

Steam/Water Heaters

Steam/water heaters are typically classified as instantaneous, semi-instantaneous and tank-type. Temperature control can be defined as either feed-forward or feedback.

Feedback systems are error-driven and rely upon an outlet or downstream thermostatic temperature-sensing device to detect a temperature change requirement and then modulate the steam to effect the heat exchange in an attempt to recover the heater set-point. Feedback systems are reactive, and a significant concern is their speed of response to system and application temperature control requirements.

Tank-Type Steam/Water Heaters (feedback)

Tank-type steam/water heaters typically include a temperature sensing element or coil immersed in a storage vessel with a separate, remote steam control valve. As a function of their integral and often significant storage capability, the poor response times often associated with the relationship of temperature-sensing device and steam control valve are less of an issue.

Tank-Type Steam/Water Heaters are a less attractive option because:

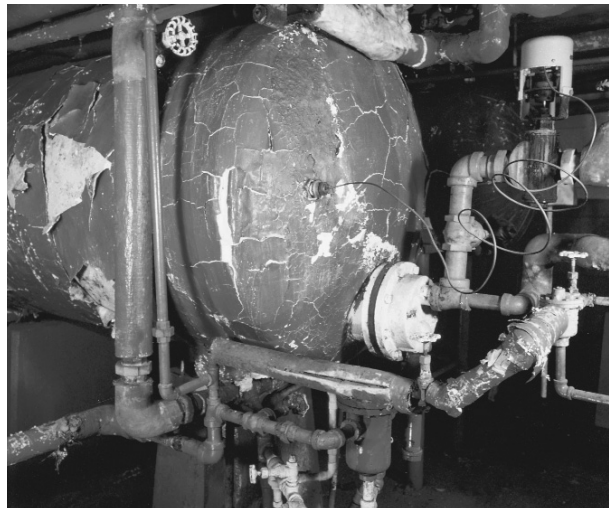
- They consume a large amount of valuable mechanical-room real estate.
- They have been identified as amplification and colonization points for Legionella bacteria.
- They have significant leak potential over time.
- Tank repair is difficult, and tank replacement often requires mechanical room/building structural modifications.
- They consume energy to heat and maintain what is effectively a reserve hot water supply.
- They require separate steam control valves, which require ongoing maintenance.
- They require thermostatic element/sensors, which have shown a tendency to wear and eventually rupture under a heavy cycle load.
- They are slow to recover and may run out of hot water during peak load periods.

Tankless Instantaneous Steam/Water Heaters (feedback)

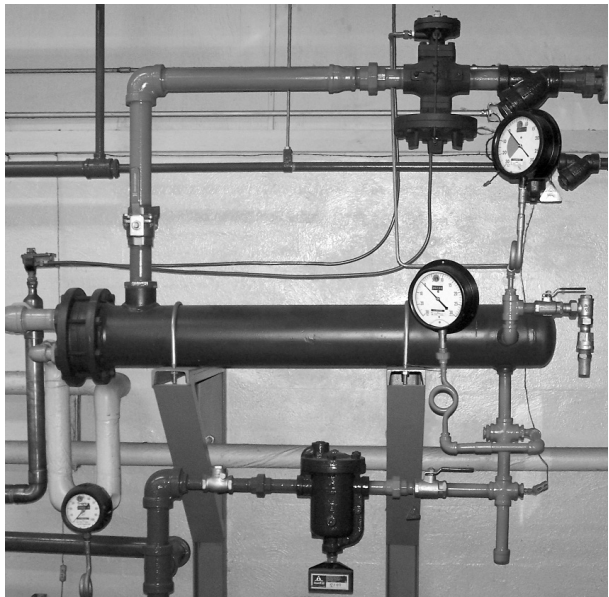
Tankless instantaneous steam/water heaters, often referred to as shell and tube heat exchangers, do not include hot water storage capacity. These models will rely upon either an outlet or downstream temperature-sensing element with a separate steam control valve.

