

# Systemic aquarium filtration



# Why is filtration in an aquarium important?



Fish, invertebrates or terrapins – they all release metabolism products into the water, which accumulate and pollute the aquarium or aquaterrarium. Cloudiness and other pollutants are being formed if the tank is not

filtered well. These are not only unsightly but also disturb the biological equilibrium. A functioning filtration is therefore essential for a beautiful aquarium or aquaterrarium with crystal clear water.



# Systemic aquarium filtration

You will find useful information about filtration in an aquarium in this guide. Besides the three types of filter media, the functional principle as well as the advantages and disadvantages of internal and external filters are also presented. Practical examples such as the filtration of community or cichlid aquariums provide practical support for orientation.

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# Filter media



In natural waters, only few animals live in plenty of space. For instance, nutrients and pollutants are thus simply diluted and washed out in a river. However, circumstances are different in an aquarium: high density of animals and no possibility to wash out nutrients or pollutants. Filtration is therefore indispensable for ensuring pollutant free, crystal clear water.



The filter media make sure that the chemical-biological equilibrium is maintained in the water. They remove fish waste, excess food and dead plant parts from the aquarium

water. This ensures stable water parameters can be maintained lastingly, which allows for keeping healthy animals.

# Types of filter media

Generally, there are three types of filter media: mechanical, absorbing and biological filter media. These can be placed in the filter chambers or baskets of the filter appliances. You should stick to the following order when adding the filter media as to achieve maximum filter performance:

## 1 Mechanical filter media



Mechanical filter media consist of synthetic fibers and retain dirt mechanically. Depending on the porosity they are divided into fine and coarse filter media.



## 2 Absorbing filter media



Absorbing filter media means granules that can bind various pollutants depending on the active components being used.



## 3 Biological filter media



Biological filter media remove pollutants as in nature: they increase the settling area for substrate dwelling filter bacteria.

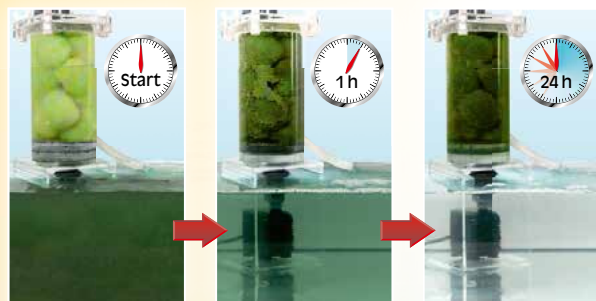
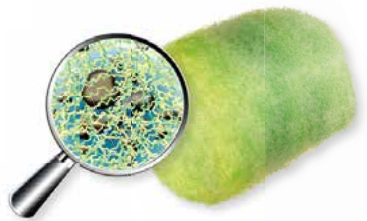
# Mechanical filter media

The mechanical filter media are used in the first stage of the filtration process. The synthetic fibers make sure that dirt particles and floating matter are removed from the water. This includes, for instance:

- sludge
- uneaten food
- plant parts
- floating algae

These particles are removed from the system by regularly cleaning or replacing the filter media. Mechanical filter media therefore ensure crystal clear water.

**sera crystal clear Professional**, for instance, removes even finest particles above 10 µm from the water within shortest time.



# Absorbing filter media

Be it pH value adjustment or pollutant removal, there are individually useable functional filter media for every care situation.

**Advice** Checking the water regularly is important for noticing deteriorating water parameters in time and react accordingly. Absorbing filter media provide support in case one or several parameters are already at dangerous levels:



## Phosphate removal

Increasing phosphate levels lead to algae growth. **sera Phosvec Granulat** removes excess phosphate.



## Silicate removal

Silicate needs to be removed from the water in case of high silicate levels in the water and growth of diatoms. **sera** provides a suitable solution with **sera Silicate Clear**.



## Binding pollutants

Pollutants such as treatment remainders, chlorine, pesticides or dyes can be removed using **sera super carbon** active carbon.



## Blackpeat granules

A lastingly low KH level as well as a pH value in the slightly acidic range should be established for fish that require very soft and generally acidic water. This is easy to achieve with **sera super peat** blackpeat granules.



