



# PRECISION BOILERS

## SP SPRAY DEAERATORS



### DESIGN ADVANTAGES

- Removal of corrosive oxygen and carbon dioxide from boiler feedwater.
- Reduction in the use of oxygen scavengers and other additives.
- Opportunity to reclaim heat by recovering exhaust and flash steam.
- Improved heat transfer by eliminating non-condensable gases.
- Reduction of thermal shock to the boiler by feeding water closer to the boiler operating temperature.
- Guaranteed oxygen removal in excess of 0.005 cc/liter.
- Guaranteed to eliminate titratable free carbon dioxide to 0.
- Guaranteed to heat water to corresponding temperature of the saturated steam contained within the vessel.
- Guaranteed to deaerate at all loads from 3% To 100% of rated capacity.
- Capacities from 5000 PPH to 300,000 PPH.
- All stainless steel internal vent condenser.
- All stainless steel spray valve(s).
- 10 minute storage capacity minimum.
- All deaerators designed for exact job conditions - no over or under sizing.
- Completely packaged and ready for installation.
- All vessels designed, built, and stamped in accordance with the ASME code for 50 psig with a 1/16 in. corrosion allowance

### STANDARD EQUIPMENT & CONNECTIONS

- ASME Deaerator Vessel (50 psig design)
- Structural Steel Stand
- Motor-Driven Feedpump(s) each with
  - Bypass Relief Orifice
  - Suction Vortex Breaker
  - Suction Piping with Stop Valve, Strainer and Flex Connector
- Steam Inlet Flange
- Manual Vent Valve with Orifice
- Vent Condenser
- High Temp Return (>227°F)
- Medium Temp Return (180 - 227°F)
- Low Temp Return (<180°F)
- Overflow Drainer
- Self-Operating Steam Pressure Reducing Valve
- Mechanical Level Control with External Float Cage and Mechanical Modulating Water Inlet Valve

- Storage Section Thermometer
- Steam Section Pressure Gauge
- Full Height Water Sight Gauge(s)
- High Level Alarm Switch
- Low Level Alarm Switch
- Sampling Valve
- Sentinel Relief Valve
- Vacuum Breaker
- Vessel Drain Valve
- UL Listed NEMA 1 Control Panel
- Chemical Injection Quill Provision
- 12" x 16" Manway

### OPTIONAL EQUIPMENT & CONNECTIONS

- Pump Discharge Piping
- Pump Bypass Relief Valve(s)
- Full Capacity (of PRV) Relief Valve(s)
- Probe -Type Level / Make-Up Control
- Electric or Pneumatic Proportional Level Control
- Electric or Pneumatic Pressure Control
- Liquid Filled Gauges
- Chemical Injection Quill
- Custom Control Panel (NEMA 4)
- Steam Section Thermometer
- Panel-Mounted Gauges Standard with Stand over 72")
- Anode(s)
- Automatic Vent Valve
- 3-Valve Bypass for PRV
- 3-Valve Bypass for Water Inlet Control Valve
- Custom Location / Sizing of Flanges
- NDE / Stress Relief of Vessel
- Oxygen Test Kit(s)

## SP SPRAY DEAERATORS DIMENSIONAL DATA

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N
SP5M	36	48	70	28	24	36	21	15	9	6	8	8	18
SP7M	36	60	82	40	36	36	21	16	9	6	8	8	18
SP9M	36	72	94	52	48	36	21	22	9	6	8	8	18
SP11M	36	96	118	76	72	36	21	22	9	6	8	8	18
SP15M	48	60	88	42	36	48	32	19	9	6	8	8	18
SP20M	48	72	100	54	48	48	32	22	9	6	8	8	18
SP25M	48	84	112	66	60	48	32	22	9	6	8	8	18
SP30M	48	120	148	102	96	48	32	32	9	6	8	8	18
SP35M	60	72	106	54	48	54	32	24	15	6	8	12	18
SP40M	60	72	106	54	48	54	32	22	15	6	8	12	18
SP50M	60	96	130	78	72	54	32	25	15	6	8	12	18
SP60M	60	120	154	102	96	54	32	26	15	6	8	12	18
SP70M	72	84	125	66	60	66	36	22	15	7	8	12	18
SP80M	72	96	137	78	72	66	36	24	15	7	8	12	18
SP90M	72	120	161	102	96	66	36	32	15	7	8	12	18
SP100M	72	120	161	102	96	66	36	32	15	7	8	12	18
SP125M	84	120	167	102	96	66	36	32	15	7	8	12	18
SP150M	84	144	191	126	120	78	36	29	16	7	8	12	18
SP175M	84	156	203	138	132	78	36	32	16	7	8	12	18
SP200M	96	120	173	104	96	90	36	32	16	7	8	12	18
SP225M	96	144	197	128	120	90	36	34	16	7	8	12	18
SP250M	96	168	221	152	144	90	36	36	18	7	8	12	18
SP300M	108	144	203	128	120	102	36	36	18	7	8	12	18

