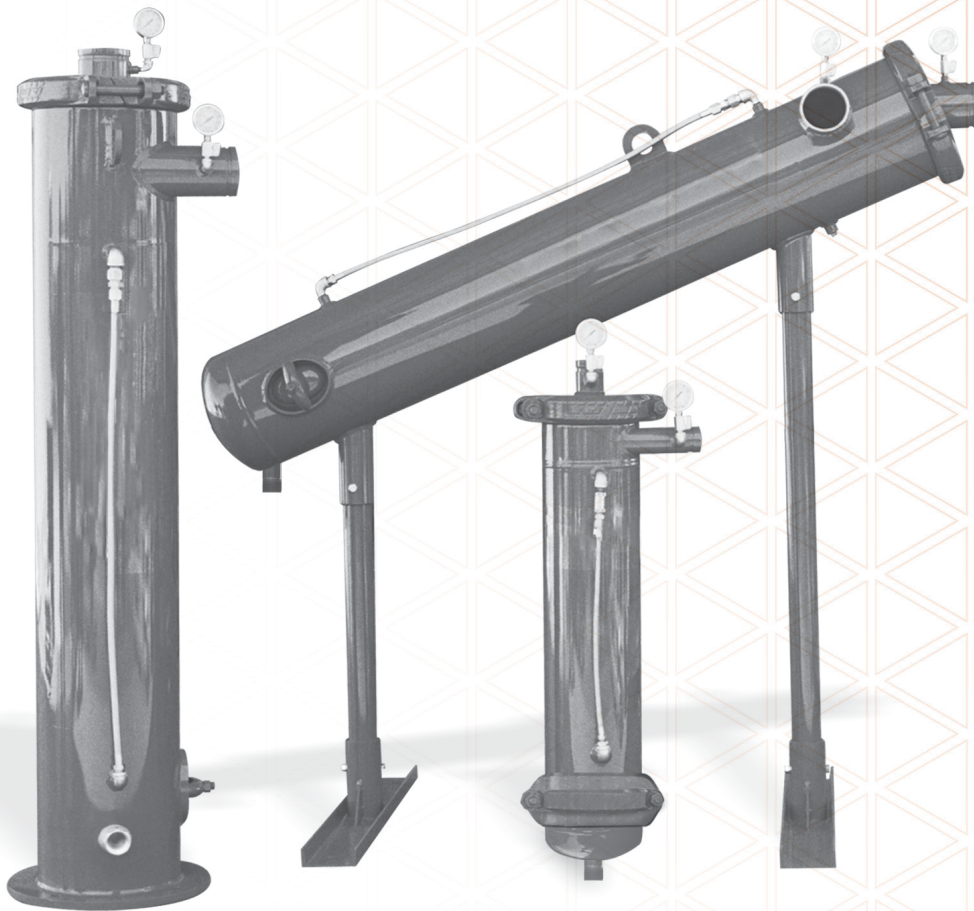


# V-Force™ Solids Separation System

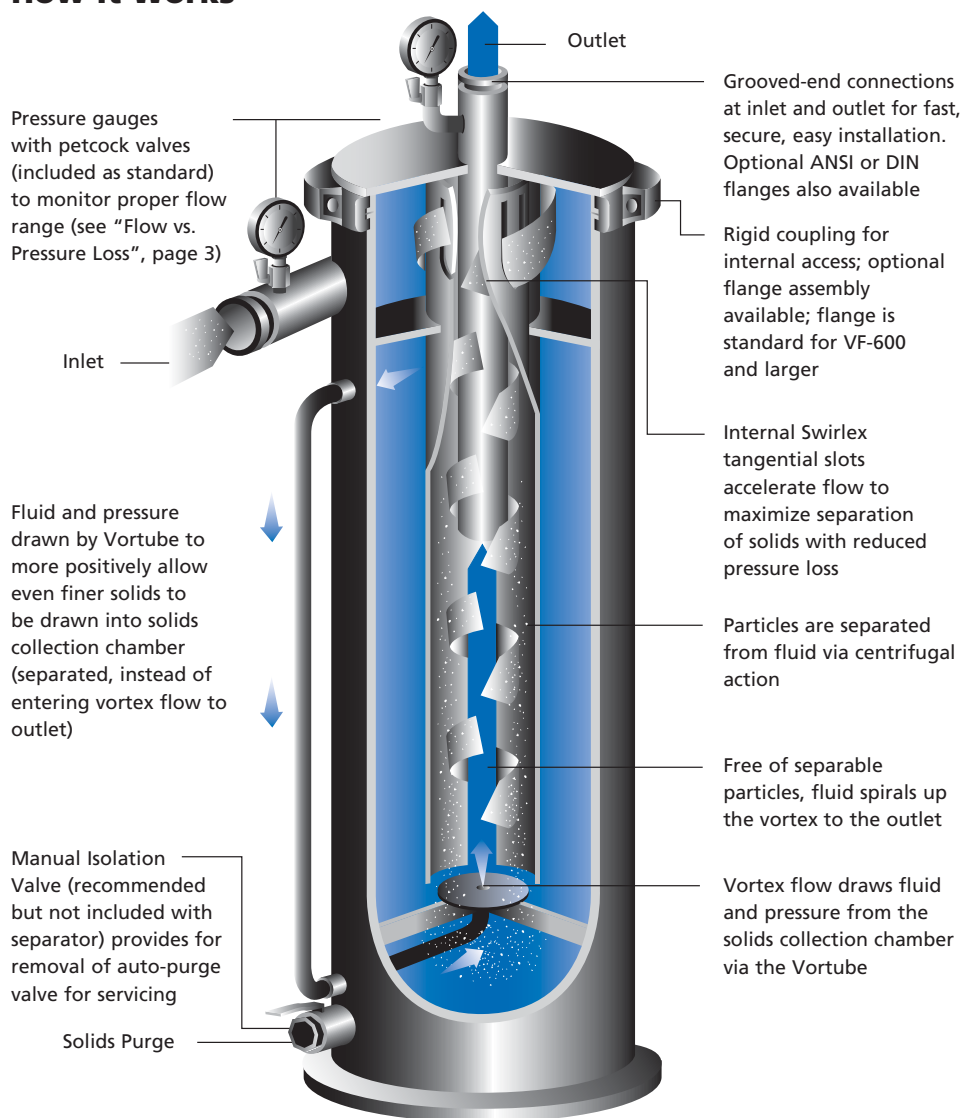


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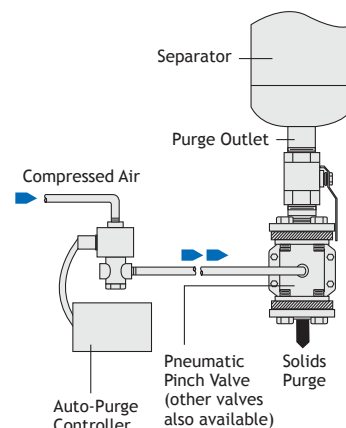
*Exclusive internal acceleration creates maximum performance to achieve maximum protection of fluid handling systems from unwanted solids.*

# V-Force Solids Separation System

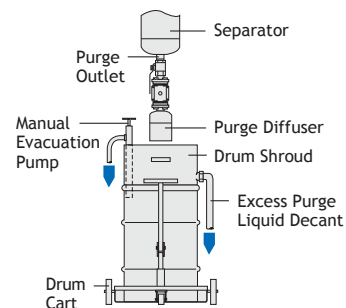
## How It Works



### Automatic Purging



### Solid Handling Options



Systems also available with a tilt-style hopper.