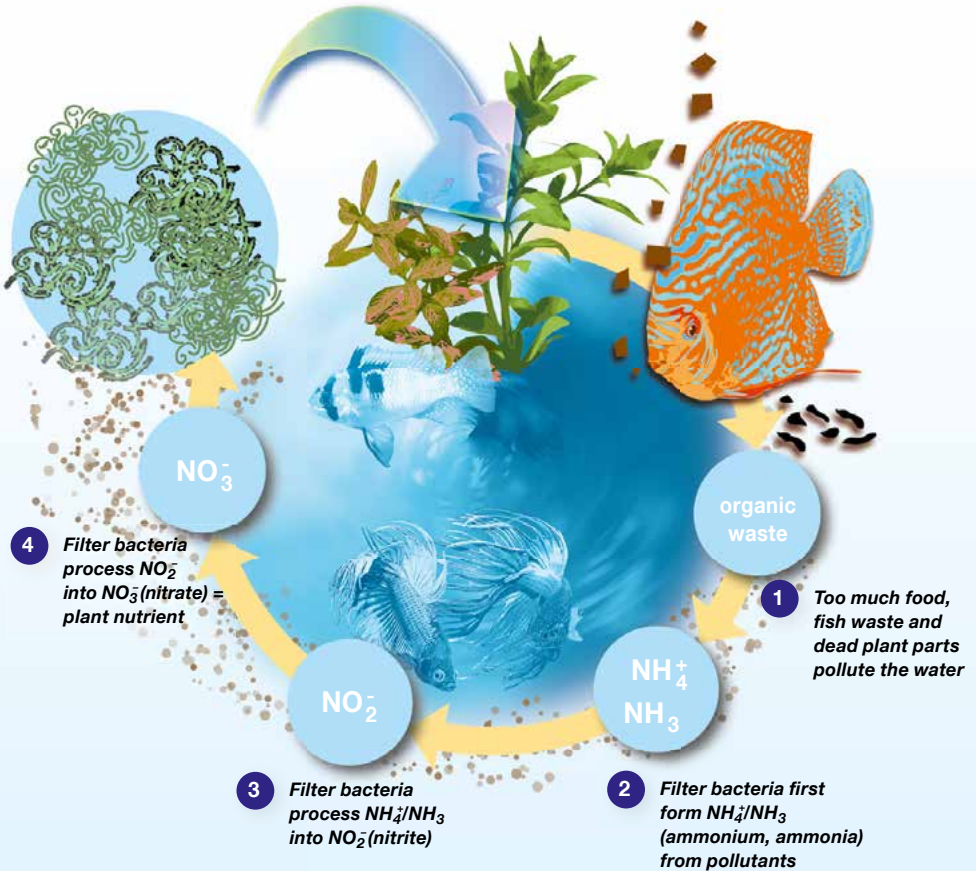


# Biological filter media

Biological filter media ensure successful pollutant removal according to nature. In natural waters, the useful filter bacteria settle mainly in the substrate and on plants where they take up their work. In an aquarium, the substrate surface is too low in relation to the occurring pollutants. The solution: using biological filter media which provide more surface area for settling filter bacteria.

This is how the chemical process of pollutant development and removal takes place:

## Breakdown of the pollutants ammonia ( $\text{NH}_3$ ), nitrite ( $\text{NO}_2$ ) and nitrate ( $\text{NO}_3$ )

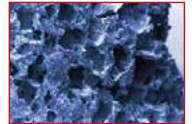




# sera siporax Professional

A biological filter medium must provide a surface and structure that allows for optimal settling of filter bacteria. This is exactly what **sera siporax** provides: it has an open pore structure with cross-linked pores. The size of the pores is ideal for the settling of purification bacteria, since they are neither too big nor too small. One liter of siporax has a settling area of precisely 270 m<sup>2</sup> (2,900 sq.ft./US gal.) per liter – this is the scientifically proven optimal value.

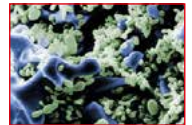
Other filter media, for instance ones made of ceramic or plastic, do not provide this high porosity. Only siporax, which consists of sintered glass, provides this characteristic. siporax is made of glass powder and salt crystals. This mixture is pressed into tube shape and sintered at approx. 780°C (1,436°F). The salt is completely rinsed out when the sintered glass tubes are washed out afterwards, leaving the pore structure that allows bacteria to settle.



