

JetFlex® CBD 105

Coarse Bubble Diffuser



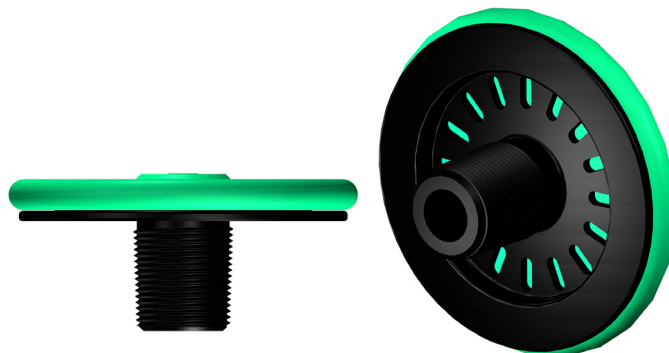


Membrane material

Silicone

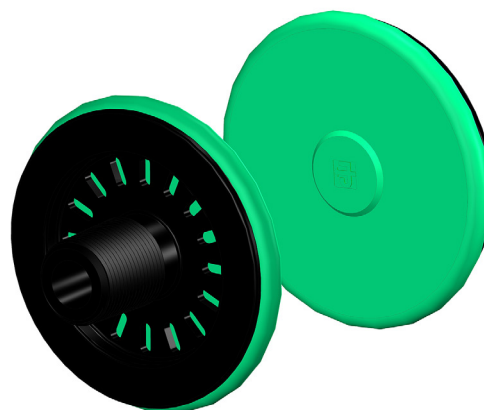
Diffuser body

Reinforced Polypropylene (PP-GF) with R ¾" external tapered thread



Dimensions

Overall Diameter	Total Height	Threaded Length	Membrane Thickness
105 mm	45 mm	25 mm	2 mm



Installation

You may install CBD 105 using our rubber saddle (EPDM) or our plastic saddle clamp. Please see our brochure "Accessories" for details and further alternatives.

Performance data

Airflow	Headloss	SSOTE
Minimum: 2 m³/h (33 liters/minute) @ STP	10 hPa	2 %/m
Maximum: 25 m³/h (420 liters/minute) @ STP	40 hPa	1 %/m

Coarse bubble diffusers are mainly used through mixing capabilities. The rising air induces a strong current, thus removing sludge from the bottom of the tank. They are therefore a very good alternative for many mechanical aeration systems.



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Operations and Maintenance Manual for JetFlex® TD Tube Diffuser





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1. Scope

This manual describes in detail the installation and operation as well as the stipulated maintenance for Tube Diffuser JetFlex® TD63-G, TD65-2 and TD90-2. Installation guidelines are included in each original carton shipped by Jäger Umwelt-Technik GmbH (JUT). Follow all recommendations in order to avoid malfunction or damage of diffusers. See our Warranty Declaration for details, downloadable at <http://www.jaeger-envirotech.com/en/download.php>. JUT controls every step from compounding to final assembly and documents the conformance of the diffusers to requirements. All diffusers are factory-assembled and ready to install. Treat diffusers carefully during transport, storage and assembly. Our General Conditions of Sale apply to all shipments; the latest issue is available for download at our website at the above-mentioned address.

2. Fine Bubble JetFlex® Tube Diffuser

2.1. Intended Use

JUT supplies diffuser for diffused air aeration in residential wastewater treatment plants. The diffusers deliver fine bubble aeration suitable for the efficient treatment of wastewater treatment plants using the activated sludge process. Especially formulated EPDM compounds with high and durable elasticity allow a long-term intermittent operation necessary for denitrification.

2.2. Wastewater Composition

The EPDM-compounds used by JUT are specially formulated for use in regular residential wastewater as defined in DWA-M 115. The plant operator has to ensure and document conformance continuously. Certain chemicals may influence the performance of diffusers: especially solvents and halogenated constituents may harm EPDM. Other hydrocarbons like oil, grease and fat may have an effect, too, at concentrations above the usual (25 ppm). 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 VMQ (silicone) FKM or others. Contact JUT for details and limitations concerning warranty conditions. Most industrial wastewater treatment may require pilot studies.

2.3. Pre-Treatment

Proper mechanical screening, sand- and grease traps are essential for the optimum performance of diffusers. Insufficient or non-existent pre-treatment will decrease the efficiency of the aeration. Check for accumulating filaments clinging to diffusers ("ragging") in the aeration tank and remove those frequently. Especially diffusers on retrievable grids may be prone to breaking when grids are lifted above the water surface.

2.4. Sunlight and UV Radiation

Although EPDM in general is weather-proof and quite UV-resistant, do not expose diffusers to direct sunlight. The black membrane will heat up easily to 80 – 100 °C inducing accelerated aging. When emptying tanks hose off diffusers and keep membranes wet as long as possible. Dried sludge on diffusers may permanently harden and keep slits closed. Fill tank with clean water above diffusers whenever possible.

2.5. Temperature

Keep water temperature between +5 and +30 °C. Avoid freezing of diffusers, this may result in permanent damage of the entire diffuser. Air temperature at the diffuser should not exceed +60 °C. Usually stainless-steel drop pipes will cool down air considerably. If you are in doubt check with JUT beforehand.

2.6. Air Requirements

Blowers must deliver oil-free air under all circumstances. A breakdown of one blower may release oil into the air mains. The remaining blowers may push this oil all the way down to the diffusers. Use dust filters according to DIN EN 779, >90% dust removal, class G4. Air going into the blowers must correspond to local regulations (see e.g. TA-Luft for Germany).

2.7. Drop-Pipes, Manifolds and Headers

Dimensions and arrangement of the piping system have to conform to the calculation and design requirements. The piping material must be qualified for the application in question. Concerning chemical resistance consider all conceivable aspects from the wastewater and the air side, including but not limited to acids or other chemicals sprayed into the airflow, shock flows of



wastewater from external sources, etc. concerning extension or upgrading of existing pipework, check the suitability of all existing pipes, valves, fittings etc. to the new requirements. Any corrosion will eventually hamper the diffusers right up to failure. All headers (= pipes carrying diffuser) in any given tank must be levelled within 10 mm in order to ensure uniform operation of diffusers. Control airflow to several tanks automatically for each individual tank. Failing this requires all headers in all tanks to be levelled to the same immersion depth.

2.8. Diffuser Dimensions, Materials, Weight, Buoyancy and drag

See Data Sheets for Details, buoyancy – depending on water flow induced by aeration – may rise to 50 N per Tube diffuser (e.g. TD90-2)

2.9. Mounting Diffusers to Headers; Accessories

Diffusers are best mounted to square pipes, usually stainless pipes as mentioned under 2.7. Tube diffuser mounted to round pipes (either SS or PVC) are equipped with an integrated clamp (not available for TD63-G). For TD63 and certain replacements you may find appropriate saddle clamps and adapters in our “Accessories” catalogue. Please check with JUT for details and refer to our Installation Instructions included in each carton for further details.

2.10. Diffuser Density

Follow the layout-drawing provided by Jaeger. If a third party provided the layout plan, please check if diffuser density (total meter of perforated length per square-meter tank floor area in the aerated area) is within limits outlined in the table below. Although this data serves as a rule of thumb only, check with the provider of the layout plan otherwise.

Tube Diffuser	Minimum Density	Maximum Density
TD 63 TD65 TD90	0.50 diff./m ²	1.50 diff./m ²

Table 1: Minimum and Maximum Diffuser Density in aeration tanks.

3. Basic Installation Information

3.1. Weather conditions

Weather conditions: Do not install diffuser if temperature drops below + 5°C (40F). If necessary use a suitable cover and forced-air heating for the tank and follow all safety guidelines of the heating system. Warm up diffuser above +5 °C before removing them from the warehouse.

3.2. Order and Cleanliness

Prior to installation finish all operations, especially welding, drilling, cutting, grinding, painting, concreting, sealing, caulking, etc. in or above the aeration tank. Remove all debris from the floor, especially stones, glass, nails, bits of wood and other sharp pieces. Check tank's upper edge and all bridges for objects which may fall into the tank. The aeration tank has to be ready for hydro-inflation before diffuser assembly.

3.3. Cleaning of Piping system (1st Flush)

Blowers have to be checked and ready to deliver full air flow to the aeration tank. Flush all pipes with maximum airflow, shut off grids if necessary and proceed section by section in order to remove all debris from within the pipes. Any remaining debris in the pipes will eventually clog the diffuser membranes and will result in an exclusion of warranty.

3.4. Mounting Tube Diffusers

Refer to our Installation Manual for details of assembly. Make sure to start leak and pattern test (see under 4) immediately after completion of diffuser installation (follow 3.6 otherwise). Inspect each diffuser for damages. Do not step on diffuser. Keep diffuser membranes free from tools and other objects. At the far end of each individual header pipe leave one or two connections blank for flushing. See next section. One blank for up to 10 diffusers per header, otherwise two.

3.5. Second Flush

Repeat flushing as described in Section 3.3 and mount all remaining diffusers to the headers.



3.6. Idle Time until Start-up

Start leak and pattern testing immediately after completion of installation. If there is for any reason idle time proceed as follows:

- Fill tank with clean water and raise water level to 1 m while diffusers are running at medium airflow (see data sheet).
- Watch for any obvious leaks. Repair leaks immediately or let blowers run until repair is possible.
- If no leaks are visible, 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.) Increase aeration time and intensity if necessary.

4. Leak and Pattern Test (separate flyer available)

A leak and pattern test is mandatory for each aeration tank. Repair all leaks and repeat the test. The end user has to approve the test in writing. A missing, incorrect or incomplete test will result in loss of warranty. JUT will not be responsible for consequential damages. Fill tank with clean non-foaming water just about 5 cm above diffusers. Operate diffusers at minimum airflow, or even lower, see data sheet. Inspect all pipes, flanges, connections and diffusers carefully. You have to walk in the tank. Use adequate personal protection equipment. Increase water level to 20 cm above diffusers for pattern test. Operate diffusers at medium airflow (see data sheet). Check immersion depth of diffusers with obvious deviations from uniformity. Small deviations may be due to differences of the membrane surface. These differences usually disappear after 1 or 2 weeks of operation (forming of biofilm).