## Overview



### Features

- No moving parts to wear out
- No screen or filter element to clean or replace
- No backwashing water loss
- Low, steady pressure loss
- Continuous, uninterrupted operation



### Benefits

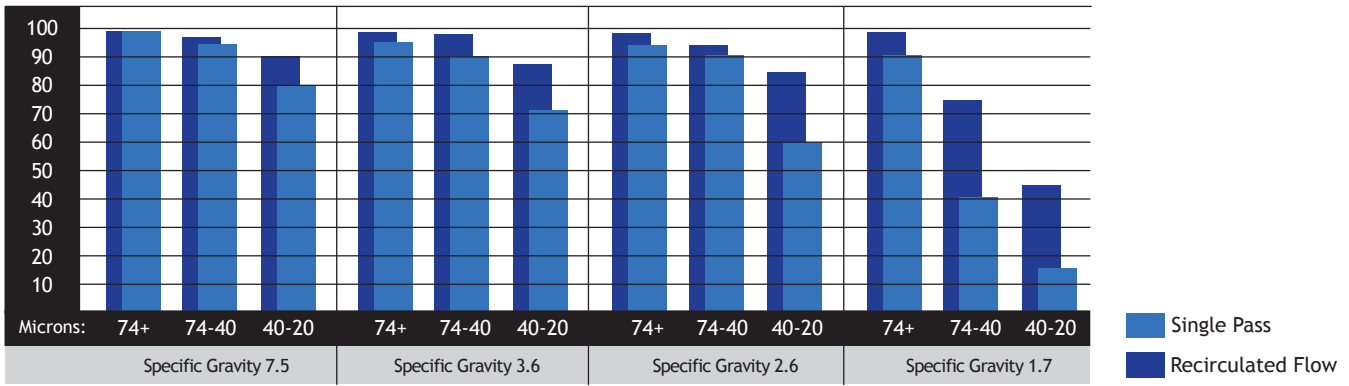
- Low maintenance
- Low operating costs
- Easily handles upsets
- High flow solids separation
- Minimal purge volume
- Quick return on investment



### Applications

- Removal of sand from rivers and lakes
- Cooling towers
- Pump protection
- Steel mill water recycling
- Spray nozzle protection