Pore structure at the surface



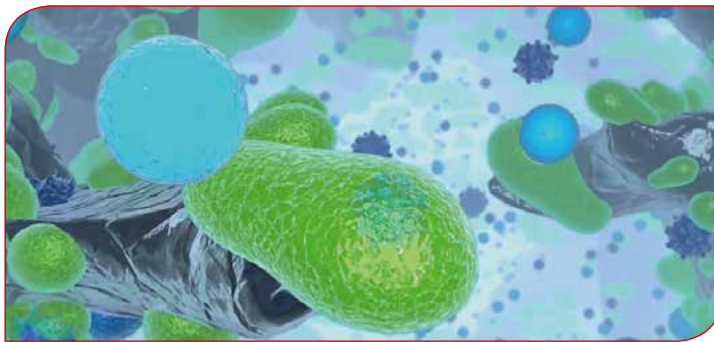
Inside pore structure



Inner surface settled with bacteria films



Three dimensionally tunnel structure



sera siporax is available in three different sizes:



for small filters



for medium sized and bigger filters



for pond filters

# sera siporax with filter bacteria

The dry water conditioner **sera siporax bio active** and the biological algae remover **siporax algovec** are already impregnated with bacteria. These bacteria take up their work and multiply upon contact with water.



The **sera siporax algovec Professional** filter medium prevents algae in a natural way. The over 80 different bacteria strains on the carrier medium **sera siporax algovec** withdraw **phosphate**, the main algae nutrient, from the water. Algae growth is thus stopped, and present algae are lastingly reduced. This active principle allows to protect the aquarium against algae growth entirely without chemical agents.

The aquarium water will remain crystal clear with **sera siporax bio active Professional**. The purification bacteria withdraw pollutants from the water, in particular **ammonium** and **nitrite**. By doing so, they ensure that the biological equilibrium is maintained and maintenance intervals become longer.



# Liquid biological filter media

The two liquid filter media **sera filter biostart** and **sera bio nitrivec** allow establishing and maintaining the biological equilibrium in the aquarium quickly and from the beginning.

There is often an insufficient number of purification bacteria in case of a new setup or after intense filter cleaning. Biology requires some time for regenerating. **sera filter biostart** consists of a balanced blend of purification bacteria and biologically active enzymes, and makes sure that a sufficient number of bacteria is available right away.



The liquid filter medium **sera bio nitrivec** contains millions of purification bacteria that break down toxic ammonium and nitrite. The additionally included mineral volcanic rock removes pollutants, effectively binds cloudiness and provides a suitable settling area for the purification bacteria.

**Advice** **sera bio nitrivec** allows adding fish already after 24 hours when combined with **sera aquatan**!




# Filter types

Choosing a filter appliance depends on the size of the aquarium and the animals kept in it. Internal filters are mainly suited for smaller aquariums with few fish. They do not require a cabinet and can be positioned anywhere, but they create less current and reduce the space

for decoration. External filters, however, are more frequently being used for bigger aquariums and ensure good water flow through the filter material. They must be placed outside the aquarium and therefore require little space in the tank.

sera filters in comparison

Filter	Performance	Space in the aquarium	Filter baskets	UV-C	Adjustable	Special features
 <p>Air operated filters L 60 – L 300</p>	-	+	-	-	✓	suitable for breeding tanks
 <p>fil 60/120</p>	+	+	+	-	-	space saving
 <p>IF 400 + UV</p>	+	-	+	+	✓	Volume
 <p>UVC Xtreme 800/1200</p>	+	+	+	+	✓	particularly energy saving

