

Standard Filter Vessel Installation and Operation Manual (VF & HF)

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WARNING

**DO NOT PRESSURE TEST
THIS VESSEL WITH AIR!**

**PRESSURE TESTING
WITH AIR IS A
HAZARDOUS PROCEDURE!**

**THIS VESSEL IS TO BE PRESSURIZED
ONLY WITH THE LIQUID FOR WHICH IT
IS INTENDED TO BE USED AND ONLY
TO THE MAXIMUM DESIGN PRESSURE
SHOWN ON THE VESSEL NAME PLATE.**

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DISCLAIMER: This generic vessel manual is provided for your information with the understanding that each vessel sent out from Parker AFD is customized for the particular vessel and contains accessory information not included in this document. This document makes references to other pieces of literature, such as schematics and drawings that are added to the manual as needed depending on the vessel parameters.

GENERAL DESCRIPTION

The Parker Velcon system that you have received consists of the vessel, filter elements, and accessory equipment to meet your specific requirements. Descriptive literature covering the accessories is included near the back of this manual.


A Parker Velcon system is specifically designed to remove solid contaminants from the product being filtered. The product enters from the inlet nozzle, rising vertically behind a baffle until it reaches the region above the top of the highest elements. The elements are arranged in vertical stacks rising up from a flat division plate. The fluid enters the outside of each element and flows toward the center of the element. The flow then goes downward to the outlet.

Parker Velcon systems are manufactured to meet a variety of different end uses and specifications. The finest workmanship has gone into the building of this Velcon. It is of no value, however, if elements are improperly installed or the unit is improperly operated. We urge you to read the manual carefully and follow the instructions given.

NOTE	Parker Velcon has qualified the FO-6xxA3 pleated media filter cartridges to EI Specification 1590, "Specifications and Qualification Procedures for Aviation Fuel Microfilters."
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INSTALLATION OF VESSEL

1. Identify the Filter inlet and outlet by the markings provided on the vessel piping. The Filter must be installed in the correct direction of flow to perform properly and to avoid damage to the system.
2. INLET and OUTLET PIPING should be carefully aligned to avoid stressing the Filter connections during installation. Installation of shut-off valves on either side of the Filter is recommended so that it can be independently drained for cartridge change or inspection.

 CAUTION	STEPS 3 AND 4 SHOULD BE PERFORMED BEFORE REMOVING HINGE OR PIVOT MOUNTED COVER TO ENSURE STABILITY OF THE FILTER.
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3. Bolt the filter to a stable base.
4. Carefully install correct gaskets on the inlet and outlet connections and connect to the inlet and outlet piping.
5. Connect any accessories that are not already installed. See Accessory Parts List and literature as required.

6. Cartridges are normally packed separately. Open the vessel cover and install cartridges as explained on page 8 and as per enclosed element stack drawing. Tighten nuts on tie rods until the rubber washers begin to curl. Do not over-torque. sequence.
7. Be sure the cover gasket is in place and properly aligned. Replace cover and secure tightly.

NOTE	FILTERS MUST BE PROVIDED WITH PRESSURE RELIEF VALVES IF THE SYSTEM HAS POSITIVE DISPLACEMENT PUMPS UPSTREAM OR AUTOMATIC SHUT-OFF VALVES DOWNSTREAM OF THE VESSEL.
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START UP PROCEDURE

If the Parker Velcon system has the accessories listed below, they should be placed in the following positions:

1. Manual drain valves closed.
2. Manual air eliminator valve open.
3. The valves in the inlet and outlet piping should be closed.
4. The pressure gauge valve to OFF position. For Filters equipped with selector valves, this is done by turning the handle outward so that the arrow points toward the vessel.

For information on operation of accessories, turn to Accessory Instructions in the back of the manual.

After the valves have been positioned as outlined, the unit is ready to be filled.

The following operating instructions can be used for initial start-up and for subsequent start-ups after installation of replacement elements or servicing of the unit.

1. Start the system pump.
2. Slightly open the inlet valve, allowing the Filter to slowly fill with fluid. (Take about 10 – 15 minutes to fill the vessel to eliminate the possibility of an internal fire.)
3. If the unit is equipped with a manual air eliminator valve, leave the valve cracked open until the fluid flows from the opening; then close quickly.
4. If equipped with an automatic air eliminator, the unit is filled when the air eliminator stops flowing air. When the Velcon Filter is filled with fluid, slowly open the valve on the inlet line, then slowly open the valve on the outlet line.

5. When the unit is in operation, open the pressure gauge, take a differential pressure reading and record the reading. If there is no pressure differential, the system should be shut down and the Filter inspected for broken seals or possibly elements left out. See Differential Pressure Readings on Page 5

OPERATING INFORMATION

Below are the Velcon recommendations for operating procedures. Your Company Maintenance and/or Quality Control procedures may provide alternate instructions on these matters.