## Performance

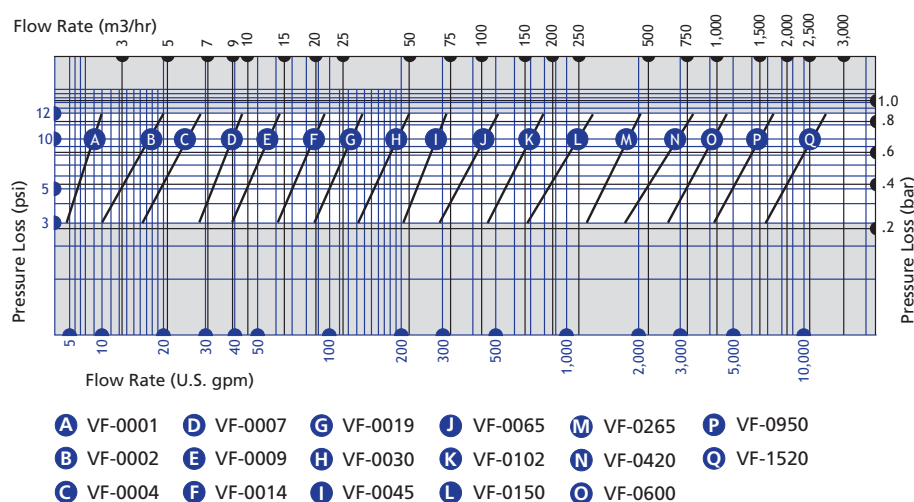


## Carbon Steel Specifications

Model	Flow Range		Inlet/Outlet Size <sup>2</sup>	Connections <sup>3</sup>		Purge Size Male N.P.T.	Collection Chamber Capacity		Weight Empty		Weight with Water	
	U.S. gpm	m <sup>3</sup> /hr		Inlet/Outlet	Top Access		gal	liters	lbs.	kg	lbs.	kg
VF-0001	4-10	1-2.5	1/2" NPT <sup>2</sup>	G	G	1"	0.09	0.3	23	10.4	37	16.8
VF-0002	10-20	2.5-4.5	3/4" NPT <sup>2</sup>	G	G	1"	0.11	0.4	48	21.8	61	27.7
VF-0004	16-30	4-7	1"	G	G	1"	0.15	0.6	53	24.0	68	30.8
VF-0007	28-45	7-10	1-1/4"	G	G	1-1/2"	0.27	1.0	84	38.1	101	45.8
VF-0009	38-65	9-15	1-1/2"	G	G	1-1/2"	0.4	1.5	107	48.5	140	63.5
VF-0014	60-100	14-23	2"	G	G	1-1/2"	0.8	3.0	188	85.3	259	117.5
VF-0019	85-145	19-33	2-1/2"	G	G	1-1/2"	0.8	3.0	229	103.9	313	142.0
VF-0030	130-225	30-51	3"	G	G	1-1/2"	0.8	3.0	241	109.3	329	149.2
VF-0045-L VF-0045-V	200-325	45-74	4"	G G	G G	1-1/2"	1.6 4.4	6.1 16.7	448 384	203.2 174.2	640 605	290.3 274.4
VF-0065-L VF-0065-V	285-525	65-120	4"	G G	G G	1-1/2"	2.1 5.4	7.9 20.5	579 488	262.6 221.4	898 781	407.3 354.3
VF-0102-L VF-0102-V	450-825	102-187	6"	G G	G G	1-1/2"	2.8 6.7	10.6 25.4	763 690	346.1 313.0	1203 1132	545.7 513.5
VF-0150-L VF-0150-V	650-1200	150-275	6"	G G	G G	1-1/2"	4.3 10.4	16.3 39.4	966 921	438.2 417.8	1664 1578	754.8 715.8
VF-0265-L VF-0265-V	1160-2150	265-490	8"	G G	G G	1-1/2"	8.6 20.5	32.6 77.6	1388 1378	629.6 622.3	2704 2627	1226.5 1191.6
VF-0420-L VF-0420-V	1850-3400	420-775	10"	G G	F F	2"	15.0 31.5	56.8 119.2	2141 2255	971.1 1022.9	4008 3977	1818.0 1803.9
VF-0600-L VF-0600-V	2650-4900	600-1115	12"	G G	F F	2"	23.5 51.1	89.0 193.4	3664 3186	1662.0 1445.1	7732 6532	3507.2 2962.9
VF-0950-L VF-0950-V	4200-7800	950-1775	16"	G G	F F	3"	52.2 99.3	197.6 375.9	6024 5761	2732.4 2613.1	13102 12867	5942.9 5836.3
VF-1520-L VF-1520-V	6700-12750	1520-2895	20"	G G	F F	3"	81.0 162.3	306.6 614.4	8476 8092	3844.6 3670.5	19612 19339	8895.8 8772.0

- Models ending with "L" are low profile; "V" for vertical profile
- Inlet/Outlet may also be specified with ANSI flanges or DIN flanges; VF-0004 and VF-0010 are standard male, N.P.T. (BSP or JIS threads available); other models also available with optional threading
- G: grooved-end, F: flange. For stainless steel specifications, including flanges and weights, consult the factory.  
 Maximum pressure rating: 150 psi (10.3 bar); consult factory for higher pressure requirements  
 Pressure loss range: 3 - 12 psi (.2-.8 bar). See chart page 4  
 Maximum temperature rating: 180°F (82.2°C) Consult factory for higher temperatures  
 Maximum particle size: VF-0004 and smaller - .25 inch (6 mm); all other models - .375 inch (9 mm)  
 Material (standard carbon steel): Domes - A-234/516 Gr 70. Outer Barrels and Nozzles - A-53B/106B or equivalent. Flat heads - A-36/516 Gr 70.  
 Paint coating: Acrylic urethane, spray-on royal blue