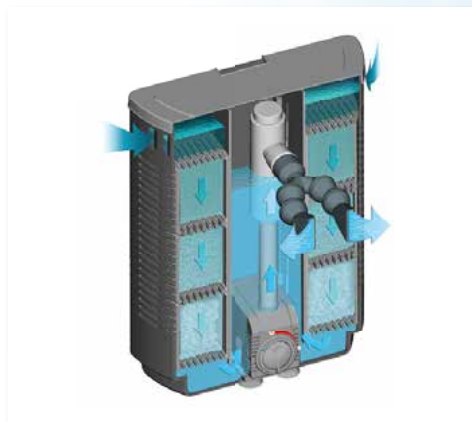


# Internal filters

Internal filters can be integrated into an aquarium particularly easily and economically. They are often the first choice in smaller aquariums. They are attached inside the aquarium with holders or suction cups. With an internal filter, the water flows directly from the aquarium into the filter via an overflow intake or an intake slot. It is then directed over the different added filter media – mechanical,

absorbing, biological – and purified. Internal filters such as the **sera IF 400 + UV** contain baskets in which the different filter media can be placed. The water flows directly from the aquarium through an overflow intake or intake slots into the filter where it is directed – while being cleaned – over the added filter media (mechanical, absorbing, biological).

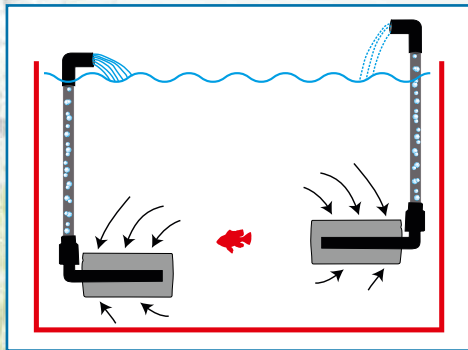
Example: **IF 400 + UV**



**Advice** The functionality of the internal filter should be checked regularly. In case of heavy pollution it may occur that the filter performance decreases, especially with mechanical filter media. If that is the case, cleaning or even replacing the filter medium will help.



# Air operated filters



An air operated filter works, as its name already implies, only with air. This leads to a lower flow rate than in other internal filter types. However, an air operated filter is particularly well suited for breeding and shrimp tanks due to this characteristic.

Air operated filters make use of the high differences in density between air and water for transporting the water. Air bubbles are blown into the tube of the air operated filter by means of an air pump. These quickly rise within the tube and create a suction effect that draws

the following water along. The sponge cartridge attached to the suction tube mainly provides mechanical filtration that retains fine particles or smallest fry. Such air operated filters are completely submerged in the aquarium except for the opening of the outlet tube.

**Advice** Who runs small breeding aquariums exclusively with air operated filters must change the water regularly. Otherwise, pollutants may accumulate too strongly due to the limited cleaning and filtering resources of a sponge cartridge.



# Integrated internal filters

In case of the biotope aquariums by **sera**, the internal filters are firmly built into the aquarium. This is especially convenient when purchasing and during operation, as the filter performance already matches the aquarium size optimally and filter media are included. The aquarium can therefore be put into operation right away.

In case of a multi-chamber internal filter built into the back wall of the aquarium, the

water is directed through the different filter media through several vertical chambers in a space saving way. Since integrated internal filters use the entire width of the aquarium back wall they provide more filter volume compared to regular internal filters. The back wall of the filter can be hidden optically by individual decoration. It basically applies to all filters: The bigger the filter, the easier conditions in the aquarium can be maintained stable.



**Advice** Using filter media bags (as seen in the picture) is advisable for placing the filter media in the chambers or baskets. This makes it easier to remove the filter media later on.



