FMC Technologies

Smith Meter® VDR Deaerator

Specifications

Issue/Rev. 0.4 (3/13) Bulletin SS01058E

*The **Smith Meter® "VDR" Vertical Deaerator** will separate and release air and gas from petroleum and other liquid products before they are metered. The deaerator is a necessary part of any metering system, whenever there is a possibility that air or gas can be pumped or siphoned into the pipeline.*

Features

- **Low pressure drop.**
- **High efficiency air release.**
- **Float operated automatic air release valve.**

Standard Specifications

Fabricated according to DIN/EN, AD2000 specification.

Temperature Range:
-29° to +65° C with Buna-N sealing.

Body Material: Carbon steel to EN Standard.

Flanges: Carbon steel raised face according to DIN/EN or ANSI B16.5.

Supports: Three (3) legs are standard on models 10-100 deaerator. Four (4) legs are standard on models 130-350 deaerator.

Sight Glass: Carbon steel with automatic air release head(s). Air exhaust: 3/4" NPT.

Automatic Air Release Head(s): Type "RB" - maximum W.P. 2,068 kPa Type "UB" - Maximum W.P. 4,964 kPa

Number of Air Release Heads per Model: VDR 10-130 (1) head, VDR 180 and 240 - (2) heads, VDR 350 - (3) Heads.

Drain: 1-1/2" NPT plugged, Model 10 to 60.

2" NPT plugged, Model 70 to 350.

Options

- **Temperature Range:**
  -12° to +65° C with Viton sealing.
- **Temperatures / Sealings other than specified:** consult factory.
- **High Pressure Application:** consult factory.
- **Special Surface Treatment:** consult factory.
- **"High Efficiency" Modification(s):**

  HE 1: Includes (1) factory installed liquid level control with ATEX explosion proof sensor to activate a Smith Meter Hydraulic Control Valve or the Smith Meter Load Controller AccuLoad®.

Model VDR Deaerator

HE 2: Includes (2) factory installed liquid level controls with ATEX explosion proof sensor to activate a Smith Meter Hydraulic Control Valve or the Smith Meter Load Controller AccuLoad.

HE 3: Includes (3) factory installed liquid level controls with ATEX explosion proof sensor to activate a Smith Meter Hydraulic Control Valve or the Smith Meter Load Controller AccuLoad.

Functional Description

The removal of air from a liquid is controlled and limited by the physical properties of that liquid and influenced by a combination of pressure, temperature, flow rate, and system design.

The presence of air or gas in a liquid system, while being measured by a positive displacement or turbine meter, will result in inaccurate measurement and can also damage the meter.

The deaerator is a necessary part of any metering system, whenever there is a possibility that air or gas can be pumped or siphoned into the pipeline.

The tangentially constructed inlet and outlet connections (**Figure 1**), force the liquid into a rotational movement. This centrifugal movement, in conjunction with a

decrease in flow velocity and pressure will allow mass volumes, as well as entrained air and gas to be segregated from the liquid and subsequently through the float operated automatic air release valve(s). A sight glass is installed to display the liquid.

In accordance with EC Weights and Measures Regulations, consideration must be given to the system design to assure sufficient back pressure (min. 0,05 kPa).

