

model SRH

HEATING LIQUIDS IN LINE

SRH (Steam Ring Heaters) are compact, inline units with low pressure drop. SRH units inject steam through a ring-shaped opening within an enlargement in the pipeline. Liquid passes through and around the ring. Heat is introduced by the direct condensation of steam. They provide fast temperature correction noiselessly and without vibration if correctly applied. Because the liquid flow area is unrestricted, pressure drops across the heater are minimized. This will reduce the horsepower requirements for the operating liquid pump.

The SRH units provide liquid flow rates up to 500 GPM. Temperature rises range up to 200°F. Heat input ranges up to 128,000 btu/min. at 150 PSIG operating steam pressure. These units can be installed in either series or parallel arrangements for increased capacities.

SRH selection using the steam consumption and performance charts.

The following information is required to select the correct model:

- Operating liquid (for liquids other than water, Consult Factory)
- Operating liquid inlet pressure PSIG (h_m)
- Desired operating liquid capacity GPM (Q_m)
- Operating Liquid Inlet Temperature °F (Contact Factory when operating liquid inlet temperature exceeds 100°F)
- Desired temperature rise °F (ΔT)
- Available steam pressure PSIG (h_s)
- Minimum discharge pressure required PSIG (h_d)
- Quality of steam available (i.e., saturated or superheated)
- Maximum pressure drop (ΔP) Refer to SRH (Steam Ring Heater) charts on this and the next page.

The following steps are provided for selecting the correct size SRH (Steam Ring Heater):

Step 1—In the Steam Consumption Chart (pg. 9) locate the point where the desired Water Flow GPM and Temperature Rise in °F (ΔT) intersect. Read off the steam consumption in lbs./min

Step 2—In the SRH Performance Chart to the right, locate the point

where the Operating Water Press. PSIG (h_m) and Steam Pressures (h_s) intersect. These represent the various steam consumptions for individual SRH units. Those consumption figures equal to or greater than the figure read off the chart in Step 1 indicate the SRH Model to choose.

Step 3—If steam flow shown for the model selected is greater than required, throttle the steam to a pressure that will provide the required steam flow.

To determine the pressure drop for the selected unit use the formula as shown.

The Rational Flow Formula is

$$dp = \left(\frac{GPM}{Cv} \right)^2 G \quad \text{or}$$

$$GPM = Cv \sqrt{\frac{dp}{G}}$$

GPM = U.S. Gallons per minute

Cv = Unit Flow coefficient

G = Specific gravity

dp = Pressure drop across the unit, PSID

Cv is defined as the number of U.S. gallons of water per minute that will flow through the unit at a 1 PSI pressure drop.

Example:

A flow of 150 GPM water through a 320 Heater would result in what pressure drop?

$$dp = \left(\frac{GPM}{Cv} \right)^2 G$$

$$dp = \left(\frac{150}{75} \right)^2 (1)$$

$$dp = 4 \text{ PSID}$$

Model SRH Sizes available

Model SRH (Steam Ring Heaters) from Penberthy are available in inlet and outlet sizes: 1½, 2 and 3 inch threaded and 6 inch flanged.

LIQUID SIZING COEFFICIENT TABLE

UNIT	Cv Liquid Sizing Coefficient (GPM)	Heat Input Max. (BTU Min. @ 150 PSIG WSP)*
310	50	32,000
320	75	48,000
330	125	79,000
340	350	128,000

*Working Steam Pressure (at operating liquid pressure of 80 PSIG.)

EXAMPLE

To heat 150 GPM water from 70 to 85°F (ΔT 15°F)
 Operating Liquid Inlet Pressure PSIG (h_m)40
 Available Steam Pressure PSIG (h_s)80
 Maximum pressure drop PSIG (Δp)5
 From Step 1 of the procedure, the steam consumption is 18.7 lb/min.

From Step 2 note the steam consumption closest to 18.7. Model 310 will handle 18 lb/min. just below our requirement and Model 320 will handle 27 lb/min.

From Step 3, select the model with the higher available steam consumption and throttle the steam accordingly. The Performance Chart indicates that the Model 320 should be throttled to slightly above 60 PSIG to achieve the desired consumption of 18.7 lbs./min.

Note that the **maximum** allowable pressure drop (Δp) is 5 PSIG in this example. Using the Rational Flow Formula example for the Model 320 selected, we see the pressure drop is 4 PSIG below the stated maximum.

SRH PERFORMANCE CHART Steam Consumption lbs./min. (Qs)

OP. WATER PRESS.** PSIG (h_m)	MODEL	STEAM PRESSURE — PSIG (h_s)											
		20	30	40	50	60	70	80	90	100	120	140	150
10	310	6	9	11	13	15	17	19	21	23	26	30	32
	320	9	14	17	20	22	25	28	31	34	40	45	48
	330	16	23	28	33	37	42	47	52	56	66	75	79
	340	25	36	45	52	60	68	75	83	90	106	121	128
20	310		7	10	13	15	17	19	21	23	26	30	32
	320		10	15	19	22	25	28	31	34	40	45	47
	330		17	25	31	37	42	47	52	56	66	75	79
	340		28	40	50	59	68	75	83	90	106	121	127
40	310				9	12	15	18	20	23	26	30	32
	320				13	18	23	27	31	34	40	45	47
	330				22	31	38	45	51	56	66	75	79
	340				35	49	61	72	82	90	106	121	127
60	310						11	15	19	21	26	30	32
	320						16	22	28	32	39	45	47
	330						26	37	46	53	65	75	79
	340						42	60	74	86	104	120	126
80	310								13	18	25	30	32
	320								20	27	37	44	47
	330								32	44	61	74	78
	340								52	71	98	119	126

All data based on 32 to 100°F inlet water temperature (T_m). For other inlet water temperatures consult factory.