## Flow vs. Pressure Loss



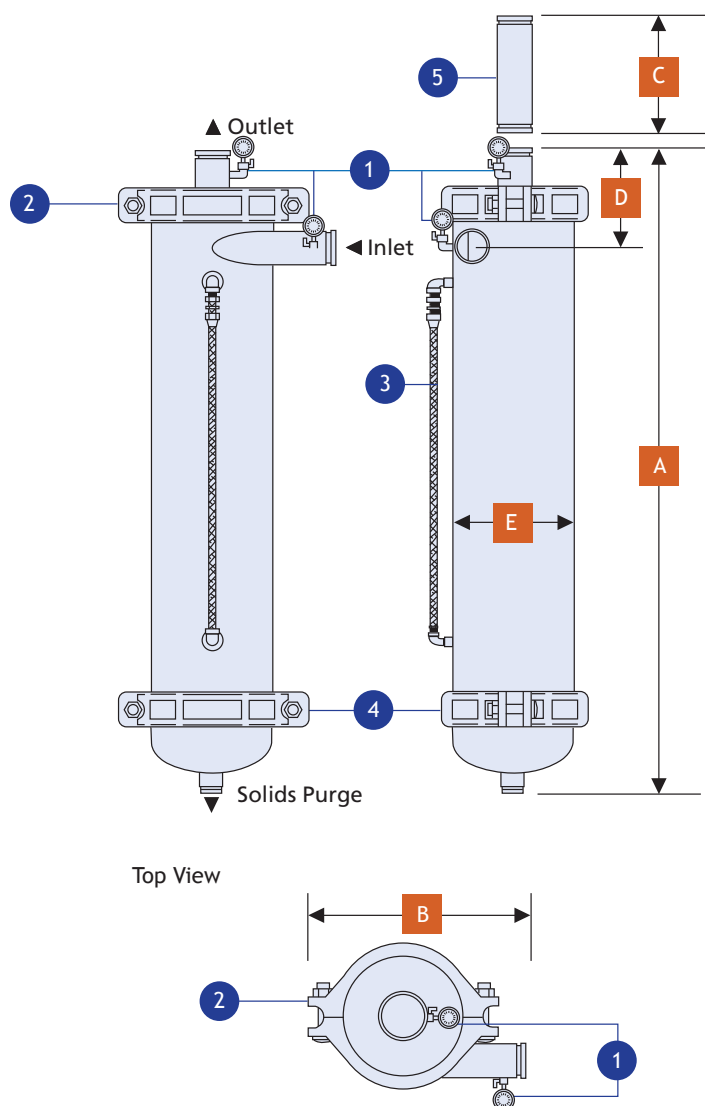
## Installation Instructions

- V-Force Solids Separation Systems are shipped on skids or in wooden crates. Support legs (when applicable) are detached for shipping. A large ring, located on the unit's side or upper chamber, is provided for hoisting as necessary.
- A suitable foundation is necessary to accommodate the V-Force Solids Separation Systems' weight including liquid (see data, page 3). Anchor bolts are recommended in the base of the legs (low profile) or skirt (vertical profile).
- Prior to installation, inspect the inlet/outlet/purge connections for foreign objects incurred during shipping/storage.
- Inlet/outlet pipe connections to the V-Force Solids Separation System should be a straight run of at least five pipe diameters to minimize turbulence and enhance performance. Separator should not support piping.
- Proper purge hardware and/or solids-handling equipment is required to flush separated solids from the separator (see details, page 2).
- All V-Force Solids Separation Systems operate within a prescribed flow range (see data, page 3). Pipe size is not a factor in model selection. Use appropriate hardware to match the inlet/outlet size. Grooved couplings are not included with the separator. Optional flanged connections are available upon request.
- Inlet pressure to the V-Force Solids Separation System must be at least equal to or greater than the anticipated pressure loss through the separator (see data above) plus whatever downstream pressure is required.
- Pressure gauges (provided as standard, with petcock valves) are required at both the inlet and outlet of the separator in order to monitor pressure loss and proper system flow (see chart above). If separator operates with an open discharge, a valve should be installed to create a back pressure of at least 5 psi (.3 bar).
- Winterizing is important if the V-Force Solids Separation System is to remain idle in freezing temperatures. Drain liquid as necessary to avoid expansion of water to ice and related damages.
- See installation manual for additional information of standard units.

## Maintenance

- V-Force Solids Separation Systems must be purged regularly to remove the separated solids from the temporary collection chamber.
- All purge hardware should be installed prior to any elbows or turns in the purge piping. Avoid "uphill" purging, which can clog purge piping and hinder effective solids evacuation.
- For best results, purging is recommended while the unit is in operation, utilizing system pressure to enhance solids evacuation.
- Kadant provides a full selection of rugged, durable automatic purging and solids-handling systems to optimize the performance of your separation system.  
  
**CAUTION:** Economy-type valves typically fail prematurely in the harsh/abrasive environment of solids purging.
- Be sure to install a manual isolation valve (provided with Kadant AutoPurge kits) prior to the automatic valve (available from Kadant at additional cost) in order to facilitate servicing of the automatic valve without system shutdown.
- Internal Access Feature: To inspect or clear an unusual blockage in the upper or lower chamber, interrupt flow to the V-Force Solids Separation System and relieve pressure (via the purge valve). For upper chamber access, remove the spool from the separator's outlet (or, if no spool has been installed, disconnect and remove piping on the outlet) to make space for removing the separator's upper section. Disconnect the rigid coupling or flange and carefully pull out the separator's vortex outlet assembly. Inspect or clean the inlet chamber as necessary. Lubricate the coupling's seal before re-installing the vortex assembly. Re-install piping and gaskets as necessary.