1. **FILTER CARTRIDGES** should be changed in accordance with one of the following (whichever comes first):
 - A. When the differential pressure reaches the level specified on the cover page of this manual. For Filters equipped with differential pressure gauges, see paragraph 2 below.
 - B. When the flow rate is reduced to an unacceptable level because the cartridges are plugged with contaminant.
 - C. Whenever effluent product is unacceptably contaminated.
2. **DIFFERENTIAL PRESSURE READINGS** Differential pressure is the difference between the pressure upstream and downstream of the Filter. Differential pressure increases when contaminant is filtered by the filter cartridges and causes flow restriction.

Readings should be taken when the system is flowing at maximum capacity. If the Filter is equipped with a direct reading differential pressure gauge, the reading shown on the gauge is the differential pressure across the Filter.

If the Filter is equipped with a pressure gauge and a selector valve, use the following procedure for determining differential pressure:

- A. Turn the handle one way and record the pressure reading.
- B. Turn the handle the other way (90° or 180°, depending on the type of valve) and record the pressure reading.
- C. Subtract the lower reading from the higher reading to determine differential pressure. (The higher reading is inlet pressure.)

If the filter/separator is equipped with a pressure

gauge and a selector valve, use the following procedure for determining differential pressure:

- A. Turn the handle one way and record the pressure reading.
- B. Turn the handle the other way (90° or 180°, depending on the type of valve) and record the pressure reading.
- C. Subtract the lower reading from the higher reading to determine differential pressure. The higher reading is inlet pressure.

Differential pressure readings should be taken at least once during every operating week and more frequently in high throughput installations or when the differential is increasing rapidly. Records of the differential pressure and throughput should be maintained to determine when cartridges should be changed.

A sudden drop in pressure differential is an indication of a possible problem. Check first to be sure that readings were taken at equivalent flow rates. If so, shut the system down, open the Filter, and inspect for the following:

- A. Collapsed or ruptured cartridges caused by severe pressure differential or shocks in excess of design limits.
- B. Ruptured seals. Check to see that all O-ring seals and gaskets seals are in place and have the same alignment as when the elements and parts were installed.
- C. Broken end plates. Inspect all of the end plates of the elements.
- D. If any of the above are observed, check the system for possible hydraulic shock conditions. If the system is not provided with adequate surge controls, the sudden start-up of a high-pressure pump can create extremely high shock

CARTRIDGE CHANGE OR INSPECTION PROCEDURE

- A. Shut off the pump.
- B. Close the inlet and outlet pipe valves.
- C. Open the drain valves and remove the product from the Filter.
- D. Open the manual air eliminator valve. This will permit the unit to drain faster.

- E. Open the cover and inspect the cover gasket – replace the gasket if it is damaged.
- F. Completely drain filter chamber.
- G. Remove spent cartridges for cartridge change.
- H. Wipe off or wash down any foreign matter from the vessel interior.
- I. Install the cartridges in accordance with instructions on page 8.
- J. Tighten nuts on tie rods until the rubber washers begin to curl. Do not over-torque.
- K. Check the cover gasket for alignment, replace the cover and secure tightly. The Filter is now ready for the start-up procedure. SUMP CHECKS

NOTE	USE ONLY PARKER VELCON CARTRIDGES IN THIS FILTER. PARKER CANNOT WARRANT PERFORMANCE IF ANY OTHER MANUFACTURER'S CARTRIDGES ARE USED.
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To reorder cartridges and replacement parts or to obtain further information, contact your Parker AFD representative:

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Installation Instructions

Installation Instruction for Open-End Filter Cartridges

1. Turn off pump. Close inlet and outlet valves and open drain valve. Open the air eliminator or manual bleed valve and drain the vessel.
2. Open vessel after making sure the vessel is completely drained.
3. Jack-up head and swing aside. Remove the spider (if installed). Remove nuts and washers, endcaps, old cartridges, and center plates, if any.
4. Wipe vessel clean whenever possible or flush.
5. Place cartridge over the center rod making sure the cartridge is centered over the guide bar or mounting adapter attached to the deck plate. The cartridge must be seated flat against the adapter or deck plate.
6. For vessels with stacked cartridges, place the first tier of filter cartridges in position at all bulkhead ports (per step 6). Insert center plate onto center rod and insert into each cartridge. Next, install the second tier of cartridges over the center plates. There must always be a center plate between every two stacked cartridges. Be sure the circular guide on both sides of the center plate projects into each cartridge.
7. When all cartridges are loaded, insert sealing cap over center rod.
8. Install rubber washer, flat washer, lock washer, and nut in that order, onto each center rod. Tighten to 4 to 5 foot pounds of torque. (DO NOT TOUCH THE OUTER FILTER MEDIA.)
9. Replace the spider as follows (if spider is not included proceed to step #10):
 - Install the flat washer over each cartridge end and install the spider over the ends of the cartridges.
 - Affix the spider to the threaded clips on the vessel walls using the nut and lockwasher.
 - Adjust the spider clip nuts, so the spider lies flat on the ends of the cartridges
 - Install the washer and nut over the ends of the cartridges, to affix the spider to the cartridge ends. Snug the nuts. DO NOT TIGHTEN YET.
 - Adjust the ends of each cartridge to create even separation between the cartridges and between the cartridge and vessel wall. Cartridges should NOT be touching each other, nor touching the vessel wall. The ends of the cartridges can be shifted within the spider plate holes as follows:

Cartridge Length	Shift Within the Spider Hole	
Greater than 33"	Full movement within the spider hole	
30"	Less than 5/8"	(16 mm)
28"	Less than 9/16"	(14 mm)
24"	Less than 1/2"	(12 mm)
22"	Less than 1/2"	(12 mm)
20"	Less than 3/8"	(10 mm)
18"	Less than 3/8"	(10 mm)
16"	Less than 1/4"	(8 mm)
14"	Less than 1/4"	(6 mm)
11"	Less than 1/4"	(5 mm)
9"	Less than 3/16"	(5 mm)

- When the cartridges are spaced properly, tighten the spider nuts to 5 ft-lbs.
10. Inspect the cover gasket and replace it if necessary. Tighten the cover securely in a cross-pattern process.
 11. Close the drain valve and start the system pump.
 12. With the outlet valve closed, slightly open the inlet valve and allow the vessel to fill SLOWLY with fuel until the air eliminator closes or fluid begins to flow from the manual air vent. Close the vent valve. Fully open the inlet valve.
 13. Open the outlet valve SLOWLY.
 14. When the unit is operating, check the differential pressure across the cartridges. There should be indication of positive pressure, normally 1-5 psid. This insures that all seals have been properly made during the installation.

OPERATING PROCEDURES

Velcon Recommended Cartridge Changeout (also reference your company guidelines):

- 1 year or 15 psid for **AVIATION APPLICATIONS**
- 3 years or 25 psid for **NON-AVIATION APPLICATIONS** whichever occurs first (**INSPECT VESSEL ANNUALLY**)

Torque Requirements for Vessels with “O-Ring Closure”

Bolted pressure vessel closures operate on the premise that the joint is clamped closed with a force sufficient to resist the internal pressure yet still maintain a seal. The clamping force, or pre-load, is applied by the closure bolts and its magnitude is controlled by the torque applied. Application of the correct preload is essential to maintaining a positive seal and avoiding closure failures from fatigue or overstressed vessel components.

The short term, and most obvious effect of grossly under-torqued bolts is insufficient clamping force resulting in a leaking closure. A more ominous result of under-torqued bolts in systems which see a great number of pressure cycles (such as refuelers, loading racks etc.), is bolt fatigue failure. Repeated applications of stress to the bolt eventually create a small crack at the surface of the bolt which continues to grow until the bolt breaks and the closure fails.

It is a good idea to re-torque the closure bolts after they have been in use for a month or so to ensure the joint has not “relaxed” and the preload reduced.

Over-torquing closure bolts will result in breaking or bending vessel bolt clips or actually breaking the bolt itself. Table One lists guideline torque values for lubricated bolts for common sizes used for vessel closures. Always use lubricated bolts, as this reduces the required torque, improves torque accuracy, and retards corrosion.

A common cause of inaccurate bolt torque is inappropriate bolt torquing procedures. Key elements to the procedure are application of the torque in stages and in a specific cross-torquing sequence. For most applications, torque is applied to all bolts to 30% of full torque, then to all bolts to 60% of full torque, and finally to all bolts to 100% of full torque. Each torquing cycle is carried out in the applicable cross-torquing sequence. Torquing sequences vary with the number of bolts on the cover.

The tightening pattern is as follows: Tighten two bolts diametrically opposite from each other, then tighten a second pair of bolts diametrically opposite each other, approximately 90 degrees away from the first pair, and so on until all bolts have been tightened.

Using a clock as an example, the sequence would be: 12 - 6, 9 - 3, 11 - 5, 10 - 4, 7 - 1, and 8 - 2.

On large vessels, the cross-torquing process is tedious but the addition of a second operator applying torque improves the situation vastly.

Correct closure torquing will result in many years of trouble-

free vessel operation. Occasional inspections for bolt cracks or clip damage is good practice to detect possible closure problems before they occur.

