

FLO

AY-160-B

DIRECT[®]

DIRECT FIRED WATER HEATER

How the Flo-Direct Gives You Top Performance and Efficiency in a Direct Fired Water Heater.

Water is introduced into the top of the unit through a series of calibrated dispersion nozzles. Cold water travels down through a bed of multifaceted stainless steel packing rings that break the water into smaller and smaller droplets.

A burner is mounted on top of the unit, firing downward through a centrally located flame tube. The flame tube is cooled by incoming cold water, and all of the fuel gasses are consumed within this flame tube. The design allows all combustion to take place within a dry and cool environment, and produces very low levels of nitrous oxide (NO) and carbon dioxide (CO₂). Heat from the flame enters the lower chamber from the bottom of the flame tube, and travels slowly upward through the packing rings. The descending water comes in contact with the bed of packing rings, where heat transfer takes place.

This "rain" of hot water then falls into the lower chamber and is pumped out to a storage tank. Water temperatures up to 185°F are available within 15 to 20 seconds after the unit starts. Outlet water temperature is set with a valve controlling the incoming water flow. More incoming water results in cooler outlet water temperatures, and less incoming water produces hotter outlet water temperatures.

The products of combustion are exhausted out of the top of the unit, and are normally 40° to 100°F in temperature.

The Result

The unit produces potable hot water within 15 to 20 seconds of starting. There is no fuel consumed for warm-up or idle time. No energy is lost through steam conversion or within a heat exchanger. Virtually all of the fuel energy is transferred to the water.

Features

- NSF certified for food grade water
 - No internal moving parts
 - Low-temperature exhaust (40° to 100°F)
 - Water temperature differential from 10° to 140°F
 - 99.7% or greater efficiency
 - Water treatment not required
 - Stainless steel construction
 - Takes up minimal floor space
 - Five-year warranty on structure
 - UL and ULC Listed
- (complete unit - not just components).





Armstrong® Flo-Direct® Direct Contact Gas-Fired Water Heater

Armstrong's Flo-Direct direct contact gas-fired water heaters are high efficiency, compact, stainless steel units that are simple in design and operation, and suitable for a wide variety of hot-water applications. With capacities from 1 million to as high as 25 million btu per hour, these units can offer fuel savings of 15% to 40% over conventional means of heating water. Features include small footprint for space savings,

99.7% or greater heat transfer efficiencies, simple installation and operation, ease of maintenance, and the ability to operate well with poor water quality. Typical applications include laundries, batch food processes, washdown, parts washers, dyeing operations, gang showers, concrete plants and boiler makeup water.

High-efficiency burner/blower for low carbon monoxide and nitrous oxide emissions. Able to meet stringent emission standards.

Exhaust temperatures between 40° and 100°F allow for inexpensive CPVC or single-walled stainless for ducting materials.

Water pressure limit switch and high temperature switch shut down the unit for safety if water pressure fails or is accidentally shut off.

Electrical programmable logic controller (PLC) for building automation system compatibility. NEMA 4 (watertight) enclosure, modular components for easy service or replacement. Status lights for easy troubleshooting.