## Low Flow Rates



### 1. Inlet/Outlet Pressure Gauges with Petcock Valves

Included as standard. Install at both inlet and outlet for proper flow verification (see chart page 4)

### 2. Rigid Coupling Connection

Provides for complete access to the upper chamber, acceleration slots and internal separation barrel; 2-piece; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer or White Nitrile

### 3. Vortube

Piping provided by Kadant

### 4. Rigid Coupling Access

Provides full access to collection chamber area for inspection/ serving; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer or White Nitrile

### 5. Connection Spool

When removed, provides space for accessing internals of separator via rigid coupling. Not included with separator, available separately

*Note: These units may also be specified with optional support skirt or legs. Consult factory for details.*

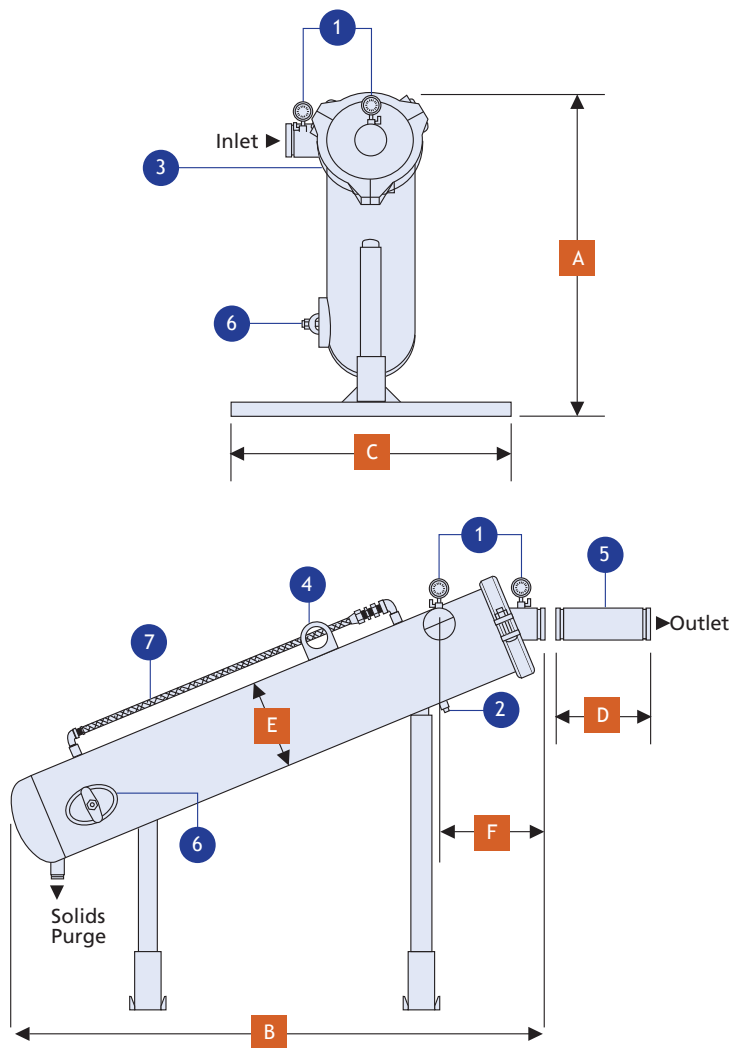
## Dimensions

Model	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
VF-0001	27-9/16	699	7-1/2	191	6	152	7-5/8	194	3-1/2	89
VF-0002	31-13/16	808	8-15/16	227	7	178	7-5/8	194	4-1/2	114
VF-0004	33-1/8	842	6	152	7	178	7-15/16	202	4-1/2	114
VF-0007	36-15/16	938	10-7/8	276	7	178	8-1/16	205	5-9/16	141
VF-0009	39-1/2	1003	11	279	8	203	8-1/8	206	6-5/8	168
VF-0014	48-13/16	1239	14-3/16	360	11	279	8-7/8	225	8-5/8	219
VF-0019	56-5/8	1438	14-3/16	360	15	381	9-5/8	244	8-5/8	219
VF-0030	59-3/4	1518	14-3/16	360	16	406	10-1/2	267	8-5/8	219

*Dimensions for reference only. Consult factory when pre-plumbing.*



## High Flow Rates - Low Profile



### 1. Inlet/Outlet Pressure Gauges with Petcock Valves

Included as standard. Install at both inlet and outlet for proper flow verification (see chart page 4)

### 2. Inspection/Drain Plug

1/2-inch NPT female; provides access to upper chamber for inspection of slot area; also allows for draining the upper chamber if necessary

### 3. Rigid Coupling Connection

Provides for complete access to the upper chamber, acceleration slots and internal separation barrel; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer, Black Neoprene or White Nitrile; model VF-0420 and larger uses flange in carbon steel construction (VF-0102 and larger in stainless steel construction)

### 4. Lifting Ring

For installation purposes

### 5. Connection Spool

When removed, provides space for accessing internal of separator via rigid coupling. Not included with separator, available separately