5. Initial Start-up

The end user has to approve the correct cleaning procedure, installation, leak test and regular aeration pattern in writing. The entire air distribution including blowers, valves, controls, pressure monitoring etc. has to be approved as well. Operate diffusers within limits only (see data sheet for details).

6. Regular Operation of Diffusers

During regular operation adjust airflow of diffusers to maintain the required oxygen level in the aeration tank. Keep airflow within the recommended range of diffusers all the time (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. Use flushing regularly, but not longer than 10 minutes for every 24-hour-period. Membrane tube diffusers are ideally suited for intermittent operation. If diffusers are operated in regular intervals (Nitrification/Denitrification) you only have to make arrangements for an absolutely leak-free piping system. But if diffusers are shut off for prolonged periods of time you have to provision against:

- Sludge accumulation (Use separate mixing systems)
- Accumulation of condensed water (upon restart increase airflow step by step only)
- Fouling of diffusers (flush diffuser weekly, or operate diffusers daily)

Keep enough distance to water accelerators (mixers, propellers etc.) Water velocity at diffusers must not exceed 1.0 m/s. Damages due to unforeseen currents are not covered by our warranty.

7. Trouble Shooting

7.1. General Advice

JetFlex® Diffusers require very little maintenance even for longterm operation due to their high-performance materials. JUT strongly recommends regular inspection intervals every 12 to 15 months in order to monitor deviations from expected performance at the earliest possible date. Check pressure loss permanently with accurate pressure gauges, an increase of more than 10 mbar per year may indicate fouling or other problems.



7.2. Malfunctions

The most common problems and their recommended corrections are:

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 joints 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.

Indication: Non uniform bubble pattern

- **Possible cause:** Insufficient blower capacity.
Procedure: Confirm blower operations, switch on additional blowers.
- **Possible cause:** Valves of drop pipes (partially) closed.
Procedure: Inspect position of check valve, open fully if necessary.
- **Possible cause:** Incomplete air distribution to diffusers.
Procedure: Drain basin to access area in question, check diffuser horizontal levelling, level within tolerance of $\pm 6 \text{ mm} / \pm 1/4''$, 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.

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.

Indication: Non uniform dissolved oxygen profile throughout basin

- **Possible cause:** Insufficient air volume.
Procedure: Confirm blower operations, switch on additional blowers, check equipment and operating conditions. Individual structural conditions (like insufficient mixing) may cause unforeseen problems. If necessary contact the contractor and/or engineering office as well as JUT.

8. Maintenance and Cleaning

8.1. 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.

8.2. Mechanical Cleaning

Deposits on membranes can be removed even with the use of a good household scrubber: just 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 aluminum- 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.

8.3. Chemical Cleaning²

Certain deposits like calcium-carbonate (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 (85% concentration) into each m^3N of air (STP) for about 30 to 60 minutes. Set airflow to maximum design airflow for diffusers used;

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 personnel required. Follow all safety instructions and MSDS recommendations with the use of formic acid.



see individual data sheets for details. Keep airflow this high for another two hours in order to remove any condensed HCOOH from the laterals and diffusers. The exact amount of acid and details of the cleaning process must be determined beforehand by appropriate tests.

9. Replacements

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

- Remove sludge from diffusers with pressure-washer¹.
- Unscrew diffuser and remove gaskets or O-Rings.
- Do not damage the hole in the header.
- Clean sealing area and connector, use new gasket and/or O-Rings.
- Mount new diffusers as described in chapter 3.
- Run leak-test as described in chapter 4.

10. Oxygen Transfer Test in Clean Water

Oxygen transfer tests may be used to determine the performance capabilities of the aeration system. Tests have to conform to standard DWA-M 209 or the corresponding parts of DIN EN 12255-15 and/or ASCE/EWRI 2-06. All details of these tests have to be agreed upon in writing at the time of order confirmation at the latest. Do not start transfer tests unless diffusers have been operated at least two weeks at regular airflow in clean water. Use only potable water for clean water tests, see suggestions provided by DWA for any other type of water. If for any reason growth of algae occurs, drain tank, clean diffusers and aeration tank and refill tank with potable water.

11. Packing, Transport, Storage

11.1. General Advice

Protect JetFlex® membrane diffusers against weathering (rainstorm, hail, freezing, excessive heat, direct sunlight etc.) and mechanical impacts all the time. Storage must conform to DIN 7716 or ISO 2230. Adverse storage conditions and improper handling may result in reduced lifetime and performance.

11.2. Packing and Transport

Store and transport diffusers and replacement parts in their original packing only. Diffusers are warranted in their original and intact packing only. Do not stack pallets of original pallets, not even temporarily. Ensure proper securing of the cargo during transport. Do not expose diffusers to the inclemency of the weather.

11.3. Storage conditions

Premises, Temperature, Humidity, Lighting, UV- and ozone-exposure

- 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, with temperatures ranging from $+5^{\circ}\text{C}$ to $+25^{\circ}\text{C}$. Consult JUT for higher or lower temperatures.
- Relative humidity to be lower than 65%. Do not use wet rooms.
- Keep heaters away from pallets, so products don't overheat ($+25^{\circ}\text{C}$).
- Prevent products from frost, excessive heat, direct sunlight, UV emitting lamps (fluorescent tubes), dust, mineral oil, solvents and hydrocarbons.
- Do not store near electrical motors, especially blowers. Electrical sparks generate ozone, which is harmful to rubber products.
- Do not store outdoors. Storage time until installation/start-up operation should not exceed one year. Consult JUT for precautions otherwise.

¹ 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 the laterals before starting the acid-cleaning process.



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Warranty Declaration for JetFlex® Complete Assembled Diffusers

Valid with effect from August 2015

Jäger Umwelt-Technik GmbH (hereinafter **JUT**) undertake to provide our purchasers with a warranty for all JetFlex® Complete Assembled Diffusers from the TD (tube diffuser), HD (disc diffuser) or SD (strip diffuser) series sold by **JUT** within and outside the Federal Republic of Germany in accordance with the following terms and conditions. Unless otherwise agreed or regulated below "Warranty" means the legal definitions and legal rights according to the German Civil Code (Bürgerliches Gesetzbuch –BGB- effective June 2009, Article 433 and Article 437 including amendment, resupply, paying damages only for actual fault). Any guarantee regulations and legal rights or damages without fault within the meaning of Article 443 of the German Civil Code (Bürgerliches Gesetzbuch –BGB- effective June 2009) are excluded. Any indispensable law will remain unaffected.

§ 1

Warranty period

- a) Unless otherwise agreed or regulated the warranty claims become to fall under the statute of limitations (normally 24 months after delivery of goods) according to the regulations of the German Civil Code (Bürgerliches Gesetzbuch –BGB- effective June 2009).
- b) Should the JetFlex® Complete Assembled Diffuser be replaced by a new JetFlex® Complete Assembled Diffuser the warranty claims of the new become fall under the statute of limitations at the 24 months after the initial first membrane has been put into service, however, at the latest 36 months after delivery of the initial first membrane. Thus the newly installed JetFlex® Complete Assembled Diffuser is not accorded its own separate period of warranty.

§ 2

Warranty conditions

The purchaser is only entitled to claim under a warranty in accordance with § 4 in the event that

- a) the JetFlex® Complete Assembled Diffuser has been installed in a municipal sewage treatment plant where the sewage composition always fulfilled the conditions laid down in the latest edition of the working specification sheet no. 115 as published by the 'German water-management, sewage and refuse association' (DWA), and this since the JetFlex® Complete Assembled Diffuser

was put into service (sewage composition according to DWA-M 115 part 1 through part 3 with a maximum of 10% industrial water calculated according to freight, not volume),

- b) Original equipment only was used on sealing and bonding elements,
- c) Attention was paid to the "Assembly, Operating and Maintenance Manual" for JetFlex® Complete Assembled Diffusers,
- d) The annual inspection of the entire diffuser system was carried out as stipulated in the instruction manual, and
- e) The JetFlex® Complete Assembled Diffuser did not remain in storage for longer than 12 months after purchase and that storage conditions conformed to DIN 7716.
- f) The purchaser had tested the JetFlex® Complete Assembled Diffuser in advance for the planned installation.

By purchasing the product the purchaser is confirming that the JetFlex® Complete Assembled Diffuser had been tested sufficiently and fits the intended installation purpose.

Proof that the conditions of the warranty have been met has to be provided by the purchaser.

§ 3

Exclusion of warranty

Claims under the warranty shall not be considered valid in the event that

- a) the JetFlex® Complete Assembled Diffuser is damaged as a result of force majeure or through the physical interference of a third party,
- b) the damage is caused by deposits on or underneath the membranes of the JetFlex® Complete Assembled Diffuser or
- c) the damage is caused by unforeseeable air current conditions resulting e.g. from the sewage accelerator.

§ 4

Warranty claims

- a) In the event that material defects or flaws in production are discovered in the JetFlex® Complete Assembled Diffuser - beyond doubt proved by the purchaser - **JUT** undertake to
 - either replace the JetFlex® Complete Assembled Diffuser by a new one on receipt of a claim in accordance with § 5 and subject to the regulations in § 4 c), above or repair

- the delivered JetFlex[®] Complete Assembled Diffuser;
- provide the purchaser with a credit note to the value of a JetFlex[®] Complete Assembled diffuser in the event that he or she exchanges the JetFlex[®] Complete Assembled Diffuser in order to prevent damage to it or commissions its exchange by a third party without having previously made a claim in accordance with § 5 or without obtaining a prior appraisal.
 - b) Any further claims, particularly claims for damages, shall not be considered valid. Any indispensable law will remain unaffected.
 - c) The aeration equipment must be designed in a way that the JetFlex[®] Complete Assembled Diffuser can be lifted easily, thus facilitating its inspection and, if necessary, exchange. If the construction supporting the JetFlex[®] Complete Assembled Diffuser cannot be lifted or can only be moved with the aid of a truck-mounted crane or machinery of similar force, JUT is only obliged to provide a warranty in the event that JUT has received a prior written declaration of cost exemption from the purchaser or sewage treatment plant operator.

