

Calcium and Alkalinity



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Turbo Chalk Reactor size 1 made of acrylic glass



Turbo Chalk Reactor size 5 made of PVC

Where are calcium and carbonate hardness consumed?

In freshwater aquariums, both calcium (total hardness) and carbonate hardness (alkalinity) are consumed to only a small extent. To adjust these values, it is sufficient to supply the water with care products or a mineral filter.

A large number of animals and algae live in the marine aquarium and require large amounts of calcium and carbonate hardness for their skeletons. These two substances are taken from the seawater. Therefore, calcium and carbonate hardness must be regularly added to the seawater aquarium.

Four successful methods are currently known:

- 1. Calcium chloride & sodium hydrogen carbonate method** according to BALLING (see care products)
- 2. Lime water** according to WILKENS (see calcium hydroxide and KWR)
- 3. Lime reactor** (*Turbo* chalk reactor)
- 4. Carbon dioxide injection** (see night shut-off and COR carbon dioxide reactor): this method can only be used for very special coral breeding systems. For the "normal" coral reef aquarium this system is not recommended.



Note that calcium can only be enriched in the marine aquarium if sufficient magnesium is present.

The *Turbo*-Chalk Reactor



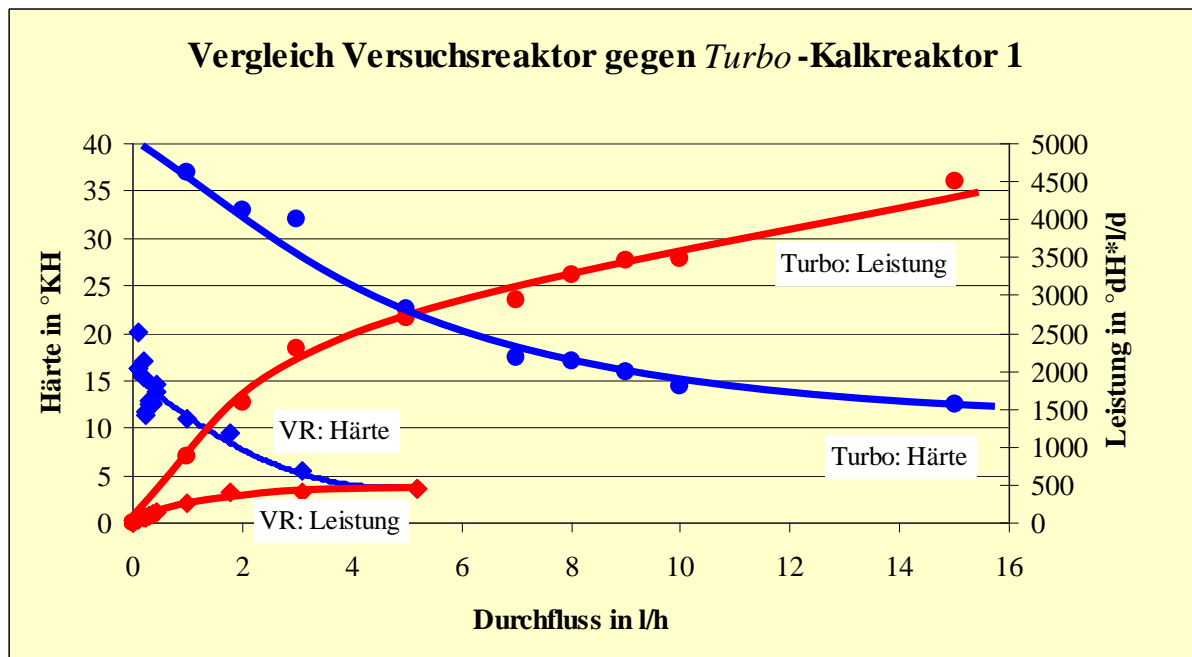
Hard corals require a large amount of dissolved lime. Foto: Hoebink

