



PRECISION BOILERS

TR TRAY 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 to .005 cc/liter (7ppb)
- Guaranteed to eliminate titratable free carbon dioxide to 0
- Guaranteed to heat water to the corresponding temperature of the saturated steam contained within the vessel
- Turndown 20-1
- Capacities from 5000 #/hr to 1,000,000 #/hr
- 10 minutes of storage capacity minimum
- #430 stainless steel Riveted Trays
- #304 stainless steel internal vent condenser (direct contact on units > 30,000 PPH)
- #316 stainless steel spray valves
- #304 stainless steel tray enclosure
- Our exclusive gliding tray door system for ease of tray inspection and removal
- 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.

STANDARD EQUIPMENT & CONNECTIONS

- ASME Deaerator and Storage Vessels (50 psig design)
- Structural Steel Stand
- Motor-Driven Feedpump(s) each with Bypass Orifice or Relief Valve, Suction Vortex Breaker, Suction Piping with Stop Valve, Strainer, and Flex Connector
- Steam Inlet Flange
- Manual Vent Valve with Orifice
- Direct Contact Vent Condenser (units > 30,000 PPH)
- High Temp Return (>227°F)
- Low Temp Return (<227°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 w/Applicable Valve
- Electric or Pneumatic Pressure Control
- Liquid Filled Gauges
- Chemical Injection Quill
- Custom Control Panel (NEMA ____)
- Installation & Lagging of Vessels
- Panel-Mounted Gauges Standard with Stand over 72"
- Steam Section Thermometer
- 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
- Weld Non-Destructive Examination
- Oxygen Test Kit(s)

TR TRAY DEAERATORS DIMENSIONAL DATA

All Dimensions in Inches

MODEL	A	B	C	D	E	F	G	H	J	K	L	N
TR5M	24	60	76	48	42	28	42	18	48	69	30	6
TR7M	24	96	112	72	66	28	42	18	48	69	48	6
TR9M	30	60	79	48	42	36	42	18	48	72	30	6
TR11M	30	84	103	60	54	36	42	18	48	72	42	6
TR15M	36	84	106	60	54	40	49	24	54	81	42	6
TR20M	36	96	118	72	66	40	49	30	54	81	48	6
TR25M	42	84	109	60	54	45	50	36	54	84	42	6
TR30M	42	96	121	72	66	45	50	36	54	84	48	6
TR35M	48	84	112	60	54	48	52	36	54	87	42	6
TR40M	48	96	124	72	66	48	52	36	54	87	48	6
TR50M	60	72	106	48	42	54	54	42	54	93	36	6
TR60M	60	96	130	72	66	54	54	48	54	93	48	6
TR70M	60	120	154	96	90	54	54	48	54	93	60	6
TR80M	72	84	125	60	54	66	56	60	54	100	42	6
TR90M	72	96	137	72	66	66	56	60	54	100	48	6
TR100M	72	120	161	96	90	66	56	60	54	100	60	6
TR125M	84	96	143	72	66	78	58	72	54	106	48	6
TR150M	84	120	167	96	90	78	58	72	54	106	60	6
TR175M	84	132	179	108	102	78	76	72	72	125	66	6
TR200M	96	120	173	96	90	90	90	72	84	142	60	9
TR225M	96	132	185	108	100	90	90	72	96	154	66	9
TR250M	96	144	197	120	112	90	90	72	96	154	72	9
TR300M	108	132	191	108	100	100	48	72	102*	166	90	12
TR400M	108	192	251	168	160	100	48	72	120*	184	120	12
TR500M	108	264	323	240	232	100	48	72	132*	196	132	12

* Dimensions are for a horizontal deaerator section: "J"= shell length, "K"= height of deaerator section

CONNECTIONS & COMPONENTS

(NPT for ≤ 2.5", FLG for > 2.5")