§ 5

Enforcement of warranty claims

If material defects or flaws in production become apparent during the warranty period, claims should be enforced immediately (within 5 working days of their detection).

In order for the claim to be enforced, the purchaser is obliged to submit the following:

- a) a description of the defect,
- b) this warranty,
- c) invoices, delivery notes or other suitable documentation for proof of the purchase date and the date on which the equipment was put into service,

- d) details of the location of the JetFlex[®] Complete Assembled Diffuser
- e) the purchaser must grant JUT or a person named by JUT the possibility of making an immediate assessment of the defect.

§ 6

Place of jurisdiction, applicable law

The place of jurisdiction for all disputes arising from this warranty is Hanover.

This warranty and all claims, rights and obligations arising from it is exclusively subject to German Law, to the exclusion of both international private law and the UN Sales Convention.

In case actual or future provisions - in whole or part - are void or are becoming void or not realizable, then this shall not effect the validity of the remaining provisions.

§ 7

Extending the warranty period

The warranty can be prolonged to a maximum of 5 years from the date of delivery on receipt of a surcharge of 25 percent of the sales prices.

Should a warranty claim arise, the cost of the replacement delivery of a JetFlex[®] Complete Assembled Diffuser or repair of the delivered JetFlex[®] Complete Assembled diffuser shall be regulated accordingly taking the amortization period into account:

- during the 3rd year of operation:
purchaser bears $\frac{1}{4}$ of the costs
- during the 4th year of operation:
purchaser bears $\frac{1}{2}$ of the costs
- during the 5th year of operation:
purchaser bears $\frac{3}{4}$ of the costs

Please contact us directly should you wish to extend your period of warranty.



Information Sheet

The new grooved design tube diffuser



2-grooved diffusers

In 2007 Jäger Umwelt-Technik developed a new kind of body to replace the 30 years successful, but old-fashioned tube diffuser of the TD63 series. Today in China we have installed more than 80.000 diffusers of the new type TD 65-2 with our special Silicon- and EPDM membranes. Our target was to develop a diffuser with optimised energy consumption in combination with a longer life-time. Long time studies have demonstrated that the special shape of this new body will reduce head loss between 10% and 25% compared to commercially available tube diffusers with a round body. The special design causes the membrane to lay flat around the body thus increasing fatigue resistance during intermittent operation. There are different options available: 1" threaded connection as well as 110 or 114 mm clamps for round headers.

The following schematic diagrams will demonstrate the differences between the old and new design in detail:

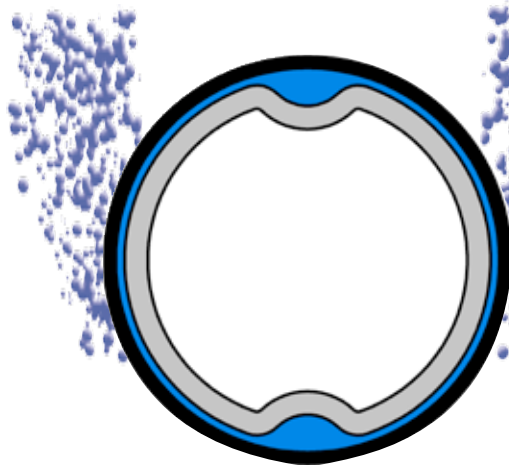


New diffuser body with grooves

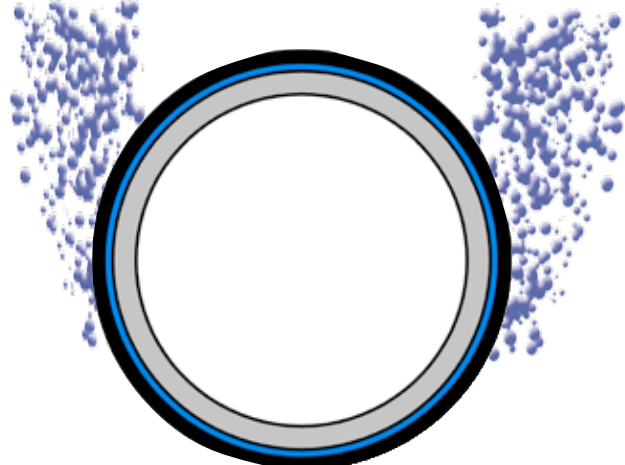


Old style round diffuser body

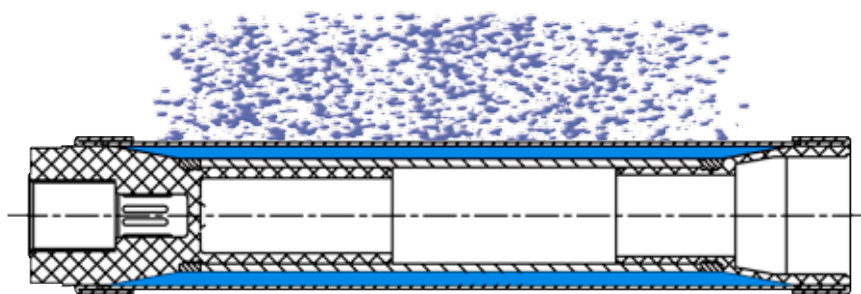
Aeration ON



Air (blue) flows easily through the grooves causing considerable lower headloss.



Air is squeezed through a narrow gap between sleeve and tube increasing headloss.

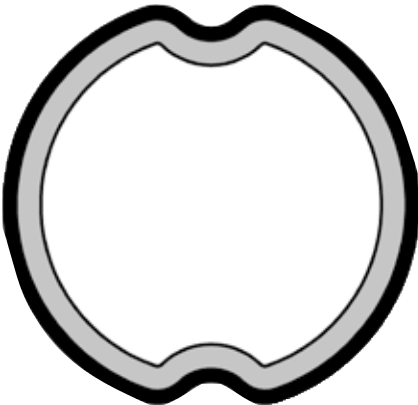


Grooves will evenly distribute air from front to end over years even in difficult to treat waste water.

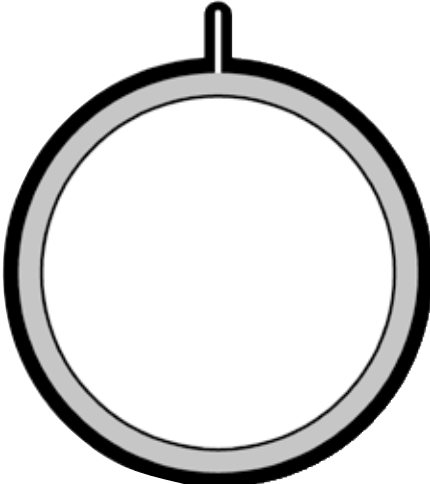


Aeration OFF

Regular Stop

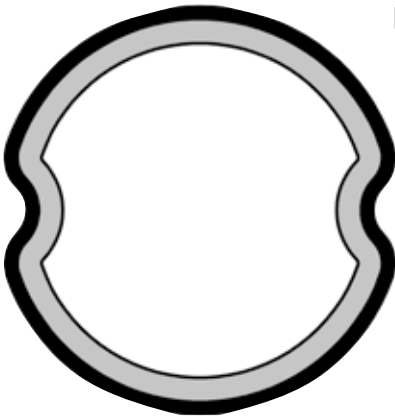


If airflow stops, sleeve will follow the outer contour of support tube, no kinks or wrinkles, almost zero stress on material.

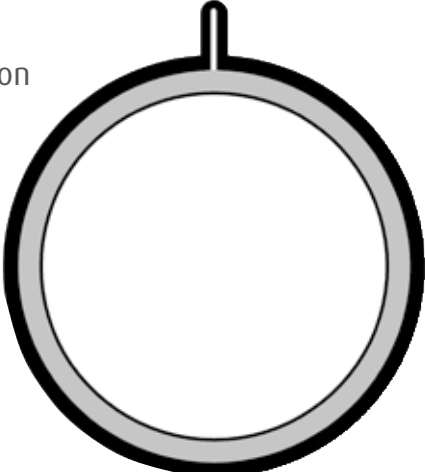


If airflow stops, water pressure sharply folds up the sleeve on top of diffuser inducing high mechanical stress in the membrane.

Imperfect Installation



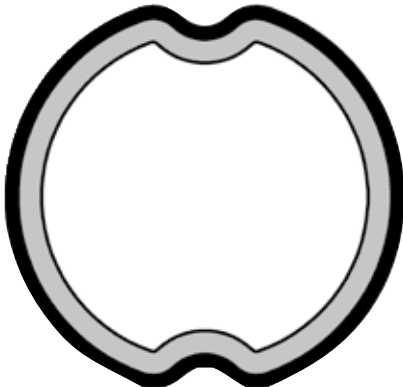
Even a 90° accidental misalignment does not influence the longevity of the sleeve. (SOTE is hampered though).



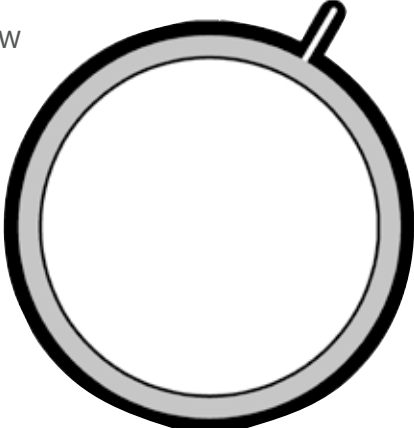
A 90° accidental misalignment will fold up the sleeve in the perforation, increasing stress even more and hampering SOTE.

Fault tolerant design: Maximum Lifetime!

Strong lateral flow



Strong water flow will not influence location of sleeve on support tube. Maximum Lifetime!




Strong water flow may shift the fold into the perforation, increasing stress again.



