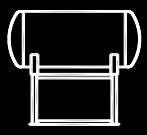
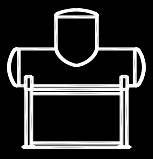
Spray - 0.005 cc/l – 7PPB

Standard Deaerating Units

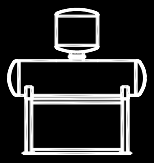
# KANSAS CITY DEAERATOR



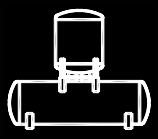
**HS Series**
Up to 350,000 #/hr
Low Headroom



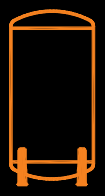
**TC Series**
Up to 250,000 #/hr
Tray Unit
Meets HEI



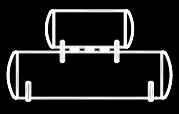
**BDS Series**
Up to 250,000 #/hr
Tray Unit
Meets HEI



**DS Series**
Up to 800,000 #/hr
Tray Unit
Meets HEI



**VS & VT Series**
Up to 800,000 #/hr
Tray Unit
Minimal Plan Area
Meets HEI



**HH Series**
Up to 16,000,000 #/hr
Tray Unit-Meets HEI

# VS – Vertical Spray Deaerator

## Principles of Operation

Kansas City Deaerator Spray deaerators provide an economical alternative to tray type units. The units feature a simple, trouble-free, quiet design and are designed for constant loads.

Incoming undeaerated water enters the Deaerator through spring-loaded, stainless steel spray valves. These variable orifice valves produce a fine spray in a uniform pattern from 5% to 200% of design.

The fine droplets of water maximize the surface area in contact with steam, raising the temperature to within a few degrees of saturation temperature and instantly releasing the majority of the corrosive, non-condensable gases. The preheated and partially deaerated water is channeled through a collection basin downcomer, through a tortuous path second stage deoxygenator. Here the hottest, purest steam vigorously scrubs the water to heat it to the saturation temperature and strips the last traces of dissolved gases.

The steam and non-condensables flow upward into the stainless steel vent condensing area where the steam is condensed with the inlet water and the gases are released to atmosphere through the vent outlet. The deaerated water then falls to the storage area.

## FEATURES

- Spray Model (VS) Deaerator
- Low Cost
- Small footprint / Plan area
- Capacities up to 260,000 #/hr with pre-engineered economy, custom units up to 800,000 #/hr
- Oxygen removal to 0.005 cc/liter (7ppb) per HEI
- Certified ASME construction
- Options:
  a. Accessory Package
  b. Accessory Piping
  c. BF Pump Package
  d. Heat Exchange Institute (HEI) Design

HEAT EXCHANGE INSTITUTE HEI INCORPORATED

Standard Vertical Spray Deaerator

# VS Deaerator SPECIFICATION

## Performance –

Fill in and send to Kansas City Deaerator or request a detailed specification sheet.
Add additional thermal cases as needed.

| | |
|---|---|
| PROJECT | |
| DEAERATOR | |
| Quantity | |
| Capacity | |
| DESIGN | |
| ASME SEC. VIII, DIV.1 | |
| Design Pressure | |
| Full Vacuum Design | |
| Design Temperature | |
| Corrosion Allowance | |

| | |
|---|---|
| OPERATING CONDITIONS | |
| Operating Pressure | |
| FEEDWATER INLET | |
| % Makeup | |
| MU Temperature | |
| %Condensate | |
| Cond. Temperature | |
| STORAGE CAPACITY | |
| Minutes at Overflow | |
| Gallon at Overflow | |

| | |
|---|---|
| SPECIAL REQUIREMENTS | |
| HEI | |
| Post Weld Heat Treatment | |
| Minimum Radiography | |
| WFMP Testing | |
| | |
| BF PUMPS | |
| Quantity | |
| Capacity | |
| TDH | |