## CONNECTIONS & COMPONENTS

(NPT for ≤ 2.5", FLG for > 2.5")

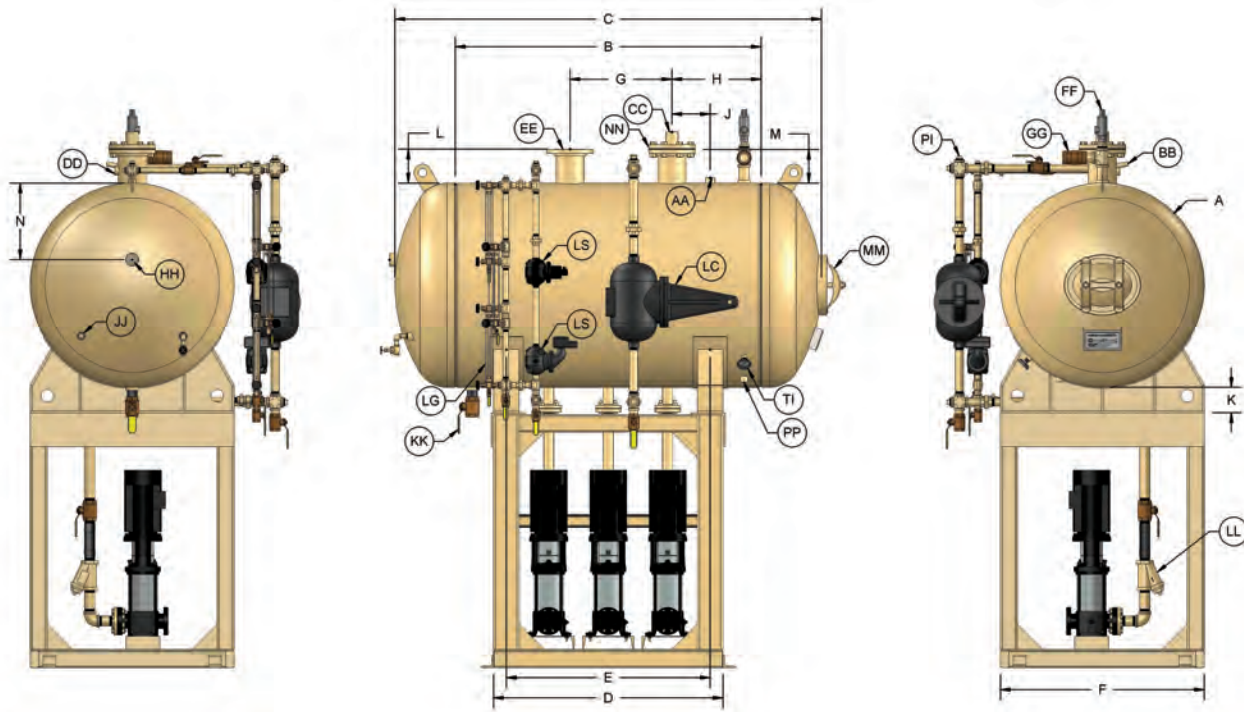
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
AA	Medium Temperature Return	HH	Overflow	LC	Level Control
BB	Manual Vent	JJ	Chemical Quill Provision	LS	Level Switch
CC	Water Inlet	KK	Vessel Drain	LG	Level Gauge
DD	High Temperature Return	LL	Equalizing Connections	PI	Pressure Indicator
EE	Steam Inlet (Flange Size)	MM	Manway	TI	Temperature Indicator
FF	Relief Valve	NN	Vent Condenser (Flange Size)		
GG	Vacuum Breaker	PP	Pump Bypass / Relief Connection		

