The Thermostatic Steam Trap

Armstrong thermostatic steam traps are available with balanced pressure bellows or wafer-type elements and are constructed in a wide variety of materials, including stainless steel, carbon steel and bronze. These traps are used on applications with very light condensate loads.

Thermostatic Operation

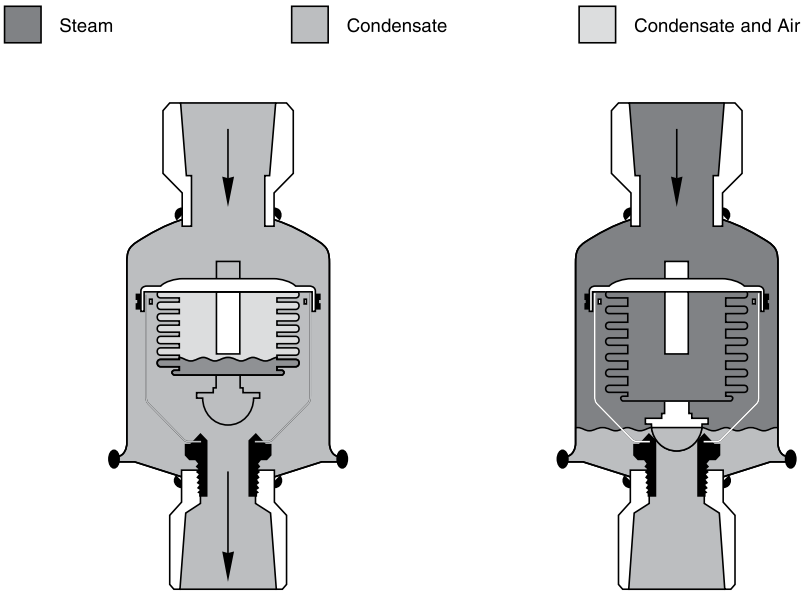
Thermostatic steam traps operate on the difference in temperature between steam and cooled condensate and air. Steam increases the pressure inside the thermostatic element, causing the trap to close. As condensate and non-condensable gases back up in the cooling leg, the temperature begins to drop, and the thermostatic element contracts and opens the valve. The amount of condensate backed up ahead of the trap depends on the load conditions, steam pressure and size of the piping. It is important to note that an accumulation of non-condensable gases can occur behind the condensate backup.

Table CG-20-1. Design Parameters for Thermostatic Traps

	Balanced Pressure Bellows		Balanced Pressure Water		
Body and Cap Material	Stainless Steel	Bronze	Stainless Steel	Carbon Steel	Bronze
Connections	15 - 20	15 - 20	10 - 25	15 - 20	15 - 25
Type Connections	Screwed, Socketweld	Screwed, Straight, Angle	Screwed, Socketweld	Screwed, Socketweld	Screwed, Straight, Angle
Operating Pressure (barg)	0 - 20	0 - 3	0 - 27	0 - 40	0 - 4
Capacity (kg/h)	To 1 600	To 750	To 30	To 40	To 450

NOTE: Thermostatic traps can also be used for venting air from a steam system. When air collects, the temperature drops and the thermostatic air vent automatically discharges the air at slightly below steam temperature throughout the entire operating pressure range.

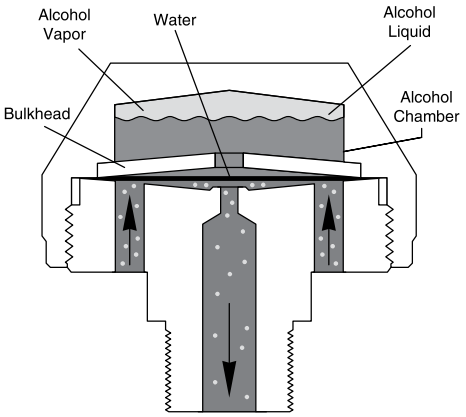
Figure CG-20-1. Operation of Thermostatic Steam Trap



1. On start-up, condensate and air are pushed ahead of the steam directly through the trap. The thermostatic bellows element is fully contracted, and the valve remains wide open until steam approaches the trap.

2. As the temperature inside the trap increases, it quickly heats the charged bellows element, increasing the vapor pressure inside. When pressure inside the element becomes balanced with system pressure in the trap body, the spring effect of the bellows causes the element to expand, closing the valve. When temperature in the trap drops a few degrees below saturated steam temperature, imbalanced pressure contracts the bellows, opening the valve.

Figure CG-20-2. Operation of Thermostatic Wafer



Balanced Pressure Thermostatic Wafer operation is very similar to balanced pressure bellows described in Fig. CG-20-1. The wafer is partially filled with a liquid. As the temperature inside the trap increases, it heats the charged wafer, increasing the vapor pressure inside. When the pressure inside the wafer exceeds the surrounding steam pressure, the wafer membrane is forced down on the valve seat, and the trap is closed. A temperature drop caused by condensate or non-condensable gases cools and reduces the pressure inside the wafer, allowing the wafer to uncover the seat.