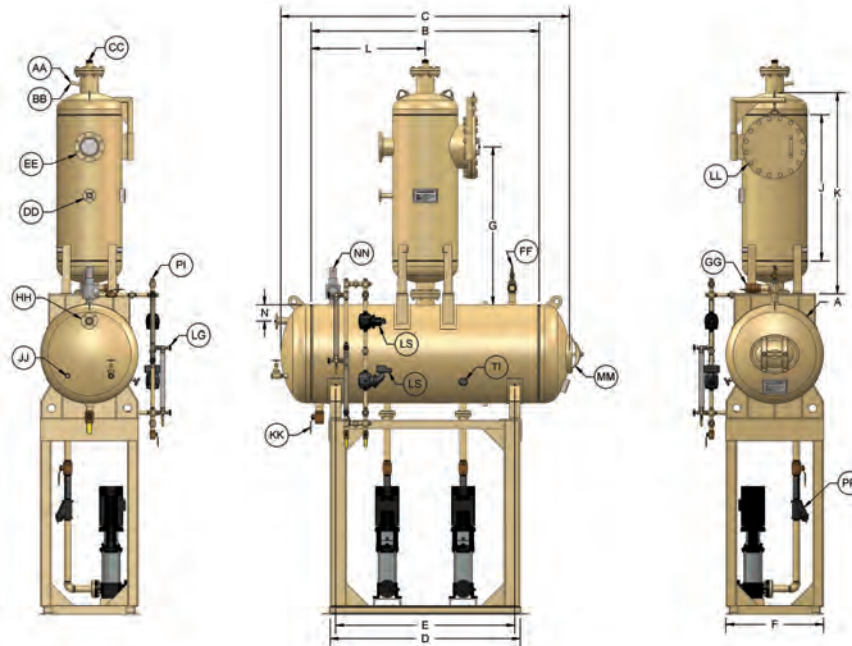
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
AA	Automatic Air Vent	HH	Overflow	LC	Level Control
BB	Continuous Vent	JJ	Chemical Quill Provision	LS	Level Switch
CC	Water Inlet	KK	Vessel Drain	LG	Level Gauge
DD	High Temperature Return	LL	Manway For Tray Access	PI	Pressure Indicator
EE	Steam Inlet (Flange Size)	MM	Manway (12" x 16")	TI	Temperature Indicator
FF	Relief Valve Size (Sentinel Only)	NN	Pump Bypass / Relief (Sized as Req'd)		
GG	Vacuum Breaker	PP	Level Instrumentation Equalizing Qty 4		

MODEL	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	PP
TR5M	0.5	0.75	1.5	1.25	4	1 x 1.5	1.5	1.5	1	1.5	12	1.5
TR7M	0.5	0.75	1.5	1.25	4	1 x 1.5	1.5	2	1	1.5	12	1.5
TR9M	0.5	0.75	1.5	1.25	4	1 x 1.5	1.5	2	1	1.5	12	1.5
TR11M	0.5	0.75	1.5	1.25	4	1 x 1.5	1.5	2	1	1.5	12	1.5
TR15M	0.5	0.75	2	1.25	6	1 x 1.5	2	2	1	2	16	1.5
TR20M	0.5	0.75	2	1.25	6	1 x 1.5	2	2	1	2	16	1.5
TR25M	0.5	0.75	3	1.25	6	1 x 1.5	2	2	1	2	16	1.5
TR30M	0.5	0.75	3	1.25	6	1 x 1.5	2	2	1	2	16	1.5
TR35M	0.5	1.5	3	1.5	8	1 x 1.5	2.5	2	1	2.5	16	1.5
TR40M	0.5	1.5	3	1.5	8	1 x 1.5	2.5	2	1	2.5	18	1.5
TR50M	0.5	1.5	3	1.5	8	1 x 1.5	2.5	3	1	2.5	18	1.5
TR60M	0.5	1.5	3	1.5	8	1 x 1.5	2.5	3	1	2.5	18	1.5
TR70M	0.5	1.5	3	1.5	8	1 x 1.5	2.5	3	1	2.5	18	1.5
TR80M	0.5	1.5	3	1.5	10	1 x 1.5	2.5	3	1	2.5	18	1.5
TR90M	0.5	1.5	4	2	10	1 x 1.5	3	4	1	2.5	18	1.5
TR100M	0.75	2	4	2	10	1 x 1.5	3	4	1	2.5	18	1.5
TR125M	0.75	2	4	2	10	1 x 1.5	3	4	1	2.5	18	1.5
TR150M	0.75	2	4	3	12	1 x 1.5	3	6	1	3	20	1.5
TR175M	0.75	2.5	6	3	14	1 x 1.5	4	6	1	3	20	1.5
TR200M	0.75	2.5	6	3	14	1 x 1.5	4	6	1	3	20	1.5
TR225M	1	2.5	6	3	16	1 x 1.5	4	6	1	3	20	1.5
TR250M	1	2.5	6	3	16	1 x 1.5	4	6	1	3	24	1.5
TR300M	1	3	6	3	18	1 x 1.5	6	6	1	3	24	1.5
TR400M	1	3	8	3	24	1 x 1.5	6	6	1	3	24	1.5
TR500M	1	3	8	3	24	1 x 1.5	6	6	1	3	24	1.5