The *Turbo* Chalk Reactor is a **consistent advancement** of conventional lime reactors. The carbon dioxide supply is visible through an **integrated bubble counter** and fills the **CO₂ column**. The resulting extremely low pH value of 5.0-5.3 allows the calcium carbonate dissolving power to reach new dimensions. Due to the extreme flow, neither channels form in the granulate tube nor sediment is deposited, which could hinder the process. The water enriched with dissolved lime is then stripped of excess CO₂ in the **neutralization stage**, so that the pH value of the outlet water is 7.0 to 7.3. This means approx. 80% less input of free carbon dioxide into the aquarium. Too small lime particles (sediment) settle in the downstream **lamella separator**. This sediment stage can be easily separated from the system and cleaned.

The ***Turbo* control** (option) of the CO₂ is carried out without pH measuring chain: this means less maintenance and costs with higher safety at the same time. With the control no carbon dioxide overdosing is possible. At the same time, **the maximum achievable output is set automatically** - regardless of

lime material and its filling level. The water inflow can be easily controlled through a **sight glass** and measured by means of a flow meter (option). In the case of small *Turbo* Chalk Reactors, the water feed can also be provided by a robust dosing pump.

Dependence of hardness and performance on flow rate.



During a research project sponsored by the AiF, the *Turbo* Chalk Reactor size 1 (PVC version with 0.24 liters of *Turbo* granules) was compared with a conventional test reactor (VR) with 2.77 liters of *Turbo* granules. Despite a 12-fold increase in reaction volume, the experimental reactor did not come close to matching the performance of the *Turbo* Chalk Reactor.

Technical Data of the *Turbo* Chalk Reactor

Size Order number	Size 1 Turbo-1	Size 2 310-002	Size 3 310-003	Size 4 Turbo-4	Size 5 310-005
maximum aquarium size in liters	500	1.000	2.500	8.000	10.000
dimensions (W×H×D) in cm	41×41×11,5	30,5×57×13	40×57×17	60×85×19	49×140×22
required height in cm	+2 cm	-	-	+2 cm	-
diameter of calcite tube in mm	40	50	63	100	110
volumen of granulate in liters	0.30	0.42	0.93	5.1	6.3
pH value of outlet	7,0...7,3				
maximum / average daily output in hardness liters at 3h/d operation	2,000 / 250	4,000 / 500	10,000 / 1,250	35,000 / 4,400	40,000 / 5,000
built-in pump	UP 300	UP 1000	UP 2000	UP 2000	UP 2000/1
electrical power in watts	4	10	18	18	38
inlet / outlet connections	PA nozzles 4 + 10	6 and 10 mm AquaCare push-fit fittings			
optimum inflow in l/h	4 - 5	8 - 10	20 - 25	70 - 90	80 - 100
flow meter in l/h (option)	-	3-24	5-50	15-150 <small>(included in the scope of delivery)</small>	15-150 <small>(included in the scope of delivery)</small>
required air flow in l/h	200	300	400	400	500
required carbon dioxide supply	Carbon dioxide pressure bottle with pressure relief valve and needle valve, a good check valve for CO ₂				
wall mounting	yes				
stand mounting / Hang-On (option)	yes	no	yes	yes	no
material	PMMA	PVC	PMMA	PMMA	PVC

BasiTech Chalk Reactor Control



The *Turbo* Chalk Reactor Control with CO₂ sensor

The *Turbo* Chalk Reactor Control of the BasiTech series considerably simplifies the operation of the *Turbo* Chalk Reactor. The circuit is strongly recommended for size 4 and larger.

The control consists of a robust designer housing and contains the circuit board, a solenoid valve, check valve and connections for 6/4mm PE hoses. Also included is the CO₂ sensor, which fits any *Turbo* Chalk Reactor size and can be easily retrofitted.



Pure hard coral aquariums are not stable for long without the regular addition of dissolved lime. Foto: Hoebink