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ECD Ceramic Micro Bubble Diffusers
User Manual

IMPORTANT: This User Manual contains important information, including safety & installation points, which will enable you to get the most out of your diffuser. Please follow the instructions and keep it in a safe place so that it is easily available for future reference, for you or any other person not familiar with the operation of this diffuser.

1. Description:

The Enviro Ceramic Diffuser (ECD) consists of a high-tech gas diffusion ceramic membrane for efficient micro bubble transmission into water or other suitable liquids. We make two different varieties, a high pressure (HP) and low pressure (LP) diffuser. The "200" for e.g. ECD200 refers to the ceramic surface area of 200 cm^2 and likewise ECD400 has 400cm^2 area of ceramic membrane. Ultra-fine mist of micro bubbles appears quickly at pressures of only 1-2 bar (14.5-29 psi) for our HP models and below 1 bar for our LP models. The bubble size distribution is between sub-micron (nano) to about 250 microns (µm) depending on conditions such as

pressures, depth, side currents and surface tensions of liquid, gas and solid interface. The engineered ceramic membrane of all our diffusers is made from ultra-fine nano porous aluminium oxide, sintered at high temperature for maximum strength and nano sized pores. The membrane is then either encapsulated in tough polyurethane (PU) filled resin or a hydraulic bonded ceramic housing for our ozone diffuser. All diffusers have stainless steel fittings for the gas connections. The unique patented design we utilise allows an airlift principle to move anaerobic or stagnant water through the centre hole of the diffuser, thereby increasing efficient gas transfer. The novel anti-microbial ceramic we have developed also aids in preventing biofouling of the diffuser, reducing maintenance.

2. Application:

Our diffusers are used in diverse applications where efficient and static gas transfer into liquids is required. These applications include, but are not limited to:

2.1. Aquaculture: Used in Recirculating Aquaculture (RAS) tanks, ponds, raceways, hatcheries, transporters and cages. These diffusers are most suitable for supplementing oxygen in both fresh and sea water with increased fish stock densities and as an emergency back-up device. It is also used effectively for the safe transportation and anesthetising fish with CO_2 for handling and processing purposes.

2.2. Waste Water Treatment: The supply of oxygen for aeration is the single largest energy consumer at an activated sludge wastewater treatment plant. Due to the higher efficiency of ECD diffusers, compared to membrane diffusers or bubbly hoses, the ECD's are effectively used for reducing biochemical oxygen demand (BOD) and chemical oxygen demand (COD) in ponds, channels and larger pipes as well as aiding aerobic bacteria for digesters.

2.3. Koi Ponds: The mist of air bubbles created optimises Koi Pond aeration and the brown ceramic and resin camouflages the diffuser visibly from disruptions of seeing your beautiful fish. Water circulation pump failure or high summer temperatures can lead to decreased oxygen levels that can

cause fish dying, diffusers aid in avoiding this. It is also recommended to supplement oxygen levels during the night. The diffuser is also used effectively for the safe transportation of fish.

2.4. **Hydroponics/Aquaponics:** In a Deep-Water Culture (DWC) hydroponic system it is vital to have sufficient oxygen levels because the roots are submerged. For optimal growth it is recommended to diffuse 1.5 L/min of air into 50 litres (130 gallons) of cooled nutrient solution to maintain Dissolved Oxygen (DO) levels of 8-9 ppm. Be aware to adjust pH levels over time and keep the water temperature around an optimum of 22°C (72°F). Other systems require less oxygen, only to maintain aerobic conditions from the perpetual motion the diffuser creates with its tiny bubbles and airlift principles.

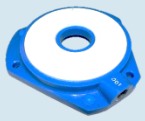
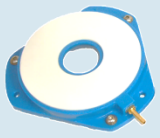
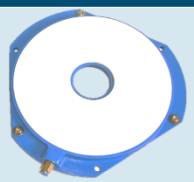
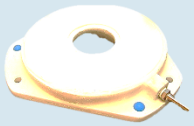
2.5. **Marine Tanks:** These diffusers are most suitable for supplementing oxygen in sea water with increased fish stock densities and as an emergency back-up device.

2.6. **Ozone Diffuser:** our latest development is a 100% ozone resistant low-pressure diffuser for ozone applications such as water sterilisation. This diffuser is also high temperature resistant and can also be used in bioreactors where temperatures exceed boiling point.

