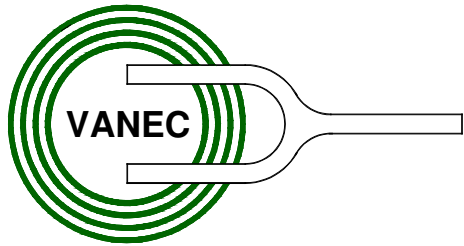


Vacuum Pump Silencers

VANEC

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VACUUM PUMP SEPARATOR / SILENCER APPLICATION DATA SHEET

Customer:		RFQ:	
Contact:	Phone:	Fax:	
Project Ref:	Email:		

Vacuum Pump Data (please fill in applicable data and units)

Make:	Model:	RPM:
-------	--------	------

Operating Conditions (please include units where applicable)

Service:	Intake	Discharge	Process Gas:	Gas MW:	C _p /C _v :	Compressibility:
Process Gas Flow Rate at Intake Conditions:			Intake Pressure:	Intake Temp.:	Water Flow:	
Discharge Pressure:		Discharge Temp.:	Site Elevation:		Site Relative Humidity:	
*Unsilenced Vacuum Pump Sound Power Level:				dB re 10-12 watts		
*Unsilenced Sound Pressure Level:				dBA at	feet from vacuum pump	intake outlet

*If available, please attach any unsilenced octave band noise data. This may be measured or predicted by the engine manufacturer.

Vacuum Pump Separator Silencer Performance Requirements

Required Silenced Noise Level:	dBA at	feet from silencer	intake	outlet
Maximum Allowable Separator/Silencer™ Pressure Drop:		psi		
Required Separation Efficiency:				

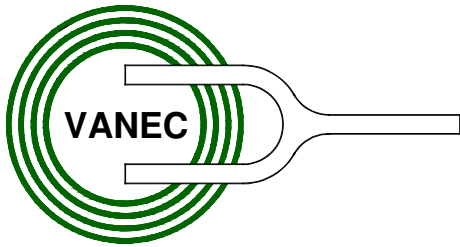
Vacuum Pump Separator Silencer Design Requirements

Shell Materials:	Internal Materials:	Inlet Size & Rating:	Outlet Size & Rating:
External Finish:		Internal Finish:	
Supports:	Legs	Vertical Shell Brackets	Saddles Other (specify):
Customer Specifications:			

Comments:

**** Please fax or Email completed data sheet to VANEC ****

File: VANEC Literature: Vacuum Pump Separator / Silencer.DOC



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Vacuum Pump Separator / Silencers

Recommended Operating Velocity Limits

4000 to 6000 FPM

Pressure Drop Factors (PDF)

(See Technical Section)

<u>Model</u>	<u>PDF</u>
181	2.2
185	2.7
175	3.3
173	2.7
171	2.7

Typically vacuum systems using liquid ring vacuum pumps are closed loop on the suction side of the pump, and discharge to atmosphere on the outlet side of the pump. VANEC inlet separator/silencers *model 181 and 185* are efficient liquid separators and low performance silencers. VANEC discharge separator/silencers *model 171 and 173* are high efficiency separators and low performance silencers. VANEC discharge separator/silencer *model 175* is a high efficiency separator and high performance silencer.

The size of the separator/silencer is dependent on the inlet gas flow in ACFM, and the seal fluid liquid load in GPM. Due to the vacuum condition, a “barometric leg” or secondary pump may be required to drain the separator sump. If a

“barometric leg” is utilized, the vertical length should be 13.6 inches for each inch of mercury (Hg) vacuum, the barometric leg should also have a liquid seal loop at the bottom. All VANE C intake separator/silencers are designed for full vacuum (29.92” Hg) at 150°F.

Pre-computed intake separator capacities at a velocity of 6000 FPM are available on Table 1. Nominal liquid separation efficiencies are:

Model # 181	90% of 100 microns & larger
Model # 185	99% of 100 microns & larger

Pre-computed discharge separator capacities (model 175, 173, & 171) are available on table 2. Calculated capacities are based on a maximum discharge velocity of 6000 FPM. Nominal separation efficiencies are:

Model # 175	99% of 100 microns & larger
Model # 173	99% of 100 microns & larger
Model # 171	99% of 100 microns & larger

Free entrained liquid efficiencies are rated on the basis of average particle size and distribution. Atmospheric discharge of saturated vapor will produce a visible plume and some droplets, this is a normal thermodynamic effect.

Vacuum System Operation & Separator/ Silencer Capacity

Vacuum pump systems have two phases of operation that must be evaluated when sizing and selecting the proper separator/silencer.

The first phase is start-up, where the vacuum pump has begun to evacuate the system starting at normal atmospheric pressure. At this phase the power requirements and system pressure drop are at the maximum level. As the system is evacuated, the inlet pressure decreases and the system pressure drop and power requirements decrease. The total inlet flow (ACFM) remains essentially constant, but because of decreasing inlet pressure the discharge volume decreases until normal operating conditions are reached. Vacuum pump capabilities are typically expressed as inlet flow (ACFM) at a vacuum condition and temperature in inches

of mercury (“Hg). Some carry over of seal fluid at the discharge separator can occur during start-up.

The second phase is normal operation. Typically peak noise levels occur at normal operation. VANEK “Dynamic Insertion Loss” ratings are available on Table 3.

Inlet separator/silencers protect the pump from liquid slugs or excessive system liquid loads. Discharge separator/silencers provide noise reduction and protection from seal fluid discharge to atmosphere.

How to Specify & Order a Vacuum Pump Separator/Silencer

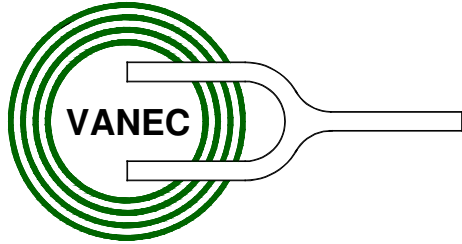
VANEK will provide on request application and selection assistance.

