Constantemp® Steam/Water Heater Installation, Operation & Maintenance Manual

Base Unit

Skidded Unit

Please read and save these instructions.

IOM-792

Armstrong®

Armstrong International
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Contents

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Safety

This bulletin should be used by experienced personnel as a guide for installing the Constantemp steam-to-water heater. Selection or installation of equipment should always be accompanied by competent technical assistance. You are encouraged to contact Armstrong International, Inc. or your local sales representative for additional information.

Icon Legend

	**DANGER!**	**Injury or death and property damage are imminent.**
	**WARNING!**	**Injury or death and property damage are probable.**
	**CAUTION!**	**Potential property damage, expensive repairs, and/or voiding the equipment warranty may result.**
	**BURN HAZARD!**	**Contact with steam, hot water, or hot metal surfaces can cause severe skin burns. Skin exposure to 140°F (60°C) water or metal for only five (5) seconds may cause second-degree burns.**

Failure to comply with instructions following a safety icon may result in adverse consequences, including property damage, personal injury, or, in extreme cases, death.

General Safety Guidelines

1. Inappropriate use (beyond typical, intended use) could cause damage to the product and other property. It may also result in personal injury or, in extreme cases, death.
2. Only designated, qualified, and competent personnel should operate, maintain, and service this equipment in accordance with the directions in this product instruction manual.
3. Improper setup, operation, or maintenance may void the product's warranty.
4. When operating and maintaining this product:
    a. ALWAYS select and wear appropriate personal protective equipment (PPE) before carrying out any physical work at the job site, per site-specific requirements. Appropriate PPE may include hard hats, safety glasses, gloves, boots, or shoes with non-slip soles and toe guards, or protective overalls.
    b. ALWAYS scan the work area and take note of potential hazards before entering. Adjust your travel path or work position to avoid hazards and personal injury.
    c. ALWAYS observe designated safety procedures when working in hazardous locations (areas containing explosive and combustible gases, vapors, and dusts) and confined spaces (locations where breathable air supply is limited or variable, or where entrapment could occur).
    d. ALWAYS use proper lockout/tag-out procedures to disconnect power sources and de-energize machinery before conducting installation, service, or repair.
    e. ALWAYS use great care and appropriate safety gear when working above ground level, especially on ladders and platforms, or in the presence of overhead electrical power lines.
    f. ALWAYS shut off all "live" steam supply, water supply, and condensate return lines before breaking or loosening any plumbing joints.
    g. ALWAYS carefully relieve any residual internal pressure in the system or connecting pipe work before breaking or loosening any plumbing joints.
    h. ALWAYS allow hot parts to cool before serving to avoid the risk of skin burns.

Materials of Construction

Heater Model					Materials of Construction
Series	**300 SERIES**	**600 SERIES**	**900 SERIES**	**1200 SERIES**	
Capacity	**30 GPM**	**60 GPM**	**90 GPM**	**120 GPM**	
Model Number	E300L	E600L	E900L	E1200L	Ductile Iron Shell, Copper Coils

Dimensions

Series E300L and E600L

Series	Unit	Pipe Size				E	F	H (PSI)	L
		A	B	C	K				
E300L	Inches	1-1/2	2	1-1/4	3	4-5/8	5-1/4	30 HG VAC TO 30 PSI	17.5
	mm	38.1	50.8	31.7	76.2	117.5	133.3		444.5
E600L	Inches	2	2	2	4	5-5/8	5-1/4		17.5
	mm	50.8	50.8	50.8	101.6	142.9	133.3		444.5

Series	Unit	P	Q	R	S	T	U	X
E300L	Inches	12-/16	6-11/16	5-23/32	1-1/4	10-1/4	15-13/16	1-3/16
	mm	306.4	169.9	145.3	31.7	260.3	401.6	30.2
E320L	Inches	11-1/4	5-7/8	5-3/4	11-11/16	10-1/16	15-13/16	1-3/16
	mm	285.7	149.2	146.0	296.5	255.6	401.6	30.2
E600L E620L	Inches	12-1/2	5-5/8	5-3/4	3-7/8	7-7/8	17-13/16	1
	mm	317.5	142.9	146.0	98.4	200	452.4	25.4

Model	Unit	J	M	N
E300L	Inches	8-3/4	10-3/8	5-3/16
	mm	222.2	263.5	131.8
E600L	Inches	9-9/32	10-11/16	5-3/16
	mm	235.7	271.5	131.8

J: Bottom of mounting frame to steam inlet on bottom of heat exchanger

M: Bottom of mounting frame to condensate outlet on bottom of heat exchanger

N: Blend valve body to bottom hot water outlet

Maximum Elevation Table		
Inlet Steam Pressure	Maximum Elevation Condensate Discharge	
2-4 psig	0 ft	0 cm
5-6 psig	2 ft	61 cm
7-8 psig	4 ft	121.9 cm
9-10 psig	6 ft	182.9 cm
10-12 psig	8 ft	243.8 cm
12-15 psig	10 ft	304 cm

Approximate Weight of Constantemp Heater (Excluding steam trap)			
Series	Product	Lbs	Kg
E300L	Heater	260 lb	117.8 kg
	813 Steam Trap	26 lb	11.8 kg
E600L	Heater	350 lb	158.7 kg
	814 Steam Trap	44 lb	20.0 kg
Heater may be supported by floor, suspension, or wall bracket. Floor type shown in Figure 3.			

Dimensions - SERIES E300L and E600L, cont.

NOTE: Piping in dotted lines is not supplied by Armstrong International.

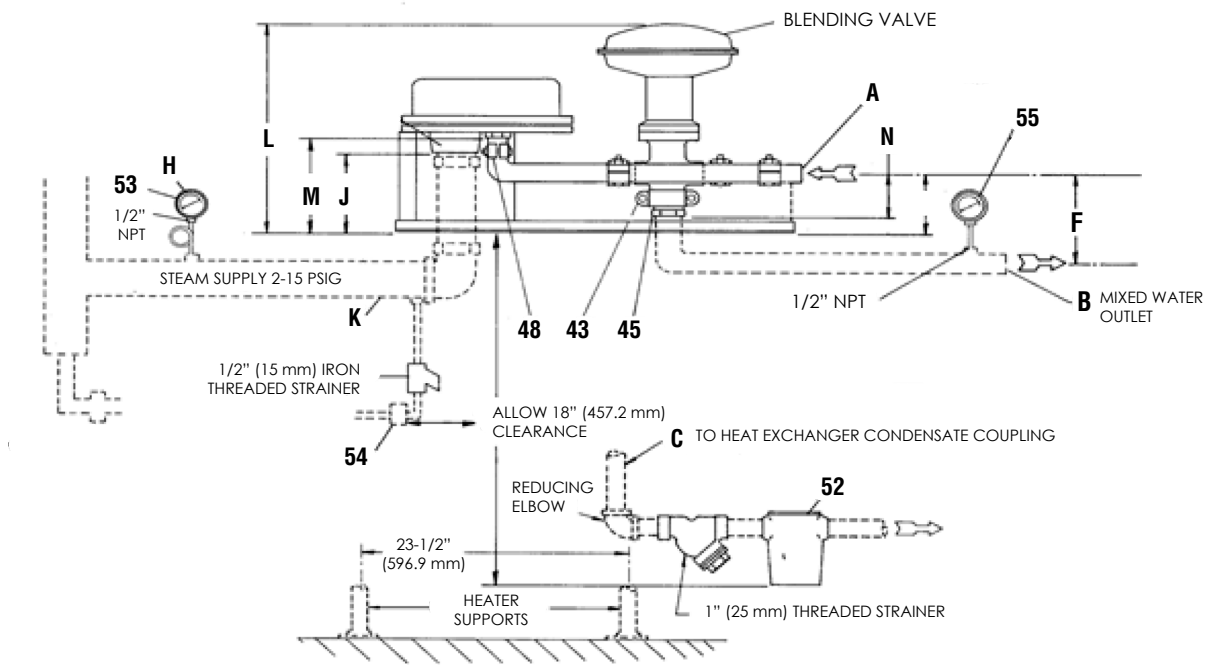


Figure 1
E300L and E600L dimensions

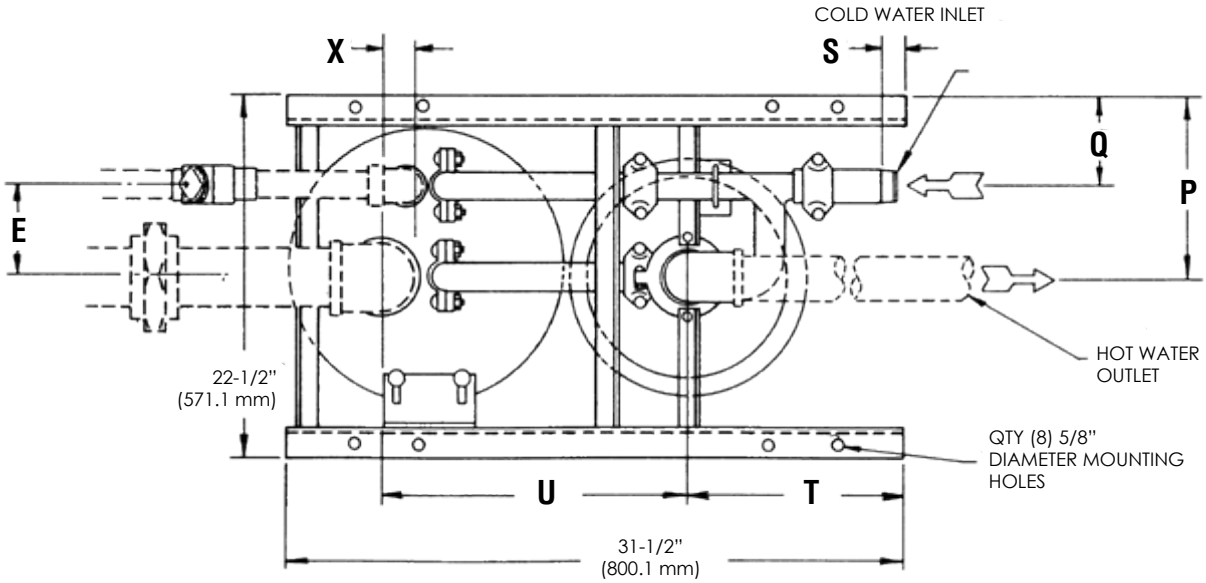
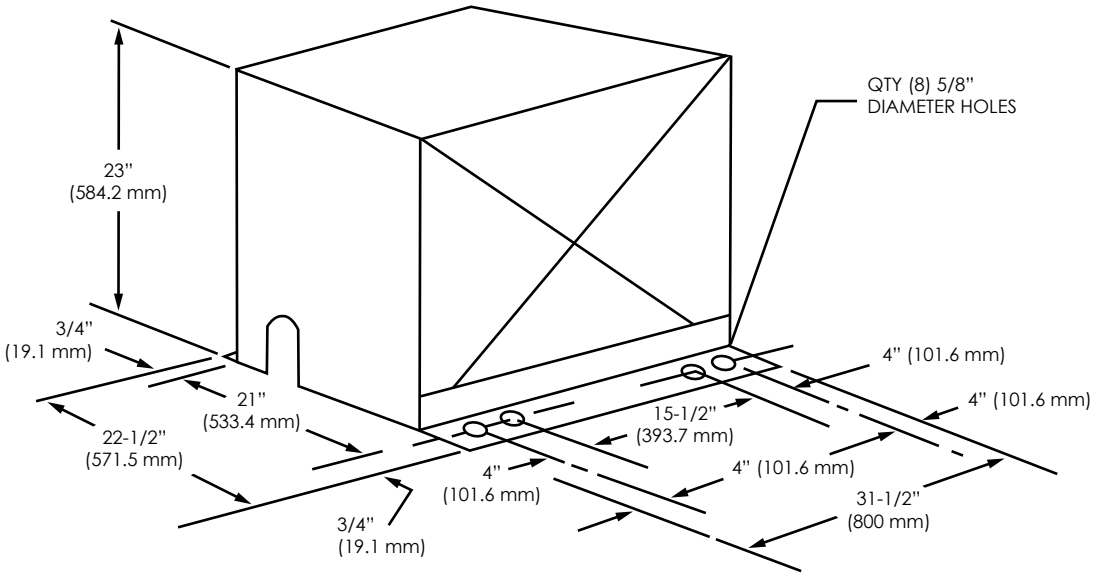


Figure 2
E300L and E600L bottom piping arrangement

Dimensions - SERIES E300L and E600L, cont.