3. Gasses to be used:

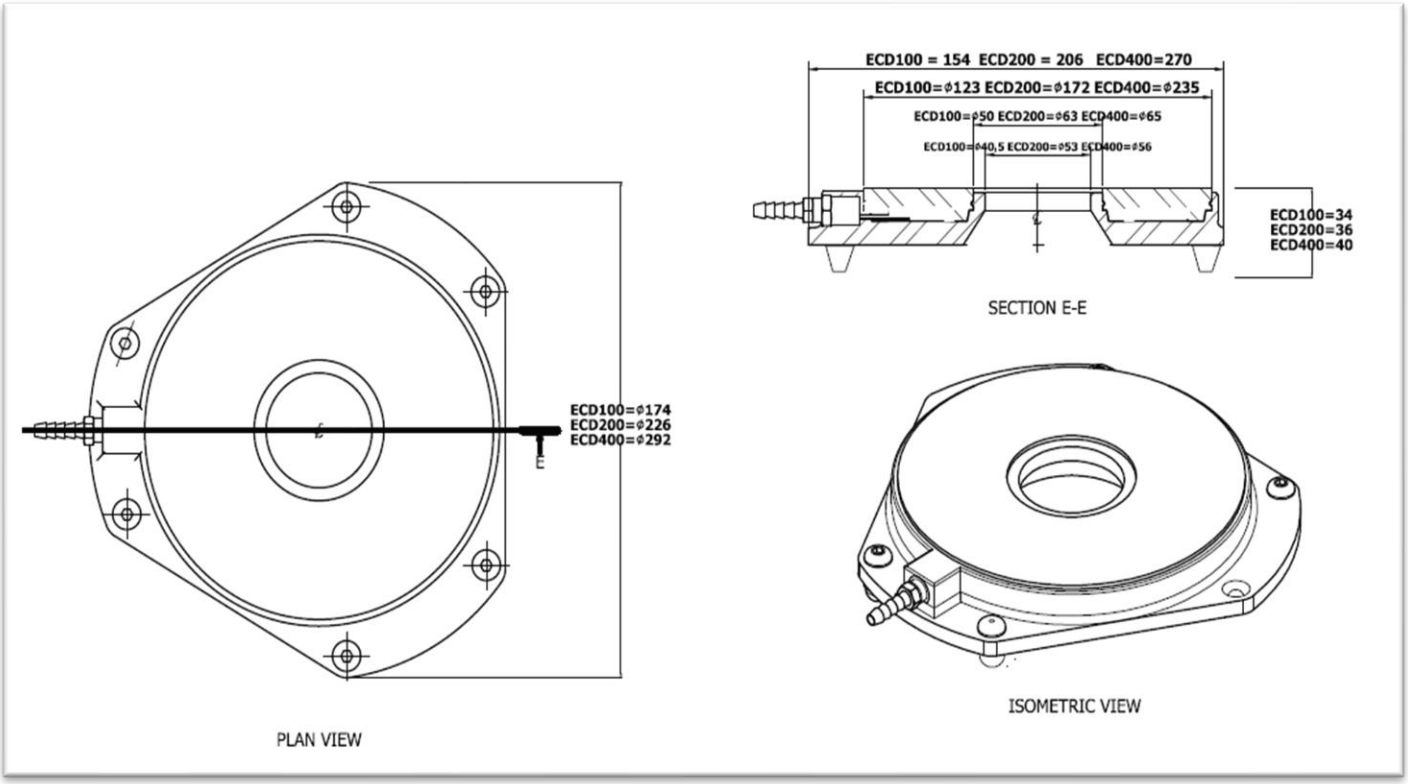
The ECD ceramic diffuser is made for use with gasses such as **oxygen, carbon dioxide, nitrogen, air** and now also **ozone**. Please contact us about any other gas applications. It is important that the gas, and especially compressed air supply, is completely oil and dust free by using suitable recommended in line filters (minimum 5 micron). This will aid in preventing internal blockages of the ceramic pores over time. When using compressed air in an aquatic system, please be aware of the possibility of causing gas bubble from dissolved nitrogen gas. For use with oxygen, the supply equipment needs to be rated for oxygen use and be degreased.

