

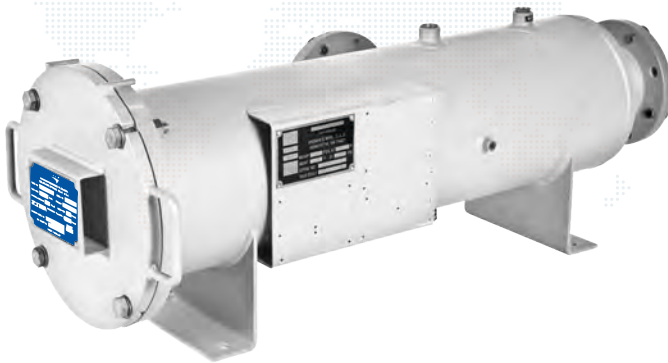


VEL2201 04/14

Velcon Filtration Division

Effective: April 2014

Monitor Vessel Installation and Operation Manual



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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 Velcon 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 Velcon Monitor Vessel that you have received consists of the vessel, monitor cartridge cartridges and accessory equipment to meet your specific requirements. Descriptive literature covering the accessories is included elsewhere in this manual.


A Parker Velcon Monitor Vessel is designed to house CDF® Monitor cartridges. The cartridges are mounted on a flat deck plate. The product being filtered enters through the inlet nozzle. The flow of the product is from outside to inside the cartridges.

CDF® Monitor Cartridges

These cartridges absorb water and filter solids from avgas and jet fuel. They remove particles down to 1 micron and provide protection against water slug transmission by restricting fuel flow when saturated. The cartridges are tested and qualified to EI 1583 6th Edition.

PLEASE NOTE: If interlock is present on the housing, please refer also to “Monitor Interlock Operating Principle” data sheet #1882 in Appendix B.

**FULLY QUALIFIED TO EI 1583
FOR MONITOR VESSELS**

 CAUTION	<p>DO NOT USE WATER ABSORBIN CARTRIDGES WITH PRE-MIXED FUEL CONTAINING ANTI-ICING ADDITIVES.</p>
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INSTALLATION OF VESSEL

1. Identify the vessel inlet and outlet by the markings provided on the vessel piping. The vessel must be installed in the correct direction of flow for the filters to function properly and to avoid damage to the system.
2. Inlet and outlet piping should be carefully aligned to avoid stressing the vessel connections during installation. Installation of valves on either side of the vessel is recommended so that it can be independently drained for cartridge change or inspection.
3. Bolt the vessel in place so that it is secure and stable.
4. Carefully install correct gaskets on the inlet and outlet and connect to the inlet and outlet piping.
5. Connect any accessories that are not already installed. See Parts List and literature as required.

6. Cartridges are normally packed separately. Open the vessel cover and install cartridges by inserting the snout ends into the deckplate holes. Seat each cartridge firmly by giving it a slight twisting motion while pushing it into the hole.
7. Install the spider assembly over the top ends of the cartridges as shown on the general outline drawing at the back of the manual. Tighten the spider hold down nuts snugly, but do not over-torque. Over-torquing could result in bent or damaged cartridges.
8. Be sure the cover gasket is in place and properly aligned. Replace cover and secure tightly.

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

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

9. Manual drain valves closed.
10. Manual air eliminator valve open.
11. The inlet and outlet pipe valves closed.
12. The pressure gauge valve to OFF position. For vessels 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 cartridges or servicing of the unit:

1. Start the system pump.
2. Slightly open the inlet valve, allowing the vessel to slowly fill with fluid.
3. If the unit is equipped with a manual air eliminator valve, leave the valve open until the fluid flows from the opening; then close. If equipped with an automatic air eliminator, the unit is filled when the eliminator stops flowing air.

4. When the Velcon Vessel is filled with fluid, slowly open the valve on the outlet line. Then slowly open the inlet valve fully.
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 vessel inspected for broken seals or possible cartridges left out. See Differential Pressure Readings below.

OPERATING INFORMATION

1. (Your Company Maintenance and/or Quality Control procedures may provide alternate instructions on these matters.) Velcon recommends the operating procedures and changeout as outlined in "Operation of Vessels Containing Water Absorbing Cartridges for Aviation Fuel (ACO/ACI/CDF®)" Form #1839 included elsewhere in this manual, and is also supplied with each cartridge shipment.
2. **DIFFERENTIAL PRESSURE READINGS.** Differential pressure is the difference between the pressure upstream and downstream of the vessel. Differential pressure (DP) increases when contaminant or water is filtered by the monitor cartridges and causes flow restrictions. If operating at less than rated flow, record DP and flow rate, then calculate corrected DP at rated flow rate (using Velcon's Cartridge Changeout Curve Label – Form 1846), also included elsewhere in this manual.