Mounting Dimensions



VIEW SHOWING THE OVERALL HEATER MOUNTING AND CLEARANCE DIMENSIONS, INCLUDING COVER.
COVER IS OPTIONAL. CONSULT PRICE BOOK OR FACTORY FOR PART NUMBER.

Figure 3 E300L and E600L mounting dimensions

Dimensions

SERIES E600L, E900L, AND E1200L

Series	Unit	A	B	C	D	E	F	G
E600L	inches	22-1/2	21	3/4	1	-3-7/8	6-7/8	12-1/2
	mm	571.3	533.4	19.1	25.4	-98.4	174.6	317.5
E900L	inches	24	21-1/2	1-1/4	1-13/16	3-7/8	6-7/8	10-3/4
	mm	609.6	546.1	31.8	46	98.4	174.6	273
E1200L	inches	27-13/16	24-5/16	1-3/4	2-13/16	2-3/8	8	15-1/4
	mm	706.4	617.5	44.5	55.6	60.3	203	387.4

Series	Unit	H	J	K	L	M	N
E600L	inches	4	5-7/16	17-13/16	31-1/2	1-1/2	2
	mm	101.6	138.1	452.4	800.1	38.1	50.8
E900L	inches	2-15/16	9	13-15/16	29-7/16	2-1/2	2-1/2
	mm	74.6	228.6	354	747.7	65	65
E1200L	inches	5-7/16	7-7/16	19-31/32	34-3/8	2-1/2	2-1/2
	mm	138.1	188.9	507.2	873.1	65	65

Maximum Elevation Table

Inlet Steam Pressure	Maximum Elevation Condensate Discharge	
2-4 psig	0 ft	0 cm
5-6 psig	2 ft	61 cm
7-8 psig	4 ft	121.9 cm
9-10 psig	6 ft	182.9 cm
10-12 psig	8 ft	243.8 cm
12-15 psig	10 ft	304 cm

Approximate Weight of Constantemp Heater
(Excluding steam trap)

Series	Product	Lbs	Kg
E600L	Heater	350 lb	158.7 kg
	814 Steam Trap	44 lb	20.0 kg
E900L	Heater	600 lb	272.2 kg
	815 Steam Trap	71 lb	32.2 kg
E1200L	Heater	720 lb	326.6 kg
	816 Steam Trap	131 lb	59.4 kg

Heater may be supported by floor, suspension, or wall bracket. Floor type shown in Figure 4.

Dimensions - SERIES E600L, E900L and E1200L, cont.

NOTE: Piping in dotted lines is not supplied by Armstrong International.

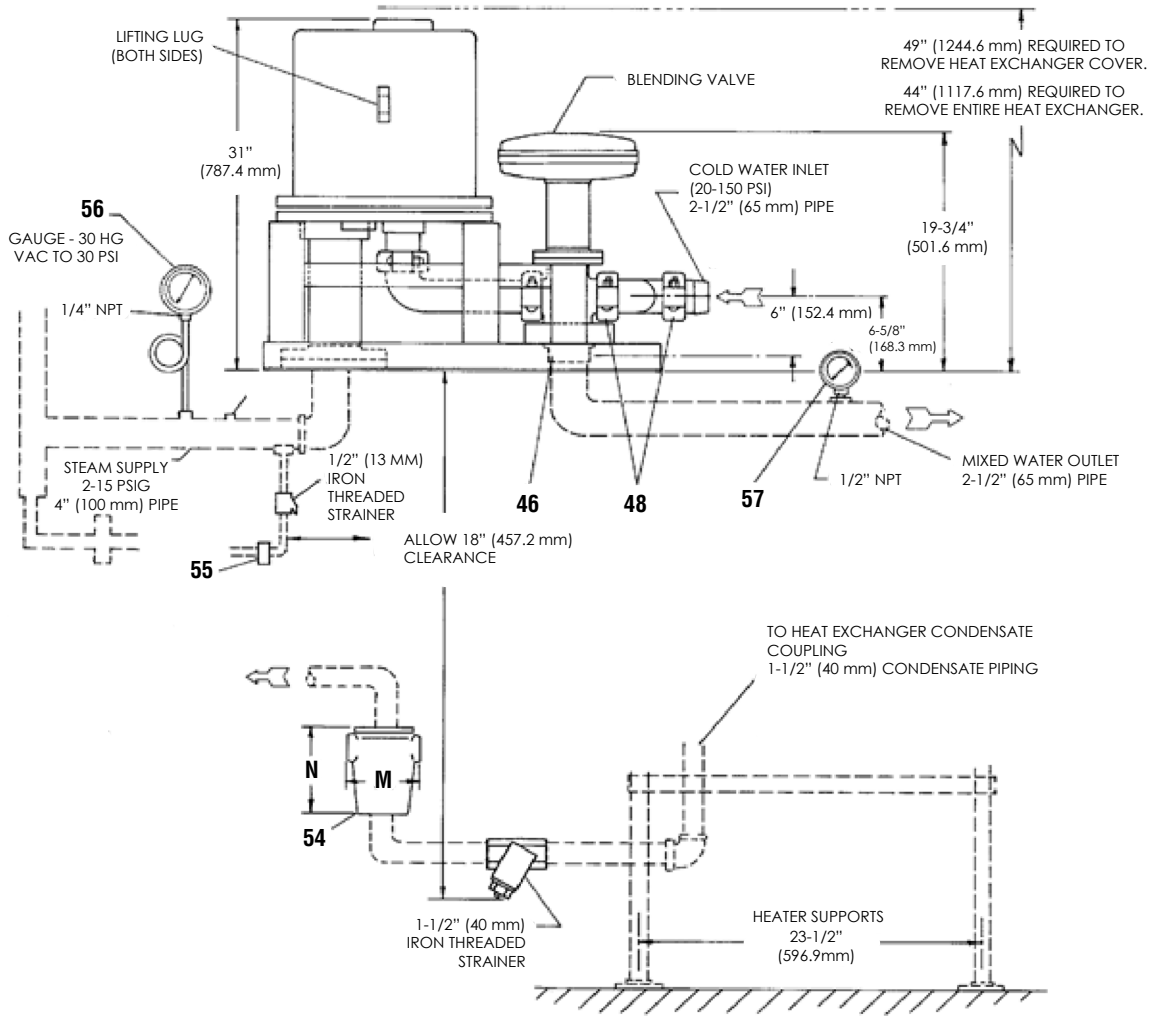


Figure 4
E600L, E900L, and E1200L dimensions

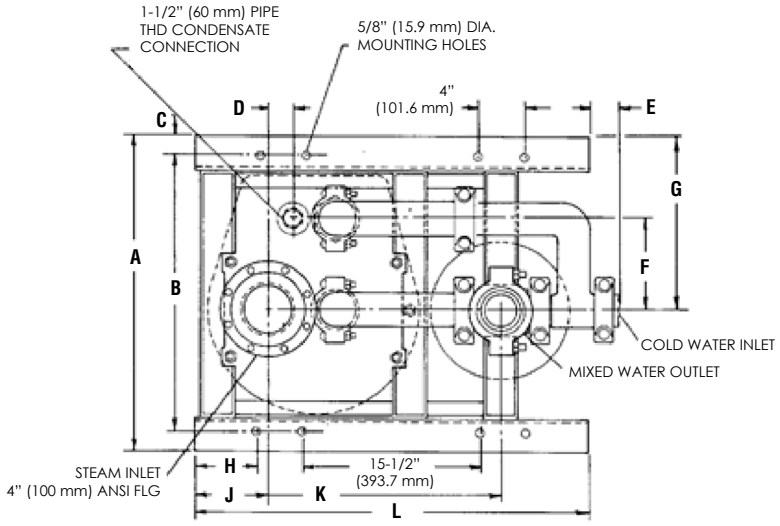


Figure 5
E600L, E900L, and E1200L bottom piping arrangement

Installation Requirements

Water Quality Requirements

The Constantemp heater requires careful attention to water treatment in order to perform efficiently. Water treatment should include filters and softeners where needed. Water quality should satisfy the following criteria:

- Water pH levels must be maintained in an appropriate range for the materials used in your Constantemp system.
  - Copper Materials: Water pH can vary. Copper alloys have a broad range of acceptable pH levels.
  - Stainless Steel Materials: pH should be maintained between 6.6 and 8.5 (per industry standards among SST exchanger manufacturers). Other components may require a more restrictive range.
- Total alkalinity should be between 100 and 500 ppm (CaCO3).
- Water filtration should align with industry best practices.
- Total suspended solids should be below 10 ppm.

Connecting Steam Trap Discharge Piping

WARNING! When connecting the Constantemp heater to material OTHER than copper pipe, use dielectric unions (isolators) to prevent possible galvanic action.

The trap must discharge into an atmospheric or sub-atmospheric system. Condensate should be free-flowing with no lift.

If steam supply pressure is greater than 5 psig, then the MAXIMUM elevation of the steam trap discharge line should be no more than six (6) feet above the heater. If the steam supply pressure can vary, or if maximum efficiency is required, then best results will be achieved if the trap discharges to an atmospheric or sub-atmospheric line that is BELOW the level of the trap.

- A safety valve must be installed in inlet steam piping if steam pressure to the heater can exceed 75 psig (for ductile iron heat exchangers) or 150 psig (for steel heat exchangers). See **Figure 2** (**Page 6**) and **Figure 5** (**Page 9**).
- An adequate steam trap system is required to ensure the steam piping is properly drained.
- A pressure gauge must be installed along the inlet steam piping close to the heater.
- A thermometer must be installed along the hot water outlet piping close to the heater.