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TR TRAY DEAERATORS



MODEL	CAPACITY	DIMENSIONS		GALLONS*	MINUTES**
		STORAGE (AxB)	DEAERATOR (HxJ)		
TR5M	5,000 PPH	24" x 60"	18" x 48"	110	10
TR7M	7,000 PPH	24" x 96"	18" x 48"	160	11
TR9M	9,000 PPH	30" x 60"	18" x 48"	180	10
TR11M	11,000 PPH	30" x 84"	18" x 48"	250	11
TR15M	15,000 PPH	36" x 84"	24" x 54"	370	12
TR20M	20,000 PPH	36" x 96"	30" x 54"	420	10
TR25M	25,000 PPH	42" x 84"	36" x 54"	530	10
TR30M	30,000 PPH	42" x 96"	36" x 54"	600	10
TR35M	35,000 PPH	48" x 84"	36" x 54"	700	10
TR40M	40,000 PPH	48" x 96"	36" x 54"	800	10
TR50M	50,000 PPH	60" x 72"	42" x 96"	1,020	10
TR60M	60,000 PPH	60" x 96"	48" x 54"	1,300	10
TR70M	70,000 PPH	60" x 120"	48" x 54"	1,570	11
TR80M	80,000 PPH	72" x 84"	60" x 54"	1,720	10
TR90M	90,000 PPH	72" x 96"	60" x 54"	1,930	10
TR100M	100,000 PPH	72" x 120"	60" x 54"	2,070	10
TR125M	125,000 PPH	84" x 96"	72" x 54"	2,470	10
TR150M	150,000 PPH	84" x 120"	72" x 54"	2,970	10
TR175M	175,000 PPH	84" x 132"	72" x 72"	3,520	10
TR200M	200,000 PPH	96" x 120"	72" x 84"	4,020	10
TR225M	225,000 PPH	96" x 132"	72" x 96"	4,520	10
TR250M	250,000 PPH	96" x 144"	72" x 96"	5,020	10
TR300M	300,000 PPH	108" x 132"	72" x 102"	6,025	10
TR400M	400,000 PPH	108" x 192"	72" x 120"	8,000	10
TR500M	500,000 PPH	108" x 264"	72" x 132"	10,000	10