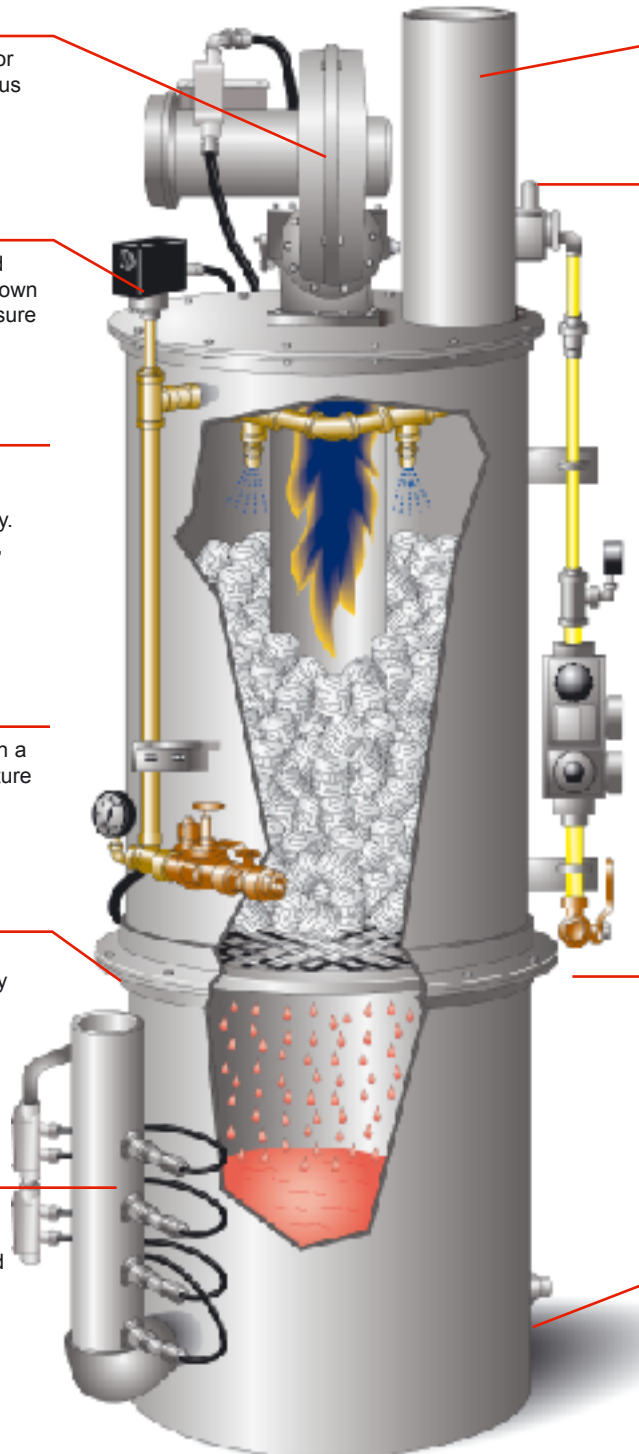
Modular fuel train using slideout components for ease of maintenance or replacement. CSA, UL and FM approved.

Stainless steel construction with a five-year warranty on the structure and its internals.

Indexability of the top portion to the bottom allows for flexibility in rotating for easiest utility hookups. Allows for ease of internal inspection.

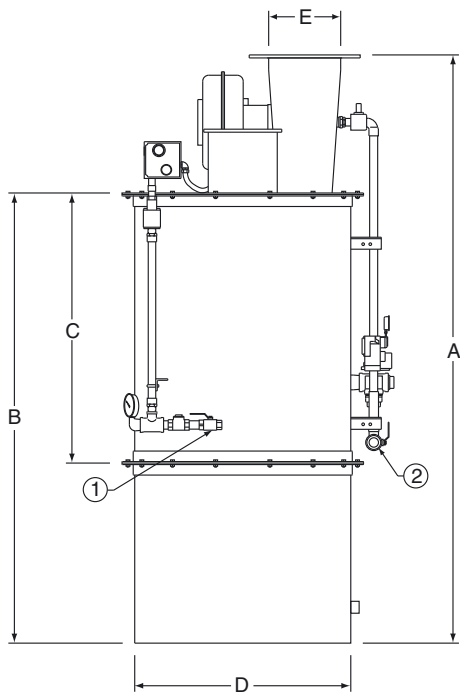
Level controls automatically control the transfer pump (included) which delivers heated water to application or storage.

Small footprint because the burner is installed on top of the unit and not on the side. No side clearance required.



Flo-Direct is U.S. patent 5,924,391.

Flo-Direct® Direct Contact Gas-Fired Water Heater



Specifications	
Gas Supply Pressure*	Water Supply Pressure*
2-6 psig (0.14-0.41 bar)	30-100 psig (2.0-6.8 bar)

*Other pressures, consult factory.

Materials	
Tank	304 SS
Gas Piping	Malleable Iron
Water Piping	Copper*
Spray Ring	304 SS
Tank Gasket	Warco White
Flame Tube	304 SS
Pall Rings	304 SS

*Stainless steel is optional.

