

# Operation Manual for the



## Membrane CO<sub>2</sub> - Reactor

### for a bubble-free dispersion of CO<sub>2</sub> into aquariums

The CO<sub>2</sub> reactor is specifically developed for the CO<sub>2</sub> fertilization in fresh water and sea water aquariums. This device is only suitable for submersible use.

**NOTE:** Please read this manual carefully to ensure a long-term reliable operation of your CO<sub>2</sub> reactor.

#### 1. Product Types

The membrane reactor is available in two versions:


- Type 1: Reactor with 2 membrane tubes, suitable for aquariums up to 200 l,
- Type 2: Reactor with 4 membrane tubes, suitable for aquariums up to 400 l.

#### 2. Theory

All plants need CO<sub>2</sub> to thrive well. If this gas is not available in sufficient quantities, the plants will be stunted. In addition, CO<sub>2</sub> is important for the buffer of fresh water and sea water because of its responsibility for the regulation and stability of the pH value.

#### **How many CO<sub>2</sub> is required?**

That depends from various factors. Just as important as the aquarium size and quantity of plants is the degree of water hardness. The harder the water, the more CO<sub>2</sub> is required to obtain the desired pH value, e.g. 6.5 in fresh water aquariums. The softer the water, the lower is the consumption of CO<sub>2</sub>. In mixed aquariums, the degree of water hardness should not be below 4° dH, otherwise strong variations of the pH value may occur.

For the preparation of too hard water we recommend the use of a reverse osmosis unit, e.g. the  **AQUA MEDIC** Standard 90.

In case of too soft water a standard compound for the building of carbonate hardness can be used.

### 3. Operation of membrane reactor

The AQUA MEDIC CO<sub>2</sub> reactor does not dispense CO<sub>2</sub> as a gas bubble into the water. It is rather diffused through the membrane tube directly into the water. This approach guarantees a 100 % use of the CO<sub>2</sub>.

The membrane tube consists of a special material which lets gas but no water through. Therefore, it works simultaneously as non return-valve. The CO<sub>2</sub> gas gets through the tube and dissolves on its surface directly in water. Thereby it is important that the gas pressure is not too high. Otherwise, the gas sparkles through the tube like through an air stone whereas most of the gas will be lost.

Even in case of precise adjustment a bubble can get out of the tube from time to time. This is a foreign gas which is contained at approx 2 % in CO<sub>2</sub> bottles and does not dissolve in water.

### 4. Installation

- A. Connect the membrane reactor with the CO<sub>2</sub> tube (6 mm standard tube) of the bubble counter.
- B. Fix the two suckers within the aquarium quite below the water surface.

#### **NOTE:**

- The CO<sub>2</sub> tube has to be connected **before** the reactor will be submerged into the water. Otherwise water may enter the interior of the membrane tubes which slows down the CO<sub>2</sub> dispersion.
- The CO<sub>2</sub> reactor should be installed near the filter outlet in as high current as possible. If the membrane tubes are continuously washed around, the CO<sub>2</sub> diffusion rate will be increased considerably.
- The reactor should be placed on a shady place to protect it against algae.

### 5. Starting

Firstly, adjust the appropriate number of bubbles by opening the regulation valve at the CO<sub>2</sub> fitting resp. The  **AQUA MEDIC** GEOMAT.

Very soon, air bubbles are released at the membrane reactor. This is a normal starting procedure because of non-soluble air in the reactor and in the tubes. After approx. 30 minutes the bubbles disappear and the CO<sub>2</sub> will be introduced in a bubble-free manner.

If the adjusted number of bubbles is higher than the reactor is able to cope with, CO<sub>2</sub> bubbles will come out of the membrane tubes. In most cases, this can be regulated by an increase of the water current (see also „Installation“).

Otherwise, the number of bubbles has to be reduced until no further bubbles come out of the reactor (see also „Performance of reactors“).

## 6. Membrane failure

Generally, the membranes are durable for a long time.

In case of a mechanical damage or if they get dirty, the complete membrane reactor has to be changed.

Replacement of single membrane tubes is not possible.

## 7. Performance of reactors (measured with the AQUA MEDIC bubble counter)

Type 1:

- in full water current: approx. 20 bubbles/minute
- without water current: approx. 10 bubbles/minute

Type 2:

- in full water current: approx. 40 bubbles/minute
- without water current: approx. 20 bubbles/minute

## 8. Further applications

The AQUA MEDIC membrane reactor can also be used as a dispenser for tablets, e.g. fish food tablets or tablets of water processing/preparation products.

- Technical changes reserved -