The following operating conditions and pump data are required:

1. Pressure/Vacuum (PSIA or “Hg)
2. Operating temperature
3. Molecular weight or specific gravity of the gas
4. Flow rate (ACFM, or SCFM at 14.7 psig and 70°F)
5. Seal fluid flow rate in GPM
6. Max. allowable pressure drop for the separator/silencer
7. Pump manufacturer and model if available
8. Connection sizes
9. Unsilenced noise level, or desired overall level at what distance
10. Required separation efficiency
11. Materials of construction

VANEK separator/silencers are available in:

- Carbon steel
- 300 series stainless steels
- FRP – fiberglass reinforced plastics
- Other materials on request



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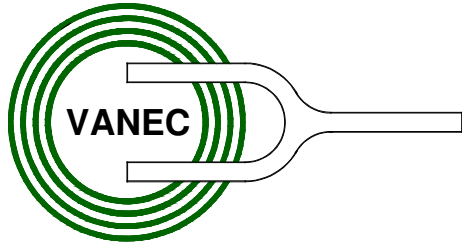
Orchard Park, New York 14127

Tel. (716) 827-4959 Fax (716) 827-1041

E-Mail: info@vanec.com

**VANEC Model #181 & Model #185
Inlet Separator Capacity**

Nominal Size	Rated Capacity (Capacities for larger sizes available on request)	
	Maximum ACFM at Vacuum (Inlet Condition)	Liquid gpm
4	530	35
5	830	55
6	1,200	80
8	2,100	150
10	3,300	200
12	4,700	300
14	6,000	400
16	7,800	500
18	10,000	600
20	12,000	800
22	15,000	1,000
24	18,000	1,200
26	21,000	1,400
28	24,000	1,600
30	28,000	1,800



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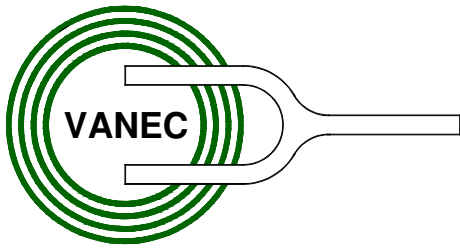
E-Mail: info@vanec.com

VANEC Model #171 & Model #175 Discharge Separator/Silencer Capacity Chart

Nominal Size	Rated Capacity, Maximum ACFM at Vacuum (Inlet Condition)								Liquid gpm
	5" Hg. Vac.	10" Hg. Vac.	15" Hg. Vac.	18" Hg. Vac.	20" Hg. Vac.	22" Hg. Vac.	24" Hg. Vac.	26" Hg. Vac.	
1	31	38	43	46	51	64	86	130	5
1½	72	90	100	107	121	151	202	305	10
2	119	149	166	177	199	250	335	505	15
2½	170	210	235	250	285	355	475	720	20
3	260	330	365	390	440	550	735	1,110	25
3½	350	440	490	520	590	735	985	1,490	35
4	450	565	630	670	755	950	1,270	1,915	40
5	710	890	990	1,055	1,190	1,495	2,000	3,020	50
6	1,025	1,285	1,430	1,520	1,715	2,150	2,880	4,345	60
8	1,775	2,220	2,475	2,635	2,975	3,725	4,985	7,525	80
10	2,780	3,500	3,900	4,155	4,685	5,870	7,855	11,865	100
12	4,015	5,025	5,595	5,960	6,725	8,420	11,265	18,015	120
14	5,080	6,355	7,080	7,545	8,510	10,660	14,260	21,535	140
16	6,695	8,375	9,330	9,940	11,215	14,045	18,790	28,380	160
18	8,535	10,680	11,895	12,675	14,295	17,905	23,955	36,175	18
20	10,330	12,925	14,400	15,335	17,300	21,670	28,990	43,780	200
22	12,590	15,750	17,545	18,690	21,085	26,410	35,330	53,355	220