MODEL	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN
SP5M	1	0.75	1.5	1.25	3	1.5	1.5	1.5	1	1.5	1.5	12x16	3
SP7M	1	0.75	1.5	1.25	3	1.5	1.5	2	1	1.5	1.5	12x16	3
SP9M	1	0.75	1.5	1.25	3	1.5	1.5	2	1	1.5	1.5	12x16	3
SP11M	1	0.75	1.5	1.25	4	1.5	1.5	2	1	1.5	1.5	12x16	3
SP15M	1.25	0.75	2.5	1.25	6	1.5	2	2	1	2	1.5	12x16	6
SP20M	1.25	0.75	2.5	1.25	6	1.5	2	2	1	2	1.5	12x16	6
SP25M	1.25	0.75	2.5	1.25	6	1.5	2	2	1	2	1.5	12x16	6
SP30M	1.25	0.75	2.5	1.25	6	1.5	2	2	1	2	1.5	12x16	6
SP35M	1.5	1.5	2.5	1.5	8	1.5	2.5	2	1	2.5	1.5	12x16	12
SP40M	1.5	1.5	2.5	1.5	8	1.5	2.5	2	1	2.5	1.5	12x16	12
SP50M	1.5	1.5	2.5	1.5	8	1.5	2.5	3	1	2.5	1.5	12x16	12
SP60M	2	1.5	3	1.5	8	1.5	2.5	3	1	2.5	1.5	12x16	12
SP70M	2	1.5	3	2	8	1.5	2.5	3	1	2.5	1.5	12x16	12
SP80M	2	1.5	3	2	10	1.5	2.5	3	1	2.5	1.5	12x16	12
SP90M	2.5	1.5	4	2.5	10	1.5	3	4	1	2.5	1.5	12x16	12
SP100M	2.5	2	4	2.5	10	1.5	3	4	1	2.5	1.5	12x16	12
SP125M	2.5	2	4	2.5	10	1.5	3	4	1	2.5	1.5	12x16	14
SP150M	3	2	6	3	12	1.5	3	6	1	3	1.5	12x16	16
SP175M	3	2.5	6	3	14	1.5	4	6	1	3	1.5	12x16	24
SP200M	4	2.5	6	3	14	1.5	4	6	1	3	1.5	12x16	24
SP225M	4	2.5	6	4	16	1.5	4	6	1	3	1.5	12x16	30
SP250M	6	2.5	6	6	16	1.5	4	6	1	3	1.5	12x16	30
SP300M	6	3	8	6	18	1.5	6	6	1	3	1.5	12x16	36



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MODEL	CAPACITY	DIMENSIONS*	GALLONS**	STORAGE***
SP5M	5,000 PPH	36" x 48"	140	14 min
SP7M	7,000 PPH	36" x 60"	160	11 min
SP9M	9,000 PPH	36" x 72"	190	10 min
SP11M	11,000 PPH	36" x 96"	240	11 min
SP15M	15,000 PPH	48" x 60"	360	12 min
SP20M	20,000 PPH	48" x 72"	420	11 min
SP25M	25,000 PPH	48" x 84"	490	10 min
SP30M	30,000 PPH	48" x 120"	670	11 min
SP35M	35,000 PPH	60" x 72"	780	11 min
SP40M	40,000 PPH	60" x 72"	780	10 min
SP50M	50,000 PPH	60" x 96"	990	10 min
SP60M	60,000 PPH	60" x 120"	1220	10 min
SP70M	70,000 PPH	72" x 84"	1410	10 min
SP80M	80,000 PPH	72" x 96"	1580	10 min
SP90M	90,000 PPH	72" x 120"	1920	11 min
SP100M	100,000 PPH	72" x 120"	1920	10 min
SP125M	125,000 PPH	84" x 120"	2790	11 min
SP150M	150,000 PPH	84" x 144"	3270	11 min
SP175M	175,000 PPH	84" x 156"	3520	10 min
SP200M	200,000 PPH	96" x 120"	3840	10 min
SP225M	225,000 PPH	96" x 144"	4490	10 min
SP250M	250,000 PPH	96" x 168"	5150	10 min
SP300M	300,000 PPH	108" x 144"	6030	10 min