## Accessories –

Select package or individual items

| ITEM | DESCRIPTION | ACC PKG | PUMP PKG | √ SELECT |
|---|---|---|---|---|
| A | WATER INLET | | | |
| A1 | Inlet Valve | | | |
| | Mechanical | STD | STD | |
| | Pneumatic | OPT | OPT | |
| A2 | Level Controller | STD | STD | |
| | Level Transmitter | OPT | OPT | |
| A3 | Inlet Valve Bypass Valves | OPT | STD | |
| A4 | Inlet Valve Bypass Piping | OPT | STD | |
| A5 | Inlet Valve Bypass Strainer | OPT | STD | |
| B | STEAM CONTROL | | | |
| B1 | Steam PRV | | OPT | |
| | Self Contained | OPT | OPT | |
| | Pneumatic | OPT | OPT | |
| B2 | Steam PRV Controller | OPT | OPT | |
| B3 | Steam PRV Bypass Valves | OPT | OPT | |
| B4 | Steam PRV Bypass Piping | OPT | OPT | |
| B5 | Steam PRV Bypass Strainer | OPT | OPT | |
| C | RELIEF VALVE | | | |
| C1 | Relief Valve | | | |
| | Sentinel | STD | STD | |
| | Full | OPT | OPT | |
| C2 | Relief Valve Exhaust Piping | OPT | OPT | |
| D | THERMOMETER | | | |
| D1 | (2) 5" Thermometer w/ss wells | STD | STD | |
| E | PRESSURE GUAGE | | | |
| E1 | (1) 4 1/2" Pressure Gauge | STD | STD | |
| E2 | Siphon & Cock | STD | STD | |
| E3 | Pressure Transmitter | OPT | OPT | |
| F | VENT | | | |
| F1 | Vent Valve | STD | STD | |
| F2 | Vent Orifice w/Flange | OPT | OPT | |
| F3 | Vent Bypass Valves | OPT | OPT | |
| F4 | Vent Bypass Piping | OPT | OPT | |
| H | VACUUM BREAKER | | | |
| H1 | Vacuum Breaker | STD | STD | |

| ITEM | DESCRIPTION | ACC PKG | PUMP PKG | √ SELECT |
|---|---|---|---|---|
| M | BFP RECIRC | | | |
| M1 | BFP Recirc Shutoff | NA | OPT | |
| M2 | BFP Recirc Check | NA | OPT | |
| M3 | BFP Recirc Orifice | NA | OPT | |
| | BFP Recirc ARC Valve | NA | OPT | |
| M4 | BFP Recirc Piping | NA | OPT | |
| M5 | BFP Recirc Pressure Gauge | NA | OPT | |
| N | BFP SUCTION | | | |
| N1 | BF Pumps | | | |
| | (2) 100% Capacity | NA | STD | |
| | (3) 50% Capacity | NA | OPT | |
| | Motors | | | |
| | ODP | NA | STD | |
| | TEFC | NA | OPT | |
| N2 | BFP Suction Isolation Valve | NA | STD | |
| N3 | BFP Suction Strainer | NA | STD | |
| N4 | BFP Suction Piping | NA | STD | |
| N5 | BFP Suction Expansion Joint | NA | STD | |
| N6 | BFP Discharge Pressure Gauge | NA | OPT | |
| N7 | BFP Discharge Check Valve | NA | OPT | |
| N8 | BFP Discharge Isolation Valve | NA | OPT | |
| O | CHEMICAL FEED | | | |
| O | Chemical Feed Quill | OPT | OPT | |
| Q | OVERFLOW | | | |
| Q1 | Overflow Valve/Trap | STD | STD | |
| Q3 | Overflow Piping | OPT | STD | |
| R | LEVEL SWITCH | | | |
| R1 | Level Switches | | | |
| | High & Low (TWO) | STD | STD | |
| | High High (ADDITIONAL) | OPT | OPT | |
| R2 | Level Switch Bridle Piping | OPT | STD | |
| S | GAUGE GLASS | | | |
| S1 | Gauge Glass | | | |
| | Red Line Pyrex | STD | STD | |
| | Reflex | OPT | OPT | |
| | Magnetic | OPT | OPT | |
| S2 | Gauge Glass Bridle | OPT | STD | |

