to be installed using stainless steel square pipes. The square pipe should have symmetrical openings on both sides, with a diameter of 28mm +0.5/-0mm (for G3/4'' threaded diffuser) or 35mm +0.5/-0mm (for G1'' threaded diffuser), and the hole centers on the same side should be uniformly aligned on a straight line.

· It is prohibited to make openings in the welding area of the pipe.

· Remove all burrs from the pipe openings.

· For ease of installation, lubricate the rubber gasket with a lubricant. It is recommended to use a commercially available water-based soap (concentration 5%-10%) or household detergent (0.01~0.1%) as a lubricant. Lubricants containing mineral oil or carbonizing compounds are not allowed.

· After blowing the pipe according to 3.3, insert the stainless steel connector into one end of the diffuser head. Install a rubber gasket on the connector, then pass the connector through the two symmetrical holes in the square pipe, install another rubber gasket, and then screw on the other diffuser manually. Ensure that the two diffusers are tightened without twisting the membrane of the diffuser.

· Use a standard open-end wrench (wrench opening is 55mm), rotate each diffuser 1/2 to 3/4 turn each time, tighten the two diffusers. The deformation degree of the rubber gaskets on both sides of the stainless steel threaded connector should be roughly the same, and the non-perforated area of the membrane (also the double groove area supporting the pipe) should be positioned at the top and bottom.

3.5. Secondary Blowing

Perform a secondary blowing following the steps described in 3.3. Then, install all remaining pipe fittings onto the air distribution header to complete the installation of the pipeline and diffusers.

4. Leak Point Testing and Commissioning

The aeration system for each aeration tank must undergo leak point testing and commissioning. Repair all identified leakage points and repeat the testing. The owner must provide written acceptance of the commissioning. Lack of, improper, or incomplete commissioning will result in warranty voidance, and Juntai will not be responsible for any consequences and damages resulting from this. Inject non-foaming clear water into the tank until it reaches approximately 10cm above the diffuser. Run the diffusers at the minimum or as low as possible airflow (refer to Section 7, Table 1), carefully inspect all connections of pipes, fittings, connectors, and diffusers for any signs of leakage. If it is necessary to walk through and inspect the tank, appropriate personal protective equipment should be used. Then, raise the water level to 20cm above the diffusers for commissioning, operate the diffusers at a moderate airflow (refer to Section 7, Table 1), and check if the immersion depth of the diffusers deviates significantly from the average. Minor deviations may be due to variations in the surface of the membranes and typically disappear after 1 or 2 weeks of operation (formation of the biofilm).

5. Idle Time Before Start-Up

Commence leak testing and commissioning immediately after installation is completed. If, for any reason, commissioning cannot proceed to immediate operation, follow the steps below：

· Inject clear water into the aeration tank and raise the water level to 1 meter while operating the diffusers at a moderate airflow (refer to Section 7, Table 1).

· Supply air to the diffusers with at least a moderate airflow for 10 minutes daily using the blower.

· If the temperature is below freezing, raise the water level (for each 1-degree reduction below freezing, an additional 20m³ of water is needed) and, if necessary, increase the aeration time and airflow.

· Operate the diffusers at the maximum designed air velocity for one week before formal operation begins.

6. Initial Start-Up

Formal initiation of the aeration system is contingent upon the end user's written endorsement of the " Installation and Commissioning Confirmation Form." Approval is also required for all air distribution facilities, including blowers, valves, control devices, pressure monitoring equipment, etc. Operate the diffusers only within the specified airflow range (for detailed information, refer to Section 7, Table 1).

7. Routine Operation of Diffusers

During regular operation, adjust the airflow of the diffusers to control the dissolved oxygen concentration in the aeration tank. Always maintain the diffuser airflow within the recommended range (see Table 1). Excessive airflow can reduce oxygen transfer efficiency and may lead to irreversible damage to the diffuser membranes. Insufficient airflow may result in uneven aeration/oxygen supply and substantial deposition of impurities on the membrane surface. Periodic flushing with the maximum overload airflow is permissible but should not exceed 10 minutes every 24 hours.