Tankless Instantaneous Steam/Water Heaters are a less attractive option because:

- Lag time from message (thermostat) to action (control valve) creates thermal lag and a resulting temperature swing.
- Modulating steam supply can cause condensate evacuation issues, resulting in damage from water hammer and tube bundle corrosion.
- A cycling phenomenon during low- or no-demand periods will cause premature wear to the thermostatic element. Thermostats typically fail in an open position, making overheated, scald-temperature water available to the system.



High-maintenance feedback systems with large storage tank may leak, corrode or rupture a thermostatic control.



Feedback instantaneous systems may suffer from lag time, tube bundle corrosion and problems with thermostatic element deterioration.

Flo-Rite-Temp™ Instantaneous Steam/Water Heater



Semi-Instantaneous Steam/Water Heaters (feedback)

Semi-instantaneous steam/water heaters typically include lower-capacity storage, with an integral steam control valve to deliver the heat exchange through an internally positioned element or coil.

Semi-Instantaneous Steam/Water Heaters are a less attractive option because:

- Poor low-flow temperature control creates an accumulation tank requirement.
- Accumulation tank creates recovery-time issues at peak demand.
- Heating element/coil in generation/accumulation tank is susceptible to failure and cross contamination.
- Accumulation tanks have been identified as amplification and colonization points for Legionella bacteria.
- Although a lower-cost option, semi-instantaneous steam/water heaters are a higher-maintenance selection.
- Semi-instantaneous steam/water heaters have a shorter service life before replacement than other choices.

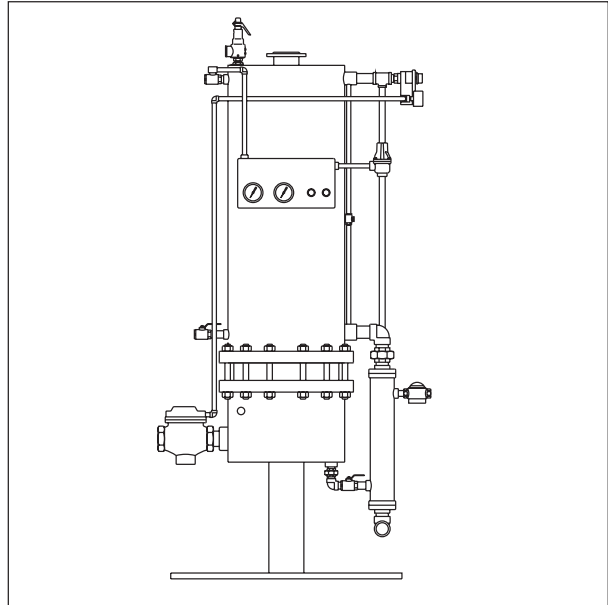
Flo-Rite-Temp™ Instantaneous Steam/Water Heaters (feed-forward)

Flo-Rite-Temp feed-forward instantaneous steam/water heaters offer a simple yet time-proven alternative to traditional feedback instantaneous, semi-instantaneous and tank-type steam-heating methods.

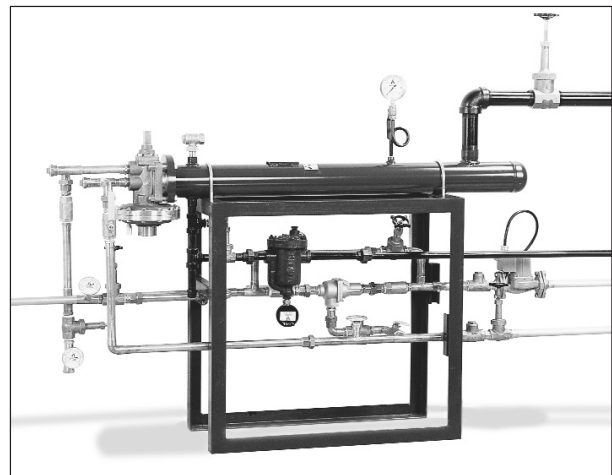
By eliminating the temperature sensing feedback element and relying upon the actual hot water system demand requirement within the system or application, feed-forward systems respond rapidly and are extremely accurate.