Operating Features

A heat exchanger that is supplied with a fixed, constant steam pressure and that has variable hot water demand normally allows water temperature to increase as demand decreases. Alternatively, water temperature will decrease as demand on the heat exchanger increases.

The Constantemp heater has an adjustable temperature gain integrated within heater control system. This feature automatically compensates, in most part, for the wide temperature variations that are normally observed when an uncontrolled steam supply pressure is supplied to the heater (see **Pages 12-13**). The Constantemp heater quickly re-proportions the blend ratio of hot and cold water on an automatic, feed-forward basis.

The blending valve includes a third window that is normally closed by a seal plate assembly. In the event that dirt or foreign material enters the blend valve and prevents movement, the yielding spring will allow the diaphragm and stem to move upward, opening the third window. As the seal plate uncovers the third window, it allows cold water to flow into the blended mix, preventing the water from becoming overheated.

Steam and Water Operating Pressures for Low Pressure Constantemp Heaters

- STEAM PRESSURE - 2 – 15 psig
- WATER PRESSURE AT COLD WATER INLET: Maximum water pressure MUST be 5 psig ABOVE maximum steam pressure used to operate the heater.

Installation Checklist

For All Models

- The drip leg and steam trap must be adequate to ensure that the steam supply line remains free of condensate.
- Install a safety valve at the steam supply connection when steam supply pressure may exceed 75 psig for ductile iron heat exchangers, or 150 psig for carbon steel heat exchangers.
- Install a small trap and strainer to drain condensation during periods of low to no demand on the heat exchanger.
- Install the supplied thermometer in the outlet hot water line.
- Install stop valves on the steam and condensate lines, as well as the water inlet and outlet lines.
- See tables on **Page 5** and **Page 8** for the maximum elevation of condensate discharge.

Heater may be wall or floor-stand mounted. Allow recommended clearances over, under, and around heater for maintenances purposes. See dimensions on **Pages 5-9**.

For Models E600L, E900L, and E1200L Only

- The condensate piping must be able to prevent excessive back pressure. When extra elbows or long pipe runs are used, the pipe size should be increased.
- Install a relief valve in the cold water supply line when water pressure may exceed 150 psig.
- Screwed fitting on E600L; flanged fitting on E900L and E1200L.

Parts Diagram

Refer to Figures **7a** and **7b**: **Complete Blending Valve** and **Top View of Constantemp Heater** to identify parts as they are called out in the commissioning and maintenance procedures following this section. Reference numbers appear in parentheses wherever a part is called out.

Ex: "*Disconnect the Victaulic coupling (43) and remove the gasket (44)…*"

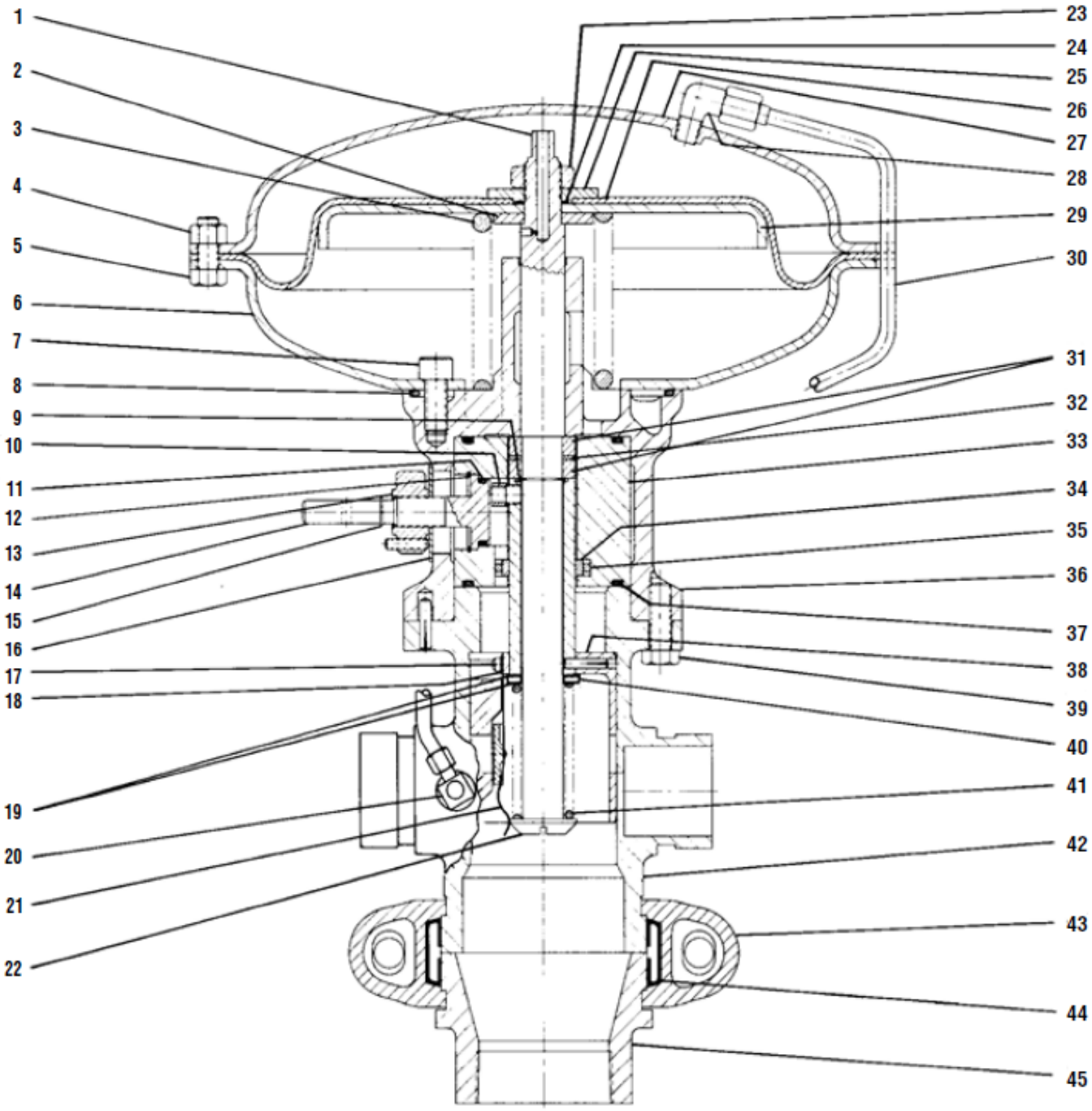
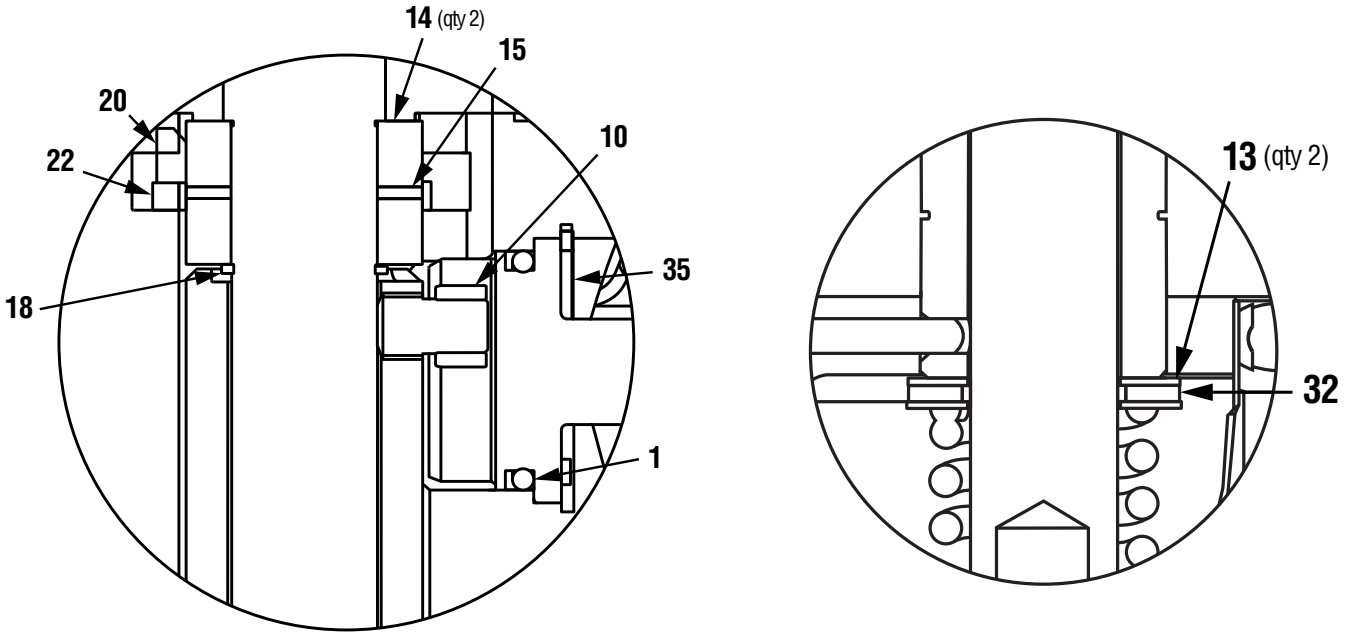


Figure 7a
Complete blending valve (Ref. Nos. 1-45)

Parts Diagram, cont.



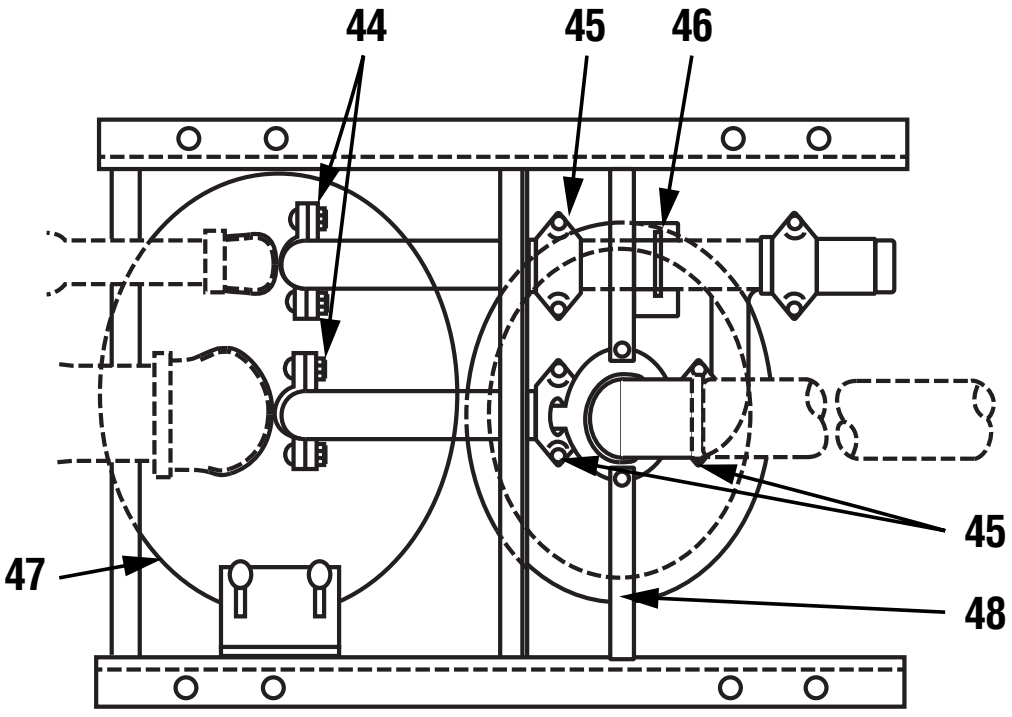


Figure 7b
Bottom piping diagram - Constantemp heater (Ref. Nos. 46-51)

Parts List

SERIES E300L AND E600L

Parts highlighted in gray MUST be on hand when overhauling equipment and are recommended to have on-hand as spare parts.