4. Specification:

ENVIRO CERAMIC MICRO BUBBLE DIFFUSER SPECIFICATIONS				
✓ Superior Technology ✓ Durable Quality ✓ Affordable Prices ✓ Worldwide Distribution by our team of experts				
Application:	For Fish Farming as oxygen supplement, emergency backup, hatcheries and transportation.			Ozone water treatment & sterilisation.
Model Number:	ECD 100	ECD 200	ECD 400	ECO_3D 200
Ceramic Diffusing Area:	100 cm^2 / 16 in^2	200 cm^2 / 31 in^2	400 cm^2 / 62 in^2	200 cm^2 / 31 in^2
Recommended Operating Range:	0.75 to 1.5 L/min @ 1 to 2 bar 1.6 to 3.2 ft3/hr @ 14.5 to 29 psi	1.5 to 3 L/min @ 1 to 2 bar 3.2 to 6.4 ft3/hr @ 14.5 to 29 psi	3 to 6 L/min @ 1 to 2 bar 6.4 to 12.8 ft3/hr @ 14.5 to 29 psi	1.5 to 3 L/min @ 0.3-0.7 bar 3.2 to 6.4 ft3/hr @ 4 to 10 psi
Maximum Operating Pressure:	It is not necessary to exceed 2.5 bar/36psi			1.5 bar / 22 psi
Size/Dimensions:	Ø174 x 35 mm high	Ø225 x 35 mm high	Ø292 x 40 mm high	Ø225 x 40 mm high
Nett Weight:	0.7 kg / 1.5 lbs	1.35 kg / 3.0 lbs	2.6 kg / 5.7 lbs	1.7 kg / 3.7 lbs
Ceramic Pore Size/ Bubble Size:	Pores avg. 0.5 micron (500 nano metres) / bubbles avg. 120 µm (<50 to 200 µm) at 1-2 bar			Pores avg.0.5 µm/<50 to 250 µm at 0.3-0.7 bar
Gas inlet connection Fittings:	Use a 1/4" NPT thread male fitting for your gas hose connector. Our diffuser fitting is a 1/4" female NPT thread from 316 SS.			Supplied with a 316 SS Hose Barb 1/8" NPT male for a Ø6-7 mm hose
Materials of manufacture:	Inert anti-biofouling nano porous ceramic membrane with a tough polyurethane resin housing, silicone and 316 stainless-steel fittings.			100% inert ceramic with silicone and 316 stainless steel. Ozone Resistant.

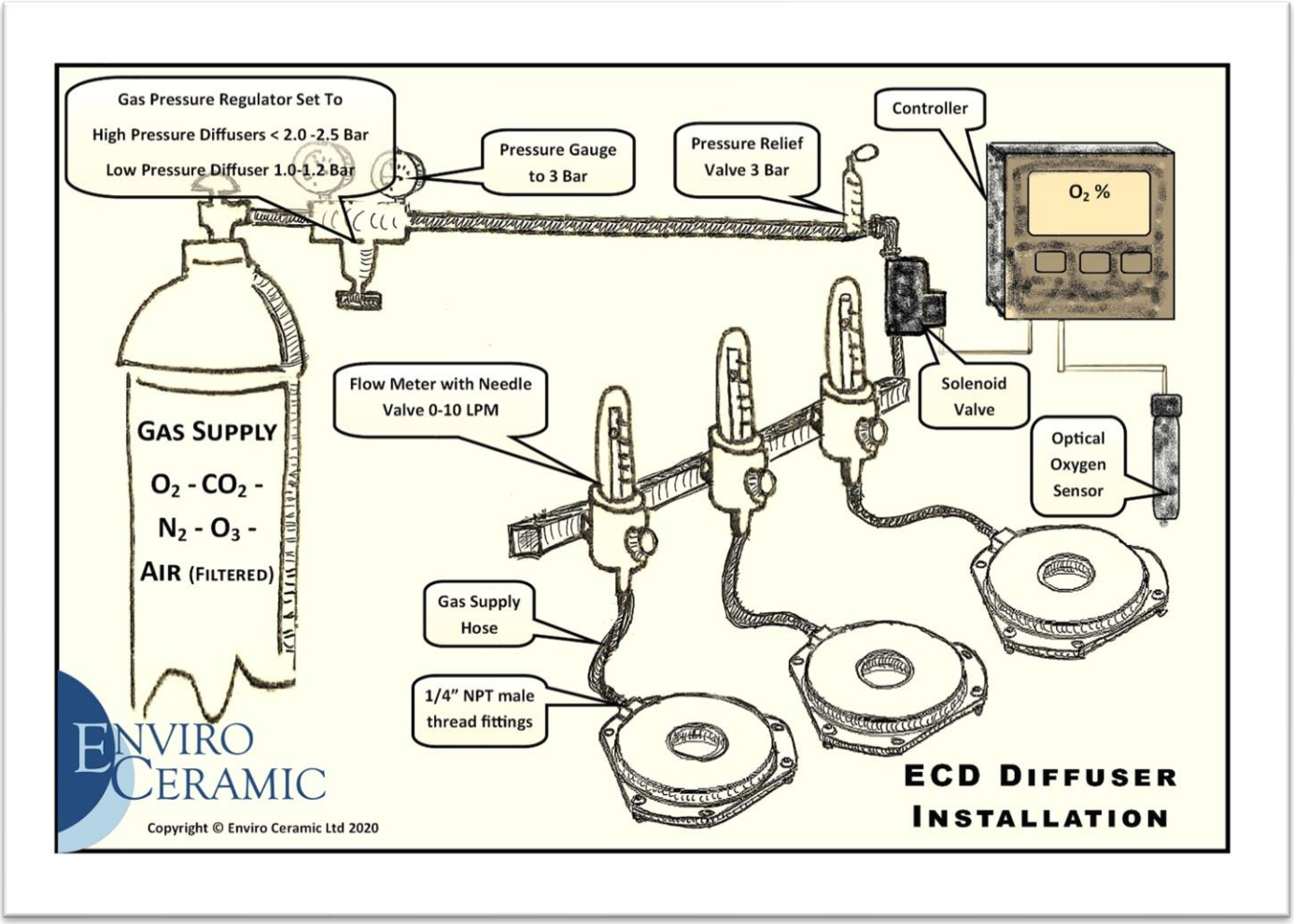
✓ Anti-Biofouling inert ceramic: protecting the working surface and inside from algae growth, reduces maintenance and risk of blocked pores.
✓ Unique design with patented central hole causes water stream to mix with the air lift for additional aeration efficiency.
✓ Nano sized pores result in the finest bubbles possible and reliable gas transfer.