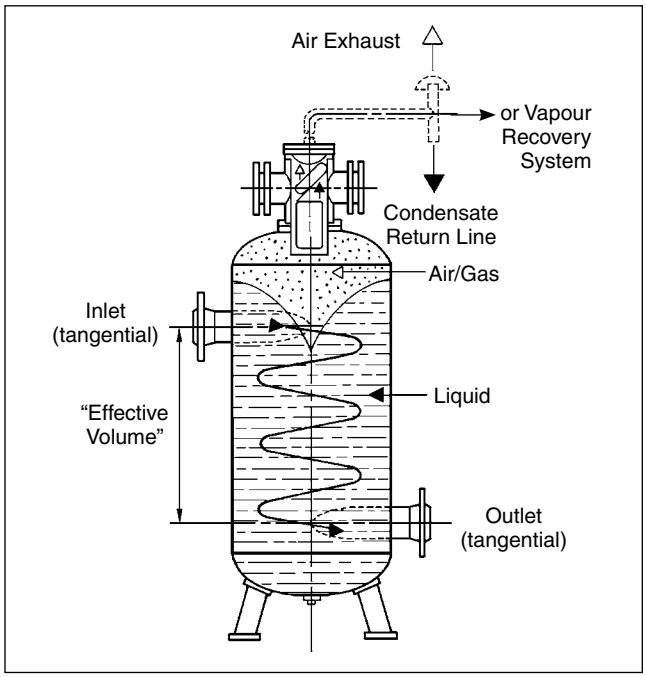


Figure 1 – VDR Deaerator

Efficiency

Deaerators must release up to 30% volume of air/gas from the flowing liquid stream. Increased efficiency can be achieved by installing liquid level control(s) in conjunction with a Smith Meter 200 Series Hydraulic Control Valve.

Installation

Deaerators should be installed downstream from the pump, as close to the meter as possible. The air release should be piped to a vapour recovery system or to a convenient and safe point of discharge. (Provide the end of the air release pipe with a suitable flame arrestor.) The condensate return line can be discharged into a suitable container or back to storage.

Liquid Level Controls

The Standard Smith Meter "VDR" Series Centrifugal Deaerator is designed and approved to release up to 30% volume of air/gas from the flowing product. When even greater volumes of air/gas are likely to enter into the line, or when the highest degree of systems accuracy is the primary design criterion, the addition of a Liquid Level Control L.L.C. in conjunction with a Smith Meter 200 Series multifunction hydraulic control valve will ensure maximum deaerator efficiency.

Three (3) variations are available as factory installed options on the "VDR" Series Deaerators.