### 6. Hand-Hole Inspection Port

Provides access to collection chamber; Neoprene gasket

### 7. Vortube

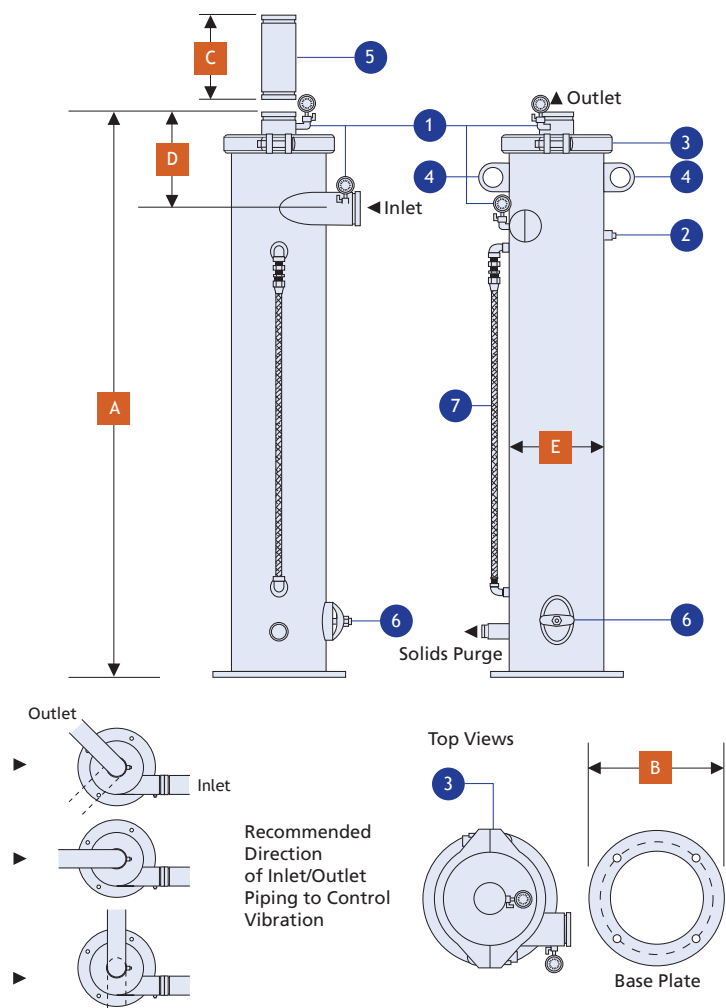
Piping provided by Kadant

## Dimensions

Model	A		B		C		D		E		F	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
VF-0045	71	1803	65-1/4	1657	40	1016	21	533	10-3/4	273	13	330
VF-0065-L	78-1/2	1994	79-5/8	2022	40	1016	21	533	12-3/4	324	15-7/8	403
VF-0102-L	85-11/16	2176	94-5/16	2396	40	1016	24	610	14	356	15-1/4	387
VF-0150-L	92	2337	106-1/8	2696	40	1016	24	610	16	406	17-7/8	453
VF-0265-L	104-3/4	2661	127-3/16	3231	40	1016	30	762	20	508	21-13/16	554
VF-0420-L	113-7/16	2881	150-3/8	3820	40	1016	33	838	24	610	34-1/8	867
VF-0600-L	126-1/2	3213	165-13/16	4212	60	1524	38	965	28	711	37	940
VF-0950-L	149-1/4	3791	208	5283	60	1524	51	1295	36	914	47-5/8	1210
VF-1520-L	168-1/4	4274	244-1/2	6210	60	1524	60	1524	42	1067	53-1/2	1360

Dimensions for reference only. Consult factory when pre-plumbing.

## High Flow Rates - Vertical Profile



### 1. Inlet/Outlet Pressure Gauges with Petcock Valves

Included as standard. Install at both inlet and outlet for proper flow verification (see chart page 4)

### 2. Inspection/Drain Plug

1/2-inch NPT female; provides access to upper chamber for inspection of slot area; also allows for draining the upper chamber if necessary

### 3. Rigid Coupling Connection

Provides for complete access to the upper chamber, acceleration slots and internal separation barrel; standard EPDM gasket - also available in Nitrile, Silicone, Fluoroelastomer, Black Neoprene or White Nitrile; model VF-0402 and larger uses flange in carbon steel construction (VF-0102 and larger in stainless steel construction)

### 4. Lifting Rings

For installation purposes

### 5. Connection Spool

When removed, provides space for accessing internal of separator via rigid coupling. Not included with separator, available separately

### 6. Hand-Hole Inspection Port

Provides access to collection chamber; Neoprene gasket

### 7. Vortube

Piping provided by Kadant

## Dimensions

Model	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
VF-0045-V	73-13/16	1875	16	406	21	533	11-1/2	292	10-3/4	273
VF-0065-V	79-9/16	2021	18	457	21	533	14-3/16	360	12-3/4	324
VF-0102-V	94-5/8	2403	20	508	24	610	13-3/8	340	14	356
VF-0150-V	107-3/8	2727	22	559	24	610	15-3/4	400	16	406
VF-0265-V	128-1/8	3254	26	660	30	762	18-7/8	479	20	508
VF-0420-V	148-5/16	3767	32	813	33	838	28	711	24	610
VF-0600-V	168-3/4	4286	36	914	38	965	31	787	28	711
VF-0950-V	205-3/16	5212	44	1118	51	1295	39-1/8	994	36	914
VF-1520-V	244-3/8	6207	52	1219	60	1524	43	1092	42	1067

Dimensions for reference only. Consult factory when pre-plumbing.

## Multi-Stage Separators

Separators installed in a series (outlet to inlet) will:

- Effectively handle higher solids concentrations
- Improve fine particle removal performance

Combining V-Force Solids Separation Systems in a "Bi-Sep" or "Tri-Sep" configuration, the first-stage separator will always most effectively remove larger solids, which are easily influenced by centrifugal action. Often, it is the larger solids that make up a great percentage of the overall solids volume. When finer, yet separable solids are also present and larger solids have limited the space available on the perimeter of the separation barrel, the second-stage separator then performs to remove even more of the finer solids.

Essentially, removing the larger solids in the first-stage separator effectively reduces the overall solids concentration, allowing the second-stage separator to more easily handle the lower solids concentration and the smaller particles. And, in applications where the particle geometry is flakes, rods and/or irregular shapes, two-stage separators have been utilized to successfully increase overall particle-removal.