Flo-Rite-Temp Feed-Forward Instantaneous Steam/Water Heater is a more attractive option because:

- The constant, non-modulating steam pressure within the shell eliminates cycling wear and tear.
- The system demand or flow feed-forward activation eliminates the requirement for either steam control valve or thermostatic control device.
- Flo-Rite-Temp delivers a consistent outlet temperature (+/-4°F of set-point) with no thermal lag and resulting temperature swing.
- Flo-Rite-Temp is extremely safe because the mixing unit will position to cold water flow upon failure of the primary operating component.



Semi-instantaneous water heaters are subject to poor recovery time at peak demand, inadequate low-flow temperature control and shorter service life.



Flo-Rite-Temp instantaneous steam/water heaters can easily do the work of a storage tank unit many times its size—at lower installed cost and with minimum maintenance. Even the largest capacity Flo-Rite-Temp requires only 7 square feet (0.63 m²) of floor space.



Armstrong Flo-Rite-Temp™ Instantaneous Steam/Water Heater

The Flo Rite Temp instantaneous Steam/Water heater has a unique feed forward design which features a differential pressure diaphragm actuated mixing unit integral to a shell and tube heat exchanger.

The Flo Rite Temp mixing unit manages the water flow through the heat exchanger based upon downstream hot water demand and eliminates the requirement for a modulating steam control valve.

Operating on constant low pressure (2-15PSI) steam, the Flo Rite Temp mixing unit supplies water to the heat exchanger where it is overheated and then returned to the mixing unit for proportional re-mixing with cold water to a pre-set outlet temperature.

Speed of response

The differential pressure diaphragm within the mixing unit rapidly responds to a change in system demand and significantly reduces the lag times typically associated with feed back/modulating steam control valve systems.

Failure Safe

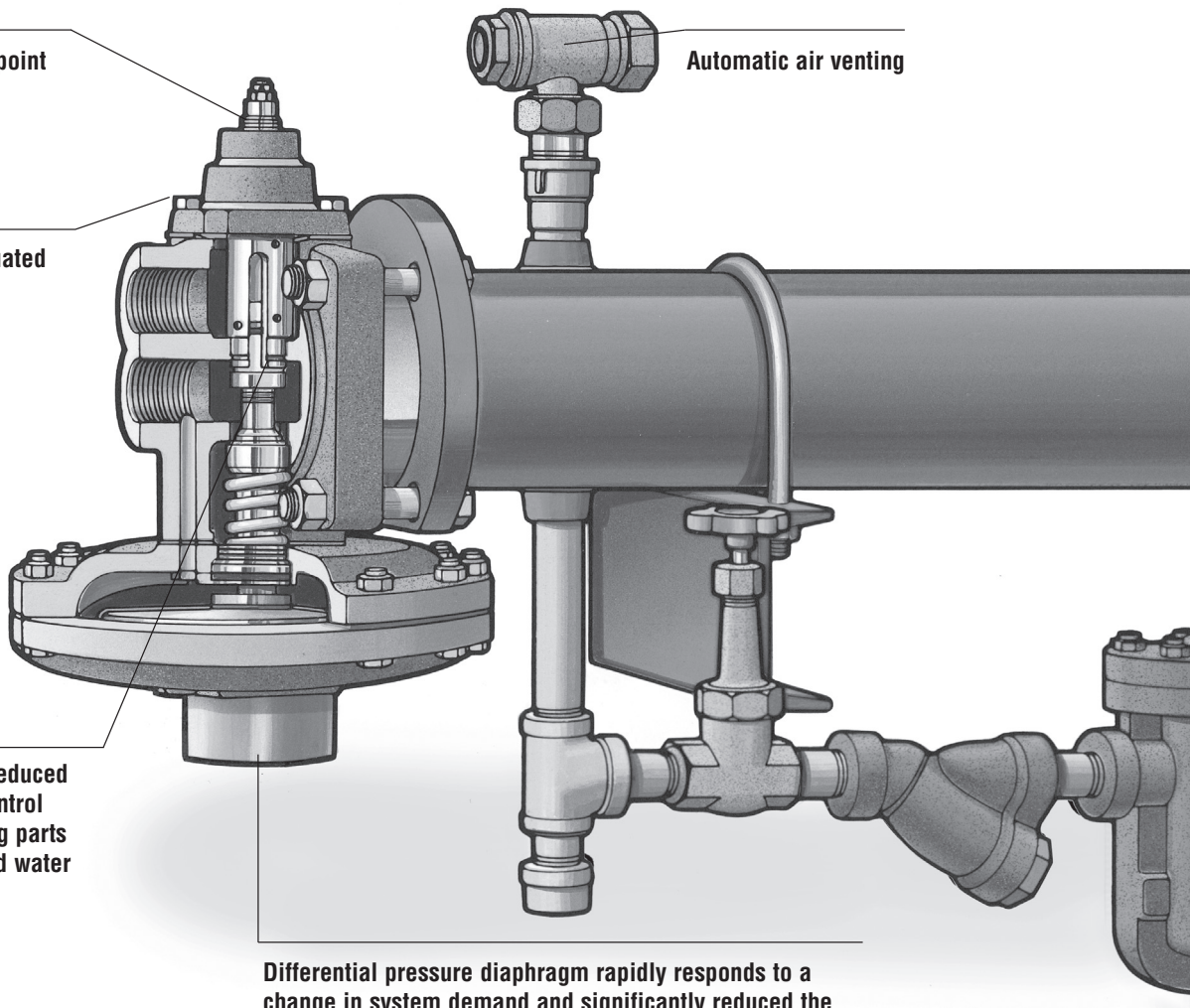
The Flo Rite Temp mixing units diaphragm actuated design can be described as "failure safe" because in the event of a diaphragm failure the mixing unit will fail with a cold bias and will not allow hot water to exit the heat exchanger.