Please note that we aim to improve our diffusers at all times and that our specifications may change from time to time. Contact us if you have any particular questions regarding our specifications.



"Resources are limited, Resourcefulness is not"

5. Installation & Operation:



The following instructions are guidelines for installation but individual applications may differ.

5.1. Additional equipment needed to efficiently use the diffuser.

5.1.1. Use a good quality **Pressure Regulator** suitable for the gas type used. This should be **set at the lowest pressure required, usually 2.0 bar (29 psi) or lower. Do not exceed a maximum of 2.5 bar (36 psi).**

5.1.2. When using compressed air, a **gas filter** should also be fitted in line to remove any oil and dust particles **(<5 micron)** that may originate from the supply line going to the diffusers. This dust or oil can block the fine pores inside the ceramic on the long term and cannot be removed.

5.1.3. For additional safety fit a **pressure relief valve set at 3 bar** (43 psi) on the gas line, this protects the diffusers and rotameters from damage if by chance from being over pressurized.

5.1.4. Water/Air Hammer effect can be detrimental to the diffuser ceramic and resin, or even the rotameters. Water penetrates the diffuser and when gas pressure hits the water it sends a shockwave through the diffuser sometimes breaking the weakest point of the diffuser especially with repeated shocks occur as with using Solenoid Valves. If a gas hammer effect is evident, in order to absorb some of the shock created by fast opening valves then longer hoses are recommended to be used. Also **IMPORTANT see controller set up and solenoid bypass method described in 5.3.6.**

5.1.5. To ensure control of optimum gas flow rates, fit a **needle valve and rotameter (flow meter)** after the regulator/solenoid valve. It is recommended to use one for each diffuser for ultimate control. Mount the flow meter on a manifold for easy access. Ensure the flow meter reading scale is according to the requirements of the gas being used per diffuser, we recommend 0 – 10 L/min (0 – 21 scfh).

5.1.6. For the most professional and efficient regulation of oxygen, we recommend a Control Unit in conjunction with an Optical Oxygen Sensors and a Solenoid Valve (see water hammer effect – 5.3.6.).

5.2. Connecting the Diffuser:

5.2.1. Connect your choice of **¼ inch NPT thread male fittings for your gas supply hose connection (usually a Ø 6-8 mm hose)** to the diffusers female ¼ inch NPT threaded stainless steel fitting. Do avoid different metals for connectors as galvanic corrosion can occur especially in sea water. **Do not over tighten connections**, but ensure there are no leaks by testing under water (use a fish tank for optimal side view – views from the top may be

distracting). Use PTFE tape or a suitable sealant on the threads if required. BSP 1/4" threads may also be used with some PTFE tape if NPT thread is not available.