Ref. No.	Part Name	Material	E300L		E600L	
			Qty Per	Part No.	Qty Per	Part No.
1	Upper Stem	Stainless steel	1	LH-A66688	1	LH-A66688
2	Spring Washer Guide	Stainless steel	1	LH-A64632	1	LH-A64632
3	Blending Valve Spring	Stainless steel	1	LH-A66696	1	LH-N64747
4	Nut	Steel	14	LH-A23194	14	LH-A23194
5	Bolt	Steel	14	LH-A69988	14	LH-A66998
6	Diaphragm Base (Lower)	Stainless steel	1	LH-A64443	1	LH-A64443
7	Socket H.D. Cap Screw	Steel	6	LH-A39655	6	LH-A39655
8	O-Ring	Synthetic rubber	1	LH-N6476994	1	LH-N6476994
9	Spirolox Ring	Stainless steel	1	LH-A59025	1	LH-A59025
10	Key Cylinder	Stainless steel	1	LH-A58998	1	LH-A58998
11	O-Ring	Synthetic rubber	1	LH-N5905294	1	LH-N5905294
12	Retaining Ring	Stainless steel	1	LH-A59023	1	LH-A59023
13	Lock Nut - Complete	Brass	1	LH-N59001	1	LH-N59001
14	Gain Adjustor	Stainless steel	1	LH-A58995	1	LH-A58995
15	Retaining Ring	Copper	1	LH-A59024	1	LH-A59024
16	Cover Plate	Brass	1	LH-N59009	1	LH-N59009
17	Screw	Stainless steel	2	LH-A70929	2	LH-A70929
18	Lockwasher	Stainless steel	2	LH-A59013	2	LH-A59013
19	Spring Seat Washer	Stainless steel	2	LH-A59013	2	LH-A59013
20	Relief Valve	Brass	1	D102817	1	D102817
21	Seal Plate Assembly	Stainless steel	1	LH-A59031	1	LH-A59031
22	Screw	Bronze	1	LH-A59486	1	LH-A59486
23	Jam Nut	Steel	1	LH-N50547	1	LH-N50547
24	O-Ring	Synthetic rubber	1	LH-N4974694	1	LH-N4974694
25	Shouldered Washer	Stainless steel	1	LH-A64645	1	LH-A64645
26	Diaphragm	Synthetic rubber	1	LH-A3780994	1	LH-A3780994
27	Diaphragm Cover (Upper)	Stainless steel	1	LH-A64442	1	LH-A64442
28	Male Elbow - Flared	Brass	1	LH-N64829	1	LH-N64829
29	Diaphragm Plate	Stainless steel	1	LH-A64641	1	LH-A64641
30	Formed Tubing	Copper	1	LH-A66690	1	LH-A66690
31	Stem Collar Washer (Upper)	Stainless steel	1	LH-A59014	1	LH-A59014
32	Thrust Washer	Graphite Teflon or stainless steel	1	LH-A59015	1	LH-A59015
33	Temperature Adjusting Sleeve - Complete	Stainless steel	1	LH-A58989	1	LH-A58989
34	Guide	Graphite Teflon or synthetic rubber	1	LH-N59107	1	LH-N59107
35	Guide Energizer	Synthetic rubber	1	LH-A59166	1	LH-A59166
36	Yoke	Cast bronze	1	LH-A90160	1	LH-A90160
37	O-Ring	Synthetic rubber	2	LH-N5902994	2	LH-N5902994
38	Valve Plug - Complete Incl. seal plate (21), screws (17), and lockwasher (18)	Monel	1	LH-A73463	1	LH-A73463
39	Cap Screws (Requires both part numbers)	Steel	4	LH-A45840	4	LH-A45840
			2	LH-A59478	2	LH-A59478

Parts List, cont.

SERIES E300L AND E600L, cont.

Parts highlighted in gray MUST be on hand when overhauling equipment and are recommended to have on-hand as spare parts.

Ref. No.	Part Name	Material	E300L		E600L	
			Qty Per	Part No.	Qty Per	Part No.
40	Needle bearing	Nylon and stainless steel	1	LH-A68484	1	LH-A68484
41	Yielding spring	Stainless steel	1	LH-A59019	1	LH-A59019
42	Body	Cast bronze	1	LH-A90164	1	LH-A58985
43	Coupling	Malleable iron	1	LH-A79572	1	LH-A79572
44	Gasket	Commercial	1	LH-A56237	1	LH-A56237
45	Reducing Coupler	Cast bronze	1	D142076	1	D142076
46	Heat Exchanger (Ductile iron body, copper coil)	Ductile iron, copper	1	LH-A68609	1	LH-A68610
	Heat Exchanger (Steel body, copper coil)	Steel, copper	1	LH-A686092022	1	LH-A686102022
48	Coupling (**Size**: **E300L**: 1-1/4"**; E600L**: 2")	Malleable iron	2	LH-N55568	3	LH-N58187
49	Coupling (**Size**: **E300L**: 1 1/4"**; E600L**: 1-1/2")	Malleable iron	4	LH-A56547	4	LH-A56547
50	Mounting Frame	Carbon steel	1	LH-A67761	1	LH-A59096
51	U-Bolt and Nuts	Steel	1	LH-N58654	1	LH-N58654
52	Steam Trap (**E300L**: 1"**; E600L**: 1-1/2")	Cast iron	1	C5318-14	1	C5318-35
53	Pressure Gauge	Steel case	1	LH-A63092	1	LH-A63092
54	1/2" Steam Trap	Cast iron	1	C5323-5	1	C5323-5
55	Thermometer	Stainless steel	1	LH-N60184	1	LH-N60184
56a	Strainer (**E300L**: 1"**; E600L**: 1-1/2")	Cast iron	1	LH-F000220053W	1	LH-F000220056W
56b	1/2" Strainer	Cast iron	1	LH-F000220051W	1	LH-F000220051W
57	Nipple	Brass	1	LH-A56639	1	LH-A58189
58	Inlet Manifold	Cast bronze	1	LH-A90150	1	LH-A90149
59	Exchanger Manifold	Cast bronze	2	LH-A90157	2	LH-A90148
60	Fitting (Male Elbow)	Brass	1	LH-N64770	1	LH-N64770
61	Pigtail Siphon	Cast iron	1	LH-N56745	1	LH-N56745
62	Stem Thrust Washer (Lower)	Graphite filled Teflon or stainless steel	1	LH-A59014	1	LH-A59014

Part numbers for parts not shown in Figures 7a and 7b		
Description	Part No.	
	E300L	E600L
Copper coil kit for heat exchanger (46)*	LH-U011854085 (E300L)	LH-U011854087
	LH-U011854086 (E320L)	
Manifold gasket for heat exchanger (46)	LH-A80306	LH-A80301
Casing gasket for heat exchanger (46)	LH-N5668567 (E300L)	LH-N5668667
	LH-N5796167 (E320L)	
Coupling gasket for coupling (48)	LH-A56236	LH-A58188
Coupling gasket for coupling (49)	LH-A56548	LH-A56548
Coil lock ring*	LH-N61394	LH-N61395
Coil lock nut*	LH-N59409	LH-A59431

*The coil kit includes the coil, manifold gaskets, casing gasket, lock rings, and lock nuts. Lock rings and lock nuts are available for purchase separately.

Parts List

SERIES E900L AND E1200L

Parts highlighted in gray MUST be on hand when overhauling equipment and are recommended to have on-hand as spare parts.

Ref. No.	Part Name	Material	E900L		E1200L	
			Qty Per	Part No.	Qty Per	Part No.
1	Upper Stem	Stainless steel	1	LH-A66693	1	LH-A66693
2	Spring Washer Guide	Stainless steel	1	LH-A64632	1	LH-A64632
3	Blending Valve Spring	Stainless steel	1	LH-A66697	1	LH-A66697
4	Nut	Steel	14	LH-N23194	14	LH-N23194
5	Bolt	Steel	14	LH-A69988	14	LH-A69988
6	Diaphragm Base (Lower)	Stainless steel	1	LH-A64443	1	LH-A64443
7	Socket H.D. Cap Screw	Steel	6	LH-A39655	6	LH-A39655
8	O-Ring	Synthetic rubber	1	LH-N6476994	1	LH-N6476994
9	Spirolox Ring	Stainless steel	1	LH-A59025	1	LH-A59025
10	Key Cylinder	Stainless steel	1	LH-A58998	1	LH-A58998
11	O-Ring	Synthetic rubber	1	LH-NB39812572	1	LH-NB39812572
12	Retaining Ring	Stainless steel	1	LH-A59494	1	LH-A59494
13	Lock Nut - Complete	Brass	1	LH-N59001	1	LH-N59001
14	Gain Adjustor	Stainless steel	1	LH-A59291	1	LH-A59291
15	Retaining Ring	Copper	1	LH-A59024	1	LH-A59024
16	Cover Plate	Brass	1	LH-A59314	1	LH-A59314
17	Screw	Stainless steel	2	-	2	-
18	Lockwasher	Stainless steel	2	LH-A21666	2	LH-A21666
19	Spring Seat Washer	Stainless steel	2	LH-A59013	2	LH-A59013
20	Relief Valve	Brass	1	D102817	1	D102817
21	Seal Plate Assembly	Stainless steel	1	LH-A63996	1	LH-A63996
22	Screw	Bronze	1	LH-A59486	1	LH-A59486
23	Jam Nut	Steel	1	LH-N50547	1	LH-N50547
24	O-Ring	Synthetic rubber	1	LH-N4974694	1	LH-N4974694
25	Shouldered Washer	Stainless steel	1	LH-A64645	1	LH-A64645
26	Diaphragm	Synthetic rubber	1	LH-A3780994	1	LH-A3780994
27	Diaphragm Cover (Upper)	Stainless steel	1	LH-A64442	1	LH-A64442
28	Male Elbow - Flared	Brass	1	LH-N64829	1	LH-N64829
29	Diaphragm Plate	Stainless steel	1	LH-A64641	1	LH-A64641
30	Formed Tubing	Copper	1	LH-A66695	1	LH-A66695
31	Stem Collar Washer (Upper)	Stainless steel	1	LH-A59489	1	LH-A59489
32	Thrust Washer	Graphite Teflon or stainless steel	1	LH-A68484	1	LH-A68484
33	Temperature Adjusting Sleeve - Complete	Stainless steel	1	LH-A59288	1	LH-A59288
34	Guide	Graphite Teflon or synthetic rubber	1	LH-A59312	1	LH-A59312
35	Guide Energizer	Synthetic rubber	1	LH-A59166	1	LH-A59166
36	Yoke	Cast bronze	1	LH-A90161	1	LH-A90161
37	O-Ring	Synthetic rubber	2	LH-NB39823572	2	LH-NB39823572
38	Valve Plug - Complete Incl. seal plate (21), screws (17), and lockwasher (18)	Monel	1	LH-A73460	1	LH-A73460
39	Cap Screws (Requires both part numbers)	Steel	4	LH-A59478	4	LH-A59478
			2	LH-N40091	2	LH-N40091

Parts List, cont.