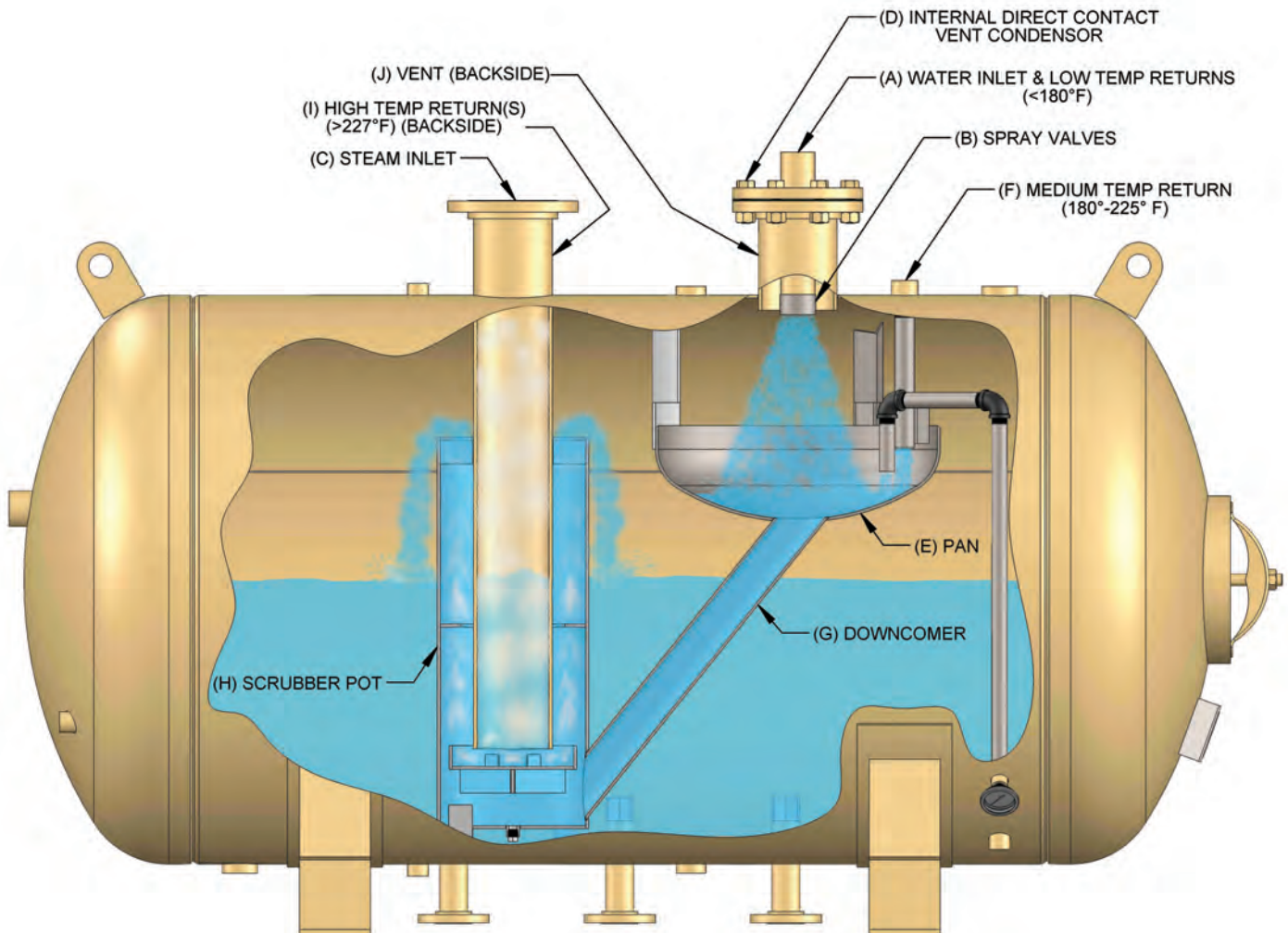
\* Dimensions are "A x B". \*\* Approximate gallons to overflow. \*\*\* Minutes based on rated capacity.