*Kansas City Deaerator Company*
6731 West 121st Street, Overland Park, KS 66209
Tel (913) 338-2111 Fax (913) 338-2144
Website: www.deaerator.com Email: info@deaerator.com

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# SELECTION CHART

## 10 Minutes Storage

| DA MODEL | Boiler Capacity (HP) | Rated Capacity (#/HR) | Storage to Overflow (Gallons) | Storage Capacity (Minutes) | Vessel Dimension (L1 x W1x H1) | Water Inlet "A" (in) | Steam Inlet "B" (in) | Empty Weight (lbs) | Operate Weight (lbs) | Flooded Weight (lbs) | Total Accessory (L2 x W2x H2) | Pump Package (L3 x W3x H3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VS-3006-010 | 290 | 10,000 | 210 | 10 | 3'0"x2'7" x 7'9" | 1 | 3 | 1,300 | 3,000 | 4,000 | 6'6"x5'9" x9'3" | 7'0"x2'11" x2'10" |
| VS-3508-020 | 580 | 20,000 | 420 | 10 | 3'6"x2'11" x 9'11" | 1.5 | 6 | 1,700 | 5,000 | 7,000 | 6'10"x7'7" x11'11" | 7'6"x3'3" x2'10" |
| VS-4008-025 | 725 | 25,000 | 525 | 10 | 4'0"x3'4" x 10'1" | 2 | 6 | 2,100 | 7,000 | 9,000 | 7'1"x8'3" x12'1" | 8'0"x3'8" x3'0" |
| VS-4508-030 | 870 | 30,000 | 630 | 10 | 4'6"x3'8" x 10'4" | 2 | 6 | 2,400 | 8,000 | 12,000 | 7'4"x8'6" x12'3" | 8'0"x4'0" x3'0" |
| VS-5008-040 | 1,159 | 40,000 | 840 | 10 | 5'0"x4'1" x 10'10" | 2 | 6 | 2,700 | 10,000 | 14,000 | 6'9"x9'4" x12'9" | 9'0"x4'5" x4'0" |
| VS-5508-050 | 1,449 | 50,000 | 1,050 | 10 | 5'6"x4'5" x 11'0" | 2.5 | 8 | 3,100 | 12,000 | 17,000 | 6'9"x10'2" x12'6" | 9'6"x4'9" x3'6" |
| VS-6008-060 | 1,739 | 60,000 | 1,260 | 10 | 6'0"x5'2" x 11'3" | 2.5 | 8 | 3,300 | 14,000 | 20,000 | 6'10"x10'6" x12'9" | 10'6"x5'4" x3'6" |
| VS-6009-070 | 2,029 | 70,000 | 1,470 | 10 | 6'0"x5'2" x 12'3" | 3 | 8 | 3,600 | 16,000 | 23,000 | 7'3"x11'2" x13'9" | 10'6"x5'4" x3'6" |
| VS-6010-080 | 2,319 | 80,000 | 1,680 | 10 | 6'0"x5'2" x 13'3" | 3 | 10 | 4,000 | 18,000 | 25,000 | 7'3"x11'2" x14'9" | 10'6"x5'4" x3'6" |
| VS-6510-090 | 2,609 | 90,000 | 1,890 | 10 | 6'6"x5'7" x 13'5" | 3 | 10 | 4,400 | 20,000 | 29,000 | 7'10"11'5" x14'11" | 12'0"x5'9" x4'5" |
| VS-6512-110 | 3,188 | 110,000 | 2,310 | 10 | 6'6"x5'7" x 15'5" | 4 | 10 | 5,100 | 24,000 | 34,000 | 7'6"x12'10" x18'8" | 11'7"x5'9" x4'5" |
| VS-7012-130 | 3,768 | 130,000 | 2,730 | 10 | 7'0"x5'11" x 15'7" | 4 | 12 | 5,900 | 29,000 | 40,000 | 8'2"x13'1" x18'10" | 11'7"x6'1" x4'11" |