24	15,070	18,850	21,000	22,370	25,235	31,610	42,290	63,865	240
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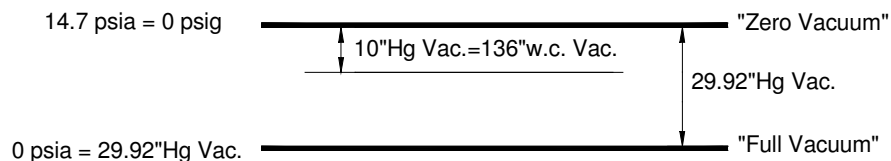
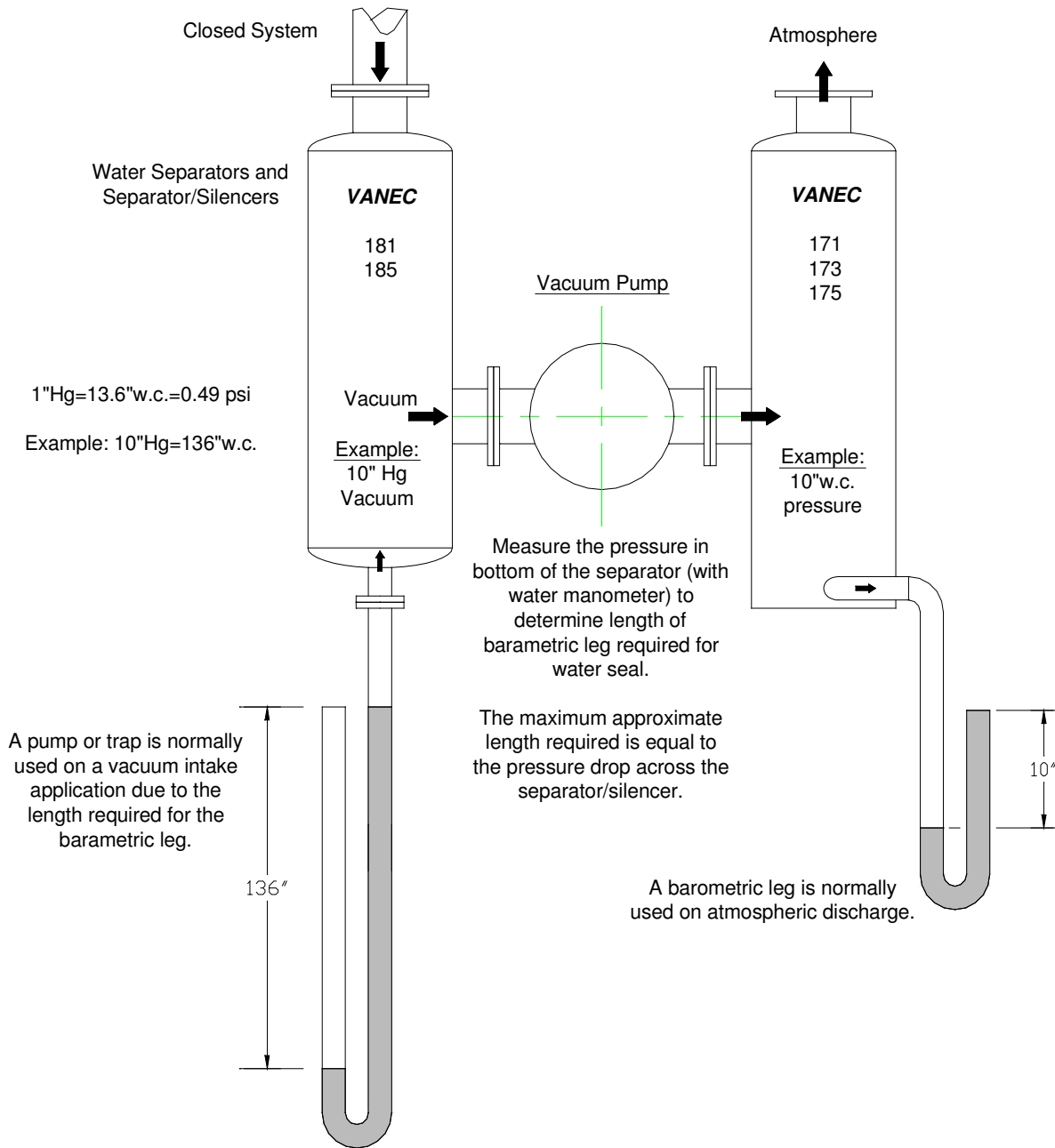
Capacities for larger sizes available upon request.

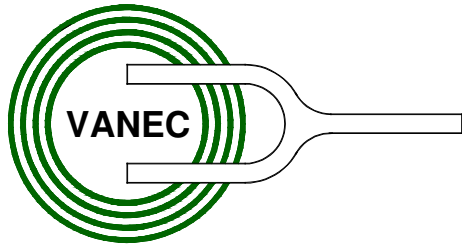


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TYPICAL BAROMETRIC LEG ARRANGEMENTS



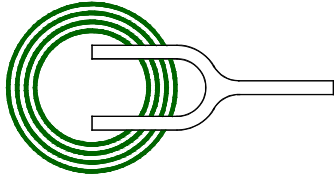


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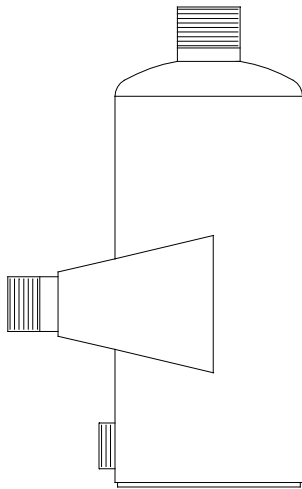
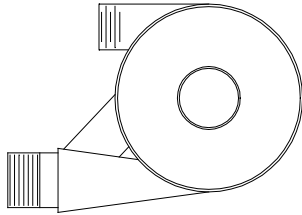
COMMON VACUUM PUMP OPERATIONAL OR CORROSION PROBLEMS

- HIGH BACKPRESSURE
- LOSS OF LIQUID SEAL
- IMPROPER SEAL LEG LENGTH
- HIGH CONDUCTIVITY LIQUIDS
- PH (7 = NEUTRAL)
- SOLID FOULING
- HIGH VELOCITY FLOW EROSION
- CAVITATION



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Model 171 Separator Silencer

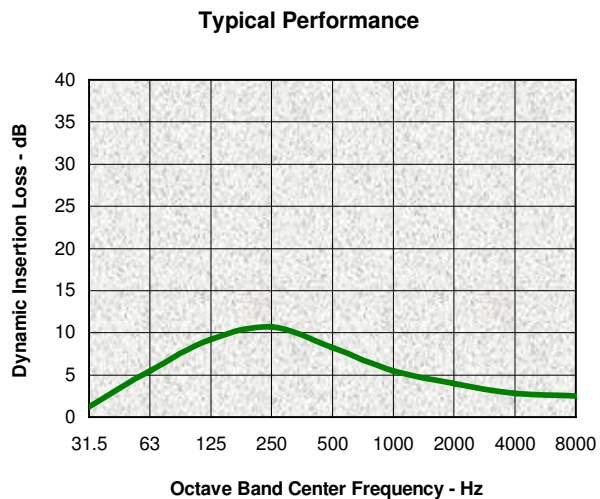
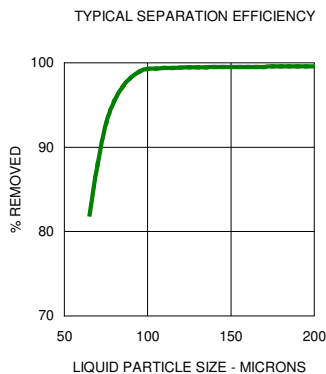


Standard Features:

- ✓ All Steel Welded Construction
- ✓ Quality Fabrication Techniques
- ✓ Shell Constructed with Integral Damping
- ✓ Reinforced Inlet Transition
- ✓ Threaded connections in small sizes
- ✓ Plate Flanges to Match ASA 125# Flanges
- ✓ Prime Coated Exterior Surfaces

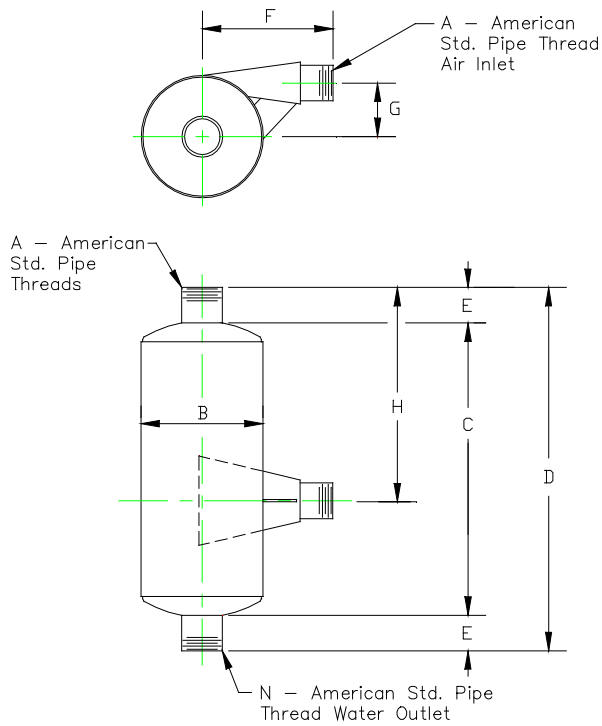
Optional Features:

- ✓ Materials as Specified
- ✓ Finish as Specified
- ✓ Companion Flanges
- ✓ Inspection Openings or Man Ways
- ✓ Flange Drilling as Specified

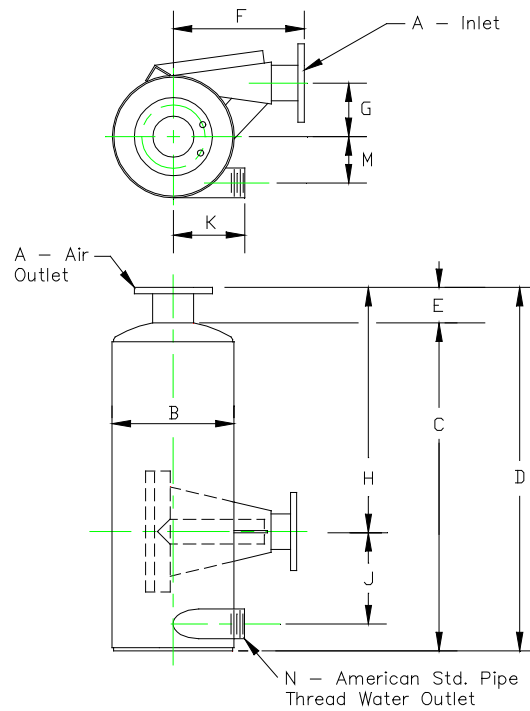


Application:

The **VANEC** Model 171 Separator Silencer is designed for use on liquid sealed vacuum pumps. It separates the seal water from the gas stream while suppressing the vacuum pump exhaust noise.



Sizes 1 Through 3 1/2

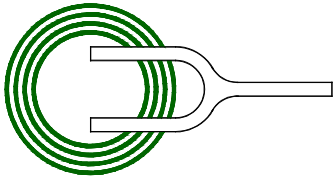


Sizes 4 Through 16

VANEC Model 171

Model	Dimensions in Inches												Est. Wt. Lbs.
	A	B	C	D	E	F	G	H	J	K	M	N	
171-01	1	4-1/2	10	14	2	6	2-3/32	8-3/4	-	-	-	1	10
171-01.25	1-1/4	4-1/2	10	14	2	6	2-1/16	8	-	-	-	1	10
171-01.5	1-1/2	6	13	17	2	7	2-3/4	10	-	-	-	1-1/2	15
171-02	2	8	18	22	2	9	3-11/16	13-1/8	-	-	-	2	25
171-02.5	2-1/2	10	18	24	3	10	4-5/8	14	-	-	-	2	35
171-03	3	10	21	27	3	11	4-9/16	16-1/4	-	-	-	2-1/2	50
171-03.5	3-1/2	12	24	30	3	12	5-1/2	18	-	-	-	2-1/2	60
171-04	4	12	26	29	3	13-1/2	5-7/16	18-1/2	7-1/2	7	4-3/8	3	85
171-05	5	16	31	34	3	14-1/2	7-5/16	21-1/2	9-1/2	9	6-1/2	3	130
171-06	6	18	38-3/4	41-3/4	3	18	8-3/16	27	11-1/2	10	7-3/8	3	175
171-08	8	22	48-1/4	51-1/4	3	21-1/2	9-15/16	32	16	12	9-1/2	3	285
171-10	10	24	51-1/4	55-1/4	4	26	10-11/16	32	20	13	10-1/2	3	440
171-12	12	30	64	68	4	31-1/2	13-7/16	40-1/2	24	16	13	4	685
171-14	14	36	71	75	4	36-1/2	16-1/4	43	28	19	16	4	1,390
171-16	16	42	84	88	4	41-1/2	18-7/8	52	32	22	19	4	1,860