Outlet temperature set-point adjustment

Integral diaphragm actuated mixing unit eliminates intermediate pipework

Scaling and fouling is reduced because the internal control valves/seats and moving parts are only exposed to cold water

Automatic air venting



Differential pressure diaphragm rapidly responds to a change in system demand and significantly reduced the lag time

Temperature Control and User Safety

Capable of controlling outlet temperatures $\pm 4^{\circ}\text{F}$, this principal of operation offers the additional relevant benefit of reducing the waterborne bacterial content of the water during the overheating process. In addition, with no water storage requirement, Flo Rite Temp water heaters are a sensible selection as a component of a broader system design initiative for Legionella risk reduction.

Ease of Maintenance

Accessible "non helical" admiralty brass straight tubes inside the carbon steel shell available mechanical cleaning and visual inspection. Non modulating constant steam pressure ensures condensate drainage and removes the potential for water hammer damage and corrosion. There is no steam control valve to maintain and typically no supplemental condensate return equipment required.

Ease of Installation

No storage tank, small footprint, access via a standard doorway and pre-piped packaged solutions reduce installation time, space and expenditure.

How Flo-Rite-Temp Scores on Key Benefits

	Flo-Rite-Temp Feed-Forward	Storage Tank Feedback	Tankless Instantaneous Feedback
Saves space	Yes	No	Yes
Saves energy	Yes	No	Yes
Eliminates temp. swings	Yes	Yes	No
Eliminates thermal lag	Yes	Yes	No
Ensures accurate control	Yes	Yes	No
Designed with straight tubes for easy cleaning	Yes	No	No
Eliminates potential health hazard of standing water	Yes	No	Yes
Fails cold for safety	Yes	No	No
Eliminates thermostatic control	Yes	No	No

Straight tubes for easy cleaning and easy removal

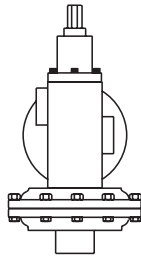
Removable tube bundle cover/cap eases maintenance inspection and mechanical cleaning