5.2.2. Any number of diffusers can be connected to a common supply line as long as they each have a rotameter connected, otherwise the last diffusers in line could get no gas. Avoid using other manufacturer's diffusers on the same common supply line, unless a rotameter is used and minimum pressure is maintained. Other diffusers function at different flow rates and pressures.

5.2.3. There are 6 mounting holes (Ø 8 mm, 5/16") provided on the diffuser resin base to secure it to a frame or tank floor as required. A rope may also be used for it to lift the diffuser.

5.2.4. The deeper the diffuser is underwater, the better the efficiency will be, as the bubbles take longer to rise. A minimum depth of 50 cm is recommended. Over 4 m depth the efficiency is 100% but beware of excess pressure.

5.2.5. A sideway current over the diffuser will increase the efficiency as bubbles drift sideways and take longer to rise.

5.2.6. Always seat the diffuser horizontally, without obstructions, to avoid rising bubble coalescence.

5.2.7. The higher the flow rate deviates from the recommended range, the larger the bubbles will become and the gas transfer efficiency will decrease accordingly.

5.2.8. Due to the unique design of the ECD, the diffuser should always be lifted at least 10 mm off the tank floor in order to create the motion needed to move water through the diffuser centre (airlift principle) that increases gas transfer efficiency. The provided silicone feet aid in this. If the air lift is not required it can be eliminated by simply removing the silicone feet and resting the diffuser flat on the tank floor.

5.3. Start Up:

5.3.1. Ensure the set supply pressure will not exceed 2.5 bar (36 psi) for HP and 1.5 bar (22 psi) for LP Diffusers.

5.3.2. Open the regulator to the recommended lowest running pressure.
5.3.3. Open the needle valve on the flow meter slowly to the fully open position.
5.3.4. If the diffuser was submerged for a while, there will be a small delay before start up. It can take up to 2 minutes for the flow rate to stabilise and push out all the water from the diffusers air plenum at the set recommended pressure.
5.3.5. Now reduce the flow rate with the needle valve to its recommended operating flow rate, this will supply you with its ideal gas/oxygen absorption performance.
5.3.6. When using a solenoid valve to open/close the gas supply with a controller, then program controller to open the valve every 15 minutes for 30 seconds to ensure the water inside the diffuser is pushed out and optimal flow rates are quickly achieved, especially in emergency situations. A **"solenoid bypass method"** can also be used where a gas line bypasses the solenoid valve that has a low pressure (<0.5 bar/ 7 psi) regulated, this ensures no water can penetrate into the diffuser, but it will not waste gas.

5.4. What not to do:

5.4.1. A diffuser produces the best bubbles when the ceramic is pre-wetted. Soak diffusers for 1 hour before testing or visual evaluation. A dry diffuser will show bigger and irregular bubbles when put in direct use. Try viewing diffusers in an aquarium for best comparisons as viewing from the top of a tank is not advisable for visual evaluation.
5.4.2. Do not contaminate the ceramic surface with any hydrophobic materials (i.e. oils, fats or greases) as these repel water and cause large bubble formation. High lipid content water will also reduce performance due to bubble coalescence.
5.4.3. Avoid physical shock (i.e. dropping) as this may cause defects or breakages. Always handle with care.
5.4.4. Avoid exposing the diffuser to freezing temperatures, the water inside the plenum may freeze and expand and this can cause the ceramic or resin to

crack. This has not been observed in tests conducted at -20°C (- 4 °F) but caution should be taken.

5.4.5. Do not expose the diffusers to temperatures above 60 °C (140 °F) as it will weaken the resin and cause cracks.

6. Health & Safety:

Gasses under pressure can be dangerous. Our HP diffusers are tested to 5 bar (72.5 psi) and LP to 3 bar (43 psi) for safety. Avoid over pressurizing and exposure to oxidizing agents and always operate diffusers only submerged under water unless cleaning. All health and safety issues relating to gasses, cleaning chemicals and other equipment should be strictly adhered to according to the supplier's recommendations. Equipment used with oxygen such as hoses, fittings etc must be suitably approved and free of oil and grease. For ozone use, only utilise ozone resistant materials and follow strict instructions and regulations. Overdose of ozone can be lethal.

7. Cleaning & Maintenance:

The ECD's are developed with an inert anti-microbial ceramic that prevents algae growth and biofouling on the ceramic surface and inside the pores. However, with time and adverse waters, the gas flow rate may decrease (i.e. higher pressure is needed to achieve the same gas flow rate) and periodic checks are required to ensure the surface is still performing effectively.