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

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

- A. Turn the handle to the outlet side so that the arrow points toward the inlet. Record gauge reading as "Inlet Pressure."
- B. Turn handle toward the inlet side so that arrow points toward the outlet. Record gauge reading as "Outlet Pressure."
- C. Subtract outlet pressure from inlet pressure to determine differential pressure.
- D. Turn handle outward so that arrow points toward vessel which is the "OFF" position. **To avoid damage to the pressure gauge, leave**

the handle in the "OFF" position when readings are not being taken.

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 the readings were taken at equivalent flow rates. If so, shut the system down, open the vessel, 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 are in place and have the same alignment as when the cartridges and parts were installed.
- C. If either 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 loads that may exceed the design of these components.

CARTRIDGE CHANGE OR INSPECTION PROCEDURE

1. Shut off the pump.
2. Close the inlet and outlet pipe valves.
3. Open drain valves and remove product from the vessel.
4. Open the manual air eliminator valve. This will permit the unit to drain faster.
5. Open cover and inspect cover gasket – replace gasket if it is damaged.
6. Remove spent cartridges for cartridge change.
7. Wipe off or wash down any foreign matter from the vessel interior.
8. Install cartridges in all mounting holes. Use a slight twisting motion while pushing each cartridge into place.
9. Install the spider assembly over the top ends of the

cartridges as shown on the spider schematic at the back of the manual. Tighten the spider holding down nuts snugly, but do not over-torque. Over-torquing could result in bent or damaged cartridges.

- 10. Check cover gasket for alignment, replace cover and secure tightly. The vessel is now ready for the start-up procedure

To reorder cartridges and replacement parts or to obtain further information contact Parker Velcon or your authorized representative

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SUMP CHECKS

Whether or not the vessel is equipped with an automatic drain valve*, the sump should be manually drained on a regular basis to remove any collected water. This should be done at least once each operating day and more often if required to prevent water carryover. Aircraft Fueling Regulations will govern the frequency of sump checks for into-aircraft equipment.

Draining or sump sampling should preferably be done during flow though the vessel, or at least when the vessel is pressurized. This will provide velocity to remove collected water from any flat surfaces to the drain valve, and will also prevent air from entering the vessel. Carefully open the drain valve as far as possible without causing spillage. Drain off into a white bucket until all water is removed. Even small quantities of water should be kept drained from kerosene or diesel products to prevent microbial growth at the fuel/water interface.

NOTE	<p>VELCON DOES NOT RECOMMEND, WARRANTEE, OR SELL AUTOMATIC DRAIN VALVES. They do not completely drain the water from the sump and they malfunction too often resulting in costly fuel spills and subsequent environmental problems.</p> <p>USE ONLY VELCON FILTERS INC. CARTRIDGES IN THIS VESSEL. VELCON CANNOT WARRANT PERFORMANCE IF ANY OTHER MANUFACTURER'S CARTRIDGES ARE USED.</p>
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Installation Instructions

**CAUTION: DO NOT USE WITH PRE-MIXED JET FUEL
CONTAINING ANTI-ICING ADDITIVES
(Di-EGME, FSII, Fizzy®, Prist®)**

CDF® SERIES CARTRIDGES

1. Stop the pump and close valves in inlet and outlet piping to isolate housing.
2. Open bottom drain valve(s) and top air vent to drain product from housing.
3. Open cover and inspect cover gasket. Replace gasket if it is damaged.
4. Remove spider and used cartridges.
5. Clean any foreign matter from the interior of the vessel.
6. Remove the new cartridges from their poly-bags - handle by endcaps only.
7. Lubricate the o-ring end of each filter with clean fuel to help ensure a smooth, secure fit into the deckplate. Gently push new cartridges into housing with a twisting motion so that the o-ring seal seats inside the outlet orifice. Push the cartridge in until the plastic shoulder is flush against the cartridge mounting plate or deckplate of the housing.
8. Reinstall the spider.
9. NOTE: The retaining spiders in most multi-cartridge housings do not insure that the cartridges are seated. Check each cartridge to insure that it is firmly seated against the deckplate before securing the spider. Torque the spider only **HAND-TIGHT. DO NOT OVER-TORQUE** the spider.
10. Replace the cover and close the bottom drain valve(s).
11. Start the system pump.
12. Slightly open the inlet valve, allowing the housing to slowly fill with fluid.
13. If the unit is equipped with a manual air vent valve, leave the valve cracked open until fluid flows from the opening; then close quickly. If equipped with an automatic air eliminator, the unit is filled when the eliminator stops flowing air.
14. When the vessel is filled with fluid, fully open the inlet valve and then **SLOWLY** open the outlet valve.
15. After changing cartridges circulate flow through vessel for at least 3 minutes. Return fuel to storage. Use millipores to check for fibers and also check hose end strainers. Remove any debris that may be present.