** (with water flowing)

NOTE: Operation in shaded ranges is susceptible to high frequency noise.

NOTE: Always specify material, model and unit size when ordering. For available materials, check Penberthy Material Specifications Sheet.

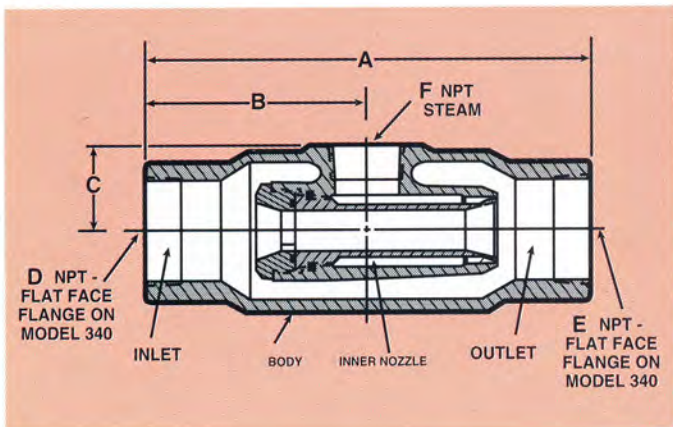
STEAM CONSUMPTION CHART:

SRH STEAM CONSUMPTION (lbs. per minute)
RELATED TO TEMPERATURE RISE AND WATER FLOW*

WATER FLOW GPM (Gm)	TEMPERATURE RISE IN °F (ΔT)																													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	95°	100°	110°	120°	130°	140°	150°	160°	170°	180°	190°	200°
10	.4	.8	1.2	1.7	2.1	2.5	2.9	3.3	3.7	4.2	4.6	5.0	5.4	5.8	6.2	6.7	7.1	7.5	7.9	8.3	9.2	10.0	10.8	11.7	12.5	13.3	14.2	15.0	15.8	16.7
15	.6	1.2	1.9	2.5	3.1	3.7	4.4	5.0	5.6	6.2	6.9	7.5	8.1	8.7	9.4	10.0	10.6	11.2	11.9	12.5	13.7	15.0	16.2	17.5	18.7	20	21	22	24	25
20	.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8	11.7	12.5	13.3	14.2	15.0	15.8	16.7	18.3	20	22	23	25	27	28	30	32	33
25	1.0	2.1	3.1	4.2	5.2	6.2	7.3	8.3	9.4	10.4	11.4	12.5	13.5	14.6	15.7	16.7	17.7	18.7	19.8	21	23	25	27	29	31	33	35	37	40	42
35	1.5	2.9	4.4	5.8	7.3	8.7	10.2	11.7	13.1	14.6	16.0	17.5	18.9	20	22	23	25	26	28	29	32	35	38	41	44	47	50	52	55	58
45	1.9	3.7	5.2	7.5	9.4	11.2	13.1	15.0	16.9	18.7	21	22	24	26	28	30	32	34	36	37	41	45	49	52	56	60	64	67	71	75
60	2.5	5.0	7.5	10.3	12.5	15.0	17.5	20	22	25	27	30	32	35	37	40	42	45	47	50	55	60	65	70	75	80	85	90	95	100
80	3.3	6.7	10.0	13.3	16.7	20	23	27	30	33	37	40	43	47	50	53	57	60	63	67	73	80	87	93	100	107	113	120	127	133
100	4.2	8.3	12.5	16.7	21	25	29	33	37	42	46	50	54	58	62	67	71	75	79	83	92	100	108	117	125	133	142	150	158	167
125	5.2	10.4	15.6	21	27	31	36	42	47	52	57	62	68	73	78	83	88	94	99	104	115	125	135	146	156	167	177	187	198	208
150	6.2	12.5	18.7	25	31	37	44	50	56	62	69	75	81	87	94	100	106	112	119	125	137	150	162	175	187	200	212	225	237	250
175	7.3	14.6	22	29	36	44	51	58	66	73	80	87	95	102	109	117	124	131	138	146	160	175	189	204	219	233	248	262	277	291
200	8.3	16.7	25	33	42	50	58	67	75	83	92	100	108	117	125	133	142	150	158	167	183	200	217	233	250	267	283	300	317	333
250	10.4	21	31	42	52	62	73	83	94	100	114	125	135	146	156	167	177	187	198	208	229	250	271	291	312	333	354	375	396	416
300	12.5	25	39.4	50	62	74	88	100	112	124	138	150	162	175	187	200	212	225	237	250	275	300	325	350	375	400	425	450	475	500
400	17	33	50	67	83	100	117	133	150	167	183	200	217	233	250	267	283	300	317	333	367	400	433	466	500	533	566	600	633	666
500	21	42	62	83	104	125	146	166	187	200	229	250	271	291	312	333	354	375	396	416	458	500	541	583	625	666	708	750	791	833

*Based on 60°F inlet water

SRH



SRH DIMENSIONS (in inches)

UNIT	INLET	OUTLET	STEAM	A	B	C
310	1 1/2	1 1/2	1	6 5/8	3 3/8	1 3/4
320	2	2	1 1/4	9 3/4	4 7/8	1 7/8
330	3	3	1 1/2	10 3/4	5 3/8	2 1/2
340	6 (Flgd.)	6 (Flgd.)	2	10	5	3 3/4