Product Specifications	Standard Airflow(Nm³/h)	Maximum Overload Airflow(Nm³/h)
TD65-1000	4-14	20
TD65-750	3-11	15
TD65-500	2-8	10
TD93-1000	9-20	30
TD93-750	7-16	23
TD93-500	5-12	16
TD113-1000	12-28	40
TD113-750	9-23	31
TD113-500	6-18	22

If the aeration pipes operate intermittently (nitrification/denitrification), it is only necessary to ensure that the pipeline system is free from leaks. However, if the aeration pipes are shut down for an extended period, preventive measures must be taken for the following scenarios:

· Sludge Accumulation: Use a separate agitation system.

· Accumulation of Condensate: Gradually increase airflow upon restart.

· Adherence of Impurities to Diffuser Membranes: Flush the diffuser pipes weekly, run the diffuser pipes daily, or re-commission the aeration system before restarting.

· Maintain a sufficient safety distance between the diffuser pipes and water accelerators (agitators, flow promoters), and the water flow velocity at the diffuser pipes must not exceed 0.5 m/s.

· Damage caused by unforeseen accidents is not covered by our warranty.

8. Troubleshooting

8.1 General Recommendations

Due to the use of high-performance materials, Juntai aeration pipes require minimal maintenance even with prolonged use. Juntai strongly recommends periodic checks every 12 to 15 months to detect any deviations from expected performance early on. Use a precise pressure gauge to monitor pressure loss, and if the pressure loss increases by more than 20mbar in a year, it may indicate fouling of the membranes or other issues.

8.2 Common Failures and Solutions:

Symptom 1: Excessive airflow in a local area

· Possible Cause 1: Leakage in the air distribution pipe

Solution 1: Lower the water level in the tank, enter the problematic area, maintain moderate airflow, inspect fittings and pipes for signs of damage, and repair or replace damaged components.

· Possible Cause 2: Damage or detachment of diffuser membrane

Solution 2: Lower the water level in the tank, enter the problematic area, maintain moderate airflow, visually inspect the diffuser pipes, and replace the membrane or the entire diffuser pipe.

Symptom 2: Uneven Aeration

· Possible Cause 1: Insufficient capacity of the blower

Solution 1: Verify the proper operation of the blower, consider activating an additional blower.

· Possible Cause 2: Valve(s) on the air riser closed (or partially closed)

Solution 2: Inspect the position of the butterfly valve, fully open it if necessary.

· Possible Cause 3: Uneven air distribution in the diffuser pipes

Solution 3: Lower the water level in the tank, enter the problematic area, check the levelness of the diffuser pipes, adjust their tolerance to ±25mm, inspect pipes and joints for blockages caused by debris, and clean using air blowing or water flushing as needed.

· Possible Cause 4: Deposits on the diffuser membrane

Solution 4: Check for deposits and scaling on the diffuser membrane, and clean or replace the diffuser pipes as required.

Symptom 3: Decrease in Dissolved Oxygen or Increase in System Resistance

· Possible Cause: Deposits on the diffuser membrane

Solution: Inspect the diffuser membrane for deposits and scaling; clean or replace the diffuser pipes as needed.
Symptom 4: Uneven Distribution of Dissolved Oxygen Throughout the Entire Tank

Symptom 4: Uneven Distribution of Dissolved Oxygen Throughout the Entire Tank

· Possible Cause 1: Insufficient air supply

Solution: Verify the proper operation of the blower, consider activating another blower. Check equipment and operational status.

· Additionally, design flaws in the aeration tank itself (such as inadequate mixing) may lead to unforeseen issues. If necessary, collaborate with the contractor, design unit, and Juntai to analyze the problem.

9. Maintenance and Cleaning

9.1 Maintenance

Continuous monitoring of aeration is required during routine operations to promptly detect uneven aeration conditions and higher-than-expected pressure losses. Depending on the wastewater type, treatment process, and operating conditions, regular removal of deposits on the diffuser membrane is necessary if fouling occurs, as it can reduce the oxygen transfer efficiency of the aeration pipes. It's important to prevent sludge on the membrane from drying out during the cleaning process, as dried sludge can adhere permanently to the diffuser membrane, potentially causing blockages.

9.2 Mechanical Cleaning

Deposits on the membrane can be removed using a good-quality household detergent: simply brush lightly and rinse with a large amount of water. If necessary, a high-pressure water cleaning machine can be used (following the safety guidelines of the high-pressure water cleaning machine manufacturer), but the nozzle must be kept at a distance of approximately 50 cm from the membrane, and the nozzle should be set to wide spray rather than direct jet. It is recommended to use a high-pressure cleaning machine to remove scaling caused by aluminum and iron salts. The chemicals themselves will not corrode the membrane surface, but they may, at times, contribute to additional scaling.