OPERATING PROCEDURES

Please refer to Operating Procedures for Water Absorbing Cartridges, Velcon PN 09-923, Form 1839

(Also refer to your company guidelines)

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 (<i>in.</i>)	Recommended Torque m-kgs (<i>ft-lb</i>)
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.

Operation of Vessels Containing Water Absorbing Cartridges (ACO/ACI/CDF®) for Aviation Fuel

NOTE	If pump discharge pressure can exceed 25 psi, do not use this cartridge unless pressure gauges are installed to measure the differential pressure. For ALL systems, differential pressure gauges are strongly recommended, along with daily monitoring of dP. If the gauges cannot be observed easily during flow, an electronic monitoring method, with flow shutdown capability, is recommended.
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NOTE	Always ensure that the vessel and drain plug are properly grounded. If the Aquacon® cartridge (ACO-xxxxx) is used in a VF-31E, VF-61, VF-61E, or VF-609 or similar sized housings, please refer to the instructions for the housings in which cartridges are installed for more information.
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Contact Parker Velcon for more information.

Recommended procedures* to follow with water absorbing cartridges in a vessel:

1. Quality Control Checks.

Reinforce quality control checks and diligently conduct water removal procedures at all locations in the fuel distribution system. This includes daily draining of all sumps, low points, and dead legs in the piping system.

2. Monitor dP Daily.

If operating at reduced flow, record differential pressure and flow rate and calculate normalized differential pressure. (See page 9). **Change ACO, ACI, & CDF® cartridges when normalized differential pressure reaches 25 psid**. Replace all cartridges if the normalized differential pressure has dropped 5 psid below the previous reading.**

3. Check for Free Water Content.

Sample fuel and check for free water content using the Velcon Hydrokit® or other chemical method in accordance with your company's fuel handling procedures. Replace cartridges if the water content exceeds your company guidelines.

4. EI Monitor Spec. 1583.

In converted filter/separator vessels where the deck-plate or manifold strength does not meet the 15 bar

(220 psi) strength required by the EI Monitor Spec. 1583, a differential pressure limiting device, set from 25-30 psid, should be installed across the vessel.

5. Spare Water Absorbing Cartridge.

Have a spare set of water absorbing cartridges on hand, or available at a nearby Velcon Distributor, for the unexpected plug-up.

6. Confirm dP if Operating below 50%.

If fueling unit is operating consistently below 50% of rated flow then periodically check fueling unit at test stand and check DP at flow rate of 50% or higher and confirm corrected DP.

7. Check for Fibers and Hose End Strainers.

After changing cartridges circulate flow through vessel for at least 3 minutes, use millipores to check for fibers and also check hose end strainers.

8. Cartridge Restricting Flow.

As the cartridges begin to restrict the flow due to a water slug, ALL upstream and downstream piping should be checked and purged before resuming operations with a new set of cartridges. Any aircraft involved in fueling when the flow through a cartridge is restricted, should also be checked for the possibility of water reaching the aircraft. Check the tank to determine where the excess water came from, and purge the tank of any water before resuming operation.

9. Cartridges should not be dried and re-used.

When water saturated media is dried, it may shrink and crack, leading to possible internal bypass.

*Please also check with your company's fuel handling guidelines and operating procedures.

**ATA 103 compliance now requires 15 psid normalized differential pressure changeout.

SERVICE LIFE

Service life for all water absorbing cartridges, including two (2), five (5) and six (6) inch diameter cartridges, should be one (1) year, unless stated otherwise by your company's fuel handling procedures.