Connections and Weights

Model	Connections				Dimensions										Weight*		BTU's per Hr.
	1		2		A		B		C		D		E		lb	kg	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm			
1000	1	25	1	25	95	2413	71	1803	39	991	24	610	8	203	825	375	1,000,000
1500	1	25	1	25	97	2464	73	1854	41	1041	26	660	8	203	850	386	1,500,000
2000	1-1/2	40	1-1/2	40	100	2540	76	1930	44	1118	30	762	10-3/4	273	1500	680	2,000,000
3000	1-1/2	40	1-1/2	40	100	2540	76	1930	44	1118	36	914	12	305	1600	725	3,000,000
5000	2-1/2	65	2	50	127	3226	97	2464	65	1651	44	1118	14	356	2500	1136	5,000,000
7000	3	80	2	50	139	3531	107	2718	77	1956	50	1270	18	457	3200	1455	7,000,000
9000	3	80	2-1/2	65	169	4293	139	3531	107	2718	60	1524	20	508	5000	2273	9,000,000
11000	4	100	3	80	181	4597	151	3835	119	3023	61	1549	22	559	5500	2495	11,000,000
15000	4	100	3	80	192	4877	161	4089	129	3277	70	1778	24	610	7000	3175	15,000,000
18000	4	100	3	80	218	5537	187	4750	155	3937	76	1930	26	660	8000	3636	18,000,000
25000	6	150	4	100	264	6706	203	5156	165	4191	98	2489	32	813	15000	6818	25,000,000

*The weight can vary due to options.

Sizing Calculations

To determine proper Flo-Direct model:

$$\frac{\text{GPM} \times \Delta T}{2} = \text{Flo-Direct Model}$$

Note: Round number up to nearest model number when result is not even.

To determine GPM of a given Flo-Direct model:

$$\frac{\text{Flo-Direct Model} \times 2}{\Delta T} = \text{GPM}$$

To determine temperature rise of a given Flo-Direct Model:

$$\frac{\text{Flo-Direct Model} \times 2}{\text{GPM}} = \Delta T$$

Where:

GPM = Gallons Per Minute

ΔT = Temperature Rise (°F)

Flo-Direct Model = Numeric Model (i.e. 1500, 3000, 7000)

Sizing Example

A food plant wants to heat 105 GPM of water from 50°F to 180°F for washdown. What model of Flo-Direct would be required:

$$\frac{\text{GPM} \times \Delta T}{2} = \frac{105 \times 130}{2} = 6,825 \text{ round up to } 7000 \text{ (Model 7000)}$$