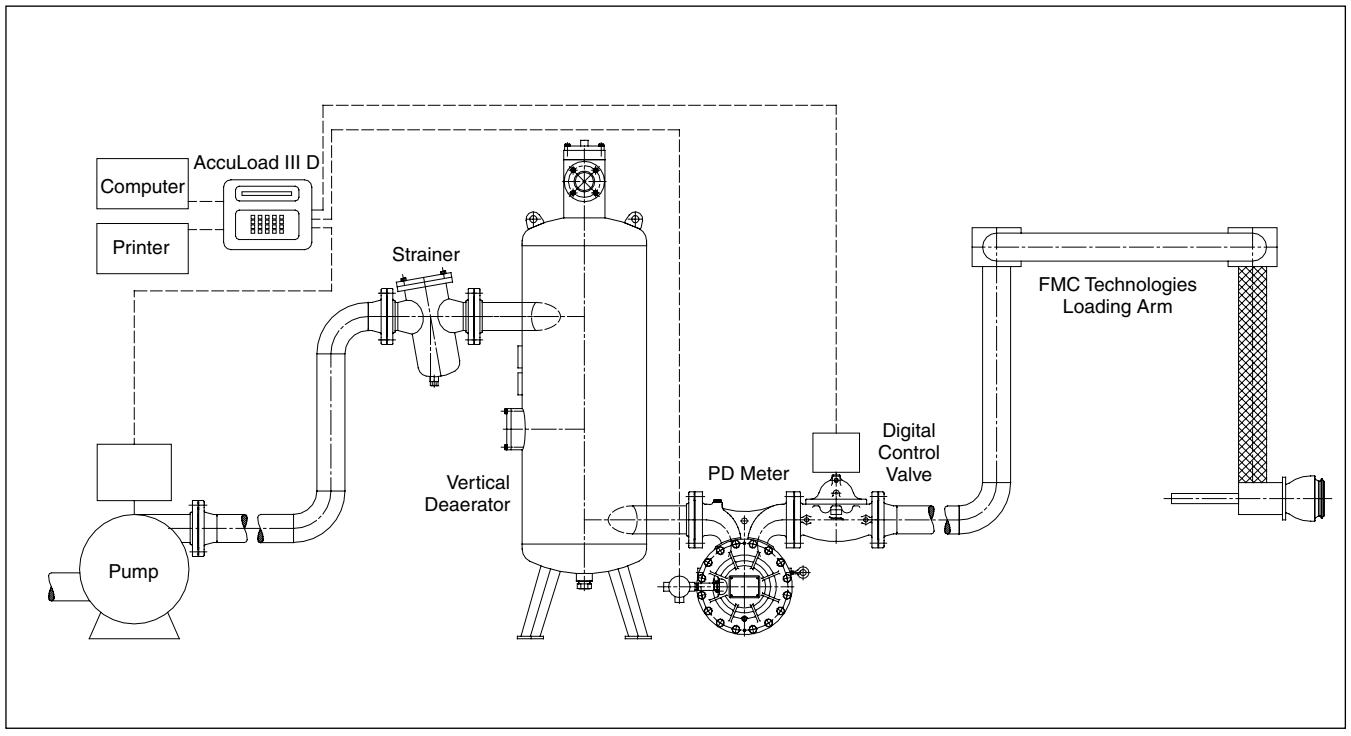


Figure 2 – Typical Installation for Loading Application

Options

Option HE 1:

One (1) L.L.C. with ATEX approved explosion proof sensor, stainless steel adapter assembly, side mounted as high or low level control, and electrically connected to a Smith Meter model 200-31 Solenoid Block Valve, provides final closure of the valve.

The sensor signal can also be wired into a Smith Meter model 296 Set-Stop Valve or the Smith Meter Load Controller AccuLoad, whereby the level control action temporarily overrides the set-stop counter micro switches.

Option HE 2:

Two (2) L.L.C.'s with ATEX approved explosion proof sensor, stainless steel adapter assembly, side mounted as high and low level control.

Used with AccuLoad III (Figure 4) or Smith Meter Model 296 Two Stage Set-Stop Valve **(Figure 3)**. First-stage closure (flow rate decreases from high flow to low flow rate) is provided when the "high level control" switch is activated and final closure is provided, if the liquid level continues to drop until the "low level control" switch is activated.

Note: *For application of extreme air exhaust an additional air release valve may be fitted, which also will be controlled by the liquid level control device.*

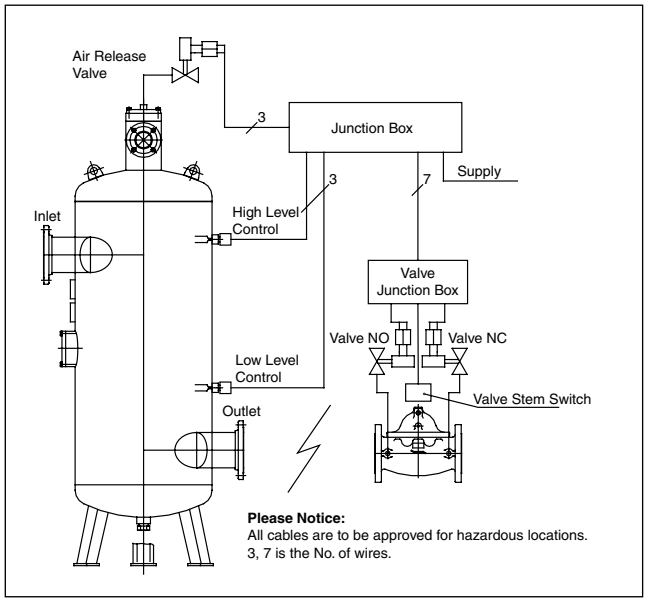


Figure 3 – Smith Meter Liquid Level Control Model 296 Set-Stop Valve

Option HE3:
(Typical Installation for Unloading Application)

Three (3) L.L.C.'s with ATEX approved explosion proof sensor, stainless steel adapter assembly, side mounted as comprehensive level control.

Used exclusively with Smith Meter AccuLoad **(Figure 4)**.

Control of delivery is accomplished by three digital inputs, configured as high, low and stop switch. These inputs define when to advance from high flow rate to low flow rate and final closure when the liquid level drops below the stop switch.