*****CAUTION*****

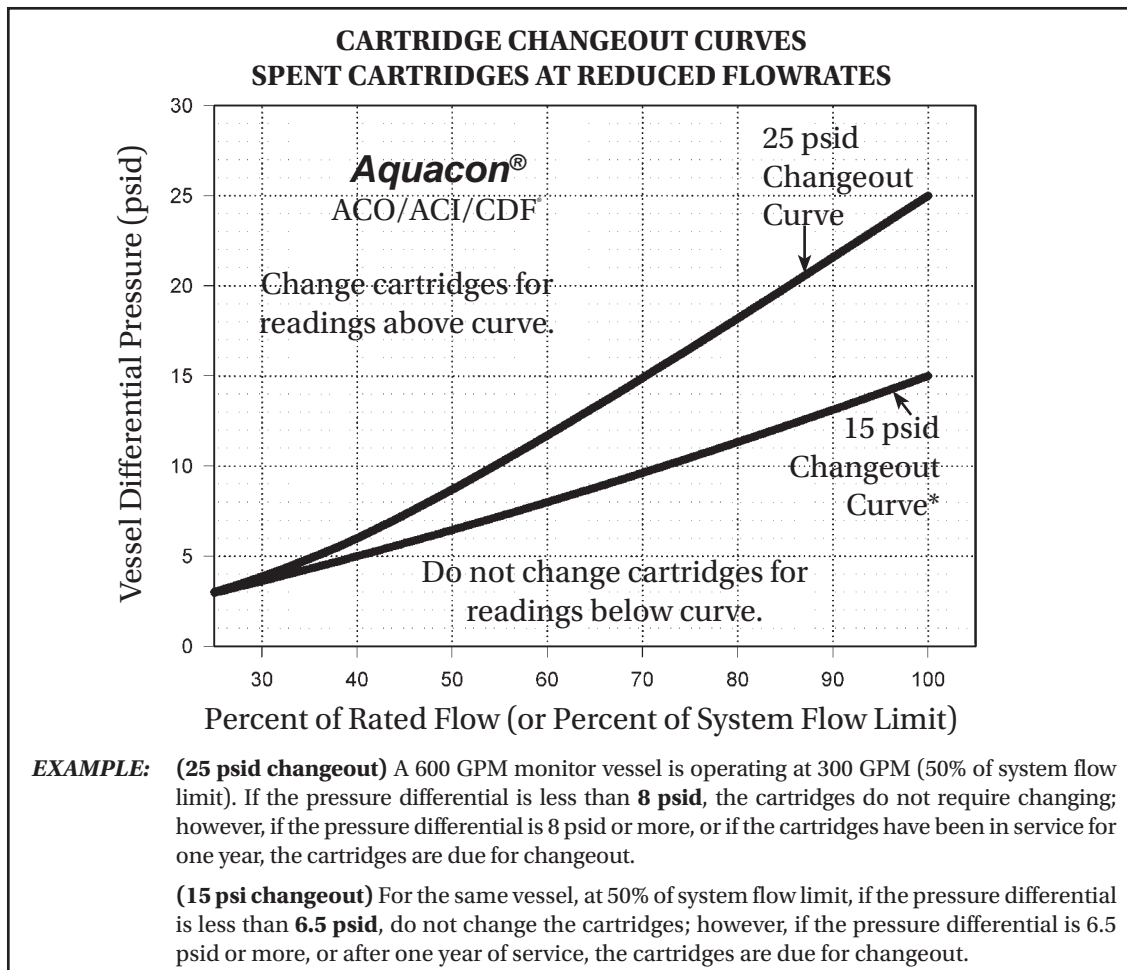
DO NOT USE WATER ABSORBING CARTRIDGES WITH PRE-MIXED JET FUEL CONTAINING ANTI-ICING ADDITIVES

WARNING

Absorbent-type monitor cartridges will NOT remove water from fuel containing alcohol-blending agents (commonly called gasohol).

For removal of solids, please use Parker Velcon particle removal filters specifically made for gasohol. Consult your Parker Velcon representative.

For technical support, contact Velcon or your authorized Parker Velcon distributor.