SERIES E900L AND E1200L, cont.

Parts highlighted in gray MUST be on hand when overhauling equipment and are recommended to have on-hand as spare parts.

Ref. No.	Part Name	Material	E900L		E1200L	
			Qty Per	Part No.	Qty Per	Part No.
40	Needle bearing	Nylon and stainless steel	1	LH-A68484	1	LH-A68484
41	Yielding spring	Stainless steel	1	LH-A59299	1	LH-A59299
42	Body	Cast bronze	1	LH-A90175	1	LH-A90175
43	Coupling	Malleable iron	1	LH-A79576	1	LH-A79576
44	Gasket	Commercial	1	LH-A59492	1	LH-A59492
45	Reducing Coupler	Cast bronze	1	LH-A90151	1	LH-A90151
46	Heat Exchanger (Ductile iron body, copper coil)	Ductile iron, copper	1	LH-A68611	1	LH-A68612
	Heat Exchanger (Steel body, copper coil)	Steel, copper	1	LH-A686112022	1	LH-A686122022
48	Coupling (**Size**: **E900L**: 2")	Malleable iron	2	LH-N58187	0	-
49	Coupling (**Size**: 2-1/2")	Malleable iron	4	LH-A58860	6	LH-A58860
50	Mounting Frame	Carbon steel	1	LH-A60797	1	LH-A59200
51	U-Bolt and Nuts	Steel	1	-	1	-
52	Steam Trap (**Size: E900L**: 1-1/4", **E1200L**: 2")	Cast iron	1	D502644	1	D530938
53	Pressure Gauge	Steel case	1	LH-A63092	1	LH-A63092
54	1/2" Steam Trap	Cast iron	1	C5323-5	1	C5323-5
55	Thermometer	Stainless steel	1	LH-N60184	1	LH-N60184
56a	1-1/2" Strainer	Cast iron	1	LH-F000220056W	1	LH-F000220056W
56b	1/2" Strainer	Cast iron	1	LH-F000220051W	1	LH-F000220056W
57	Nipple	Brass	1	LH-A59361	1	LH-A59361
58	Inlet Manifold	Cast bronze	1	LH-A90152	1	LH-A90352
59	Exchanger Manifold	Cast bronze	2	LH-A90153	2	LH-A90351
60	Fitting (Male Elbow)	Brass	1	LH-N64770	1	LH-N64770
61	Pigtail Siphon	Cast iron	1	LH-N56745	1	LH-N56745
62	Stem Thrust Washer (Lower)	Graphite filled Teflon or stainless steel	1	LH-A59493	1	LH-A59493

Part numbers for parts not shown in Figures 7a and 7b		
Description	Part No.	
	E900L	E1200L
Copper coil kit for heat exchanger (46)*	LH-U011854087	LH-U011854089
Manifold gasket for heat exchanger (46)	LH-A80301	LH-A80311
Casing gasket for heat exchanger (46)	LH-N5668667	LH-A5955167
Coupling gasket for 2" coupling (48)	LH-A58188	-
Coupling gasket for 2-1/2" coupling (49)	LH-A58862	LH-A58862
Coil lock ring*	LH-N61395	LH-A61396
Coil lock nut*	LH-A59431	LH-A60596

*The coil kit includes the coil, manifold gaskets, casing gasket, lock rings, and lock nuts. Lock rings and lock nuts are available for purchase separately.

Start-Up

1. Turn on the cold water supply. With NO water flowing through the heater, slowly open the steam stop valve to the heat exchanger, ensuring the traps are functioning properly (to prevent water hammer).
2. Loosen the pipe plug on top of the exchanger casing. Vent air from the casing and then re-tighten the pipe plug.

NOTE: Before proceeding to Step 3 below, refer to the **Capacity and Gain Adjustment Tables** on **Page 13**, as well as the **Gain Adjustment Curve Diagram** below. Following the guidelines outlined in these tables will allow the Constantemp heater to perform at maximum efficiency.

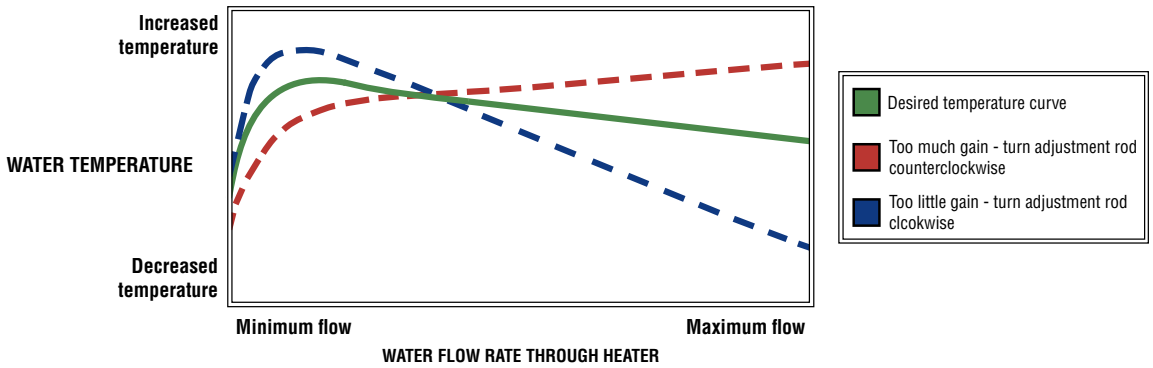
3. Loosen the set screw and lock nut (13) in the temperature/gain adjuster (14). Move the lock nut (13) away from the cover plate (16). Refer to the **Capacity and Gain Adjustment Tables** on **Page 13** to determine the Constantemp heater capacity (in GPM) under your specific operating conditions. Adjust water flow through the heater so that the heater reaches 50% of the determined capacity. Move the temperature/gain adjuster (14) right or left until the desired mixed outlet temperature is reached.

NOTE: There MUST be water flow through the heater in order to make gain adjustments. Observe the outlet temperature at minimum flow and at maximum flow. Rotate the gain control as shown on the **Gain Adjustment Curve Diagram** below until there is minimal variation in the mixed water outlet temperature at minimum and maximum flow rates. Move the temperature/gain adjuster in small increments when making adjustments. Total rotary movement of the adjuster is 30° (See Figure 6).

4. Move the lock nut (13) until it is against the plate (16). Secure the lock nut (13) in place with the lock nut set screw.
5. The Constantemp heater is now adjusted and operating. No other adjustments are necessary unless there is a change in operating conditions. To SHUT DOWN CONSTANTEMP HEATER the heater must be drained. See **Page 23** for instructions on how to drain the heater.

NOTE: If heater is to be shut down for a prolonged period of time, see Page 23 for instructions on how to drain heater.

Gain Control Adjustment Curve Diagram



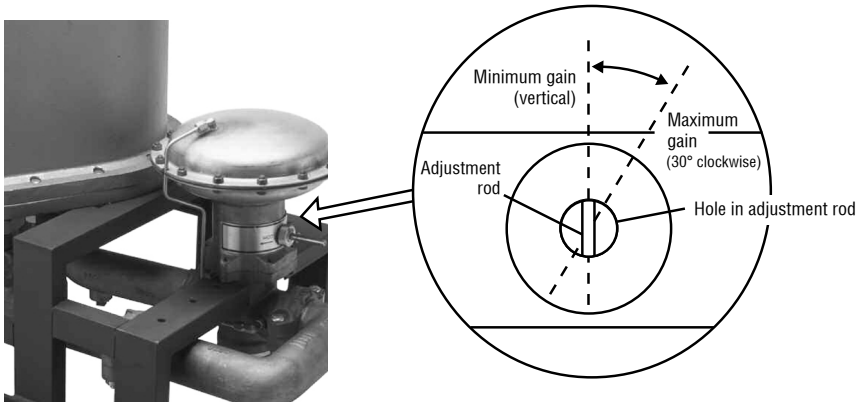


Figure 6
Gain control adjustment curve diagram

Capacity and Gain Adjustment Table

Capacity and Gain Adjustment Table - E300L / E600L

Inlet Temperature	Setpoint Temperature	E300L Steam Pressure in PSIG* (Steam PSIG measured at the heat exchanger inlet)				E600LSteam Pressure in PSIG* (Steam PSIG measured at the heat exchanger inlet)			
		2	5	10	15	2	5	10	15
		Capacity in GPM (Gain Adjustor setting in °)				Capacity in GPM (Gain Adjustor setting in °)			
40 °F	120 °F	27 GPM (25°)	30 GPM (24°)	30 GPM (23°)	30 GPM (22°)	54 GPM (15°)	60 GPM (14°)	60 GPM (13°)	60 GPM (12°)
	140 °F	20 GPM (30°)	22 GPM (30°)	24 GPM (30°)	27 GPM (30 °)	46 GPM (36°)	54 GPM (25°)	58 GPM (25°)	60 GPM (20°)
	150 °F	17 GPM (30°)	19 GPM (30°)	21 GPM (30°)	23 GPM (30 °)	40 GPM (30°)	49 GPM (30°)	53 GPM (27°)	54 GPM (25°)
	160 °F	*	*	*	*	34 GPM (30°)	41 GPM (30°)	44 GPM (30°)	46 GPM (30°)
	180 °F	*	*	*	*	21 GPM (30°F)	23 GPM (30°F)	25 GPM (30°F)	28 GPM (30°F)
60 °F	120 °F	30 GPM (22°)	30 GPM (21°)	30 GPM (20°)	30 GPM (19°)	60 GPM (12°)	60 GPM (11°)	60 GPM (10°)	60 GPM (9°)
	140 °F	23 GPM (25°)	25 GPM (24°)	27 GPM (23°)	30 GPM (22°)	57 GPM (15°)	59 GPM (14°)	60 GPM (13°)	60 GPM (12°)
	150 °F	20 GPM (28°)	22 GPM (27°)	24 GPM (27°)	27 GPM (26°)	49 GPM (23°)	54 GPM (21°)	57 GPM (18°)	60 GPM (16°)
	160 °F	*	*	*	*	42 GPM (30°)	49 GPM (28°)	51 GPM (25°)	56 GPM (20°)
	180 °F	*	*	*	*	29 GPM (30°)	33 GPM (30°)	39 GPM (30°)	44 GPM (30°)