For detailed information see following bulletins:

AccuLoad Operator Reference Manual – MN06129

AccuLoad Unloading – AB06055

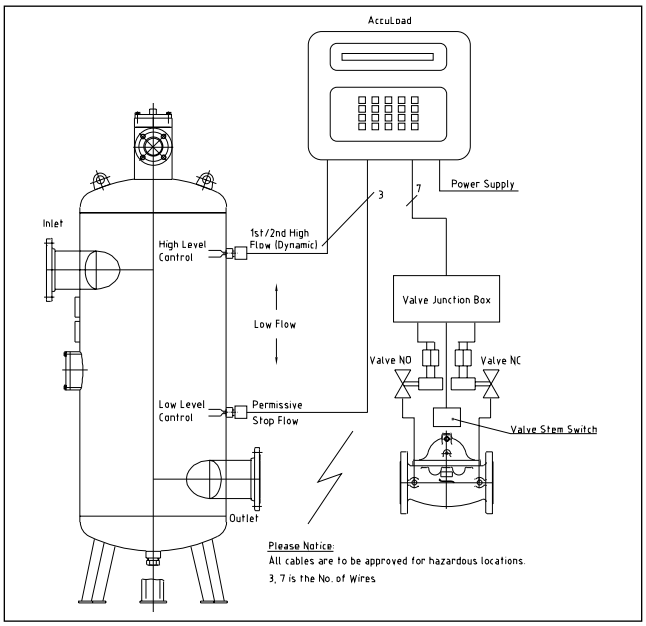


Figure 4 – Smith Meter Liquid Level Control Model 210 Digital Electro-Hydraulical Set-Stop Valve

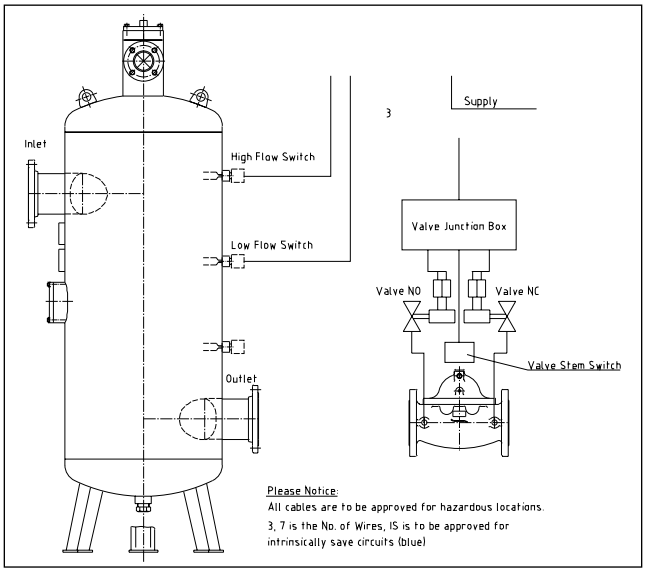


Figure 5 – Smith Meter Liquid Level Control Model 210 Digital Electro-Hydraulical Set-Stop Valve

Model Designation "VDR"	Design Capacity* (L/Min)	Inlet/Outlet Flange** (Std. Available)	Volume (Liters)	
			Total	Effective
010	1,000	2", 2-1/2", 3"	95	56
020	2,000	2", 3", 4"	196	112
025	2,500	3", 4", 6"	288	160
030	3,000	4", 6"	420	252
040	4,000	4", 6"	480	293
060	6,000	6", 8"	1,025	598
070	7,000	6", 8"	1,860	1,051
100	10,000	8", 10"	2,090	1,236
130	13,000	8", 10"	2,360	1,388
180	18,000	10", 12"	3,765	2,346
240	24,000	10", 12", 14"	5,400	3,328
350	35,000	12", 16"	8,750	5,903

** Consult factory for design capacities above 35,000 l/min.*
Design flow capacity of equipment for product viscosity 20 cP @ 20° C.
*** Inlet and/or outlet flange sizes other than those listed, consult factory.*