9.3 Chemical Cleaning

Formic acid is a hazardous chemical that can cause serious injury and death. It should only be handled by personnel trained in its use with specialized equipment. The use of formic acid must adhere to all safety instructions and recommendations.

During normal operation of the aeration system, certain deposits, such as calcium carbonate (CaCO3), can be removed by continuously introducing formic acid (HCOOH) into the airstream. Depending on the degree of scaling, prepare the formic acid dosage according to the standard of injecting 10 mL of 85% concentration formic acid into 1 Nm^3 of air (at 20°C and atmospheric pressure) for approximately 30 to 60 minutes. Set the airflow to the maximum design flow rate of the diffuser pipes (for detailed information, refer to Section 7, Table 1). Maintain this maximum design airflow for an additional 2 hours to remove any residual formic acid in the pipes and diffuser. The exact quantity of formic acid and cleaning details must be determined through appropriate testing beforehand and followed by the relevant usage instructions.

10. Replacement

When necessary, membranes or entire diffuser pipes should be replaced. However, replacing just the membranes generally takes more time, so it is often more cost-effective to replace the entire aeration pipe.

· Clean the surface of the diffuser pipes with a high-pressure water gun.

· Remove the diffuser pipes and take off the gasket or O-ring.

· Avoid damaging the openings on the air distribution pipe.

· Clean the sealing area and connectors, using new gaskets or O-rings.

· Install the new diffuser pipes as described in Section 3.

· Perform a leak test as described in Section 4.

11. Dissolved Oxygen Transfer Efficiency Test in Clear Water

The dissolved oxygen transfer efficiency test can be employed to determine the performance of the aeration system. The testing must comply with the relevant sections of the standard CJ/T 475-2015. All details of these tests must be mutually agreed upon in writing by both parties no later than the order confirmation. Before commencing the dissolved oxygen transfer test, it must be ensured that the aeration pipes have been operating at the regular airflow rate in clear water for at least 2 weeks. Use only tap water for the clear water test; for any other type of water, please refer to the recommendations provided by CJ/T. In case of algae growth, empty the pool, clean the aeration pipes and aeration tank, and refill the pool with tap water.

12. Packaging, Transport, and Storage

12.1 General Recommendations

Juntai membrane-type aeration pipes must always be protected from weathering (rain, hail, freezing, overheating, direct sunlight, etc.) and continuous mechanical impacts. Storage conditions must comply with the requirements of standards DIN7716 or ISO2230. Poor storage conditions and improper handling may result in a shortened lifespan and reduced performance of the aeration pipes.

12.2 Packaging and Transport

Aeration pipes and replacement parts can only be stored and transported in their original packaging. The guarantee of the aeration pipes is only valid in their original and intact packaging. Do not stack the cardboard of the original packaging, even temporarily. Ensure proper securing of the goods during transport. Do not expose the aeration pipes to harsh weather conditions.

12.3 Storage Conditions

Site, Temperature, Humidity, Lighting, Ultraviolet, and Ozone

· According to DIN 7716 and ISO2230 standards, store the equipment and aeration pipes, along with all accessories, in their original packaging in a dry and well-ventilated room with a temperature range of +5°C to + 25°C. For higher or lower temperatures, consult Juntai.

· Relative humidity must be below 65%, and do not use damp storage rooms.

· Keep away from heat sources to prevent overheating (above 25°C).

· Avoid frost, overheating, direct sunlight, exposure to ultraviolet fluorescent lamps, contact with dust, mineral oil, solvents, and hydrocarbons.

· Do not store the product near electric motors, especially blowers, as the ozone generated by electrical sparks is harmful to rubber products.

· Do not store the product outdoors. The storage time before installation/startup should not exceed one year. For further details, consult Juntai.

13. Recycling

Local regulations regarding waste storage or disposal of scrap metal should be considered. The decisive factor is compliance with effective laws and regulations related to the recycling and disposal of products after their end-of-life, as well as relevant environmental protection requirements.

If our products are not contaminated by other materials, there is no need for specific monitoring of waste. In cases of contamination, please consult with your regulatory authorities.

14. Disclaimer

The information provided above is based on our existing knowledge and is intended to offer general annotations for our products and their applications. Therefore, it does not commit to the specific performance or adaptability of the product to particular fields. We adhere to existing industrial property laws and provide quality assurance for products under standard sales conditions.

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