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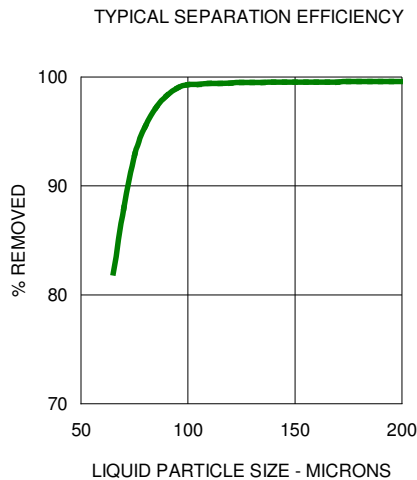
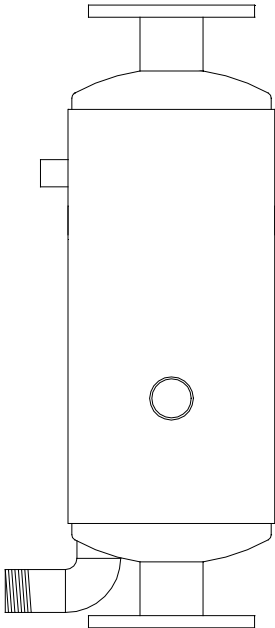
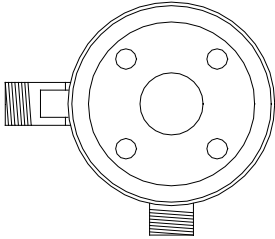
Model 173 Overhead Separator

Standard Features:

- ✓ All Steel Welded Construction
- ✓ Quality Fabrication Techniques
- ✓ Shell Constructed with Integral Damping
- ✓ Threaded Connections in Small Sizes
- ✓ Plate Flanges to Match ASA 125# Flanges
- ✓ Anti-Cavitation Connection
- ✓ Prime Coated Exterior Surfaces

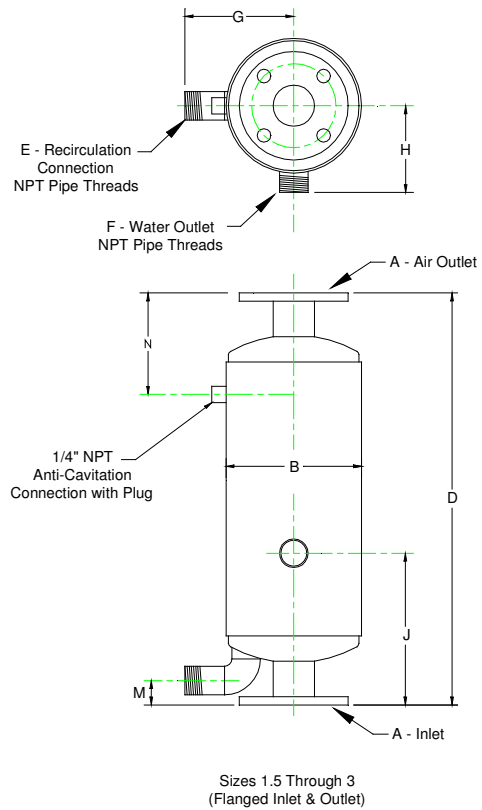
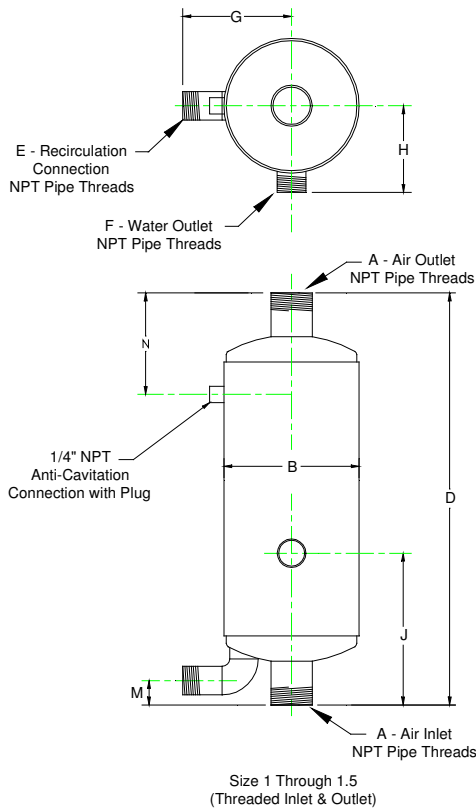
Optional Features:

- ✓ Materials as Specified
- ✓ Finish as Specified
- ✓ Companion Flanges
- ✓ Inspection Openings or Man Ways
- ✓ Flange Drilling as Specified



Application:

The **VANEC** Model 173 Overhead Separator is designed for use on liquid sealed vacuum pumps. It separates the seal water from the gas stream while suppressing the vacuum pump exhaust noise.



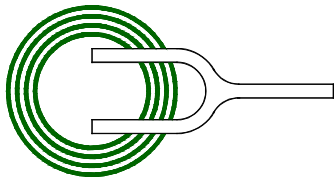
VANEC Model 173 Threaded Inlet & Outlet

Model	Dimensions in Inches										Est. Wt. Lbs.
	A	B	D	E	F	G	H	J	M	N	
173-01	1	4-11/16	16	3/4	1	4-1/4	4	6	1-1/16	5	12
173-01.25	1-1/4	4-11/16	16	3/4	1	4-1/4	4	6	1-1/16	5	12
173-01.5	1-1/2	6	19	1	1	5	4	7	1-1/8	6	14

VANEC Model 173 Flanged Inlet & Outlet

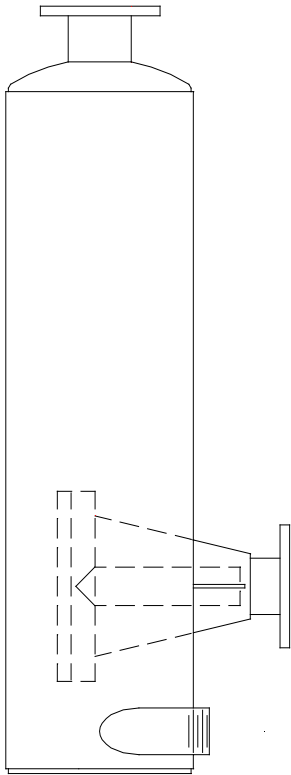
Model	Dimensions in Inches										Est. Wt. Lbs.
	A	B	D	E	F	G	H	J	M	N	
173-01.5	1-1/2	6	19	1	1	5	4	7	1-1/8	6	18
173-02	2	8	24	1-1/2	1-1/2	6	6	8	2-5/16	6	22
173-03	3	10	29	1-1/2	1-1/2	7-1/2	7	8	1-15/16	7	35