Pressure Drop

Based on Fluid: Kerosene, Density: 794 Kg/m³, Viscosity: 1.73 mPa•s

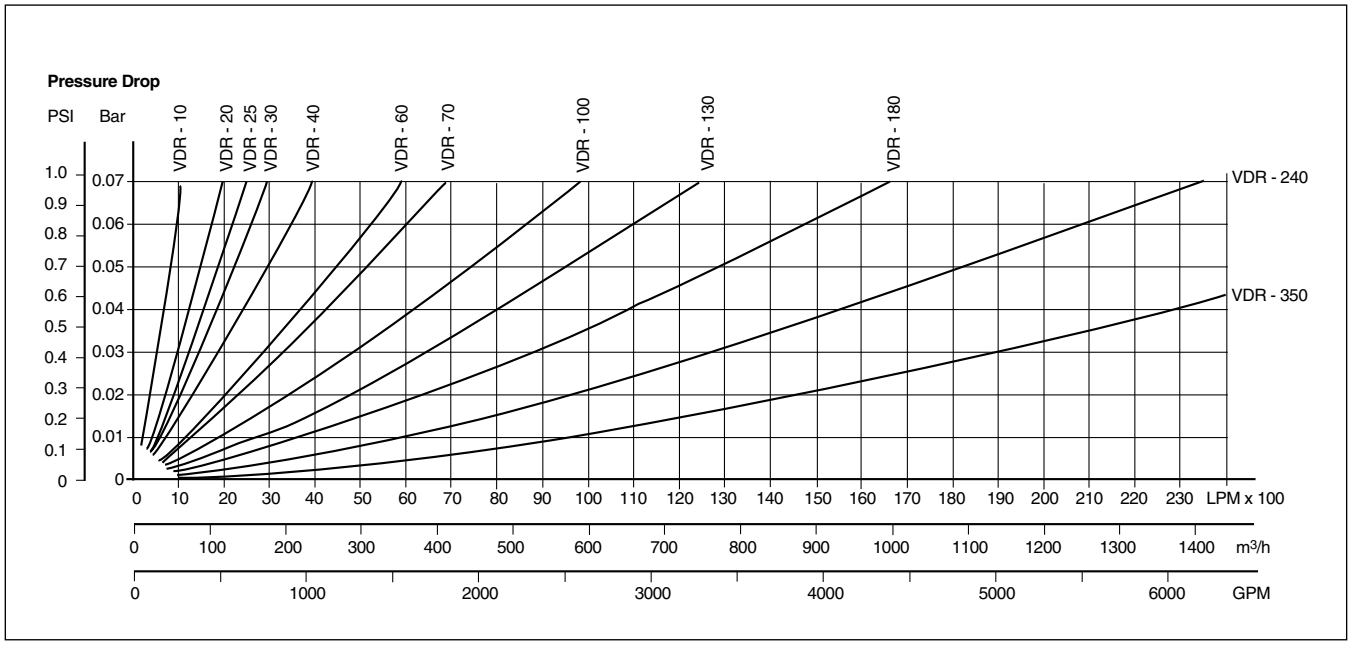


Figure 6 – Pressure Drop

Modeling

Example: VDR — 060 — 2 — 04A — A —T0 — A — H0 — L

Type of Equipment
VDR - Vertical Deaerator

VDR Model

010 - VDR-10	070 - VDR-70
020 - VDR-20	100 - VDR-100
025 - VDR-25	130 - VDR-130
030 - VDR-30	180 - VDR-180
040 - VDR-40	240 - VDR-240
060 - VDR-60	350 - VDR-350

Working Pressure
1 - PN 10 or 150 psi
2 - PN 16 or 232 psi
3 - PN 25 or 362 psi

Flange Size

02A - 2" ANSI	02D - DN 50 DIN
25A - 2.5" ANSI	25D - DN 65 DIN
03A - 3" ANSI	03D - DN 80 DIN
04A - 4" ANSI	04D - DN 100 DIN
06A - 6" ANSI	06D - DN 150 DIN
08A - 8" ANSI	08D - DN 200 DIN
10A - 10" ANSI	10D - DN 250 DIN
12A - 12" ANSI	12D - DN 300 DIN
14A - 14" ANSI	14D - DN 350 DIN
16A - 16" ANSI	16D - DN 400 DIN

Flange Arrangement and Flow Direction
A - Arrangement A, Right Hand Spin
B - Arrangement B, Right Hand Spin
C - Arrangement C, Right Hand Spin
D - Arrangement D, Left Hand Spin
E - Arrangement E, Left Hand Spin
F - Arrangement F, Left Hand Spin

Elastomer Seals
see bulletin AB0A003E

Design Standards
see bulletin AB0A003E

Liquid Level Controls (Model L.L.C.)
H0 - not required
H1 - 1 for High or Low Level Control
H2 - 2 for High and Low Level Control
H3 - 3 for Comprehensive Level Control
H4 - 3 Connections for Level Control