Floating head reduces tube stress

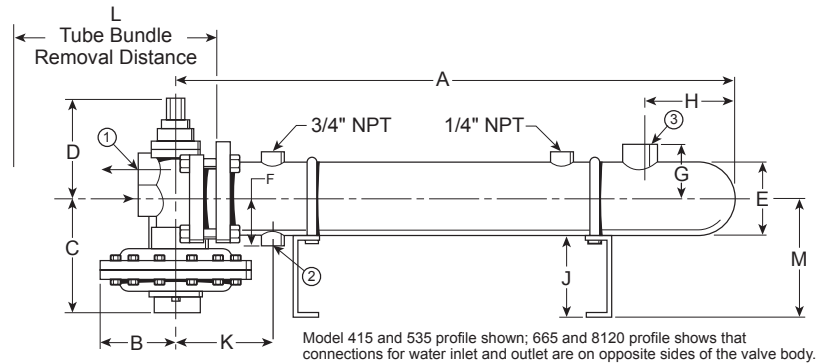
Constant steam pressure drains condensate which reduces tube bundle corrosion and water hammer issues.



Armstrong® Flo-Rite-Temp™ Instantaneous Steam/Water Heater



Model 665 and 8120 Valve



Model 415 and 535 profile shown; 665 and 8120 profile shows that connections for water inlet and outlet are on opposite sides of the valve body.

Dimensions

Model	A		B		C		D		E		F		G		H		J		K		L		M	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
415	54	1,372	4-1/2	114	7-1/2	190	7	178	4-1/2	114	3-5/16	84	3	76	7	178	6	152	6-1/4	159	50	1,270	7-1/2	190
535	67-1/2	1,715	5-1/4	133	8-5/8	219	9	229	5-9/16	141	4	102	3-11/16	94	7-7/8	200	7	178	7-1/2	191	62	1,575	9	229
665	82	2,083	5-3/4	146	10-3/8	264	10-3/8	264	6-5/8	168	4-5/8	117	4-9/16	116	9-1/4	235	8	203	8-3/4	222	74	1,880	11	280
8120	85	2,159	5-3/4	146	11-3/4	299	12	305	8-5/8	219	6	152	8-7/8	225	9-1/2	241	8	203	9-1/2	241	74	1,880	12-3/8	314

Connections and Weights

Model	Connections			Weight	
	1	2	3		
	in (mm)	in (mm)	in (mm)	lb	kg
415	1 (25) NPT	3/4 (20) NPT	2 (50) NPT	133	60
535	1-1/2 (40) NPT	1 (25) NPT	2-1/2 (65) NPT	235	107
665	2 (50) NPT*	1-1/4 (32) NPT	3 (80) NPT	358	162
8120	3 (80) NPT*	2 (50) NPT	4 (100) 150# ANSI	585	265

*665 and 8120 connections for water inlet and outlet are on opposite sides of the valve body.

Specifications

Application	Steam Supply Pressure	Water Supply Pressure	Maximum Water Pressure Drop
Steam to Water	2 - 15 psig (0.14 - 1.0 bar)	20 - 150 psig (1.4 - 10.3 bar)	10 psig (0.7 bar)

NOTE: Reusable insulation wraps available.

Materials

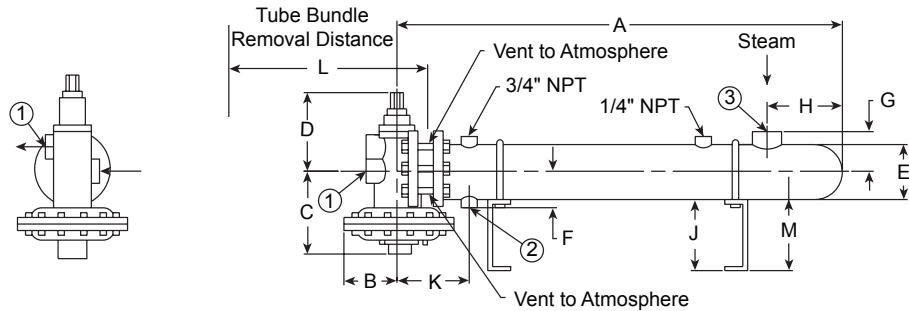
Body	Valve	Valve Seats	Diaphragm	Heat Exchanger Shell	Heat Exchanger Tubes	Tube Sheets	Tube Bundle End Cap
Bronze	(415) 303 Stainless Steel w/Teflon Inserts	(415/535) 303 Stainless Steel	Viton® GF Reinforced w/Nomex® Fiber	Carbon Steel ASTM SA 106-B ASME "U" Stamped	5/8" 16 BWG Admiralty Brass	Brass	Brass
	(535/665/8120) Brass	(665/8120) Brass					