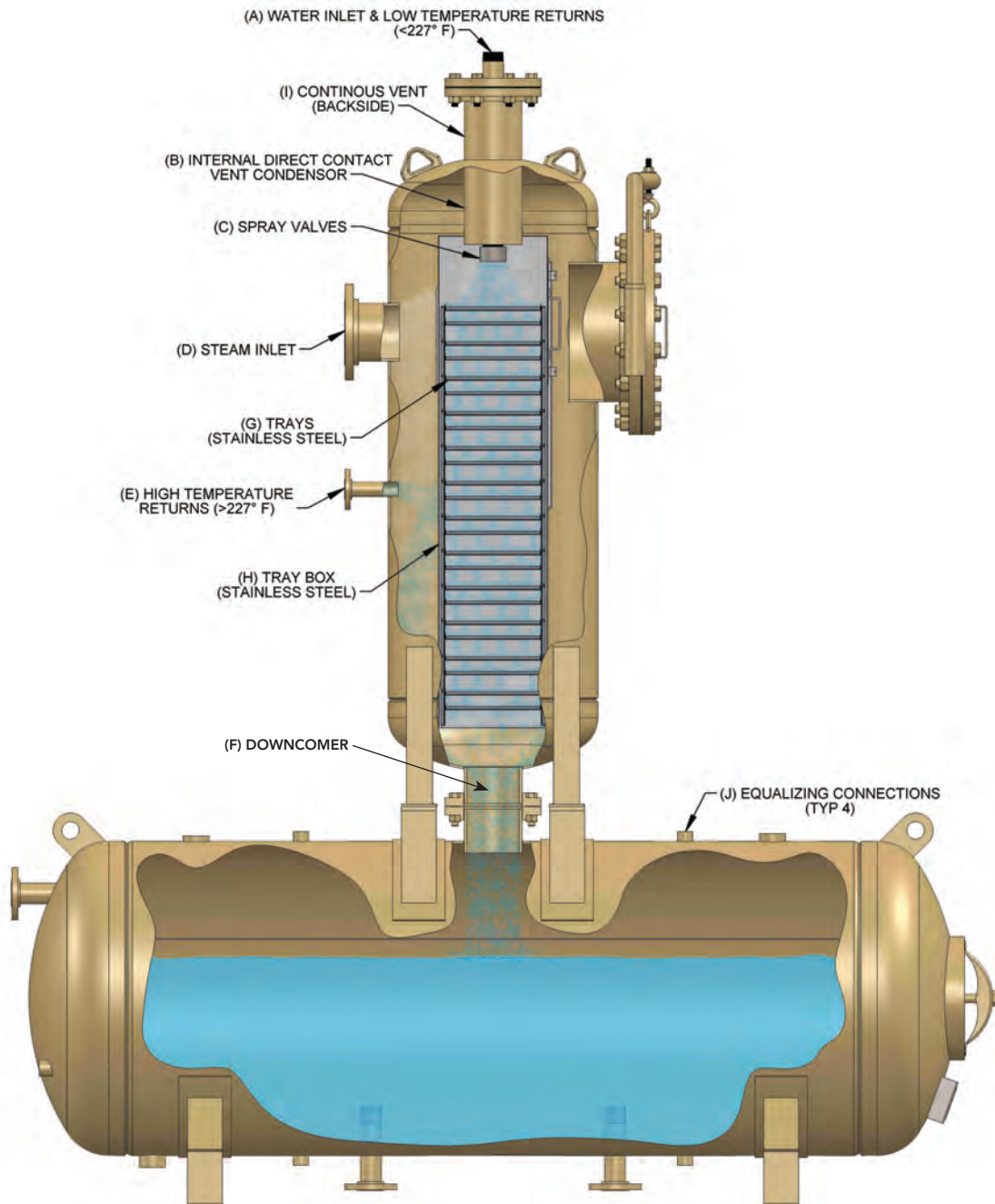
* Approximate gallons to overflow. ** Minutes of storage based on rated capacity.

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



OPERATIONS OF THE TYPE "SP" SPRAY DEAERATOR

Water (<math><180^{\circ}\text{F}</math>) enters the internal direct contact vent condenser (B) thru (A) water inlet. Water flows thru spray valves (C) into a thin hollow cone pattern thru the steam atmosphere of the tray box (H). The now preheated and partially deaerated water is directed over the trays (G) and cascades thru the tray stack. Steam enters thru (D) and flows upward thru the trays (G) as the water flows downward (this is called a counterflow design). In this final stage of deaeration the steam, while moving upward thru the trays, is scrubbing the water flowing downward. The deaerated water then exits the tray box (H) passes thru the downcomer (F) and enters the storage section. All non-condensable gases are omitted thru the vent (I).