TABLE ONE*

Bolt Diameter mm (in.)	Recommended Torque m-kgs (ft-lb)
13 (1/2)	3 (20)
19 (3/4)	6 (45)
25 (1)	14 (100)
32 (1-1/4)	22 (160)
38 (1-1/2)	36 (260)

**NOTE: These recommended torque values are only for vessels with an O-Ring closure.*

Installation of Tie Rods

REFERENCE MATERIAL

Form 1801- "Assembly Torque Recommendations"

VESSELS WITH TIE RODS

- Filter vessels
- Clay vessels
- Monitor vessels containing 6" Aquacon® cartridges
- Filter/separator vessels (for coalescer and separators)

HARDWARE

- Tie rods
- Hardware (nuts, flat washers, lock washers, seal nuts)
- Cartridges
- Mounting adapters
- Center spacers
- End caps

MOUNTING CONFIGURATIONS

- With spider
- Without spider
- With seal nut

VERTICAL OR HORIZONTAL OPEN ENDED CARTRIDGES WITH SPIDER PLATE:

1. Screw a nut on one end of the tie rod to about 2" from the end (see note on bottom of page 2).
2. Slide a lock washer up against the nut on the short-ened side of the tie rod.
3. Slide a mounting adapter (on vessels with integral cast-in or welded-in mounting adapters, no additional adapter is required) on the short side of the tie rod with the cartridge seal side facing the nut and washer.
4. While holding the mounting adapter on the end of the rod, screw the short end of the tie rod into the tie rod bar on the vessel. Screw in about one inch.
5. Install a cartridge over the tie rod and into place on the mounting adapter.
6. If cartridges are stacked, install center spacers between cartridges.

7. Place an end seal plate on the top or end of the cartridge (or cartridge stack) with the tie rod extending out from the end seal plate tie rod hole.
8. Adjust the tie rod by screwing it in or out until the amount extending beyond the end cap is 1-5/8". Remove the cartridges, spacers, and caps.
9. Screw the nut at the end of the tie rod down against the mounting adapter while preventing the tie rod from turning.
10. Tighten the nut to 5 foot pounds of torque.
11. Install the other tie rods so that they extend out from the mounting adapters the same length as the first rod.

VERTICAL OR HORIZONTAL OPEN ENDED CARTRIDGES WITH NO SPIDER PLATE:

1. Screw a nut on one end of the tie rod to about 2" from the end. (See note below.)
2. Slide a lock washer up against the nut on the short-ened side of the tie rod.
3. Slide a mounting adapter (on vessels with integral cast-in or welded-in mounting adapters, no additional adapter is required) on the short side of the tie rod with the cartridge seal side facing the nut and washer.
4. While holding the mounting adapter on the end of the rod, screw the short end of the tie rod into the tie rod bar on the vessel. Screw in about one inch.
5. Install a cartridge over the tie rod and into place on the mounting adapter.
6. If cartridges are stacked, install center spacers between cartridges.
7. Place an end seal plate on the top or end of the cartridge (or cartridge stack) with the tie rod extending out from the end seal plate tie rod hole.
8. Adjust the tie rod by screwing it in or out until the amount extending beyond the end seal plate is one (1) inch.
9. Remove the cartridges, spacers, and seal plates.

10. Screw the nut at the end of the tie rod down against the mounting adapter while preventing the tie rod from turning.
11. Tighten the nut to 5 foot pounds of torque.
12. Install the other tie rods so that they extend out from the mounting adapters the same length as the first rod.

SEPARATOR WITH SEAL NUT (WITH OR WITHOUT SPIDER PLATE):

1. Screw a nut on one end of the tie rod to about 2" from the end. (See note below.)
2. Slide a lock washer up against the nut on the shortened side of the tie rod.
3. Slide a mounting adapter (on vessels with integral cast-in or welded-in mounting adapters, no additional adapter is required) on the short side of the tie rod with the cartridge seal side facing the nut and washer.
4. While holding the mounting adapter on the end of the rod, screw the short end of the tie rod into the tie rod bar on the vessel. Screw in about one inch.
5. Install a separator over the tie rod and into place on the mounting adapter so the tie rod extends from the end seal cap tie rod hole.
6. On double open ended separators, place an end seal plate on the top or end of the separator, with the tie rod extending out from the end seal plate tie rod hole.
7. Adjust the tie rod by screwing it in or out until the amount extending beyond the end seal plate is one (1) inch.
8. Remove the cartridges, spacers, and seal plates.
9. Screw the nut at the end of the tie rod down against the mounting adapter while preventing the tie rod from turning.
10. Tighten the nut to 5 foot pounds of torque.
11. Install the other tie rods so that they extend out from the mounting adapters the same length as the first rod.

NOTE	<ol style="list-style-type: none"> 1. In AHM06xxx, AVM06xxx, HM06xxx, and VM06xxx Aquacon® vessels, the nut should be screwed on to the tie rod to about 4" from the end instead of 2". 2. In three stage HVM-xxxx filter/separator vessels, the nut on the separator tie rods should be screwed on to the tie rod to about 4" from the end instead of 2".
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