VANEC Industrial Silencers
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Model 175 Separator Silencer

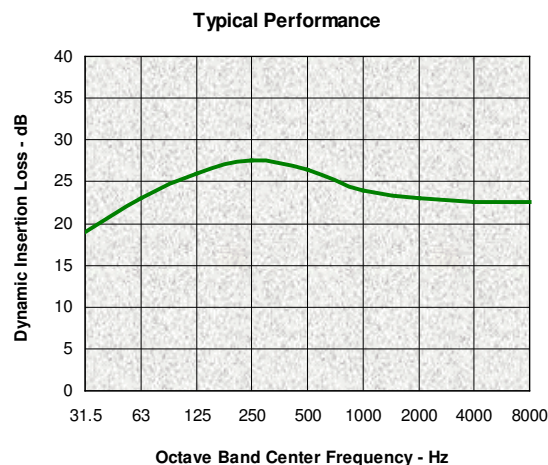
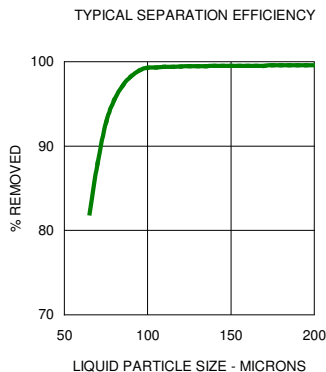


Standard Features:

- ✓ All Steel Welded Construction
- ✓ Quality Fabrication Techniques
- ✓ Shell Constructed with Integral Damping
- ✓ Reinforced Inlet Transition
- ✓ Threaded connections in small sizes
- ✓ Plate Flanges to Match ASA 125# Flanges
- ✓ Prime Coated Exterior Surfaces

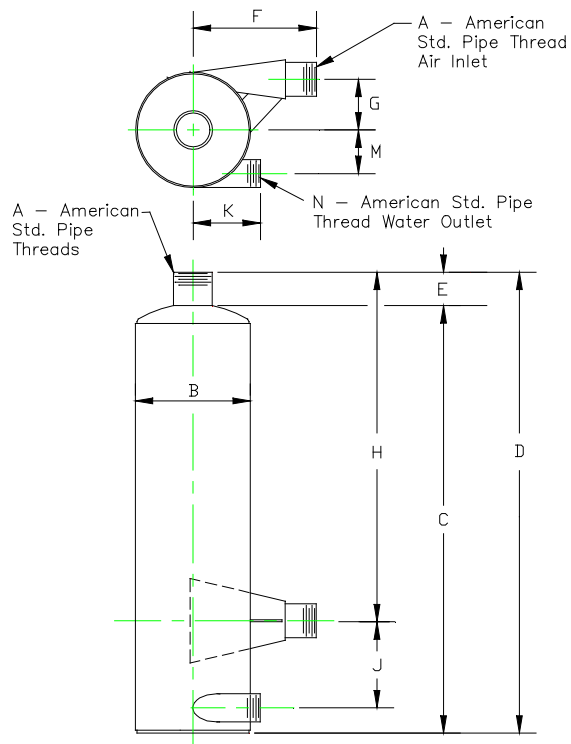
Optional Features:

- ✓ Materials as Specified
- ✓ Finish as Specified
- ✓ Companion Flanges
- ✓ Inspection Openings or Man Ways
- ✓ Flange Drilling as Specified

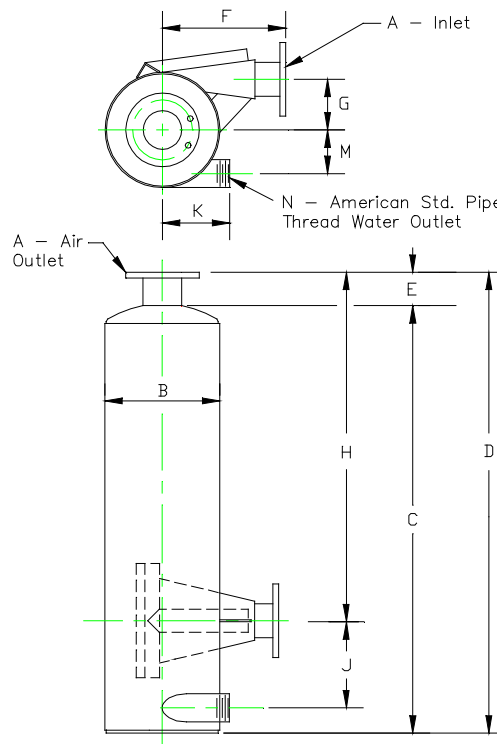


Application:

The **VANEC** Model 175 Separator Silencer is designed for use on liquid sealed vacuum pumps. It separates the seal water from the gas stream while suppressing the vacuum pump exhaust noise.



