

# Chillers: Which Type is Right for Your Aquarium

*Drs. Foster & Smith Educational Staff*

A constant, appropriate water temperature is vital to keeping your aquarium inhabitants healthy. A sudden temperature change can place undue stress on your aquatic life, increasing their susceptibility to infection and disease.

Aquarium setups, reef aquariums in particular, often employ equipment (lighting and water pumps especially) that produce enough heat to raise water temperature. Without a chiller to decrease water temperature, aquarium water can warm to a point where it no longer holds enough oxygen to sustain the inhabitants.

If you need a chiller, plan to install it into your system as early as possible. Chillers are external units that often require plumbing and always require adequate space and sufficient ventilation. They give off significant amounts of heat when in use - in fact, you should avoid placing your chiller in an enclosed aquarium stand, because it can give off enough heat to raise water temperature. It may also cause the chiller to overheat and not work as effectively.

The word "chiller" may be a misnomer. A chiller does not create cold, but actually removes heat. The ability of a chiller to remove heat is measured in BTUs (British Thermal Units). One BTU will raise one pound of water (approximately one pint) 1°F. A unit with a higher BTU is more efficient and will remove heat faster than one with a lower BTU. A chiller operates similar to a refrigerator or air conditioner. The refrigerant gas picks up heat from the aquarium water and then delivers it to the radiator as the gas pressure is dropped. A fan then dispels heat from the radiator.

## Types of chillers

### Thermoelectric Chillers

Quiet, energy-efficient thermoelectric chillers are intended for use with smaller freshwater and saltwater aquariums (less than 55 gallons) and insulated bait/specimen tanks with a slow water flow. Thermoelectric chillers are not effective on large aquariums with a fast water flow.

### In-Line Chillers

Intended for use on larger systems with in-line filtration, in-line chillers cool already-filtered water, and are used primarily with saltwater reef setups. In-line chillers are available in several sizes (from 1/5 to 1 HP), and therefore work with several sizes of aquariums. These chillers require plumbing, and should be incorporated into the overall aquarium plan prior to execution.

### Drop-In Chillers

Drop-in chillers have a probe that is placed directly into wet/dry filters or any filter with a sump, and are used primarily with saltwater reef setups. Drop-in chillers are available in a variety of sizes (1/5 to 1/3 HP) and are ideal for systems with minimal space and the need for easy setup (since they require no plumbing).

### Factors to consider when choosing a chiller

When choosing a chiller, consider the size of your aquarium and sump, your aquarium setup, and additional equipment and the heat it generates. An estimate of the maximum temperature your setup may produce and the temperature requirements of your aquarium inhabitants are also very important considerations when choosing a chiller. In order to choose a chiller, you will need to calculate the amount of "pull-down" you will need. To do this, subtract the temperature at which you want your aquarium to be from the maximum temperature you think will be produced in the aquarium during the peak heat during the summer. Here is an example on how to determine pull-down:

$$\text{Estimated maximum desired aquarium temperature} \quad \ominus \quad \text{Desired aquarium temperature} \quad = \quad \text{Pull-down}$$

$$\text{Example: } 90^{\circ}\text{F} \quad \ominus \quad 75^{\circ}\text{F} \quad = \quad 15^{\circ}\text{F pull-down}$$

Choose a chiller that effectively cools your aquarium water in the space and setup you have allotted. If your cooling requirements are on the upper end of what is recommended, choose the next largest chiller to ensure an adequately cooled aquarium and healthy inhabitants. Using the table below, if you have a tank size of 225 gallons and you need an estimated pull-down of 15°F, the 1/5 and 1/4 horsepower units would be too small; you would need a 1/3 hp unit. Some expert aquarists recommend to always get an over-sized chiller since it may save on electricity by not needing to run as long.

HP	Suggested Tank Size (in gallons)	Min/Max Flow GPH	Maximum Tank Size for Degrees of Pull-Down Needed			
			10°F	15°F	20°F	25°F
1/5	55-225	360-900	225	120	80	55
1/4	80-320	480-1200	320	175	110	80
1/3	125-475	600-2100	475	250	175	125

In the better models of chillers, the heat exchanger and compressor are held rigidly together, NOT with a flexible connection. The two metals most commonly used in the heat exchanger are titanium, and Teflon-coated copper. Titanium is expensive and is not a good conductor of heat, however, it is impervious to the saltwater that can corrode many other types of metal. When using coated copper, routinely perform a visual inspection of the unit. Any crack in the coating can expose the copper to the saltwater and result in increased copper levels in the water, with possible toxicity and death of the inhabitants.