Capacity and Gain Adjustment Table - E900L / E1200L

Inlet Temperature	Setpoint Temperature	E900L Steam Pressure in PSIG* (Steam PSIG measured at the heat exchanger inlet)				E1200L Steam Pressure in PSIG* (Steam PSIG measured at the heat exchanger inlet)			
		2	5	10	15	2	5	10	15
		Capacity in GPM (Gain Adjustor setting in °)				Capacity in GPM (Gain Adjustor setting in °)			
40 °F	105 - 110 °F	87 GPM	90 GPM	90 GPM	90 GPM	116 GPM	120 GPM	120 GPM	120 GPM
	120 °F	81 GPM (15°)	90 GPM (14°)	90 GPM (13°)	90 GPM (12°)	108 GPM (15°)	120 GPM (14°)	120 GPM (13°)	120 GPM (12°)
	140 °F	69 GPM (30°)	81 GPM (28°)	87 GPM (25°)	90 GPM (20°)	92 GPM (30°)	108 GPM (28°)	116 GPM (25°)	120 GPM (20°)
	150 °F	60 GPM (30°)	73 GPM (30°)	79 GPM (27°)	81 GPM (25°)	80 GPM (30°)	98 GPM (30°)	106 GPM (27°)	108 GPM (25°)
	160 °F	51 GPM (30°)	61 GPM (30°)	66 GPM (30°)	69 GPM (30°)	68 GPM (30°)	82(30°)	88 GPM (30°)	92 GPM (30°)
	180 °F	31 GPM (30°)	34 GPM (30°)	37 GPM (30°)	42 GPM (30°)	42 GPM (30°)	50 GPM (30°)	50 GPM (30°)	56 GPM (30°)
60 °F	105 - 110 °F	90 GPM	90 GPM	90 GPM	90 GPM	120 GPM	120 GPM	120 GPM	120 GPM
	120 °F	90 GPM (12°)	90 GPM (11°)	90 GPM (10°)	90 GPM (9°)	120 GPM (12°)	120 GPM (11°)	120 GPM (10°)	120 GPM (9°)
	140 °F	85 GPM (15°)	88 GPM (14°)	90 GPM (13°)	90 GPM (12°)	114 GPM (15°)	118 GPM (14°)	120 GPM (13°)	120 GPM (12°)
	150 °F	73 GPM (23°)	81 GPM (21°)	85 GPM (18°)	90 GPM (16°)	98 GPM (23°)	108 GPM (21°)	114 GPM (14°)	120 GPM (16°)
	160 °F	63 GPM (30°)	73 GPM (28°)	76 GPM (25°)	84 GPM (20°)	84 GPM (30°)	98 GPM (28°)	102 GPM (25°)	112 GPM (20°)
	180 °F	43 GPM (30°)	49 GPM (30°)	58 GPM (30°)	66 GPM (30°)	58 GPM (30°)	66 GPM (30°)	78 GPM (30°)	88 GPM (30°)

Maintenance of System Components

Blending Valve Disassembly

1. Close steam and water inlet and outlet stop valves. Disconnect tubing from body and upper diaphragm cover (27).
2. Disconnect the Victaulic coupling (43) and remove gasket (44). Remove the reducing coupling (45) and tubing (30).
3. Loosen and remove casing bolts (5) and nuts (4). Lift the upper diaphragm cover (27) off of the unit.
4. Remove the retaining ring (15) from the temperature/gain adjuster. Then remove the lock nut (13) and cover plate (16).
5. Remove retaining ring (12) from adjusting sleeve (33). Then remove temperature/gain adjuster (14) and key cylinder (10).
6. Hold the upper stem (1) fast by placing an open-end wrench on the flats of the upper stem (1). Remove the jam nut (23) with another wrench.
7. Remove the shouldered washer (25), O-ring (24), diaphragm (26), diaphragm plate (29), blending valve spring (3), and the spring guide washer (2) from the lower diaphragm case (6).

CAUTION! Do not allow the valve plug assembly to fall from the lower end of the valve body. The valve plug assembly should NOT be disassembled unless parts need to be replaced due to wear or damage. For disassembly instructions, refer to Page .

8. Remove the valve plug assembly from the lower opening of the valve body (42).
9. Remove the socket head cap screws (7) and take off the lower diaphragm base (6). Remove the O-ring (8) from the top of the yoke (36).
10. Disconnect the Victaulic couplings from the valve body (42) and remove the gaskets.
11. Take out the cap screws (39) and remove the valve body (42).
12. Push the temperature adjusting sleeve (33) out of the yoke (36).

All parts should be cleaned with an approved solvent. Wipe off with a clean cloth. Do not use abrasives of any kind. Handle parts carefully and avoid damaging critical surfaces. Replace any parts with damaged or badly worn surfaces.

NOTE: If the blending valve needs to be completely disassembled, it is recommended to remove the valve from the heater and disassemble on a work bench.

Maintenance, cont.

Actuator Assembly

IMPORTANT! Lubricate all O-rings with silicon grease.

1. Place O-ring (8) in the top of the yoke (36). Position and attach the lower diaphragm base (6) to the yoke (see **Figure 9**). Fasten the base (6) to the yoke (36) with cap screws (7) in sequence until tight (Torque: 21 ft-lb).
2. Install O-ring (37) in the grooves of the temperature adjusting sleeve (33). Insert the rubber guide energizer (35) and Teflon valve plug guide (34) into the groove in the bore of the adjusting sleeve (33). The chamfer on the guide should face out and the ends should butt against the two groove pins (See **Figure 10** and **Figure 11**).
3. Insert the temperature adjusting sleeve assembly (33) in the yoke (36) with the Teflon guide (34) facing out. The hole in the sleeve must line up with the yoke window.

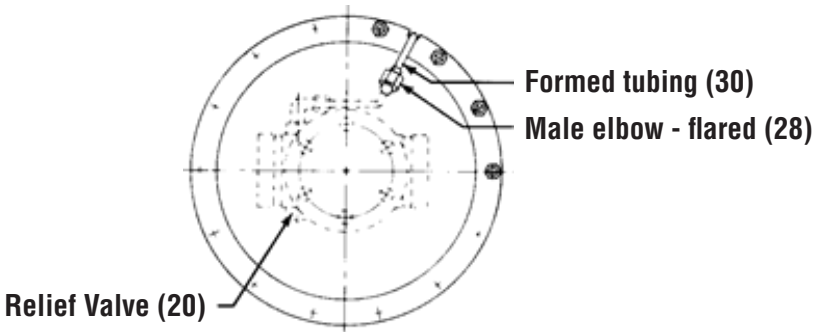


Figure 9
Top view showing the position of notches to valve body, and tubing and fitting to cold water inlet

Valve Plug Assembly

1. Fasten the seal plate assembly (21) to the valve plug (38) with screws (17) and lock washers (18) (Torque: 7 ft-lb).
2. Place the following (in order) over the upper stem: Stem collar washer (31), Teflon thrust washer (32) and a second stem collar washer (31). Ensure the parts shoulder on the step of the upper stem. Insert the Spirolox retaining ring (9) into the upper stem groove.

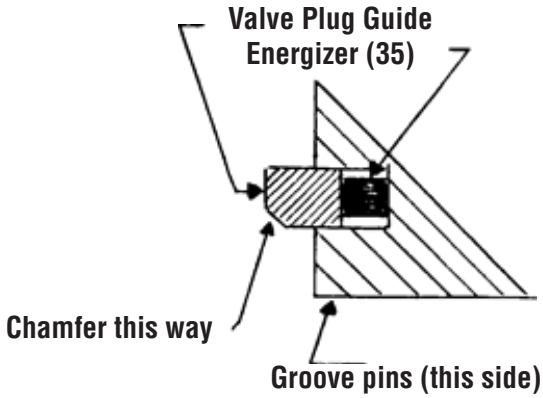


Figure 10
Valve plug assembly guide

3. Insert upper stem (1) through hole in the valve plug (38) so that stem collar (31) rests on smaller end of the valve plug.
4. The bearing assembly consists of a spring seat washer (19), a thrust washer (40) and washer (19). Place this assembly over the upper stem (1) into the large bore of the valve plug (38) so that it rests on the bottom of the bore. Place an additional washer (19) followed by the yield spring (41). Hold the upper stem (1) at the extreme upper end with a wrench.
5. Tighten the screw (22) (Torque: 10 ft-lb), ensuring that it shoulders on the lower section of the upper stem. Apply a light coating of silicon grease to the surface of the valve plug.

Maintenance, cont.

Valve Plug Disassembly

1. Loosen the screw (22) that is shouldered on the lower section of the upper stem.
2. Remove the yield spring (41), spring seat washer (19) and bearing assembly from the large bore of the valve plug.
3. Remove the upper stem (1) from the valve plug (38).
4. Remove the Spirolox retaining ring (9) from the upper stem groove. Remove the stem collar washer (31), Teflon thrust washer (32), and stem collar washer from the upper stem.
5. Loosen the lock washers (18) and screws (17) from the valve plug (38) to remove the seal plate assembly.

Blending Valve Assembly

1. Install the pressure relief valve (20) in the boss on the side of the body. Make sure the correct valve body (42) is used.
2. Assemble the valve body (42) to the yoke (36) with the cold water inlet facing the same direction as the yoke window (36). Secure with cap screws (39).
3. Install O-ring (11) in groove of temperature/gain adjuster (14), and temporarily (for alignment purposes), insert adjuster through yoke window. Ensure that the keyway and notch on the outer diameter of the temperature/gain adjuster are lined up with the pin inside the temperature adjusting sleeve (33). See Figure 11. DO NOT INSTALL RETAINING RING (12).