Sizes 1 Through 3

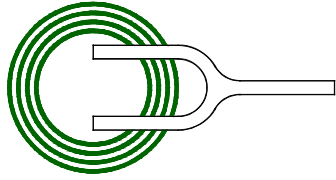


Sizes 3 1/2 Through 16

VANEC Model 175

Model	Dimensions in Inches												Est. Wt. Lbs.
	A	B	C	D	E	F	G	H	J	K	M	N	
175-01	1	4-1/2	18-3/4	20-3/4	2	6	2-3/32	15-1/2	4-3/8	3-1/4	1-13/16	1	15
175-01.25	1-1/4	4-1/2	18-3/4	20-3/4	2	6	2-1/16	14-3/4	5-1/8	3-1/4	1-13/16	1	20
175-01.5	1-1/2	6	23	25	2	7	2-3/4	19	4-1/2	4	2-3/16	1-1/2	28
175-02	2	8	30-7/8	32-7/8	2	9	3-11/16	25	5-7/8	5	2-15/16	2	45
175-02.5	2-1/2	10	32-1/2	35-1/2	3	10	4-5/8	26	7-1/2	6	3-15/16	2	65
175-03	3	10	38	41	3	11	4-9/16	31	7-3/4	6	3-3/4	2-1/2	85
175-03.5	4	12	41-3/8	44-3/8	3	13	5-1/2	33	8-7/8	7	4-3/4	2-1/2	120
175-04	4	12	44	47	3	13-1/2	5-7/16	36-1/2	7-1/2	7	4-3/8	3	165
175-05	5	16	56-1/2	59-1/2	3	14-1/2	7-5/16	47	9-1/2	9	6-1/2	3	225
175-06	6	18	68-3/4	71-3/4	3	18	8-3/16	57	11-1/2	10	7-3/8	3	415
175-08	8	22	87-1/4	90-1/4	3	21-1/2	9-15/16	71	16	12	9-1/2	3	560
175-10	10	24	99-1/4	103-1/4	4	26	10-11/16	80	20	13	10-1/2	3	770
175-12	12	30	124-1/2	128-1/2	4	31-1/2	13-7/16	101	24	16	13	4	1,160
175-14	14	36	137-1/4	141-1/4	4	36-1/2	16-1/4	109-1/4	28	19	16	4	1,860
175-16	16	42	150-1/4	154-1/4	4	41-1/2	18-7/8	118-1/4	32	22	19	4	2,460

VANEC Industrial Silencers
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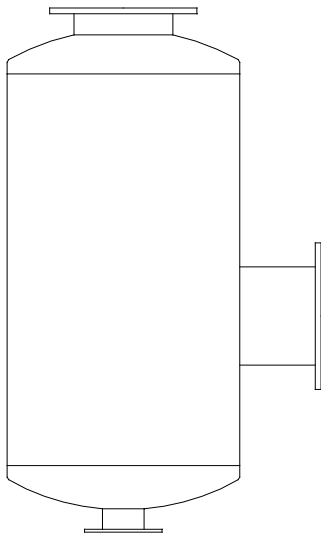
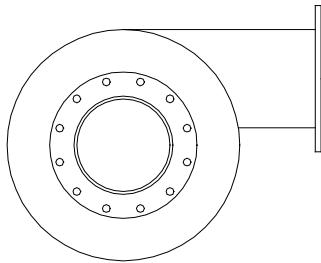
Model 181 Inlet Separator

Standard Features:

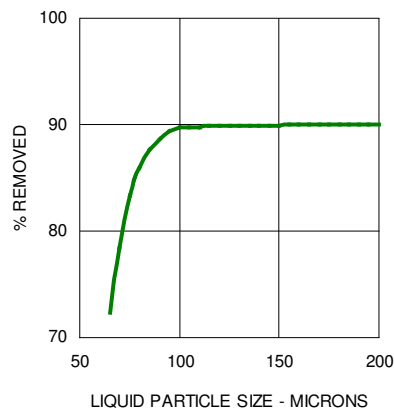
- ✓ All Steel Welded Construction
- ✓ Quality Fabrication Techniques
- ✓ Plate Flanges to Match ASA 125# Flanges
- ✓ Prime Coated Exterior Surfaces

Optional Features:

- ✓ Materials as Specified
- ✓ Finish as Specified
- ✓ Threaded Connections
- ✓ Companion Flanges
- ✓ Inspection Openings or Man Ways
- ✓ Flange Drilling as Specified

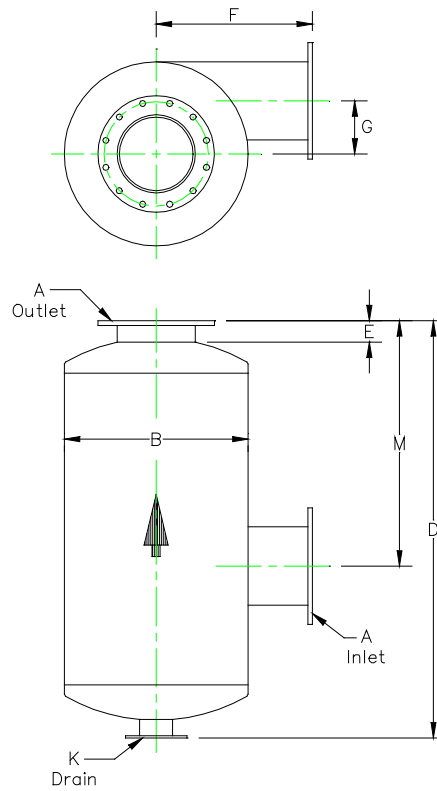


TYPICAL SEPARATION EFFICIENCY



Application:

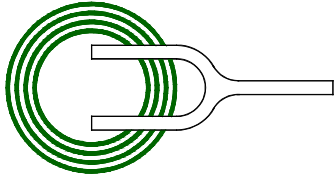
The **VANEC** Model 181 Separator is designed for use on the inlet of liquid sealed, vacuum pumps. It separates the process liquid from the gas stream.