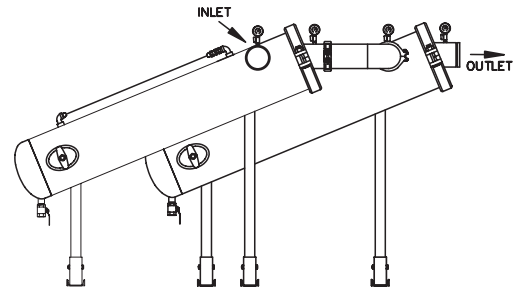
## Annual Transfer Ring

For larger solid particles. Used in applications where fibrous solids require alternative internal acceleration. Available for VF-045 and larger.

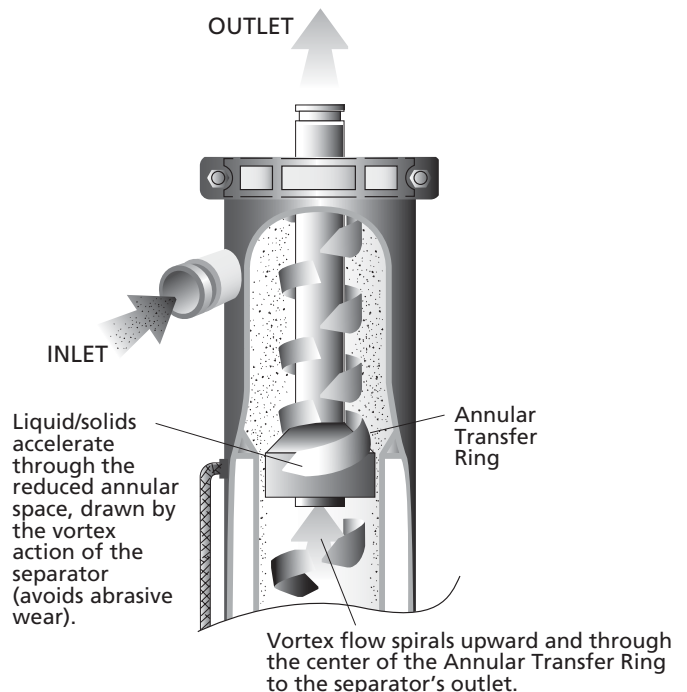
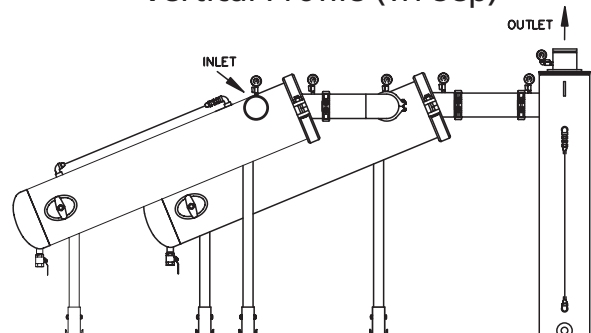
When large or fibrous solids are present, the Annular Transfer Ring offers an alternative means for internal acceleration to achieve maximum centrifugal action performance. The full-around annular open area resists clogging by large or stringy contaminants. The actual particle size that can pass the annual transfer ring will vary with the unit size and ranges from 0.4" on the 4" unit to 2.0" on the 20" design. Contact Kadant for additional details.

The V-Force will typically remove little or no fiber. The design will allow fiber to pass through the unit without getting caught in the Swirlex slot in the V-Force top housing.

VF Low Profile (Bi-Sep)



VF Low Profile and Vertical Profile (Tri-Sep)





# Sample Specifications

## Separator Type & Performance

The removal of specific unwanted solids from a pumped/pressurized fluid flow system shall be accomplished with a centrifugal-action vortex separator. Solids removal efficiency is principally predicated on the difference in specific gravity between the liquid and the solids. Fluid viscosity must be 100 SSU or less.

In a single pass through the separator, given solids with a specific gravity of 2.6 and water at 1.0, performance is predictably 98% of 74 microns and larger. Additionally, particles finer in size, heavier by specific gravity and some lighter by specific gravity will also be removed, resulting in an appreciable aggregate removal of particles (up to 75%) as fine as 5 microns.

In a recirculating system, 98% performance is predictable to as fine as 40 microns (given solids with a specific gravity of 2.6), with correspondingly higher aggregate performance percentages (up to 90%) of solids as fine as 5 microns.

## Performance Requirement

Separator performance must be supported by published independent test results from a recognized and identified test agency. Standard test protocol of upstream injection, downstream capture and separator purge recovery is allowed with 50-200 mesh particles to enable effective, repeatable results. Single-pass test performance must not be less than 95% removal. Model tested must be of the same flow-design series as specified unit.

## Separator Design & Function

A tangential inlet and mutually tangential internal accelerating slots shall be employed to promote the proper velocity necessary for the removal of the separable solids. The internal accelerating slots shall be spiral-cut (Swirllex) for optimum flow transfer, laminar action and particle influence into the separation barrel. The separator's internal vortex shall allow this process to occur without wear to the accelerating slots.

Separated particle matter shall spiral downward along the perimeter of the inner separation barrel, in a manner that does not promote wear of the separation barrel, and into the solids collection chamber, located below the vortex deflector stool.

To insure maximum particle removal characteristics, the separator shall incorporate a vortex-induced pressure relief line (Vortube), drawing specific pressure and fluid from the separator's solids collection chamber via the outlet flow's vortex/venturi effect, thereby efficiently encouraging solids into the collection chamber without requiring a continuous underflow or excessive system fluid loss.