Liquid Level Controls
0 - not required
L - Low Level Control
H - High Level Control

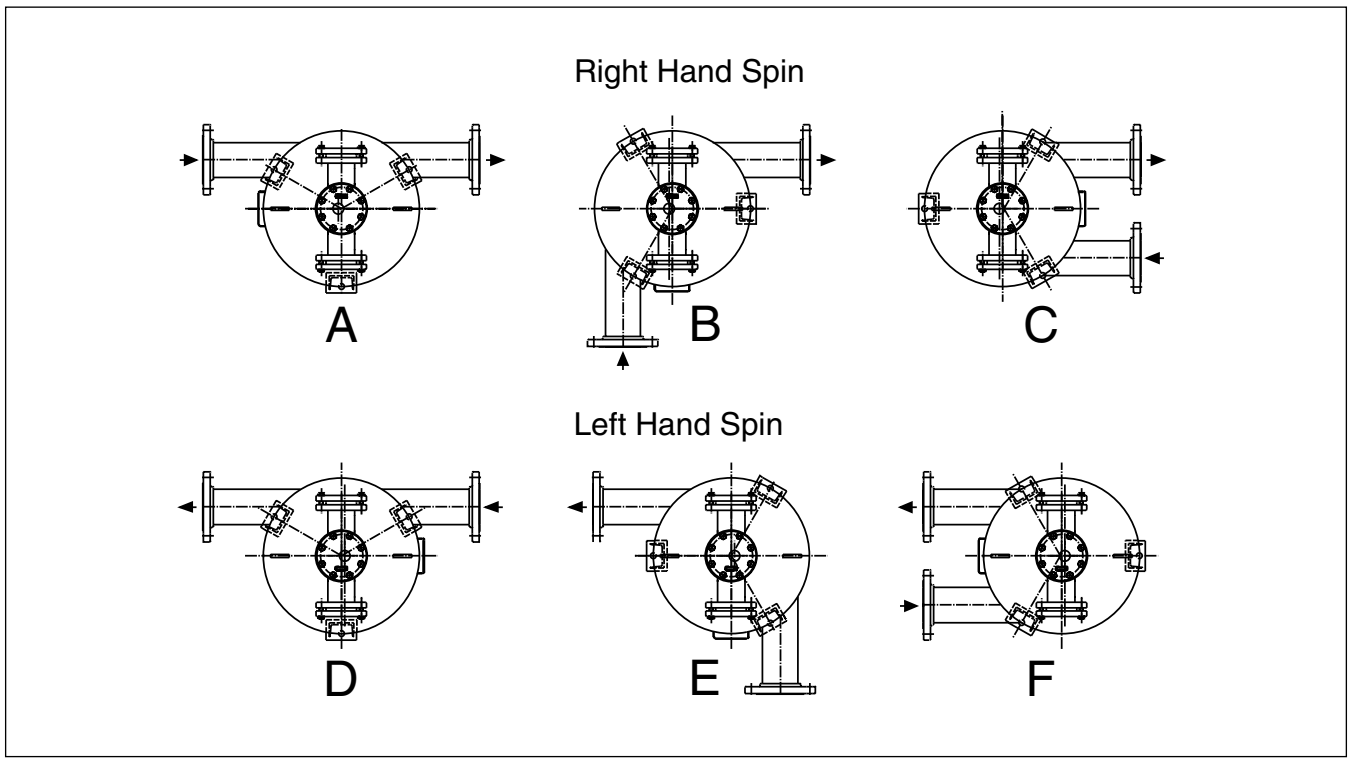


Figure 7 – Flange Arrangement and Flow Direction

Dimensions