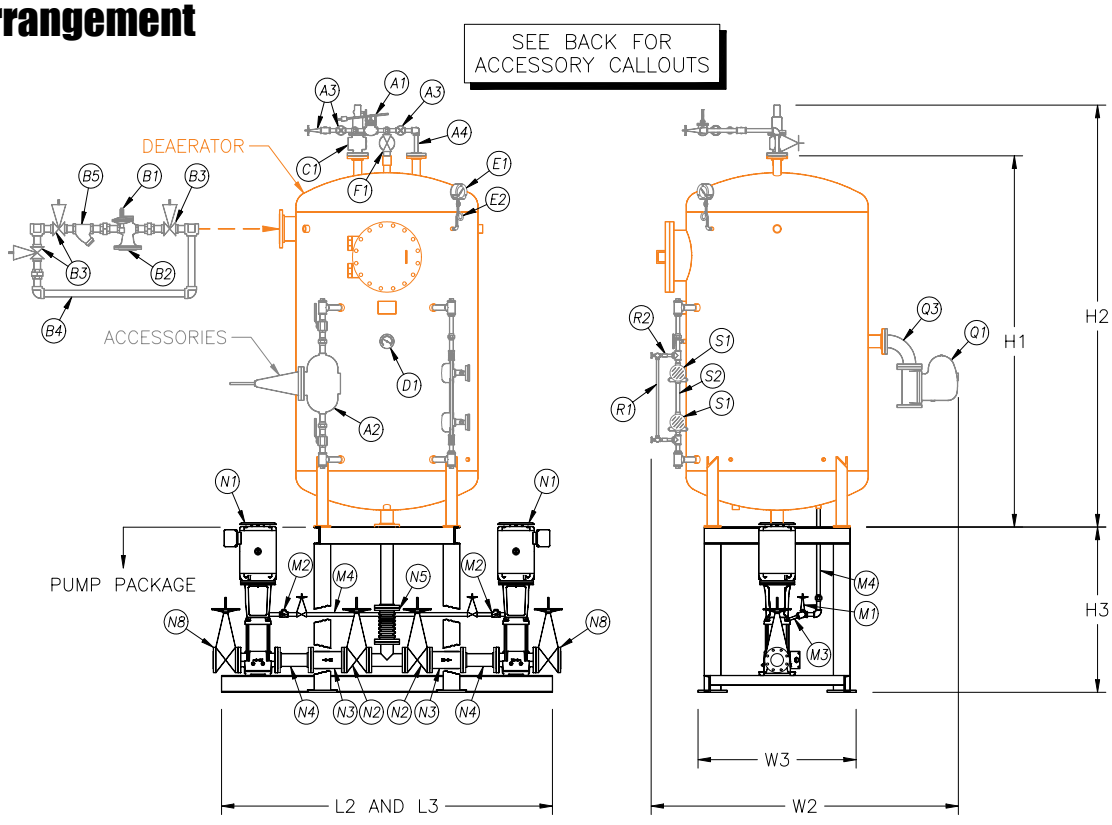
## 5 Minutes Storage

| DA MODEL | Boiler Capacity (HP) | Rated Capacity (#/HR) | Storage to Overflow (Gallons) | Storage Capacity (Minutes) | Vessel Dimension (L1 x W1x H1) | Water Inlet "A" (in) | Steam Inlet "B" (in) | Empty Weight (lbs) | Operate Weight (lbs) | Flooded Weight (lbs) | Total Accessory (L2 x W2x H2) | Pump Package (L3 x W3x H3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VS-3006-020 | 580 | 20,000 | 210 | 5 | 3'0"x2'7" x 7'9" | 1.5 | 6 | 1,400 | 3,000 | 4,000 | 6'3"x5'9" x9'3" | 7'0"x2'11" x2'10" |
| VS-3508-040 | 1,159 | 40,000 | 420 | 5 | 3'6"x2'11" x 9'11" | 2 | 6 | 2,000 | 6,000 | 7,000 | 6'3"x8'7" x11'11" | 8'6"x3'3" x3'10" |
| VS-4008-050 | 1,449 | 50,000 | 525 | 5 | 4'0"x3'4" x 10'1" | 2.5 | 8 | 2,400 | 7,000 | 10,000 | 6'2"x9'5" x11'7" | 8'6"x3'8" x4'0" |
| VS-4508-060 | 1,739 | 60,000 | 630 | 5 | 4'6"x3'8" x 10'4" | 2.5 | 8 | 2,700 | 8,000 | 12,000 | 6'3"x9'9" x11'10" | 8'6"x4'0" x4'0" |
| VS-5008-080 | 2,319 | 80,000 | 840 | 5 | 5'0"x4'1" x 10'10" | 3 | 10 | 3,200 | 11,000 | 15,000 | 6'11"x10'8" x12'4" | 9'0"x4'5" x4'0" |
| VS-5508-100 | 2,899 | 100,000 | 1,050 | 5 | 5'6"x4'5" x 11'0" | 4 | 10 | 3,400 | 12,000 | 18,000 | 6'6"x12'4" x12'10" | 10'0"x4'9" x5'6" |
| VS-6008-120 | 3,478 | 120,000 | 1,260 | 5 | 6'0"x5'2" x 11'3" | 4 | 12 | 3,900 | 15,000 | 21,000 | 6'10"x12'7" x13'0" | 10'0"x5'4" x5'6" |