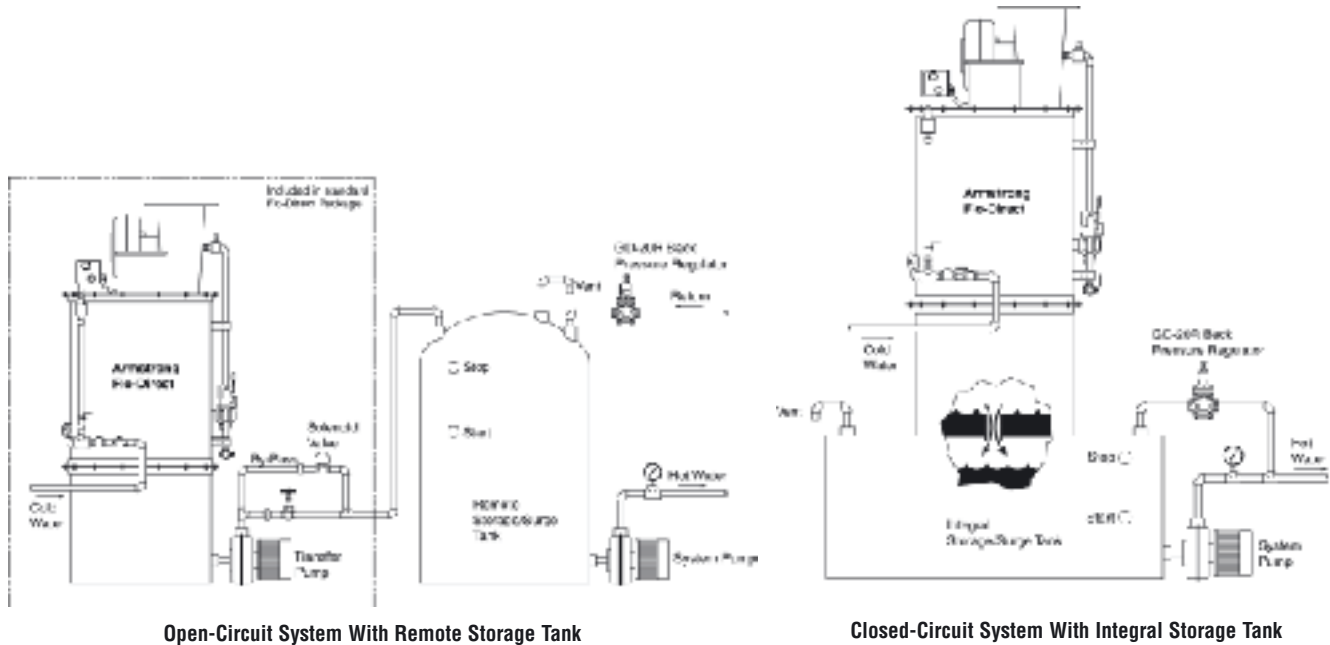
All dimensions and weights are approximate. Use certified print for exact dimensions. Design and materials are subject to change without notice.



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Example Installations of the Flo-Direct Direct Fired Water Heater

The unit can be used in both open-circuit and closed-circuit systems. Additionally, the unit may have either an integral or remote storage tank. See the following examples.



Armstrong-Yoshitake, Inc. Limited Warranty and Remedy

Armstrong-Yoshitake, Inc. ("Armstrong") warrants to the original user of those products supplied by it and used in the service and in the manner for which they are intended, that such products shall be free from defects in material and workmanship for a period of one (1) year from the date of installation, but not longer than 15 months from the date of shipment from the factory [unless a Special Warranty Period applies, as listed below]. This warranty does not extend to any product that has been subject to misuse, neglect, or alteration after shipment from the Armstrong factory. Except as may be expressly provided in a written agreement between Armstrong and the user, which is signed by both parties, Armstrong **DOES NOT MAKE ANY OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.** The sole and exclusive remedy with respect to the above limited warranty or with respect to any other claim relating to the products or to defects or any condition or use of the products supplied by Armstrong, however caused, and whether such claim is based upon warranty, contract, negligence, strict liability, or any other basis or theory, is limited to Armstrong's repair or replacement of the part or product, excluding any labor or any other cost to remove or install said part or product, or, at Armstrong's option, to repayment of the purchase price. As a condition of enforcing any rights or remedies relating to Armstrong products, notice of any warranty or other claim relating to the products must be given in writing to Armstrong: (i) within 30 days of last day of the applicable warranty period, or (ii) within 30 days of the date of the manifestation of the condition or occurrence giving rise to the claim, whichever is earlier. **IN NO EVENT SHALL ARMSTRONG BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF USE OR PROFITS OR INTERRUPTION OF BUSINESS.** The Limited Warranty and Remedy terms herein apply notwithstanding any contrary terms in any purchase order or form submitted or issued by any user, purchaser, or third party and all such contrary terms shall be deemed rejected by Armstrong.

Special Warranty Periods are as follows:

Flo-Rite-Temp Instantaneous Water Heater- The tube bundle shall have a 10-year guarantee against failure caused by materials or workmanship provided by Armstrong but not against gasket failure or damage caused by corrosion, water hammer or lack of proper cleaning.

Flo-Rite-Temp Packaged Instantaneous Water Heater- Two (2) years from the date of installation, but not longer than 27 months from the date of shipment.

Flo-Direct Gas Fired Water Heater- The stainless steel structure and stainless steel internals shall have a 5-year guarantee against failure caused by materials or workmanship provided by Armstrong. Provided only clean potable water is heated.