NOTE: Units are NSF-61 certified.

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.



Flo-Rite-Temp™ Instantaneous Steam/Water Heater Double Wall



Model 665DW and 8120DW Valve

Model 415DW and 535DW Profile

The DW (double wall) version of the Armstrong Flo-Rite-Temp instantaneous water heater uses a double-wall tube to provide positive separation of the steam and water in the heat exchanger. The area between the walls of the tubes vents to atmosphere so you can detect tube failure without cross-contaminating either the steam or water. The Flo-Rite-Temp DW is well suited for all hot water applications where steam is available and plumbing codes or safety requirements prevent the heating medium and the potable water supply from being cross-contaminated.

Specifications			
Application	Steam Supply Pressure	Water Supply Pressure	Maximum Water Pressure Drop
Steam to Water	2 - 15 psig (0.14 - 1.0 bar)	20 - 150 psig (1.4 - 10.3 bar)	10 psig (0.7 bar)

Connections and Weights							
Model	Connections			Tube Bundle Removal		Weight	
	① in (mm)	② in (mm)	③ in (mm)				
415DW	1 (25) NPT	3/4 (20) NPT	2 (50) NPT	75	1,905	199	90
535DW	1-1/2 (40) NPT	1 (25) NPT	2-1/2 (65) NPT	75	1,905	270	122
665DW	2 (50) NPT*	1-1/4 (32) NPT	3 (80) NPT	87	2,210	444	201
8120DW	3 (80) NPT*	2 (50) NPT	4 (100) 150#ANSI	75	1,905	665	302

*665 and 8120 connections for water inlet and outlet are on opposite sides of the valve body.

Materials						
Body	Valve	Valve Seats	Diaphragm	Heat Exchanger Shell	Heat Exchanger Tubes	Tube Sheets*
Bronze	(415DW) 303 Stainless Steel w/Teflon Inserts (535DW/665DW/8120DW) Brass	(415DW/535DW) 303 Stainless Steel (665DW/8120DW) Brass	Viton® GF Reinforced w/Nomex® GF	Carbon Steel ASTM SA 106-B ASME "U" Stamped	5/8" Copper Inner Tube 3/4" ID Grooved Copper Outer Tube	Steam Side Steel Water Side Brass

*There is an open vent to atmosphere between the tube sheets to detect tube failure.

Dimensions																								
Model	A		B		C		D		E		F		G		H		J		K		L		M	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
415DW	76-1/8	1,934	4-1/2	114	7-1/2	191	7	178	4-1/2	114	3-3/8	86	3-3/4	95	10-1/2	267	6	152	6-7/8	175	75	1,905	7-1/2	190
535DW	77-3/8	1,965	5-1/4	133	8-5/8	219	9	229	5-9/16	141	4	102	4-1/4	108	11-1/2	292	7	178	8-1/8	206	75	1,905	9	229
665DW	90-5/8	2,302	5-3/4	146	10-3/8	264	10-3/8	264	6-5/8	168	4-3/4	121	5	127	11-3/4	298	8	203	9-3/4	248	87	2,210	11	280
8120DW	79-7/8	2,029	5-3/4	146	11-3/4	298	12	305	8-5/8	219	6	152	8-3/4	222	12-5/8	321	8	203	11-5/8	295	75	1,905	12-3/8	314

All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.