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 www.jaeger-envirotech.com	<h2>Technical Information</h2>	<h3>Diffuser Engineering Guide</h3>
Installation Manual TD65-2-xxx	Date Language: Page 1	05 / 2012 English of 3
Prepared by:	Natcha Kosolkamolmas	Date revised

Complete set consists of:

Tube Diffuser TD65-2-xxx

Nomenclature:

- TD65 = tube diffuser diameter 65 mm
- xxx = clamp for air supply pipes with outer diameter xxx mm
- membrane sleeve material EPDM or Silicone fixed with 2 stainless steel clamps



Accessories

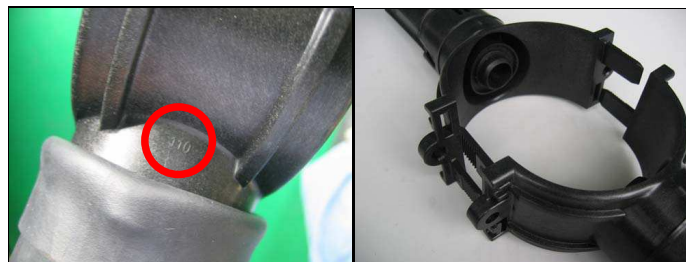
- sealing O-ring either EPDM (black) or Silicone (red)
- ID 30 x 4 mm
- screw bolt set with 2 washers and self-locking nut



Installation Process

Check clamp dimension 90, 110 or 114,3

- Clamp is built with a catch and locking mechanism



Check air supply hole diameter

- Hole diameter shall be 28+0.5mm -0mm in the header pipe
- Both holes must be aligned horizontally ± 0.5 mm, Symmetry at ± 0.5 mm
- Use sandpaper to clean the holes and to slightly harsh the surrounded surface.



Fixing the O-ring

- Press the O-ring into the clamp's circular groove



Connecting 2 tube diffusers at the air supply pipe

- Diffusers are installed in pairs
- Hold the diffusers at each side of the pipe and on the same level of the hole
- Push the diffusers against each other until the lock closes
- Fix the screw bolt on both sides with the sequence: bolt – washer – header – washer – nut
- Fix clamp with the nut. The torque to tighten the M8*45 bolt is at 15N.m



**Warning:**

Be sure that you connect both tube diffusers in a position for assembly:
The ratch is designed to hold the tube diffusers even before the screw bolt is fixed;
Removing or disassembly of the tube diffusers will DAMAGE the ratch.

Remarks:

Tube diffuser header locking mechanism shall level both sides of diffuser pipe automatically. Under the condition that the air supply pipe holes are drilled perpendicularly to the ground, then the tube diffuser is levelled without the need for fixation levers.

Alternatively you can purchase JetFlex™ TD63/2xxx or TD65-2-G1-xxx with the separate clamp of your choice.



Beside of the O-ring in the clamp you also have to attach the sealing to the clamp before screwing the tube diffuser into the clamp. Sealing is included in the delivery.

The required hole to be drilled in the air pipe for 110mm (4inch) clamp has a diameter of 40 +0mm -1mm and for the 90mm (3,5inch) clamp 15mm +0mm -1mm!

JetFlex® HD 270 Disc Diffuser



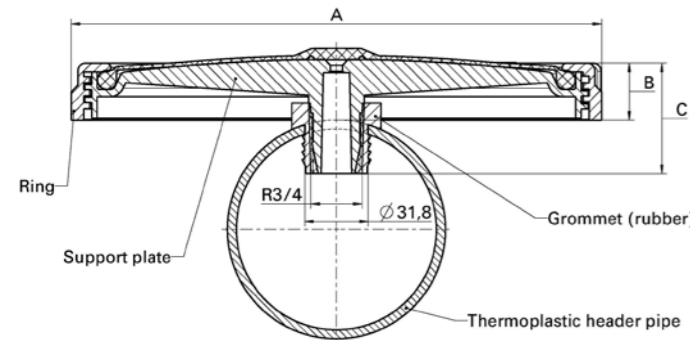


Dimensions

Diameter total [A] / effective	Installation height above pipe [B]	Overall height [C]	Orifice	Thread
268/218 mm	30 mm	60 mm	8 mm	R 3/4"

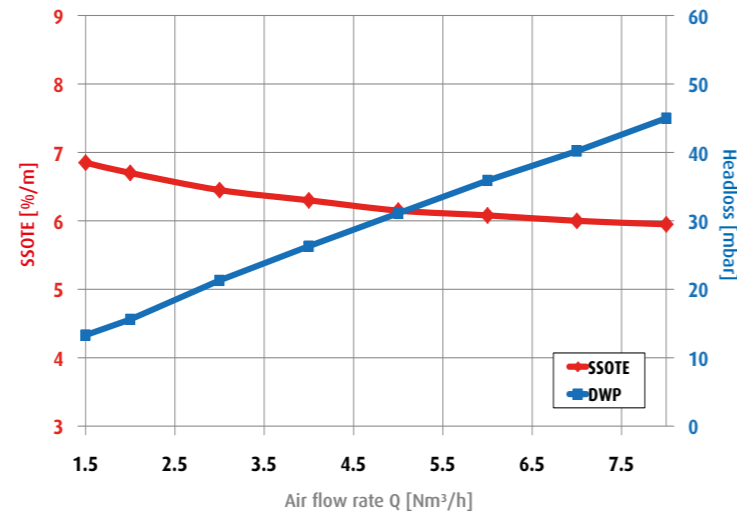


Installation drawing



A = 268 mm
B = 30 mm
C = 60 mm

SSOTE and headloss for HD 270 F053A



Perforated area	Air flow rate at standard operating conditions	Max. overload / maintenance air flow rate	Operating mode
0.037 m²	1.5 - 8 Nm³/h	10 Nm³/h	continuous/intermittent

Connectors to plastic header pipe

	Colour	Permitted wall thickness of header tube	Diameter of straightdrill hole	Material
Rubber saddle	black	4 - 8 mm	32 mm	EPDM 75 ± 5 Shore A
PVC saddle 90 + 110 mm	grey/white	2 mm	35 mm	PVC
Clamp adapter 90 + 110 mm	black	2 mm	multiple	PP 20 % GF / SI / VA

Please see our operation manuals for more details.



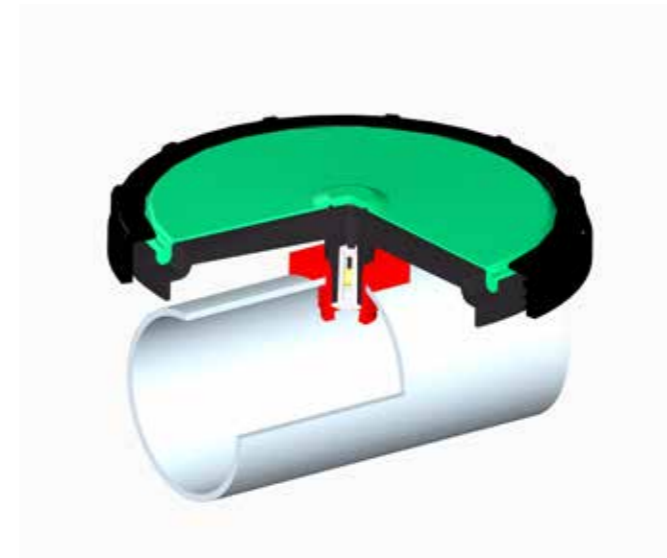
Membrane materials

Material	Techn. standard	EPDM F053A	EPDM F057A	Techn. standard	Silicone
Colour		black	black		green
Plasticiser (%)		28	9		0
Density (g/cm³)	DIN EN ISO 1183-1	1.07	1.06	DIN EN ISO 1183-1	1.17
Tensile strength (N/mm²)	DIN 53504	>10	>8	DIN 53504	>9
Elongation at break (%)	DIN 53504	>450	>300	DIN 53504	>510
Tear strength (N/mm)	DIN EN ISO 34-1 (method A)	>6	>3	DIN EN ISO 34-1 (method B)	>36
Hardness (Shore A)	DIN ISO 7619	52 ± 5	60 ± 5	DIN 53505	60 ± 5
Operating air temperature (°C)		5 - 80	5 - 80		5 - 100
Operating water temperature (°C)		5 - 40	5 - 40		5 - 40

Support plates

Material	Colour
PP 30% GF	black

Accessories



Rubber saddle PVC saddle Check valve



Clamp adapter with female thread Clamp adapter without thread

Please see our accessories catalogue for more details.



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JetFlex® HD 340 Disc Diffuser



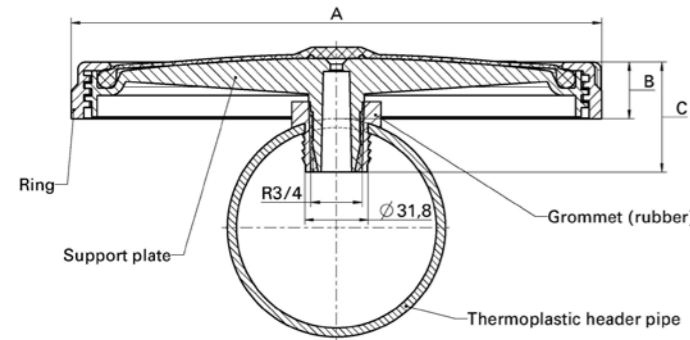


Dimensions

Diameter total [A] / effective	Installation height above pipe [B]	Overall height [C]	Orifice	Thread
346/295 mm	46 mm	76 mm	10 mm	R 3/4" +1"