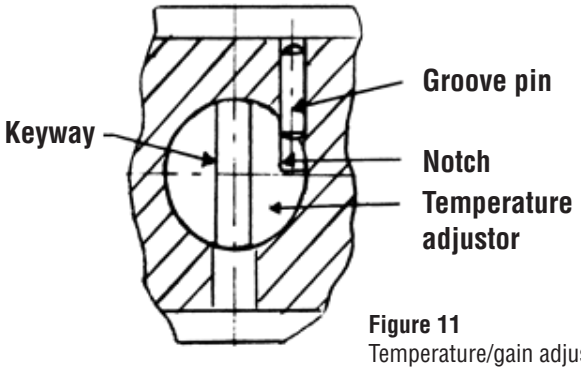


Figure 11
Temperature/gain adjuster

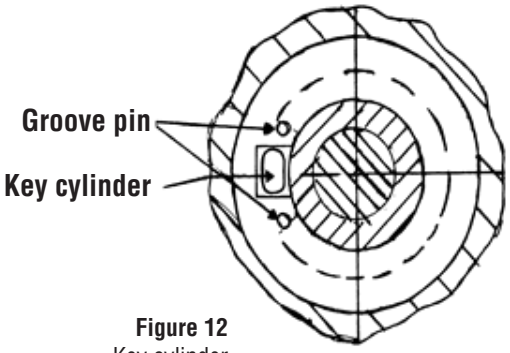


Figure 12
Key cylinder

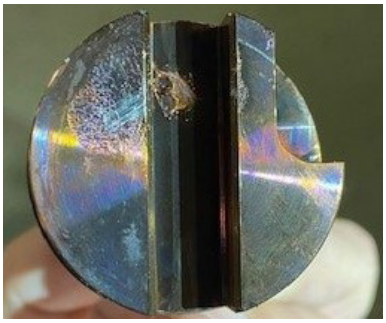


Figure 13
Key cylinder

Figure 14
Key cylinder

4. Center the valve plug key and temperature/gain adjuster (14) with one another. Insert the valve plug assembly in the valve body (42) bore. The plug assembly will move freely in the body until the collar hits the guide (34) in the temperature adjusting sleeve (33).
5. Push the plug stem up through the Teflon guide (34) until it hits the stop in the valve body. If the plug does not bottom against the stop, then turn the temperature/gain adjuster (14) back and forth while pushing the plug upwards until it goes into the keyway in the temperature/gain adjuster (14). Once the plug hits the stop, lower end of the plug should sit approximately 2-3/16 inches inside the lower face of the body.

Maintenance, cont.

IMPORTANT! Plug assembly must be held in place during Step 6 below.

6. Hold the valve plug assembly in place and install the blending valve spring (3). Make sure the spring seats properly on the yoke (36) spring seat area. Place the spring washer guide (2) over the upper stem and seat. Install the diaphragm plate (29), diaphragm (26), O-ring (24), shouldered washer (25), and jam nut (23) over the upper stem. Position the diaphragm holes over the holes in the lower diaphragm base (6), and tighten the jam nut (23).
7. Install the upper diaphragm cover (27) and position it over the diaphragm holes. Make sure the diaphragm rests flat on the flange and is not pinched or twisted. Fasten the bolts (5) and nuts (4) sequentially across from each other until tight.

Heat Exchanger

NOTE: Check the tightness on all bolts and nuts in the heat exchanger casing after the unit has been in operation for a few hours, and again after twenty-four hours of operation.

Heat Exchanger Disassembly

1. Disconnect water piping.
2. Remove all nuts around the heat exchanger casing.
3. Remove heat exchanger casing from the base plate.
4. Remove manifold nuts, lock rings, coil manifold, and manifold gaskets.

Heat Exchanger Assembly

NOTE: Clean all parts and replace any damaged parts. Use new gaskets when reassembling the heat exchanger.

1. Install manifold gaskets between manifold collar and the exchanger's base plate. Insert coil manifolds into the base plate.
2. Place the lock rings over the manifold ends so that the lock rings fit into the slots. Install manifold nuts and tighten securely.
3. Place casing gasket on the exchanger's base plate. Then, place the casing over the coil assembly. Make sure the recesses in the heat exchanger's casing align with the tops of the coil manifolds.
4. Install nuts (2) and bolts (3) in the holes of the heat exchanger casing and base plate. Tighten evenly to ensure a tight, leak-proof seal.
5. Reinstall water piping.
6. Vent the steam side of the heater as described under Section II - Start-Up procedure.

Draining Unit for Prolonged Shutdown

1. Turn off the steam supply and water supply to the heater.
2. Open a vent line in high point of system piping.
3. Remove a relief valve to drain water from the blending valve.
4. Open drain connections in the steam and condensate lines.
5. Ensure that water is drained from the blend valve and system if there is any potential for freezing temperatures.
6. When restarting the system, tighten all connections and close all vents. Follow instructions shown in the commissioning procedure to prepare heater for operation again.

Troubleshooting Guide

Recirculating Systems

IMPORTANT! Study the installation drawings and carefully read the installation details for your heater and trapping system. Follow these recommendations to ensure that your Constantemp heater performs at maximum efficiency.

Problem	Probable Cause	Corrective Action
Excessive rise in water temperature occurring during or after prolonged periods of zero-system demand	Too much water being recirculated through the heater	Reduce water flow through the heater by throttling the recirculation stop valve. This allows time for the water in the piping system to cool and assume a new temperature setting. If the piping system is extensive and contains a large volume of water, the following procedures can speed the cool-down process. 1. Close the steam supply stop valve to the heat exchanger. 2. Open faucets, preferably at the end of the loop, until the water temperature drops a few degrees below the heaters' adjusted outlet water temperature. 3. Close the recirculation stop valve and open the steam stop valve to the heater. 4. With the recirculation pump operating, open the recirculation stop valve in small increments, while allowing adequate time for water to be recirculated through the piping before making an additional adjustment. 5. Repeat Step 4 until the desired recirculation water temperature is achieved.
	Three-way thermostatic mixing valve is causing too much water to be recirculated through the heater	If a three-way thermostatic mixing valve is used in the system, the port connected to the heater's cold water supply MUST close to prevent excessive water flow back to the heater. If the port does not close, check for a damaged element or seals, dirt, or an obstruction between seating surfaces.
	Faulty element	Immerse the unit in an agitated bath of hot water. If the water temperature rises between 10° and 12 1/4° F above the operating range of any of the heater's elements, the port connected to the heater's cold water supply pipe should be replaced. NOTE: Check the operating range of each element to make sure the range is sufficient for your system's requirements. The operating range of the thermostatic valve should be 10-15 °F lower than the Constantemp heater's adjusted operating temperature. Ex: If a heater is adjusted to deliver hot water at 140° F, and a three-way valve in the system is set to deliver water at 110° F, the recirculated water will assume a temperature of 110° F during prolonged periods of zero-system demand. If a 180° F valve is set under the same conditions, the recirculated water temperature will rise to 180° F.
Excessive drop in water temperature occurring during or after prolonged periods of zero-system demand	Steam pressure	Ensure that steam is being delivered to the heat exchanger at the correct pressure.
	Faulty recirculation	Check that the recirculation system's pumps, valves, and controls are operating properly.

Troubleshooting, cont.

Heat Exchanger and Blending Valve

Problem	Probable Cause	Corrective Action
Drop in controlled water temperature occurring before rated capacity (GPM) is reached	Inlet water and steam pressures	Ensure that water and steam are being delivered to the heater at the correct pressure before and during any operational tests. The water supply pressure must be AT LEAST 5 psig above the maximum steam pressure used to operate the heater. The MAXIMUM water supply pressure for all heaters is 150 psig. NOTE: Seal plate (45) must be tight in order to prevent cold water from leaking into blended water. A loose seal plate can cause an uncontrolled drop in the blended-water adjusted temperature.
	Clogged steam strainers or improperly functioning traps resulting in flooding in heat exchanger	Check to make sure all steam strainers are clean and that all steam traps are functioning efficiently. Excessive back pressure in the trap discharge piping system can cause flooding. Partly clogged piping can also restrict the flow of condensate from the heater and cause flooding. Dirty or plugged strainer screens can also cause this problem. A flooded or partly-flooded heat exchanger can cause little or no heat transfer. Ensure that the trap discharge piping is operating properly before checking for fouled coils.
	Fouled coils	Remove pipe plugs from the blending valve cover and base. Install a gauge in each connection. Temperature of the heated water leaving the exchanger should be approximately 200-215° F when the heater is operating within its rated capacity. See **Capacity and Gain Adjustment Table** on **Page 13** to determine Constantemp heater's rated capacity. Check water temperature using a contact pyrometer held against a smooth, filed section of the exchanger outlet piping. 1. The following procedure can test for fouled coils: 2. Ensure traps are functioning efficiently. 3. Adjust the water flow through the heat exchanger so that water is flowing through at 60% of the heater's rated capacity (approx. 5 psig differential across the blending valve diaphragm). 4. Record the outlet water temperature from the heat exchanger as flow is increased towards the heater's capacity. If the outlet water temperature drops below 200 1/4° F and continues to fall as flow is increased towards the heater's capacity, then the coils may be fouled and should be cleaned or replaced. A coil cleaning Adapter Kit (supplied with instructions for use) is available through your local sales representative. Heater coils can foul rapidly when the heater is supplied with poor quality water. Corrective water treatment may be required.

Troubleshooting, cont.

Heat Exchanger and Blending Valve (cont.)

Problem	Probable Cause	Corrective Action
Insufficient steam supply to heat exchanger	Inlet water or steam pressure	Ensure that water and steam are being delivered to the heater at the correct pressure before and during any operational tests. The water supply pressure must be AT LEAST 5 psig above the maximum steam pressure used to operate the heater. The MAXIMUM water supply pressure for all heaters is 150 psig.
	Clogged steam strainers or improperly functioning traps	Check to make sure all steam strainers are clean and that all steam traps are functioning efficiently. Excessive back pressure in the trap discharge piping system can cause flooding. Partly clogged piping can also restrict the flow of condensate from the heater and cause flooding. Dirty or plugged strainer screens can also cause this problem. A flooded or partly-flooded heat exchanger can cause little or no heat transfer.
	Improperly functioning pressure-reducing valve	Ensure that the steam pressure-reducing valve is operating properly, if applicable
Excessive steam supply to heat exchanger	Improperly functioning steam source or pressure-reducing valve	Ensure that the steam source and the steam pressure-reducing valve are operating properly, if applicable
Excessive drop in water temperature (below heater setpoint) during low flow	Inlet water and steam pressures	Ensure that water and steam are being delivered to the heater at the correct pressure before and during any operational tests. The water supply pressure must be AT LEAST 5 psig above the maximum steam pressure used to operate the heater. The MAXIMUM water supply pressure for all heaters is 150 psig. NOTE: Seal plate (45) must be tight in order to prevent cold water from leaking into blended water. A loose seal plate can cause an uncontrolled drop in the blended-water adjusted temperature.
	Inefficient trap operation	Check to make sure all steam strainers are clean and that all steam traps are functioning efficiently. Excessive back pressure in the trap discharge piping system can cause flooding. Partly clogged piping can also restrict the flow of condensate from the heater and cause flooding. Dirty or plugged strainer screens can also cause this problem. A flooded or partly-flooded heat exchanger can cause little or no heat transfer.
	Too little gain	Adjust the temperature/gain settings as shown in the **Capacity and Gain Adjustment Tables** on **Page 13**. NOTE: A 3 °F change in the inlet water temperature in either direction will result in an approximate 1 °F temperature change (in the same direction) of the outlet temperature of the blended water.

Troubleshooting, cont.

Heat Exchanger and Blending Valve (cont.)