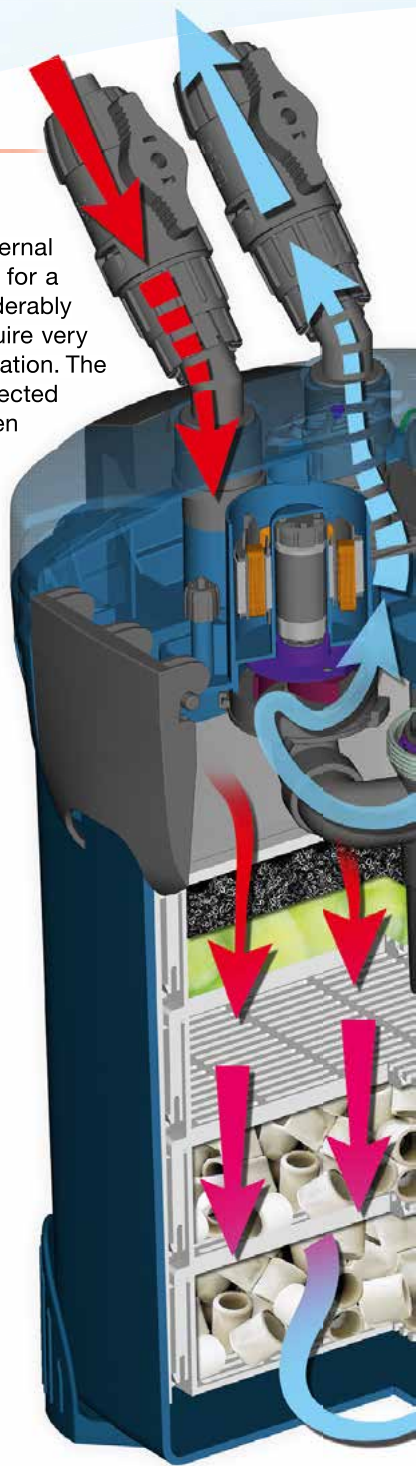


# External filters

Due to their integrated feed pump, external filters are the most powerful filter options for a freshwater aquarium. They can achieve a considerably higher flow rate than other filter types and also require very little space inside the aquarium due to their external installation. The intake and outlet tubes are easy to attach, and are connected to the water inside the aquarium this way. The water is then directed through the different filter media, which are placed in big filter baskets.

## Function principle

The water is drawn in by the external filter and directed through mechanically, absorbing and biologically cleaning filter media in the filter canister. Some of the **sera** external filters afterwards even provide final treatment of the cleaned water with UV-C radiation, which removes pathogens and algae spores. The external filter is opened for cleaning and for replacing the filter media: The filter media can be removed conveniently and placed again inside the filter with the baskets. The new **sera UVC-Xtreme** filters additionally include electric suction pumps that make refilling the filter with water after cleaning very easy – manual suction is not required anymore. An integrated energy saving motor allows choosing different performance steps as a setting for any individual aquarium. It is thus possible to pump large amounts of water with very little energy consumption.





## Water flow

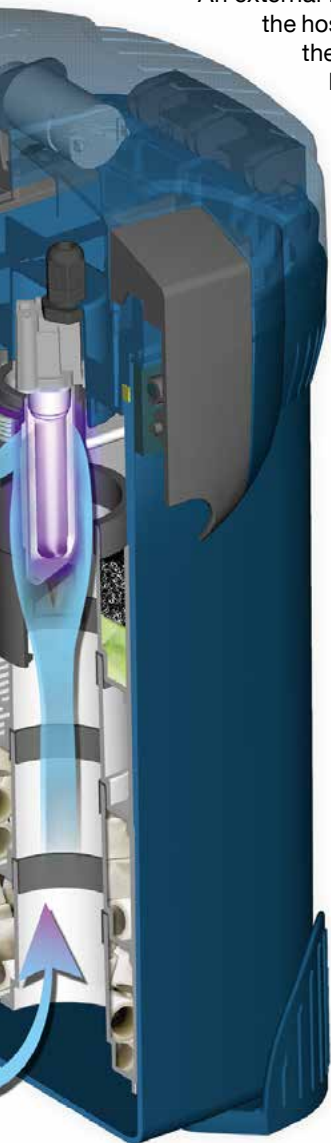
The pump design is responsible for the efficiency of the pump performance. Kinetic energy is retained and not lost in friction if the water is mainly directed in curves rather than in 90° angles. The connected intake and outlet tubes also must be suitably dimensioned for achieving optimal pump performance. In addition, the hose must have the correct diameter. Too narrow a hose leads to a reduced amount of water being pumped and, accordingly, to not using the maximum pump performance.

An external filter can pump 1.3 – 1.4 m (4.3 – 4.6 ft.) water per second through the hose at the maximum. However, it depends on the internal diameter of the hose how much water volume can actually be pumped. A suitable hose should be chosen depending on the pump performance of the external filter. The chart lists some hoses common in the aquarium hobby as well as the maximum water volumes that can be pumped through the hoses by an external filter.