VANEC Model 181

Model	Dimensions in Inches								Est. Wt. Lbs.
	A	B	D	E	F	G	K	M	
181-04	4	12	26	3	11	3 3/4	2	15	60
181-05	5	16	31	3	14 1/4	5 3/16	2 1/2	18	95
181-06	6	18	36	3	15 1/2	5 11/16	3	21	125
181-08	8	22	46	3 1/2	18	6 11/16	3 1/2	27	175
181-10	10	24	58	3 1/2	23	6 5/8	4	34	285
181-12	12	30	68	3 1/2	25 1/2	8 5/8	5	40	460
181-14	14	36	78	3 1/2	28	11	6	46	690
181-16	16	42	88	3 1/2	28	13	6	52	1,045
181-18	18	42	98	3 1/2	30 1/2	12	8	58	1,175
181-20	20	48	108	4 1/2	33	14	8	64	1,500
181-22	22	54	120	4 1/2	35	16	8	71	1,815
181-24	24	60	130	4 1/2	38	18	10	77	2,650
181-26	26	66	140	4 1/2	40 1/2	20	10	83	3,250
181-28	28	72	150	4 1/2	43	22	10	89	3,805
181-30	30	78	160	4 1/2	45 1/2	24	10	95	4,560

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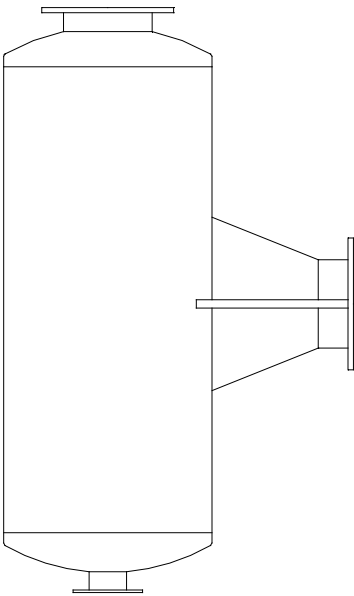
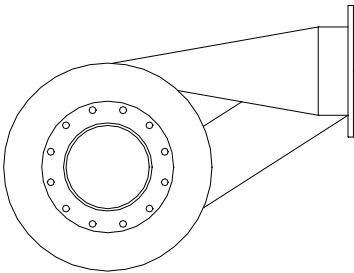
Model 185 Inlet Separator

Standard Features:

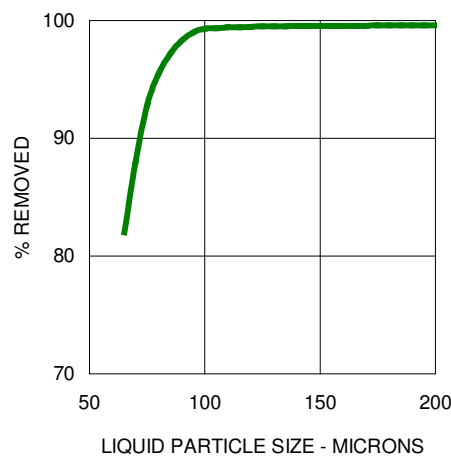
- ✓ All Steel Welded Construction
- ✓ Quality Fabrication Techniques
- ✓ Plate Flanges to Match ASA 125# Flanges
- ✓ Prime Coated Exterior Surfaces

Optional Features:

- ✓ Materials as Specified
- ✓ Finish as Specified
- ✓ Threaded Connections
- ✓ Companion Flanges
- ✓ Inspection Openings or Man Ways
- ✓ Flange Drilling as Specified

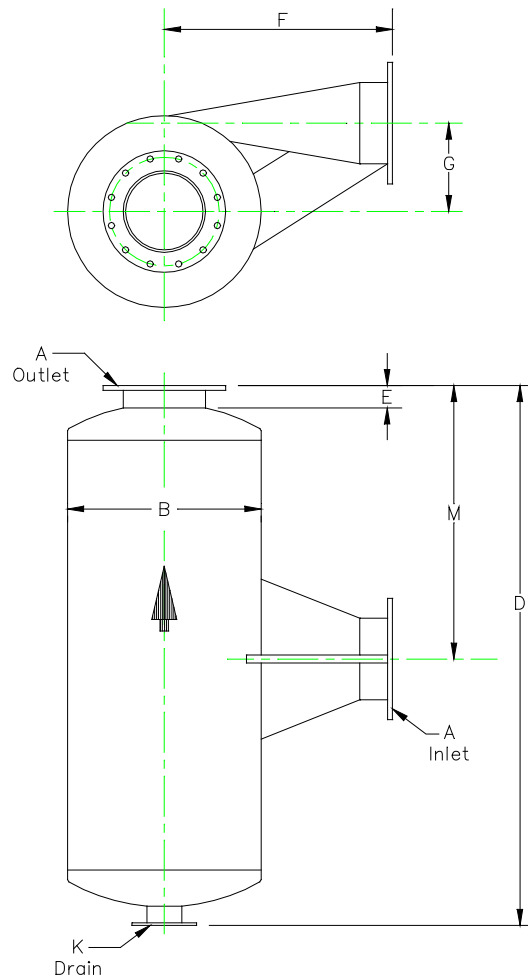


TYPICAL SEPARATION EFFICIENCY



Application:

The **VANEC** Model 185 Separator is designed for use on the inlet of liquid sealed, vacuum pumps. It separates the process liquid from the gas stream.



VANEC Model 185

Model	Dimensions in Inches								Est. Wt. Lbs.
	A	B	D	E	F	G	K	M	
185-04	4	12	52	3	13 1/2	5 5/8	2	19 1/2	100
185-05	5	16	58	3	14 1/2	7 1/8	2 1/2	23 1/2	140
185-06	6	18	66	3	18	8	3	30	190
185-08	8	22	78	3 1/2	22	9 3/4	3 1/2	36	270
185-10	10	24	85	3 1/2	24	10 1/2	4	37	430
185-12	12	30	97	3 1/2	31 1/2	13 1/4	5	45	750
185-14	14	36	105	3 1/2	36 1/2	16	6	47	1,000
185-16	16	42	114	3 1/2	41 1/2	18 9/16	6	50	1,600
185-18	18	42	135	3 1/2	47	18 7/16	8	68	1,900
185-20	20	48	138	4 1/2	52	21 1/8	8	66	2,300
185-22	22	54	149	4 1/2	57	23 7/8	10	70	2,800
185-24	24	60	158	4 1/2	62	26 5/8	10	74	3,750

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