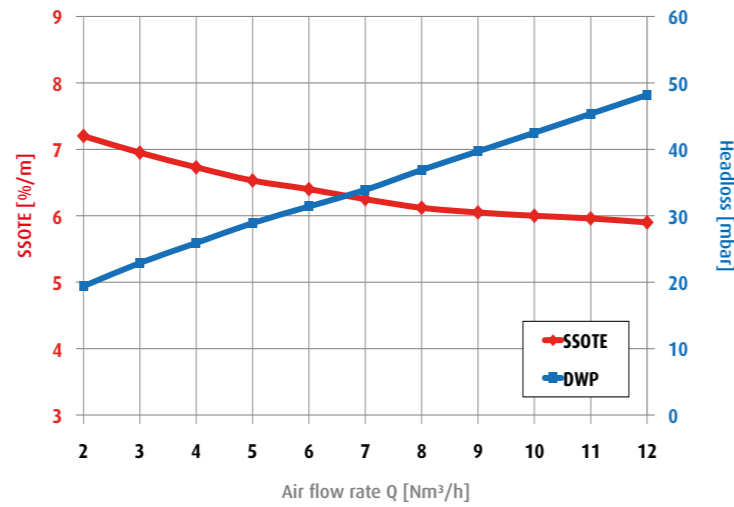


Installation drawing



A = 346 mm
B = 46 mm
C = 76 mm

SSOTE and headloss for HD 340 F053A



Perforated area	Air flow rate at standard operating conditions	Max. overload / maintenance air flow rate	Operating mode
0.060 m²	2 - 12 Nm³/h	15 Nm³/h	continuous / intermittent

Connectors to plastic header pipe

	Colour	Permitted wall thickness of header tube	Diameter of straight-drilled hole	Material
Rubber saddle	black	4 - 8 mm	32 mm	EPDM 75 ± 5 Shore A
PVC saddle 90 + 110 mm	grey/white	2 mm	35 mm	PVC
Clamp adapter 90 + 110 mm	black	2 mm	multiple	PP20%GF/SI/VA

Please see our operation manuals for more details.



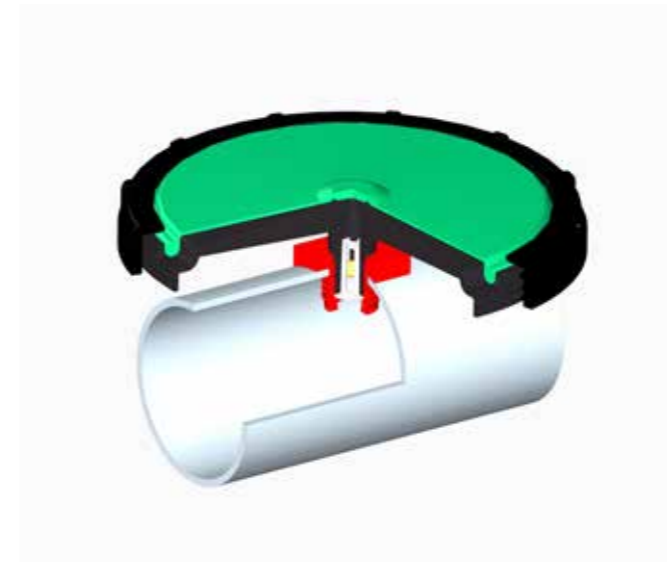
Membrane materials

Material	Techn. standard	EPDM F053A	EPDM F057A	Techn. standard	Silicone
Colour		black	black		green
Plasticiser (%)		28	9		0
Density (g/cm³)	DIN EN ISO 1183-1	1.07	1.06	DIN EN ISO 1183-1	1.17
Tensile strength (N/mm²)	DIN 53504	>10	>8	DIN 53504	>7
Elongation at break (%)	DIN 53504	>450	>300	DIN 53504	>300
Tear strength (N/mm)	DIN EN ISO 34-1 (method A)	>6	>3	DIN EN ISO 34-1 (method B)	>37.7
Hardness (Shore A)	DIN ISO 7619	52 ± 5	60 ± 5	DIN ISO 7619	60 ± 5
Operating air temperature (°C)		5 - 80	5 - 80		5 - 100
Operating water temperature (°C)		5 - 40	5 - 40		5 - 40

Support plates

Material	Colour
PP 30% GF	black

Accessories



Rubber saddle PVC saddle Check valve



Clamp adapter with female thread Clamp adapter without thread

Please see our accessories catalogue for more details.



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JetFlex® TD 65-2 G Tube Diffuser



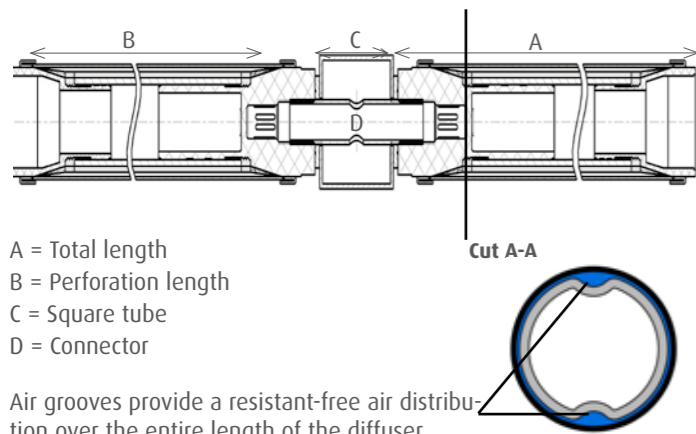


Dimensions

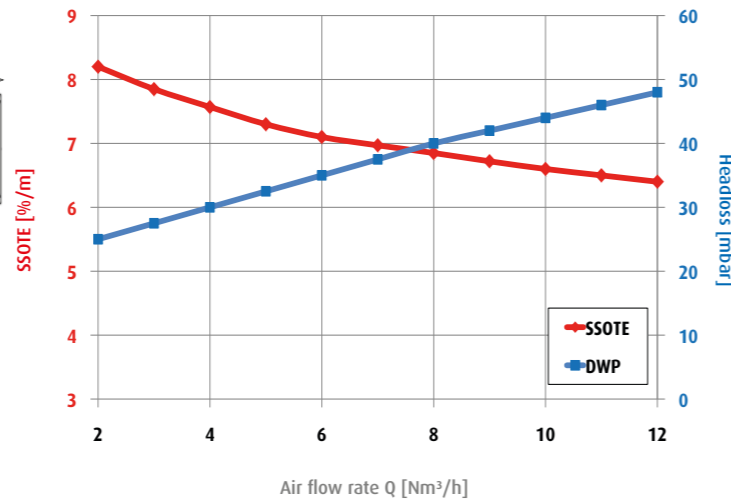
Material	Tube diameter	ID-Sleeve	Wall thickness
EPDM	63 mm	~ 65 mm	1.9 ± 0.15 mm
Silicone	63 mm	~ 65 mm	1.5 ± 0.15 mm
PUR	63 mm	~ 65 mm	0.75 ± 0.025 mm



Installation drawing



SSOTE and headloss for EPDM 1000 mm



Perforation length [B]	Total length [A]	Perforated area		Air flow rate at standard operating conditions		Max. overload / maintenance air flow rate		Operating mode
		EPDM	SI+PU	EPDM + SI	PU	EPDM + SI	PU	
1000 mm	1080 mm	0.18 m²	0.16 m²	2 - 12 Nm³/h	3 - 8 Nm³/h	20 Nm³/h	16 Nm³/h	continuous / intermittent
750 mm	830 mm	0.135 m²	0.12 m²	1.5 - 9 Nm³/h	2 - 6 Nm³/h	15 Nm³/h	12 Nm³/h	continuous / intermittent
500 mm	580 mm	0.09 m²	0.08 m²	1 - 6 Nm³/h	1 - 4 Nm³/h	10 Nm³/h	8 Nm³/h	continuous / intermittent

Dimensions for connection to square pipes

Connector [D]	Connector length square tube 80 x 80 mm [C]	Connector length square tube 100 x 100 mm [C]	Drill hole for connector
Pipe thread ISO 228 - G 1A	145 mm	165 mm	35 +1/-0 mm
Pipe thread ISO 228 - G 3/4A	145 mm	165 mm	28 +1/-0 mm

Please see our operation manuals for more details.



Membrane materials

Material	Techn. standard	EPDM	PUR	Techn. standard	Silicone
Colour		black	transparent		translucent
Plasticiser (%)		35	0		0
Density (g/cm³)	DIN EN ISO 1183-1	1.11	1.13	DIN EN ISO 1183-1	1.16
Tensile strength (N/mm²)	DIN 53504	>7	>45	DIN 53504	>9
Elongation at break (%)	DIN 53504	>400	>450	DIN 53504	>900
Tear strength (N/mm)	DIN EN ISO 34-1	>7,5	>35	ASTM D 624 B	>38
Hardness (Shore A)	DIN ISO 7619-1	40 ± 5	80 ± 5	DIN 53505	60 ± 5
Operating air temperature (°C)		5 - 80	5 - 60		5 - 100
Operating water temperature (°C)		5 - 40	5 - 40		5 - 40

Other materials

Support tube	SS clamp
PP / PP 20% GF	1.4301

Accessories



Please see our accessories catalogue for more details.