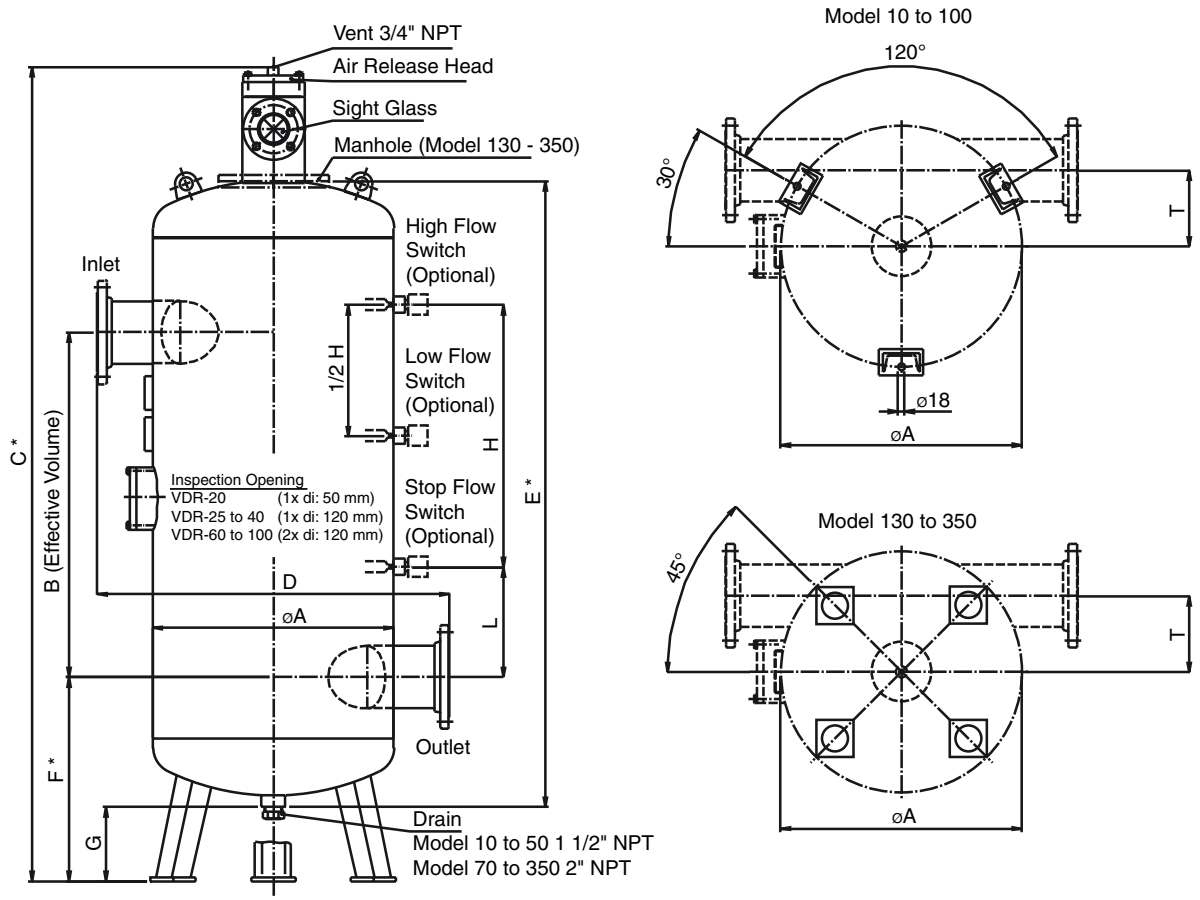


Figure 8

***** *Dimensions C, E and F are subject to change on Pressure Ratings above PN 16 or on ASME coded vessels. Please consult Factory for specific informations.*