NOTE: Size and arrangement of any system can be modified to fit customer's requirements.



### OPERATIONS OF THE TYPE "SP" SPRAY DEAERATOR

Water ( $<180^{\circ}\text{F}$ ) enters the internal direct contact vent condenser (D) thru the water inlet (A). Water flows thru the spray valves (B) in the form of a thin hollow cone pattern into the steam atmosphere. The water, now preheated and partially deaerated, enters the pan (E) and flows into the downcomer (G). Medium temperature return ( $180 - 225^{\circ}\text{F}$ ) bypasses the vent condenser and spray valves (as it is already preheated) & enters thru (F) directly into the pan and into the downcomer (G). Steam enters the steam inlet (C) & flows into the scrubber pot (H). It is in this section that the final deaeration takes place. The water enters the scrubber pot via the downcomer & mixes with the steam flowing into the scrubber pot from the steam inlet. Water and steam meet in the bottom section of the scrubber pot (H). The water is forced thru a series of baffles while being vigorously scrubbed by the steam. When the water reaches the top of the scrubber pot, it is finished with the deaeration process and flows over the top and into the storage section of the deaerator. All non-condensable gasses are released thru the vent orifice (J).







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### SPECIFICATIONS

Furnish and install one Spray Deaerator as designed and manufactured by Precision Boilers. Deaerator shall be a model number \_\_\_\_\_ and shall consist of the following:

(1) \_\_\_\_\_ PPH horizontal spray/scrubber type deaerator with a capacity of \_\_\_\_\_ gallons to overflow ( \_\_\_\_\_ minutes of storage). Vessel shall be \_\_\_\_\_ diameter by \_\_\_\_\_ shell length (not including heads). Unit shall be constructed in accordance with the ASME code (latest revision) and shall be provided with a UL Listed control panel. Deaerator shall include connections as follows: water inlet \_\_\_\_\_, steam inlet \_\_\_\_\_, pump suction \_\_\_\_\_, overflow \_\_\_\_\_, relief valve and vacuum breaker (common) \_\_\_\_\_, vent \_\_\_\_\_, high temperature returns \_\_\_\_\_, medium temperature returns \_\_\_\_\_, vessel drain \_\_\_\_\_, thermometer \_\_\_\_\_, pressure gauge \_\_\_\_\_, 12"x16" manway (minimum), and all equalizing connections required for operation

(minimum of four). Each pump suction shall be equipped with a vortex breaker which must be constructed as follows: cross plate design of 1/4" material and dimensionally two times greater than the nozzle diameter (minimum). Deaerator shall operate at all flows from 3% to 100% of rated outlet capacity and shall deaerate the water so that the oxygen effluent leaving the deaerator storage tank shall not exceed .005 cc/liter as determined by the heat exchange institute method, Winkler method, or any other testing method approved by ASTM. Deaerator shall reduce the titratable free CO<sub>2</sub> to zero as determined by the APHA testing method. The spray/scrubber deaerator shall have all stainless steel spray valves. Deaerator shall have an internal direct contact vent condenser. The final stage of deaeration will utilize a steam scrubber designed to assure the temperature of the water leaving the scrubber is equal to the temperature of the saturated steam at the pressure maintained in the unit (e.g.: 5 psig / 227°F).

#### (2) Operating Conditions:

Returns: Low (<180°F)	_____ % @ _____ °F
Med (180-225°F)	_____ % @ _____ °F
High (>227°F)	_____ % @ _____ °F
Make-Up: _____ PSIG	_____ % @ _____ °F

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- Steam Superheaters-Electric
- Circulation Heaters-Electric
- Gas or Oil-Fired Vertical Firetube Boilers and Water Heaters
- Gas or Oil-Fired WaterTube Boilers (Flextube Type)
- Chemical Bypass Feeders and Automatic Chemical Feed Systems

**NOTE:** In pursuing our policy of continuous development of products, **Precision Boilers** reserves the right to vary any detail in this bulletin without notice.

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