Problem	Probable Cause	Corrective Action
Excessive rise in water temperature above the heater setpoint during periods of low flow	Fouled coils	Remove pipe plugs from the blending valve cover and base. Install a gauge in each connection. Temperature of the heated water leaving the exchanger should be approximately 200-215° F when the heater is operating within its rated capacity. See **Capacity and Gain Adjustment Table** on **Page 13** to determine Constantemp heater's rated capacity. Check water temperature using a contact pyrometer held against a smooth, filed section of the exchanger outlet piping. 1. The following procedure can test for fouled coils: 2. Ensure traps are functioning efficiently. 3. Adjust the water flow through the heat exchanger so that water is flowing through at 60% of the heater's rated capacity (approx. 5 psig differential across the blending valve diaphragm). 4. Record the outlet water temperature from the heat exchanger as flow is increased towards the heater's capacity. If the outlet water temperature drops below 200 1/4° F and continues to fall as flow is increased towards the heater's capacity, then the coils may be fouled and should be cleaned or replaced. A coil cleaning Adapter Kit (supplied with instructions for use) is available through your local sales representative. Heater coils can foul rapidly when the heater is supplied with poor quality water. Corrective water treatment may be required.
	Inlet water and steam pressures	Check that water and steam are being supplied to the heater at the correct pressure before and during any operational tests. For LOW-PRESSURE (E300L, E600L, E900L, and E1200L) heaters, the water supply pressure must be at LEAST 5 psig ABOVE the maximum steam pressure used to operate the heater. The MAXIMUM water pressure for all heaters is 150 psig. NOTE: Seal plate (45) must be tight in order to prevent cold water from leaking into blended water. A loose seal plate can cause an uncontrolled drop in the blended-water adjusted temperature.
Excessive drop in water temperature occurring during or after prolonged periods zero-system demand	Steam pressure	Ensure that steam is being delivered to the heat exchanger at the correct pressure.
	Faulty recirculation	Ensure that the recirculation system's pumps, valves, and controls are operating properly.

Recirculation System

Standard Recirculation System Start-Up

Fully open the balancing valve and start the recirculation pump. NOTE: The balancing valve is normally fully open and is throttled only if the recirculation pump is oversized for the heater (10%).

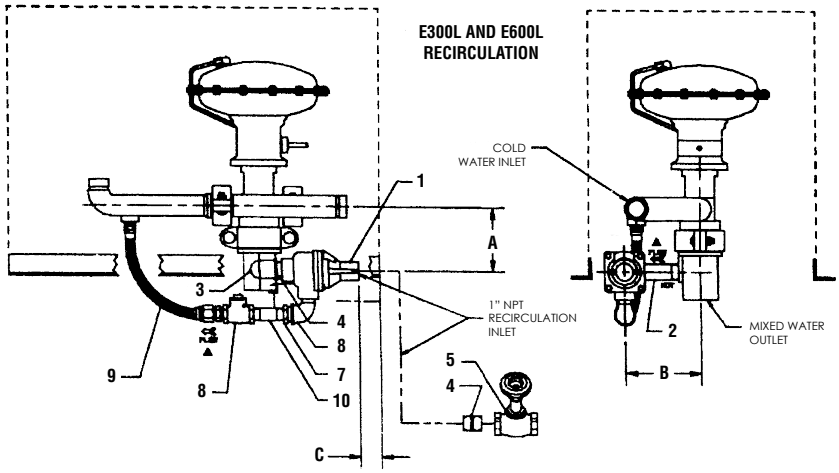


Figure 15
E300L and E600L recirculation system parts diagram

Refer to Page 28 to identify parts.

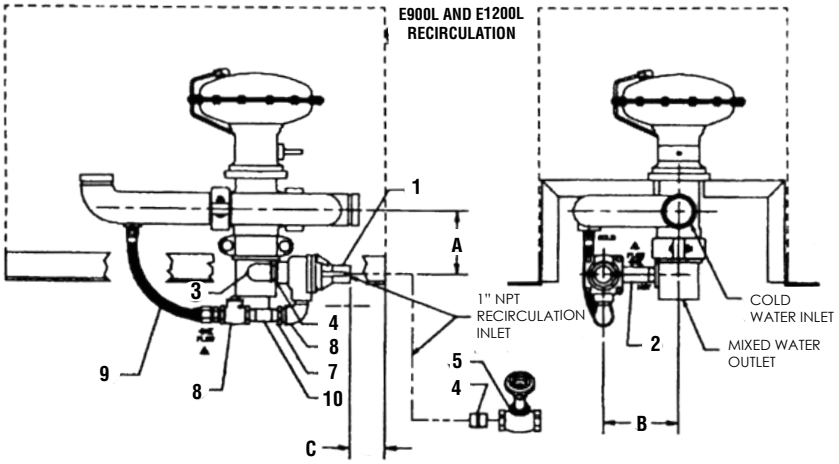


Figure 16
E900L and E1200L recirculation system parts diagram

Refer to Page 28 to identify parts.

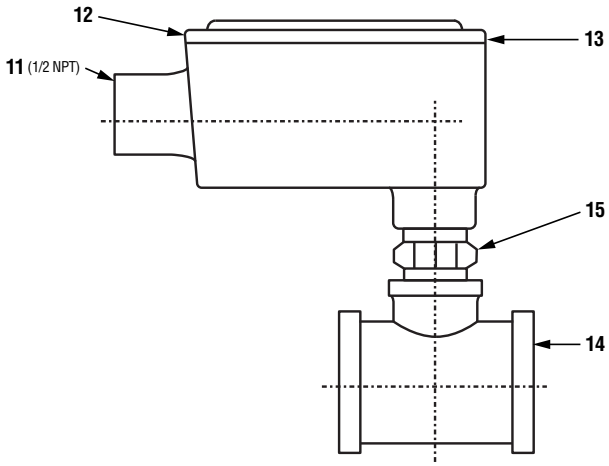


Figure 17 Recirculation switch kit parts diagram

Dimensions (± 0.1")			
Model	**A**	**B**	**C**
E300L	5.7 in	6.7 in	3.1 in
E600L	5.7 in	6.7 in	3.1 in
E900L	5.4 in	6.4 in	1.9 in
E1200L	5.4 in	6.4 in	1.9 in

Recirculation System, cont.

Recirculation System Parts List

Ref. No.	Qty Req.	Part No.	Description
1	1	**See Table 2**	Three-way thermostatic valve
2	1	LH-A74257	Nipple, 1" NPT × 3-1/2"
3	1	LH-N60958	Elbow 1" NPT 90°, 125#
4	2	LH-A60956	Nipple 1" NPT × 1-1/2"
5	1	LH-A70827	Globe Valve 1" NPT
6	1	LH-A70823	Street Elbow 1" NPT 90°
7	1	LH-A70822	Reducer 1" MALE NPT TO 3/4" NPT
8	1	LH-A70826	Check Valve 3/4" NPT
9	1	LH-A70828	Stainless Steel Braided Hose 3/4"
10	1	LH-A74256	Nipple 3/4" NPT × 3"
11	1	LH-A72763	Conduit Body
12	1	LH-A72765	Conduit Body Gasket
13	1	LH-A72764	Conduit Body Cover
14	1	LH-NB57113164	Brass Tee 1 × 1× 1/2"
15	1	**See Table 2**	Thermal Switch

Tablel 2		
Kit Rating	**Thermostatic Valve Part No.**	**Thermal Switch Part No.**
95°F	LH-D57373	LH-A742X095
110°F	LH-D57374	LH-A742X110
120°F	LH-D57375	LH-A742X120
130°F	LH-D57376	LH-A742X130
140°F	LH-D57377	LH-A742X140
150°F	LH-D57378	LH-A742X150
160°F	LH-D57379	LH-A742X160
170°F	LH-D57380	LH-A742X170
180°F	LH-D57381	LH-A742X180

Parts for the recirculation system are supplied in a box. When the heater is installed, the recirculation system parts should be installed in the order shown in the table above.

Thermal switches should be set 10° F **HIGHER** than the nominal thermostatic valve setting (recirculation "Kit Rating" temperature, shown in the table to the left).

The normal recirculation loop will require a one-inch thermostatic capsule. The capsule should be set at least 10° F **LOWER** than the desired setpoint temperature of the Constantemp heater.

The recirculating pump need only handle about 10% of water around the recirculation loop.

Recirculation System, cont.

Recirculation Switch Kit

Attention! Enclosed is a safety shut-off switch kit for use with the recirculation system installed on your Constantemp heater. This switch adds an additional safety measure to the Constantemp system. In the event of an over-temperature situation, the switch will shut down the recirculation pump.

This shut-off switch can be installed anywhere in the recirculation line and should be wired as illustrated below. Ensure compliance with all local and federal codes and guidelines when connecting this switch.

Please contact Armstrong Hot Water Group (Three Rivers, MI) for additional information or installation guidelines.

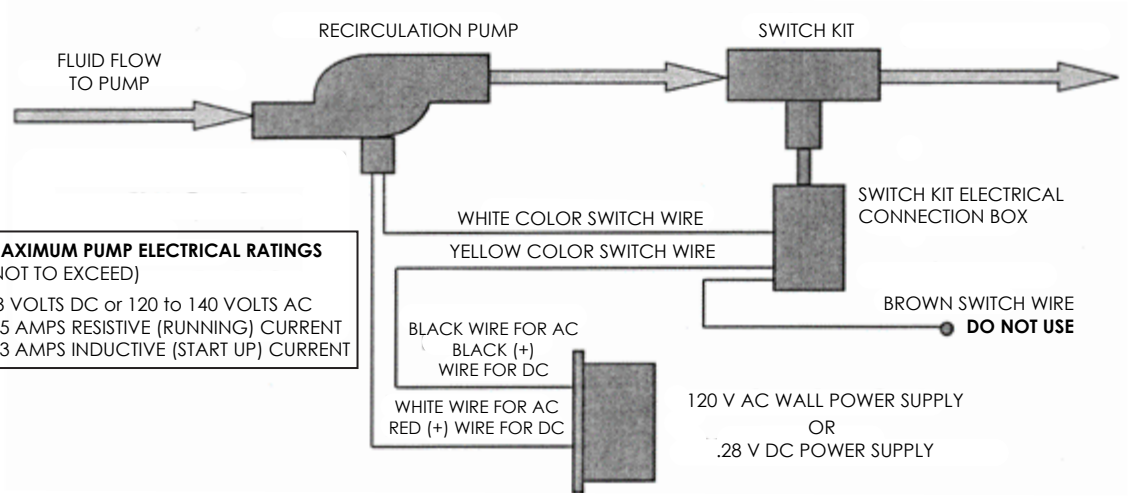


Figure 18
Recirculation switch connection diagram

Limited Warranty and Remedy

Armstrong International, Inc. or the Armstrong division that sold the product ("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.**

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Special Warranty Periods are as follows:

The Constantemp Heat Exchanger shall carry an extended warranty in addition to the manufacturer's warranty as follows:

Constantemp® Steam/Water Heater Coil: The coil 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 maintenance.

Constantemp® Steam/Water Heater: Two (2) years from the date of installation, but not longer than 27 months from the date of shipment.

Notes

Notes

Notes

Constantemp® Steam/Water Heater Installation, Operation & Maintenance Manual

Design, materials, weights, and performance ratings subject to change without notice.
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IOM-792
Printed in U.S.A. - 06/2025