Decal #VEL1846 - Cartridge Changeout Curve for cartridges with 25 psid changeout requirements
**Decal #VEL1979 - Cartridge Changeout Curve for cartridges with 15 psid changeout requirement (per ATA 103)*

*Due to continuing product improvement, Velcon Filtration Division drawings, specifications, and pictures are subject to change without notice.
 For information on recycling used filters, contact FILCare, +1 719 499 1379*

Appendix / Accessories

CDF® Fuel Monitor Cartridges

EI 1583 6th Edition P Series

Field Proven: CDF® Replacement Cartridges Assure Clean Dry Fuel Delivery

Description

The Velcon CDF® P Series cartridges are designed to provide superior performance and reliability in standard fuel monitor housings through a unique, patented combination of media that absorbs water, filters solids that may be present in the fuel and provides for reduced static charge.

The cartridge has injection molded endcaps that are bonded to the media and an O-ring seal on the outlet end. This minimizes the possibility of bypassing contaminated fuel or transmission of water downstream at low flow rates.

As the cartridge removes water and/or dirt from the influent fuel there will be an increase in the pressure differential along with a decrease in flow rate. These changes are the result of flow restriction caused by dirt retention or water absorption in the media. The rate of these changes depends on the quantity of water or dirt contamination in the fuel.

Features

- CDF® P SERIES are qualified to EI 1583 Sixth Edition specification for Aviation Fuel Filter Monitors.
- IMPROVED SALT WATER PERFORMANCE
- CONDUCTIVE END CAPS and adhesive to reduce static charge within the vessel.
- O-RING SEAL minimizes the possibility of bypassing contaminated fuel at differential pressures up to 175 psi.
- RUGGED CONSTRUCTION collapse strength exceeds 175 psi differential pressure.



*****CAUTION*****
DO NOT USE WITH PRE-MIXED
FUEL CONTAINING ANTI-ICING
ADDITIVES.

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EI Specification 1583 6th Edition Information

Velcon’s new CDF®-P Series Cartridges incorporate several structural features due to requirements of the Sixth Edition of EI 1583. Some of these include:

- Increased product conductivity to decrease the risk of electrostatic discharges
- Improved media structure to lower the risk of media migration
- Lower initial DP - a major factor for installations that require changing cartridges at 15 PSID.
- New structure that provides longer cartridge life in the presence of small amounts of water

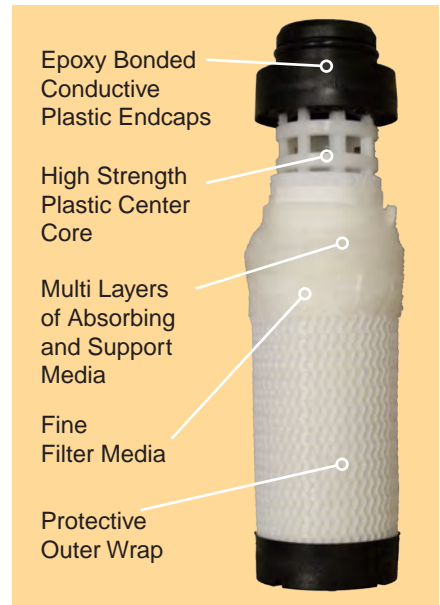
Some of the new requirements of the sixth edition of EI 1583 are:

- 18 lab qualification tests vs. 14 for the 4th edition

- Testing salt resistance
- Testing for cartridge conductivity
- Testing for structural integrity
- Testing for any trace SAP migration
- Water slug test at low flow (10% of rated flow)
- Low water (50 ppmv) at low flow (10% of rated flow)

SPECIFICATIN & TECHNICAL INFO

- 175 psid (12 bar) collapse strength
- 0.5 micron rating
- 160°F maximum operating temp.
- Recommended changeout differential pressure = 25 psid
- Typical water holding capacity for CDF-230P is 120 ml.
- For service life information, please refer to Operating Procedures # 1839 or consult your company fuel handling procedures.