7.1. **Frequency**: A routine monthly check and quick wipe clean with a soft sponge and fresh water is recommended. Cleaning will be required more frequently with high turbidity or foul water.

7.2. For seriously soiled surfaces:

7.2.1. Remove the diffuser from the working tank and place it on a clean cloth/towel.

7.2.2. Carefully/slowly with the regulator or valve (in about 30 seconds) increase the pressure to its set full 2,0 or 2,5 bar (30 to 36 psi) and fully open rotameter (full flow rate). Don't worry, the ECD diffusers will not explode.

You will see is foaming on the ceramic surface, this pushes most water from the ceramic membrane, called purging.

7.2.3. Clean the surface as best possible by wiping it with a clean cloth/towel, after about 60 seconds close the air supply, the diffuser will now be dry enough for further cleaning.

7.2.4. Soak the diffuser in clean tap water or as required for sterilisation or algae removal in a 6-10% hydrogen peroxide solution. To remove metallic salts (ferric and carbonate salts), use diluted citric or acetic acid [10%]. Soak for about 60 minutes or longer in the acids as required.

7.2.5. In some extreme cases, soaking the diffuser in a 10% Hydrochloric Acid (HCl) solution overnight also works well to remove salt deposits and organic matter. This does not affect the diffuser seals or anything. It needs to be flushed properly however before returning it to use. Soak in fresh water for 30 min then purge as described above, repeat this step at least 3 times to ensure most HCl has been removed or neutralised.

7.2.6. Rinse thoroughly with fresh water to remove all traces of the acid. Only use diluted acid as the metal fittings may corrode if used incorrectly.

7.2.7. If the above cleaning does not work, use the 1000 grit sandpaper on the ceramic surface while its foaming during purging, this removes any build up on the surface and prevents anything from entering the pores while cleaning. Rinse the diffuser regularly or even do the sanding under water in the bucket if possible. Do so until the surface is clean and reasonably white again.

7.2.8. Do not use soap or detergents as they may block the ultrafine pores.

7.2.9. Diffusers taken out of service must be cleaned, sterilised and dried before storing in a dust free dry environment at room temperature.

8. Disposal of packaging and product:

Please dispose of the packaging and product life end according to the required legislation according to your country or region.

9. Warranty & Limits of Liability:

EnviroCeramic warrants its diffusers under normal use as set out in the documentation against defects from the date of purchase/invoice/conformance certificate for a period of one year. Any failure resulting from defective parts or faulty workmanship, as determined during evaluation by EnviroCeramic, will be repaired or replaced under warranty. Enviro Ceramic's obligation under the warranty is conditional upon: 1 Such diffuser is being installed, consistently used and maintained in accordance with Enviro Ceramic's written instructions, specifications and safeguards as outlined in this latest revised document or otherwise specified in writing by EnviroCeramic. 2 The defect (s) not being the result of misuse, neglect, accident or improper application nor of any user attempts at modification or repair. 3 The purchaser reporting to EnviroCeramic any defect within five days of its occurrence. 4 EnviroCeramic may request that the diffuser in question be returned to Enviro Ceramic's premises in its original or suitable packaging. EnviroCeramic may also require a written report and photos by the purchaser of the circumstances in which the defect occurred. 5 For goods returned outside the EU there will be a returned goods delivery charge at cost price. 6 The purchaser certifies acceptance of the warranty as set out. Enviro Ceramic's obligations specifically exclude any liability whatsoever for claims by the purchaser or user or any other persons or parties: 7 In respect of merchantability or fitness for a particular purpose. 8 For any special, indirect, incidental or consequential damages resulting from the use, or as a result of a malfunction of the diffuser. 9 For personal injury or any medical or disability claims or for compensation arising therefrom. 10 This warranty and the conditions, limitations and exclusions are accepted by the purchaser as the only authorised and applicable warranty and that there are no other warranties or conditions, oral or written, expressed or implied. 11 EnviroCeramic is continuously improving its products and services and therefore reserves the right to change specifications and designs as and when needed without prior notice.

We manufacture according to strict quality systems and management principles and each hand-crafted diffuser has a unique traceable batch number displayed. Each diffuser is also tested for pressure compliance and flow rate conformance.

We aim to continually improve our diffusers by research and development in conjunction with customer needs and recommendations.
We deliver worldwide and have strategic partners/agents on all continents for further support.

PLEASE CONTACT US FOR SALES AND SERVICE AT:

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