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TR TRAY DEAERATORS

CONTACT US FOR THESE QUALITY PRODUCTS

- Electric Storage Heaters 125 to 5500 Gallons
- Electrode High Voltage Boilers
- Thermal Storage Systems Space Heating & Domestic or Process Water; Electric, Gas or Steam Fired
- Boiler Feedwater Systems
- Pressure Vessels, Water Storage Tanks, Flash Tanks, Blowdown Tanks
- Unfired Hot Water and Steam Generators
- Deaerators and Surge Tanks
- 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





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SPECIFICATIONS

Furnish and install one Tray Type Deaerator as designed and manufactured by **Precision Boilers**. Deaerator shall be a model number _____ and shall consist of the following:

(1) Basic: _____ PPH Tray 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). Deaerator shall include connections as follows: water inlet _____, steam inlet _____, pump suction _____, overflow _____, relief valve and vacuum breaker (common) _____, vent _____, high temperature returns _____, vessel drain _____, thermometer _____, pressure gauge _____, 12"x16" manway (minimum), and all water level instrumentation 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 with a 20:1 turndown ratio, shall deaerate the water so that the oxygen in the 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, and shall reduce the titratable free CO2 to zero as determined by the APHA testing method. The tray deaerator shall have spray valves which shall be #316 stainless steel,

be non-binding, and have a guide bar. Deaerator shall have an internal direct contact vent condenser. Tray enclosure shall be #304 stainless steel with 1/4" thick minimum wear plate. Tray box will be equipped with a gliding tray door system for ease of tray inspection and removal. Trays shall be constructed of #430 stainless steel and shall be all riveted. No welding of trays will be acceptable. Operation shall be of the counterflow design: water shall enter vent condenser, go through spray valves and cascade downward over trays, while the steam will enter tray compartment through the bottom of tray box, moving upwards through the trays. The result of the counterflow operation will be fully Deaerated Water exiting the tray section & spilling into the storage section

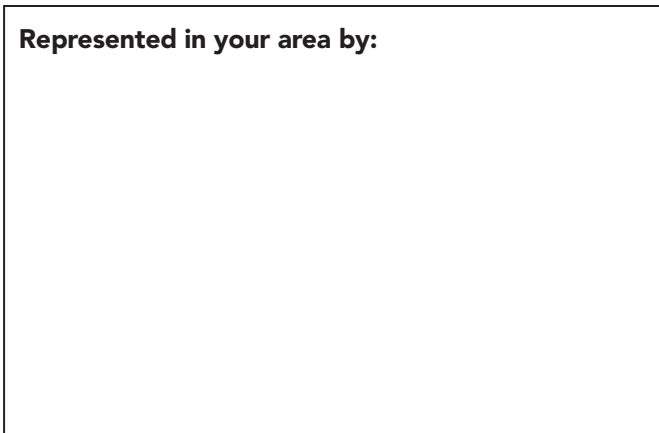
(2) System Components: Other integral and necessary components shall be per specification and shall include instrument (sight, temperature and pressure gauges, and level and pressure controls); level control valve (mechanical, electric, electro-pneumatic, pneumatic); feedpump(s) (turbine, multi-stage centrifugal, split case centrifugal, etc); overflow drainer; vacuum breaker; relief valve (sentinel or full capacity); pump suction stop valve, strainer and vibration isolator; pump discharge stop valve, check valve, bypass orifice or relief valve, pressure gauge, etc; NEMA _____ UL-Labeled control cabinet to include necessary pilot lights, switches, control transformer, disconnects, starters, logic relays, etc.

(3) Operating Conditions:

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

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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