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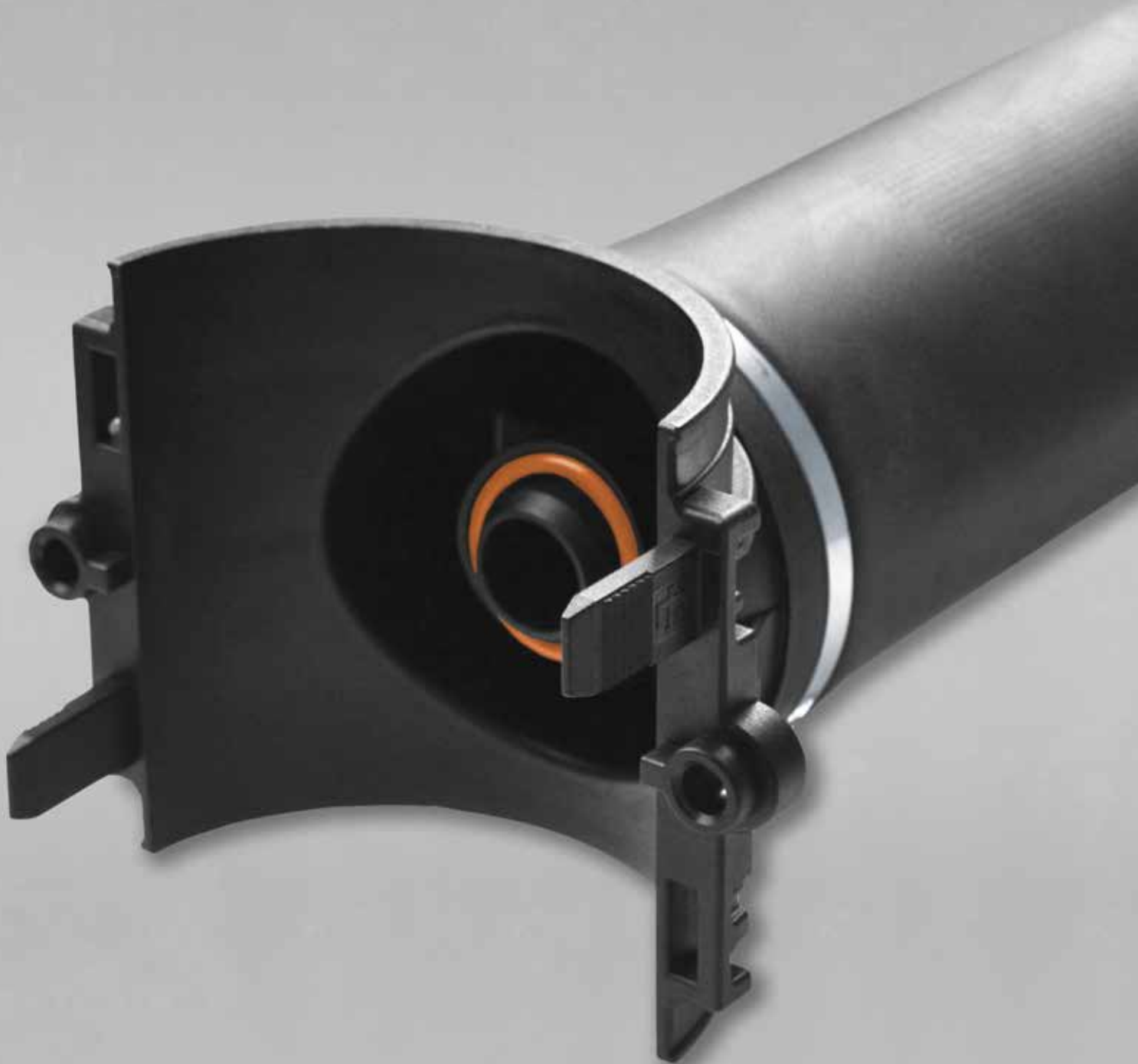


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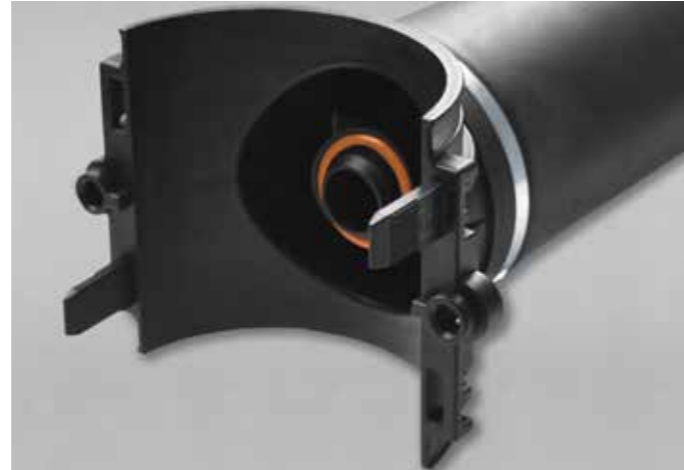
JetFlex® TD 90-2 Tube Diffuser



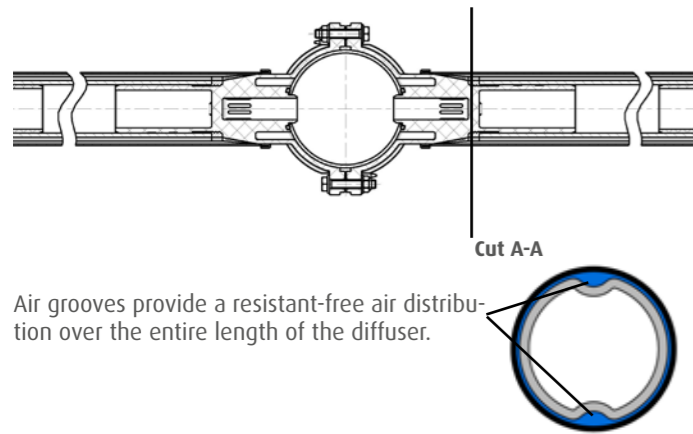


Dimensions

Material	Tube diameter	ID-Sleeve	Wall thickness
EPDM	87 mm	~ 90 mm	1.90 ± 0.20 mm
Silicone	87 mm	~ 90 mm	1.50 ± 0.20 mm
PUR	87 mm	~ 90 mm	0.75 ± 0.05 mm

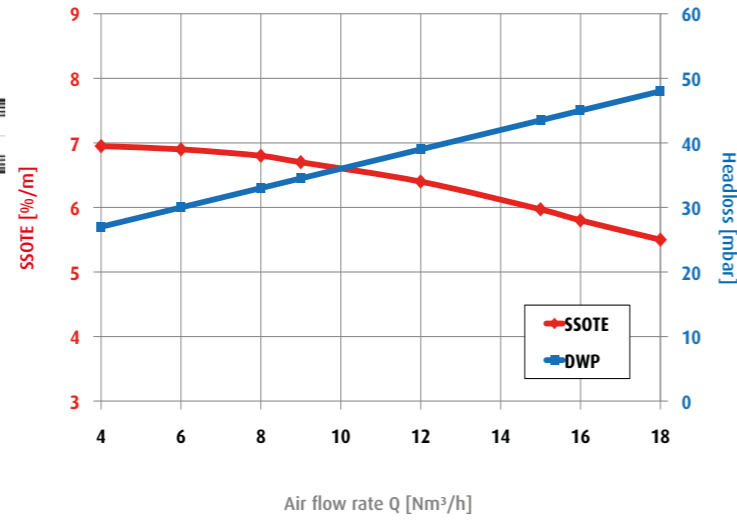


Installation drawing



Air grooves provide a resistant-free air distribution over the entire length of the diffuser.

SSOTE and headloss for EPDM 1000 mm



Perforation length	Total length	Perforated area	Air flow rate at standard operating conditions	Max. overload / maintenance air flow rate	Operating mode
1000 mm	1195 mm	0.24 m²	4 - 18 Nm³/h	28 Nm³/h	continuous / intermittent
750 mm	945 mm	0.18 m²	3 - 14 Nm³/h	21 Nm³/h	continuous / intermittent
500 mm	695 mm	0.12 m²	2 - 9 Nm³/h	14 Nm³/h	continuous / intermittent

Dimensions for connection to round pipes

Outer diameter	Material	Nominal diameter	Drill hole
114.3 mm	SS	100 mm	32 +0.5/-0 mm
110 mm	PVC	100 mm	32 +0.5/-0 mm

Please see our operation manuals for more details.

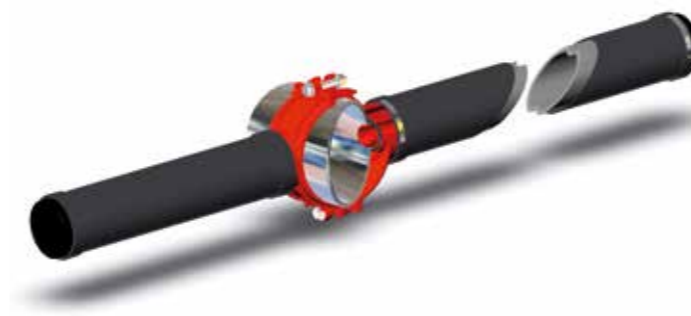


Membrane materials

Material	Techn. standard	EPDM	PUR	Techn. standard	Silicone
Colour		black	transparent		translucent
Plasticiser (%)		35	0		0
Density (g/cm³)	DIN EN ISO 1183-1	1.11	1.13	DIN EN ISO 1183-1	1.16
Tensile strength (N/mm²)	DIN 53504	>7	>45	DIN 53504	>9
Elongation at break (%)	DIN 53504	>400	>450	DIN 53504	>900
Tear strength (N/mm)	DIN EN ISO 34-1	>7.5	>35	ASTM D 624 B	>38
Hardness (Shore A)	DIN ISO 7619-1	40 ± 5	80 ± 5	DIN 53505	60 ± 5
Operating air temperature (°C)		5 - 80	5 - 60		5 - 100
Operating water temperature (°C)		5 - 40	5 - 40		5 - 40

Other materials

Support tube	SS clamp	Threaded joints
PP / PP 20% GF	1.4301	1.4301



Accessories



L-bracket and end plug

Clamp adapter without thread

Please see our accessories catalogue for more details.