CARTRIDGE SELECTION TABLE

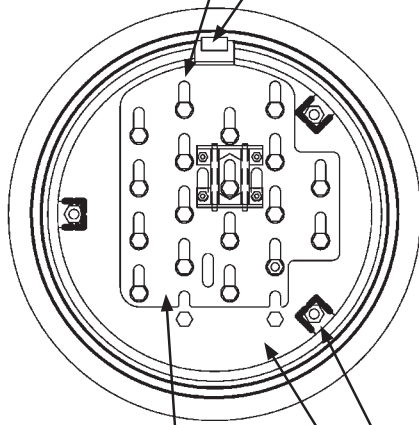
Cartridge Flow Rate USGPM	Velcon Model Number	Overall Length	Replacements for:		
			Facet Model Number	Racor Model Number	Faudi Model Number
5	CDF-205P	5 13/16"	FG-205 (-3 or -4) GNG-205	RMO-205-4-E —	M.2-134 (/4 or /E)
10	CDF-210P	10 13/16"	FG-210 (-3 or -4) GNG-210	FMI-10203 FM-10202 RMO-210-4-E	M.2-261 (/4 or /E)
15	CDF-215P	15 13/16"	FG-215 (-3 or -4) GNG-215	FMI-15203 FM-15202 RMO-215-4-E	M.2-387 (/4 or /E)
20	CDF-220P	20 13/16"	FG-220 (-3 or -4) GNG-220	FMI-20203 FM-20202 RMO-220-4-E	M.2-515 (/4 or /E)
25	CDF-225P	25 13/16"	FG-225 (-3 or -4) GNG-225	FMI-25203 FM-25202 RMO-225-4-E	M.2-642 (/4 or /E)
30	CDF-230P	30 13/16"	FG-230 (-3 or -4) GNG-230	FMI-30203 FM-30202 RMO-230-4-E	M.2-770 (/4 or /E)

Monitor Interlock Operating Principle

Plan View - Interlock Assembly

Keyhole shaped slots allow top plate to slide when nut head is raised.

Tongue prevents cover from sealing unless it is retracted.

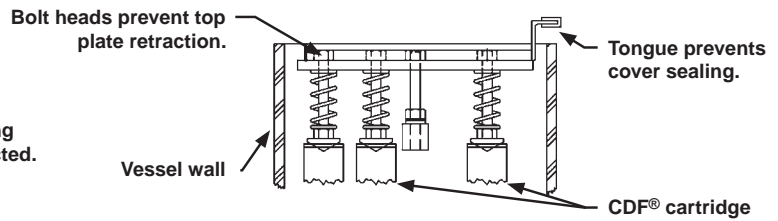


Top "sliding" plate

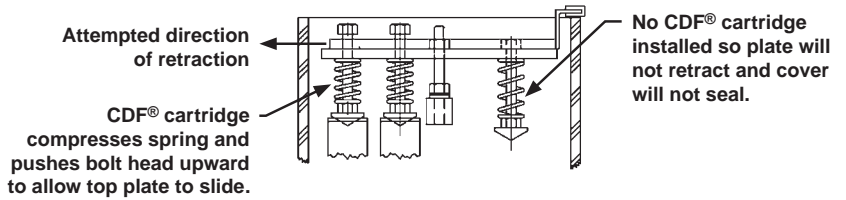
Fixed plate

Mounting nut typ for 3

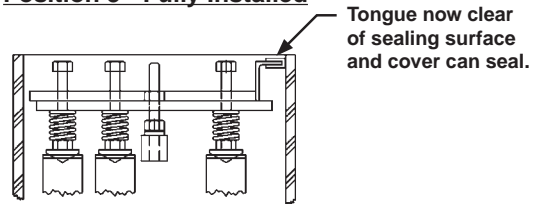
Position 1 - Before Tightening



Position 2 - Tightened Down to Retract



Position 3 - Fully Installed



Worldwide Filtration Manufacturing Locations

North America

Compressed Air Treatment Filtration & Separation/Balston

Haverhill, MA
978 858 0505
www.parker.com/balston

Finite Airtex Filtration Airtex/dornick hunter/Zander

Lancaster, NY
716 686 6400
www.parker.com/faf

Finite Airtex Filtration/Finite

Oxford, MI
248 628 6400
www.parker.com/finitefilter

Engine Filtration & Water Purification Racor

Modesto, CA
209 521 7860
www.parker.com/racor

Holly Springs, MS
662 252 2656
www.parker.com/racor

Beaufort, SC
843 846 3200
www.parker.com/racor

Racor – Village Marine Tec.

Gardena, CA
310 516 9911
desalination.parker.com

Parker Sea Recovery

Carson, CA
310 637 3400
www.searecovery.com

Hydraulic Filtration Hydraulic Filter

Metamora, OH
419 644 4311
www.parker.com/hydraulicfilter

Laval, QC Canada
450 629 9594
www.parkerfarr.com

Process Filtration dornick hunter Process Filtration

Oxnard, CA
805 604 3400
www.parker.com/processfiltration

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Parker Procal

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Process Filtration

dornick hunter Process Filtration

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