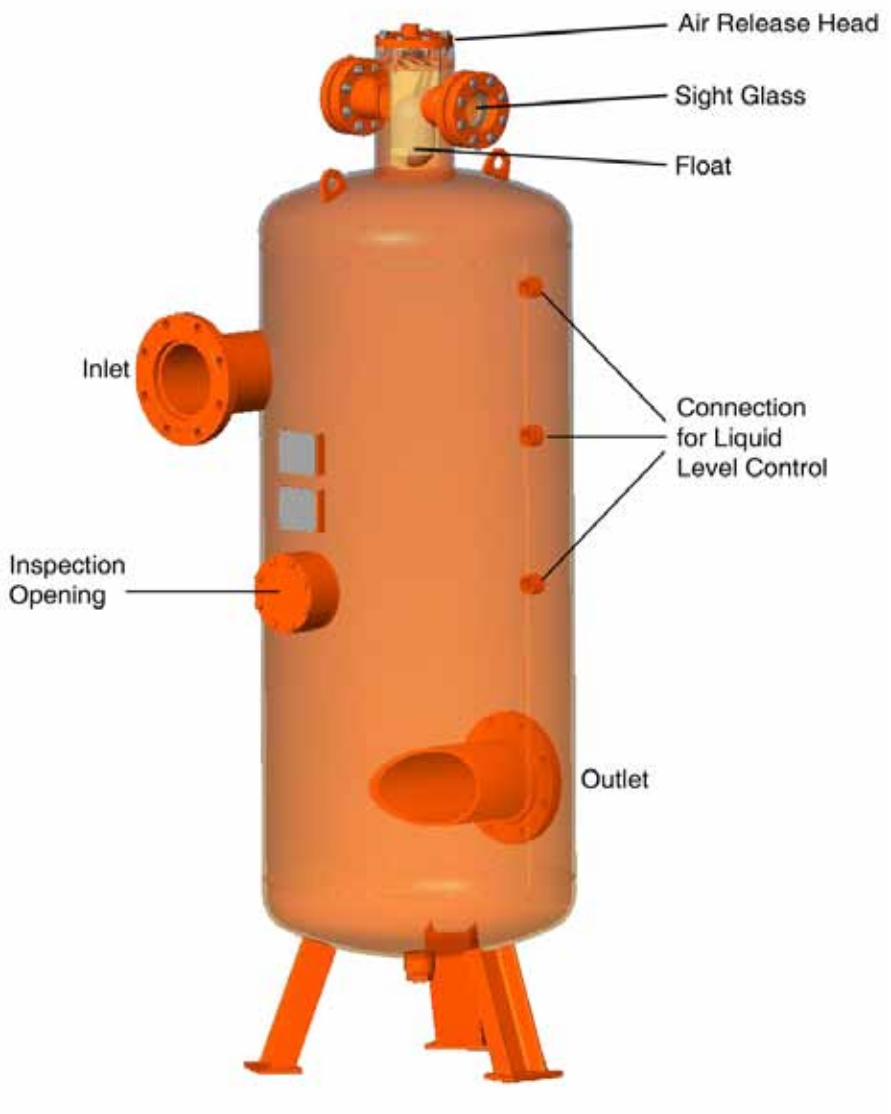
Note: *NPT threaded and plugged drains are standard. Piped and flanged drain connections available on request.*

Dimensions	Model VDR											
(mm)	10	20	25	30	40	60	70	100	130	180	240	350
A	356	457	508	610	650	813	1,016	1,100	1,150	1,350	1,550	1,900
B	600	720	830	910	930	1,200	1,350	1,360	1,395	1,700	1,835	2,155
C	1,586	1,786	2,006	2,156	2,186	2,707	2,952	2,952	3,122	3,602	3,883	4,275
D	600	700	900	950	950	1,100	1,250	1,300	1,400	1,600	1,800	2,200
E	1,100	1,300	1,520	1,670	1,700	2,175	2,420	2,420	2,570	3,050	3,330	3,800
F	430	440	480	500	550	600	660	680	725	750	820	925
G	200	200	200	200	200	200	200	200	200	200	200	200
T	125	160	160	210	205	280	380	390	415	460	570	700
H	360	405	570	590	630	880	1020	1020	1035	1330	1405	1665
L	300	340	400	420	440	450	460	480	510	550	610	710

Approximate Net Weight (kg)

Model VDR	10 Bar (-1)	16 Bar (-2)	25 Bar (-3)
10	N/A	115	155
20	N/A	145	182
25	N/A	195	245
30	250	260	320
40	275	300	380
60	480	500	624
70	710	730	923

Model VDR	10 Bar (-1)	16 Bar (-2)	25 Bar (-3)
100	930	950	1,210
130	1,040	1,050	1,352
180	1,335	1,350	1,735
240	Consult Factory		
350	Consult Factory		



VDR Deaerator Standard

Changes made to publication SS01058E Issue/Rev. 0.4 (3/13):
psi changed to kPa throughout document.
Figure 4 revised; figure 5 added.
Page 4: Revised Volume columns on Selection Guide.
Page 5: Modeling code - H4 added.
Page 6: Dimensions revised on 10 and 20.

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