| VS-6009-140 | 4,058 | 140,000 | 1,470 | 5 | 6'0"x5'2" x 12'3" | 4 | 12 | 4,300 | 17,000 | 23,000 | 6'10"x12'7" x14'0" | Consult Factory |
| VS-6010-160 | 4,638 | 160,000 | 1,680 | 5 | 6'0"x5'2" x 13'3" | 4 | 12 | 4,700 | 19,000 | 26,000 | 6'10"x12'7" x15'0" | Consult Factory |
| VS-6510-180 | 5,217 | 180,000 | 1,890 | 5 | 6'6"x5'7" x 13'5" | 6 | 14 | 5,500 | 22,000 | 30,000 | 10'8"x12'6" x16'8" | Consult Factory |
| VS-6512-220 | 6,377 | 220,000 | 2,310 | 5 | 6'6"x5'7" x 15'5" | 6 | 14 | 6,200 | 26,000 | 35,000 | 10'8"x13'5" x18'8" | Consult Factory |
| VS-7012-260 | 7,536 | 260,000 | 2,730 | 5 | 7'0"x5'11" x 15'7" | 6 | 16 | 6,900 | 30,000 | 41,000 | 11'1"x13'8" x18'10" | Consult Factory |

# Model Number Selection

**DEAERATOR** — Series, Size, Capacity
**ACCESSORIES** — Type, Piping
**STAND & PUMP/PACKAGE** — PKG, #/ Pumps, Flow, Head

- VS=Vertical Spray (See front cover for additional series)
- 3508= 20,000 #/HR
- 020=20,000 #/HR (Use actual capacity, charts show maximum capacity)
- M=Mechanical or P=Pneumatic (Leave blank for none)
- P=Piping Included O=Piping Not Included
- PKG=Package (Leave blank for none)
- 2 = # of Pumps
- 042 = Flow(GPM)
- 150 = Head(PSI)

| EXAMPLE: | SERIES | - | SIZE | CAPACITY | | TYPE | PIPED | | #/PUMPS | FLOW | HEAD |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | VS | -- | 3508 | 020 | -- | M | O | -- | PKG -- 2 | 042 | 150 |

## Typical Arrangement