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Accessories





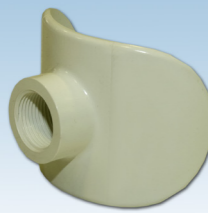
Rubber Saddles



JetFlex® Disc Diffusers with R³/₄" nipple may be installed onto all plastic pipes suitable for waste water and hot air. Grommets are suitable for all plastic pipes with outer diameter between 89 and 141 mm (3½ and 5 9/16 inch). Wall thickness for the Universal Saddle should be between 4 and 8 mm (5/32 and 5/16 inch). The exertion force for this saddle is approximately 850 N with discs properly installed. Universal Saddles work with all JetFlex® disc diffuser with ¾" male thread. For further details please refer to our Technical Information "Installation (of JetFlex® Disc Diffusers) using EPDM-Grommets" at www.jaeger-envirotech.com

part-no.	description	material	colour
01005199	rubber saddle universal	EPDM	black

PVC Saddles

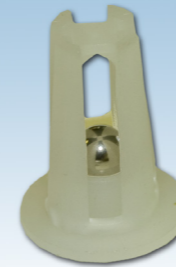


PVC Saddles are made from U-PVC and may be glued onto 90 and 110 mm PVC pipes (U-PVC and/or C-PVC). They are equipped with a G³/₄" female thread. The opening in the header pipe should measure 36 ± 0.5 mm. You may rectify slight deviations in diameter and position of bore by accurately positioning the saddle on top of the pipe, thread pointing exactly upwards. For detailed information on gluing the saddle to the header please refer to instructions from glue manufacturers, e.g. Tangit by Henkel at www.tangit.com or equivalent. You may have to secure the position of the clamp by cable ties or similar means for 5 minutes or more depending on temperature.

part-no.	description	material	colour
02003662	saddle 90 mm	PVC	white
02004508	saddle 90 mm	PVC	grey
02003663	saddle 110 mm	PVC	white
02004509	saddle 110 mm	PVC	grey



Check Valve (for JetFlex® HD200, HD270 and HD340 with R³/₄ external thread)



Check valves (non-return-valves) consist of a PP housing containing an 8 mm SS-ball. The stainless-steel ball prevents backflow of sludge into headers in case of damage to the membrane of the disc. Check valves alter the headloss characteristic of JetFlex® disc diffusers, so do not install discs with and without check valve in the same tank or on the same grid. Check valves work best if discs are installed using our clamp adaptors 90N or our rubber saddles, see above.

part-no.	description	material	colour
02003636	non-return valve	PPC30%GF/SS	white

Clamp Adapters

Clamp adapters come in a variety of sizes and threads. They require a 40⁺⁰⁻¹ mm hole in the header pipe. For disc diffusers this hole must point exactly upwards. Short tube diffusers (max. 560 mm length) have to be leveled within ± 5 mm at the ends, so both 40 mm holes must be aligned horizontally. All clamps come with a cable-tie-like mounting aid freeing your hands during installation. Clamps are installed in pairs. You need two threaded ones (1" male) for a pair of tubes or one threaded and one blind one for a single tube. Discs require one threaded and one blind clamp.

Clamp adapters 90N have been designed especially for 90 mm headers with existing openings of about 15 mm. You may connect any JetFlex® disc diffuser with a set of one 90N-clamp R³/₄ and one blind clamp. This threaded clamp easily accommodates our check-valve giving you full compatibility, if necessary.

Clamp adapter 90N-G1 male thread may be used to connect tube diffusers onto 90 mm plastic headers. The clamp requires a 16 mm opening in the header (+1/-0 mm). This clamp causes some additional headloss for airflow rates above 8 m³/h per diffuser.



Clamp Adapters with male thread



part-no.	description	material	colour
02003754	clamp adapter 114.3 with 1" male thread	PP20%GF/SI/SS	black
02003902	clamp adapter 110 with 1" male thread	PP20%GF/SI/SS	black
02004699	clamp adapter 90N with 1" male thread	PP20%GF/SI/SS	black

Clamp Adapters with female thread



part-no.	description	material	colour
02003756	clamp adapter 114.3 with R 3/4 female thread	PP20%GF/SI/SS	black
02003904	clamp adapter 110 with R 3/4 female thread	PP20%GF/SI/SS	black
02004699	clamp adapter 90N with R 3/4 female thread	PP20%GF/SI/SS	black

Clamp Adapters without thread



part-no.	description	material	colour
02003755	clamp adapter 114.3 without thread	PP20%GF/SS	black
02003903	clamp adapter 110 without thread	PP20%GF/SS	black
02003978	clamp adapter 90N without thread	PP20%GF/SS	black



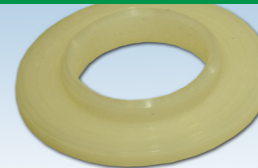
Blind Plugs



Many tube diffusers in Europe are installed onto square-tube-headers. Occasionally there is the need to omit individual diffusers due to obstructions in the tank etc. Blind plugs allow you to install a single diffuser either side of the header. Of course, a pair of diffusers may be replaced by a pair of blind plugs, too. Diffusers with 3/4" NPT usually are not installed in pairs, so the applicable blind plug serves as a cap or plug to shut off unused existing connections.

part-no.	description	material	colour
02003667	blind plug G3/4"	PP30%GF	green
02003668	blind plug G1"	PP30%GF	blue
02003670	blind plug 3/4" NPT	PP30%GF	grey

Adapters



Existing diffusers on square tubes may be mounted using different connectors and openings. We carry adapters for existing openings of 40 and 45 mm. There is no need for an additional gasket.¹ The existing connectors are replaced by our 1" stainless-steel connectors, see further below.



part-no.	description	material	colour
02003669	Flange Seal 40 mm	Desmopan	white
02004847	Flange Seal 45 mm	Desmopan	white

¹ As a matter of principle each carton with tube diffusers contains the appropriate amount of EPDM or silicone gaskets. In combination with Desmopan-Adapters you do not need these gaskets.



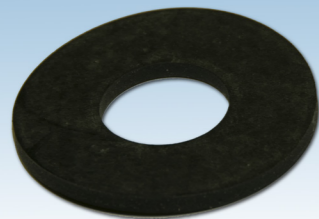
Sealing for Tube Diffusers JetFlex® TD65-2



Tube diffusers TD 63-0 usually include all necessary sealing. If for any reason diffusers are disassembled we strongly recommend replacing the seals upon re-installation.

part-no.	description	material	colour
06018329	gasket TD65-2 G1	Silicone	red
06031688	gasket TD65-2 ¾	Silicone	red

Sealing for Tube Diffusers JetFlex® TD63-0 (formerly TD 63/2 - - -)



Tube diffusers TD 63-0 usually include all necessary sealing. If for any reason diffusers are disassembled we strongly recommend replacing the seals upon re-installation.

part-no.	description	material	colour
06017160	gasket 63x27x4 mm	EPDM	black
06017161	gasket 63x34x4 mm	EPDM	black
06017163	gasket 63x27x4 mm	Silicone	red
06017164	gasket 63x34x4 mm	Silicone	red



Stainless-steel clamps



Replacing sleeves requires new clamps to secure sleeves on support tubes. We do not recommend the use of worm-gear-clamps as these clamps may squeeze and crimp the sleeve. This may damage the sleeve or cause air-leakage at the clamp. See our installation instructions for details. V2A clamps (SS304) are stocked, V4A clamps (SS316) are available, too, but non-stock items.

part-no.	description	material
12000601	clamp 66.5 mm diameter	V2A
12000602	clamp 68.0 mm diameter	V2A
12000603	clamp 69.5 mm diameter	V2A
12000761	clamp 95.0 mm diameter	V2A

Pincer



This pincer is ideally suited to close above mentioned stainless-steel clamps. A regular pair of pliers may deform the ear of the clamp and is regarded as an emergency repair tool only.

part-no.	description
91002831	pincer



Stainless-Steel Connectors (Square headers)



For almost all kinds of square and rectangular pipes there is a connector for our tube diffuser type TD63-0. All other lengths are available on request.

part-no.	description	material
21000601	connector 3/4", length 130 mm	V2A
21000602	connector 3/4", length 150 mm	V2A
21000603	connector 1", length 130 mm	V2A
21000604	connector 1", length 150 mm	V2A
21000606	connector 1", length 170 mm	V2A
21999999	connector 3/4", length 145 mm	V2A
21999999	connector 3/4", length 165 mm	V2A
21999999	connector 1", length 145 mm	V2A
21999999	connector 1", length 165 mm	V2A
21999999	connector 1", length 185 mm	V2A

Plastic connectors / Saddles (Round headers)

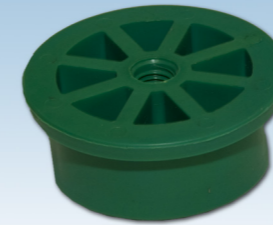


In order to join tube diffusers intended for square headers to 4-inch round headers there is a special connecting set available. Each set consists of 2 saddles and one connector threaded on both ends with 1" male threads.

part-no.	description	material	colour
01005958	saddle for 4" pipes	PP30%GF/EPDM	black
02003713	connector for 4" pipes	PA6 GF25	black



Fixing Plates



Tube diffusers may be exposed to high water currents near blade mixers etc. This may cause oscillatory instability particularly with regard to long diffusers. In order to avoid flapping of diffusers this special end cap may be inserted into the far end of the tube and fixed to the ground. The end cap does not hamper water flowing into the open end of the diffuser keeping the buoyancy of the tube low. Please specify installation height of diffusers in order to select the proper length of the SS brackets.

part-no.	description	material	colour	Threaded Nut
02003661	fixing plate for TD63	PP	green	M10
02004797	fixing plate for TD65	PP	black	M8

L-brackets



part-no.	description	material	Threaded Nut
21999999	bolt, washer, L-bracket (please call)	SS	M8 / M10



Pipe Support



Pipe supports are made from stainless steel (ANSI 304/316) with adjustable height for laterals and headers in order to achieve optimum uniformity of aeration. Available sizes are for 4" and 6" laterals and headers as well as for DN100 and DN150 metric sizes. Please, call for details.

description

pipe support 110/114.3/160 mm

material

SS



GENERAL SALES CONDITIONS JÄGER UMWELT-TECHNIK GMBH & CO. KG
Version 08/2008

I. Validity/ offers

- These General Sales Conditions shall apply for all current and future contracts and other performances. Buyer's conditions are not binding for us, although if we did not expressly object these Conditions after having received same.
- Our offers are subject to confirmation. Agreements, especially oral side agreements, promises, guarantees and other assurances of our Sales Employees become only binding if they are confirmed by us in writing.
- Documentations being part of the offer like drafts, photos, technical data, references to standards as well as statements in advertising mediums do not constitute a contractual statement or warranty of the goods unless explicitly referred to as such in writing.
- Goods may be subject to deviations in offers, samples, trial and previous deliveries which are customary according to actually valid DIN-/EN standards or other relevant technical standards.