System fluid shall exit the separator by following the center vortex in the separation barrel and spiral upward to the separator outlet.

## Purging (as a specified option)

Evacuation of separated solids shall be accomplished automatically, employing a dedicated solid-state controller in a NEMA 4 housing. Available for worldwide single-phase voltages of 24VAC to 250VAC. Programming options to include a purge frequency range of every 60 seconds to every 23 hours, 59 minutes. Purge duration options range from 2 seconds to 59 minutes, 59 seconds. Non-volatile memory. Meets CSA requirements. This controller shall automatically operate one of the following techniques:

**Motorized Ball Valve** - A full-port, electrically-actuated valve shall be programmed at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. Valve body shall be bronze (optional stainless steel also available). Valve ball shall be stainless steel with teflon seat. Valve size: \_\_\_\_\_

**Pneumatic Pinch Valve** - Compressed air shall be provided to actuate this full-port valve at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. System shall include a pressure regulator for proper modulation of air pressure. Valve liner is natural gum rubber (other liner materials available). Valve size: \_\_\_\_\_

**Pneumatic Ball Valve** - A fail-safe valve shall be programmed at appropriate intervals and duration in order to efficiently and regularly purge solids from the separator's collection chamber. A spring-control shall provide that this full-port valve closes in the event that compressed air or electricity is interrupted. Valve body shall be bronze (optional stainless steel also available). Valve ball shall be stainless steel with teflon seat. Valve size: \_\_\_\_\_

**Purge Liquid Concentrator** - A dual pneumatic pinch valve package shall be employed in order to effectively minimize the fluid loss when purging. The controller shall provide proper sequential valve actuation at appropriate intervals and duration in order to efficiently and regularly evacuate solids from the separator's collection chamber. Liners for the pinch valves shall be

natural gum rubber (optional, at extra cost: neoprene, butyl, buna N and hyponal also may be specified). System shall also include a pressure regulator to modulate air pressure to the valves, a full-size sightglass for inspection of solids accumulation during operation and a manual isolation valve for servicing requirements. Valve size: \_\_\_\_\_

## Solids Handling (as a specified option)

An appropriate solids collection device shall be provided with the separator, suitable for capturing solids and returning all excess purged liquid to system use. Size and type of collection device shall be determined according to the application requirements, selected from the following options (or custom, as specified):

**Solids Collection Drum** - In conjunction with the appropriate automatic purge valve, this package shall be employed to capture and concentrate separated solids (up to 90% solids by volume) from the separator directly into a standard 55-gallon drum, returning excess purged liquid to system use via an integral decant line on the drum shroud. Solids collection capacity: 12,700 cubic inches (200 liters). Package includes two shrouds, two shroud clamps, two drum carts for transporting the drums and a manual liquid evacuation pump. Recommended option: A Purge Diffuser shall be installed on the discharge of the automatic purge valve in order to reduce the velocity of the purge flow and enhance the settling of solids within the drum.

**Solids Collection Hopper** - In conjunction with the appropriate automatic purge valve, a one cubic yard (764 liter) hopper shall be employed to capture and concentrate separated solids (up to 90% by volume) from the separator, returning excess purged liquid to system use via an integral decant line installed directly on the hopper. The hopper shall feature a manually-actuated tilting mechanism for dumping accumulated solids as necessary. Recommended option: A Purge Diffuser shall be installed on the discharge of the automatic purge valve in order to reduce the velocity of the purge flow and enhance the settling of solids within the hopper.

## Systemization (as a specified option)

The separator and its accessories shall be packaged as a complete system, with all componentry from a single source. In addition to the equipment already specified, the system shall also include an appropriate support frame for positioning the separator accurately and effectively for solids purging/handling. Connection spool shall be provided. If the specified purging technique is a pneumatic pinch valve: A spare pinch valve liner shall also be included.

## Separator Details

- A. Inlet & outlet shall be grooved couplings, size: \_\_\_\_\_
- B. Purge outlet shall be threaded with screw-on flange, size: \_\_\_\_\_
- C. The separator shall operate within a flow range of: \_\_\_\_\_
- D. Pressure loss shall be between 3-12 psi (.2 - .8 bar), remaining constant, varying only when the flow rate changes.
- E. Included shall be pressure gauges with petcock valves for both the inlet and outlet of the separator.

## Separator Construction

The separator shall feature the following access capabilities for either inspection or the removal of unusual solids/debris:

- An upper-chamber full-size grooved coupling (flange for VF-0600 and larger), allowing complete access to the inlet chamber, acceleration slots and internal separation barrel
- A hand-hole port at the collection chamber, with Neoprene gasket (low flow rate models to feature full-size coupling at collection chamber)
- An inspection port, located at the lowest point of the upper chamber

The separator shall be of unishell construction with A-36, A-53B or equivalent quality carbon steel, minimum thickness of .25 inches (6mm). Maximum operating pressure shall be 150 psi (10.3 bar), unless specified otherwise.

Paint coating shall be oil-based enamel, spray-on.

As a specified option only: The separator shall be constructed in accordance with the standards of the American Society of Mechanical Engineers (ASME), Section VIII, Division 1 for pressure vessels. Certification shall be confirmed with the registered "U-stamp" on the body of the separator. Weld-on flanges also available.

## Separator Source & Identification

The separator shall be manufactured by Kadant

Specific model designation is: \_\_\_\_\_

# KADANT

[www.kadant.com](http://www.kadant.com)

Kadant is a global supplier of high-value, critical components and engineered systems used in process industries worldwide.

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