The chart lists some examples:

Internal diameter aquarium hose	Maximum water flow through the hose
9 mm	296 – 319 l/h (78 – 84 US gph)
12 mm	529 – 569 l/h (140 – 150 US gph)
16 mm	939 – 1,012 l/h (248 – 268 US gph)
18 mm	1,190 – 1,281 l/h (315 – 339 US gph)

**Advice** The shorter the hoses used, the less friction and current loss there is. Hoses should therefore be shortened as required. You should not use hoses that fall short of the recommended internal diameter in case longer hoses are required. Hoses also need to be cleaned from time to time, since biogenic growth can considerably reduce the effective width and may lead to loss of performance.



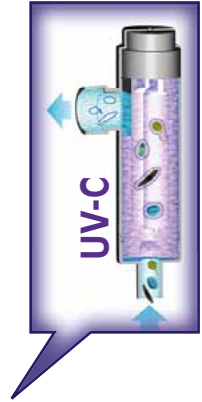


# Digression: UV-C radiation

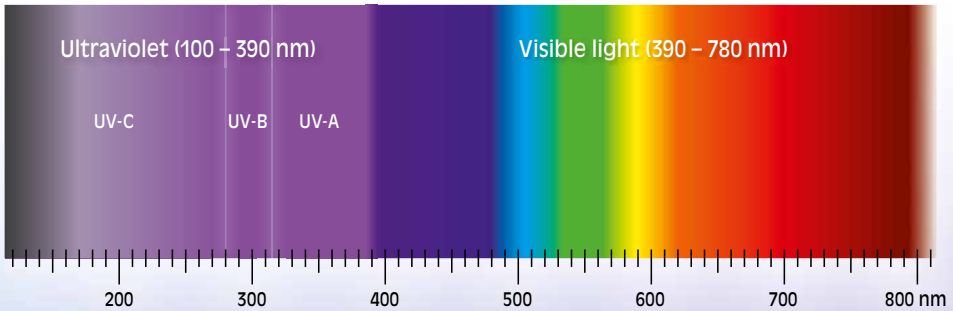
UV light (ultraviolet light) is next to the violet radiation of the visible spectrum, but is not visible to human eyes anymore. UV radiation is divided into three ranges: UV-A, UV-B and UV-C. Long-wave UV-A and UV-B are present in the atmosphere of the Earth and are considered particularly important, among others for vitamin production, but already partially dangerous in the upper frequency range. Therefore, sunscreen is used as a protection against too strong sun irradiation.

UV-C is still in the short-wave light range but is completely absorbed by the upper atmosphere of the Earth. Artificially

produced UV-C light from fluorescent tubes plays an important role in aquarium care for the effective combat against algae, pathogens and parasites. Algae had no opportunity during evolution to adapt to UV-C light. Therefore, the hard radiation from fluorescent tubes reliably eliminates algae. **sera** has integrated this advanced UV-C technology in some filters. The new **sera UVC-Xtreme** external filters are a good example for this: the amalgam UV-C lamps of the Xtreme filters require little space, emit even higher radiation values than conventional UV-C lamps and set new standards in aquarium filter utilization.



The wave spectrum of UV radiation is outside the spectrum visible to humans.



# Application examples

## Community aquarium

**up to 300 l  
(80 US gal.)**

sera fil & IF 400 + UV

**above 300 l  
(80 US gal.)**

sera UVC-Xtreme

## Shrimps & breeding

sera L 60

sera fil

## Cichlids

**up to 300 l  
(80 US gal.)**

sera fil & IF 400 + UV

**above 300 l  
(80 US gal.)**

sera UVC-Xtreme

## Terrapins

sera UVC-Xtreme

sera provides a gapless product range for aquarium, terrarium and pond care. High quality, balanced food, care and technical products allow keeping animals in a natural and uncomplicated way.

Concerning the technical equipment range, aquarium, terrarium and pond keepers can rely on long lived products that are easy to use. Ranging from aquarium sets immediately ready for use via energy saving LED technology to innovative filters such as the sera UVC-Xtreme 800 and 1200 – the broad technical equipment range by sera provides suitable products for every need.



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For natural aquariums

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