II. Prices

- Unless otherwise agreed, our prices are to be understood in EURO, and shall apply "ex factory", exclusive of packing and plus V.A.T. The calculation will be made on the basis of the prices being valid at the delivery date.
- If we deliver the merchandise packed, we shall invoice the package separately at net cost prices; within the statutory regulations we take back packings delivered by us if the Buyer returns same to us within a reasonable term and "freight paid".

III. Payment and set-off

- Our invoices become due within 14 days from date of invoice by deducting 2 p.c. discount or within 30 days net. In any case the amount shown in the invoice has to be made available to us at the latest on its due date. At the latest 10 days after our claim became due the Buyer is considered to be in default without having to send him a reminder.
- Invoiced amounts below 50,00 EUR (Euro) and those for mounting, repairs, moulds and prorate tool costs are coming due at once without any deductions.
- Counterclaims being contested by us or being of no legal force do not entitle the Buyer neither to retain nor to set-off payments.
- On expiry of any term of payment agreed upon, but at the latest from default, we are entitled to invoice interest charges in the amount of the actual overdraft interest rate but at least in the amount of 8 p.c. above the respective basic interest rate. The enforcement of further damage caused by default is reserved.
- In the event that our claims, subsequent to the conclusion of the contract, are endangered because of non-performance on the part of the Buyer, we shall be entitled to make use of the rights of Art. 321 BGB (German Civil Code) (Unsicherheitseinrede = Objection of Uncertainty). We are then also entitled to make all not barred claims from our current business connection with the Buyer due for payment and to withdraw the debit authorization acc. to clause V/5. In case of default we are also entitled, after expiry of a reasonable grace period - to demand the merchandise back as well as to forbid the resale and further use of the delivered merchandise. When taking back the goods this shall not be considered as withdrawal from the contract. All these legal consequences may be avoided if the Buyer makes a payment or gives a guarantee in the amount of the endangered payment claim. The provisions of the Insolvency Statute are not effected by the aforementioned regulations.
- An agreed discount always refers to the value of goods invoiced, exclusive of freight and assumes that all due claims of the Buyer at the day of the settlement have been paid. Tool costs are payable net without any deduction.

IV. Delivery terms

- Delivery terms and dates are considered as adhered to when up to its expiry the subject of delivery has left our factory.
- Delivery dates shall be extended to a reasonable extent in case of strikes and lockouts as well as in case of unforeseeable impediments being outside our responsibility and as far as such impediments influence the production or the delivery of the merchandise considerably. This shall also apply if those circumstances occur at sub-suppliers. We shall inform the Buyer without delay of those circumstances. These provisions apply accordingly to delivery dates. In the event that the execution of the contract becomes unacceptable for one of the contractual parties then it may withdraw from the contract.

V. Retention of ownership

- All delivered goods remain our property (Vorbehaltsware) until complete settlement of all claims arising from a current business connection, no matter for what legal reason, inclusive of future or conditional claims.
- Processing of reserved goods is performed for us as manufacturer in the sense of Art. 950 BGB, without commitment. The processed merchandise is considered as reserved merchandise in the sense of paragraph V/1. In case the Buyer processes, combines or mixes the reserved merchandise with other merchandise then we shall acquire a joint ownership in the new item in the ratio of the invoiced value of the reserved merchandise to the invoiced value of the other, processed merchandise. Should our ownership become extinguished through the connection or conversion then it shall be considered as agreed that the Buyer transfers already now his ownership in the new item to us and this to the extent of the invoiced value of the reserved goods. The Buyer shall store the thus resulting possession on our behalf. The joint ownership arising hereafter is considered as reserved merchandise in the sense of paragraph V/1.
- The buyer is entitled and authorized to resell the reserved goods only within the scope of an ordinary and proper business transaction and as long as he is not in default, provided however, that the claims out of the resale will be transferred to us according to paragraph V/4 through V/6. The Buyer is not entitled to dispose of the reserved goods in other ways.
- Buyer's claims out of the resale of the reserved goods are already now assigned to us. They serve to the same extent as guarantee like the reserved goods. In case the Buyer sells the reserved goods together with other goods not sold by us, then the assignment of the claim out of the resale applies only to that resale amount achieved for the reserved goods. In case goods are sold in which we have a joint ownership acc. to paragraph V/2, then the assignment of the claim shall apply to the amount of this joint ownership.
- The Buyer is entitled to collect claims out of the resale. This right, however, can be at any time withdrawn by us. We shall make use of the right of revocation only in those cases as mentioned under paragraph III/4. Upon our demand the Buyer is obliged to inform his customer immediately of the assignment to us - unless we ourselves inform him - and to give us the necessary informations and documents for a collection.
- The Buyer has to inform us without any delay about any distraint or other impediment through a third party.
- In the event that the value of the existing securities exceeds the secured claims totally by more than 50 p.c., then we are obliged - upon Purchaser's demand - to release securities at our choice.

VI. Performance of deliveries

- At the time when the merchandise is handed over to the forwarder, but at the latest when the goods are leaving our warehouse or - in case of direct sales - the supplying factory, the risk passes over to the Buyer, also in case of deliveries "free domicile". Duty and costs of discharge are for the account of the Buyer. We shall only insure the goods on Buyer's instructions and for its account.
- We are entitled - to a reasonable extent - to make partial deliveries. In case of customized goods excess and minor deliveries up to 10 % of the contracted quantity shall be permitted.
- In case of orders on call we are entitled to produce or let produce the whole ordered quantity en bloc. Unless otherwise agreed upon, it is not possible to consider requests for change once the order has been placed. Call-off dates and quantities can only be adhered to within the context of our delivery or production possibilities, as far as no fixed arrangements have been concluded. Should the merchandise not be called as agreed upon, then we are entitled to consider the merchandise - after a reasonable grace period - as delivered and we may invoice it.

VII. Warranty for defects

- In case of a founded, prompt notice of defect we may to our choice repair the defect or make a replacement (subsequent performance - Nacherfüllung). Should the elimination of defect or subsequent delivery fail, the Buyer shall at his discretion be entitled either to reduce the purchase price or after having set an appropriate deadline and this deadline failed, to cancel the contract. In case of minor defects the Buyer is only entitled to make use of its right for reduction.
- We shall only take over expenditures in connection with a subsequent performance as far as these are reasonable in the particular case and especially are in the ratio to the purchase price of the goods delivered. Expenditures arising because the sold merchandise has been brought to a place other than the place or the branch of the Buyer are not taken over by us unless this corresponds to contractual use.
- The Buyer may only claim defective goods, if he allows us to convince ourselves of the defect and/or he makes us available upon demand the rejected goods or samples of it.
- Further claims are excluded according to paragraph VIII. This especially applies to claims for damages which did not occur at the merchandise itself (damages caused by a defect =Mangel-/folgeschäden).

VIII. General limitation on liability and statute of limitation

- We shall only be liable for contractual and extra-contractual duties, especially for impossibility, default, culpa in contrahendo and tortious actions - also for our senior executives and other vicarious agents - in case of intention or gross negligence, limited to the typical contractual and foreseeable damage at the time when the contract was concluded.
- These limitations shall not apply in case of culpable offence against essential contractual duties, insofar as the achievement of the contractual goal will be endangered, in cases of compulsory liability according to the Law on Production Liability, in case of injury of life, body or health and if and insofar defects of the matter have been maliciously withheld or their absence guaranteed. The provisions concerning the burden of proof remain unaffected.
- Unless otherwise agreed upon, contractual claims which arose upon the Buyer against us on the occasion of or in connection with the delivery of goods, shall become time-barred one year after delivery of the merchandise. This deadline shall apply also for such goods which were used for a building according to their usual manner of use and which caused the defectiveness of same, unless this manner of use has been agreed upon in writing. This shall not affect our liability from intentions and gross negligent breaches of duty as well as the limitation of legal claims of recourse. In the event of a subsequent performance the period of limitation shall not start again.

IX. Copyright

- We reserve the property right and copyright on all offers, drafts, drawings and other documentation; which may only be disclosed to a third party upon our consent. Drawings and other documentation being part of an offer have to be returned to us upon request.
- In the event that we delivered subjects according to drawings, models, patterns or other documents pertaining to the Buyer, then the Buyer shall be liable that protective rights of third parties are not violated. If a third party prohibits us the production and delivery of such objects under reference to protective rights, we are entitled - without being committed to review the legal situation - to stop any further activity and in case of Buyer's fault, to demand damage compensation. Further the Buyer obliges himself to release us from all relating claims of third parties.

X. Trial parts, moulds, tools

- In the event that the Buyer has to supply parts which are necessary for the performance of the order, then he will have to deliver same in time, free of charge and defects and delivered free production site in the quantity needed and/or with a reasonable extra quantity for possible scrap. In case of failure, thus arising costs and other consequences shall be for the account of the Buyer.
- The production of trial parts inclusive the costs for the moulds and tools are for the account of the Buyer.
- Property rights in moulds, tools and other equipment which are necessary for the production of ordered parts depend on the agreements made. We oblige ourselves to hold such devices for at least two years after their last use.
- Our liability for tools, moulds and other production devices provided by the Buyer is limited to the care like on our own account. Costs for maintenance and care shall be borne by the Buyer. Our duty of retention expires - independent of Buyer's property rights- at the latest two years after the mould or tool has been used last time.

XI. Place of Performance, Jurisdiction, Applicable Law

- Unless otherwise agreed to, our local office shall be the place of performance for our deliveries, if otherwise agreed, our headquarter in Hannover, Germany. The place of jurisdiction is Hannover, Germany. We can claim against the Buyer also at his place of jurisdiction.
- All legal relationships between ourselves and the Contractor shall be governed by the laws of the Federal Republic of Germany supplementing these Purchase Conditions, including the provisions of the United Nations Convention on Contracts for the International Sale of Goods of (CISG) of 11-04-1980.

XII. Applicable Version

In cases of doubt, the German version of these General Conditions of Purchase shall apply.



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