



# Insulating Oil Filters

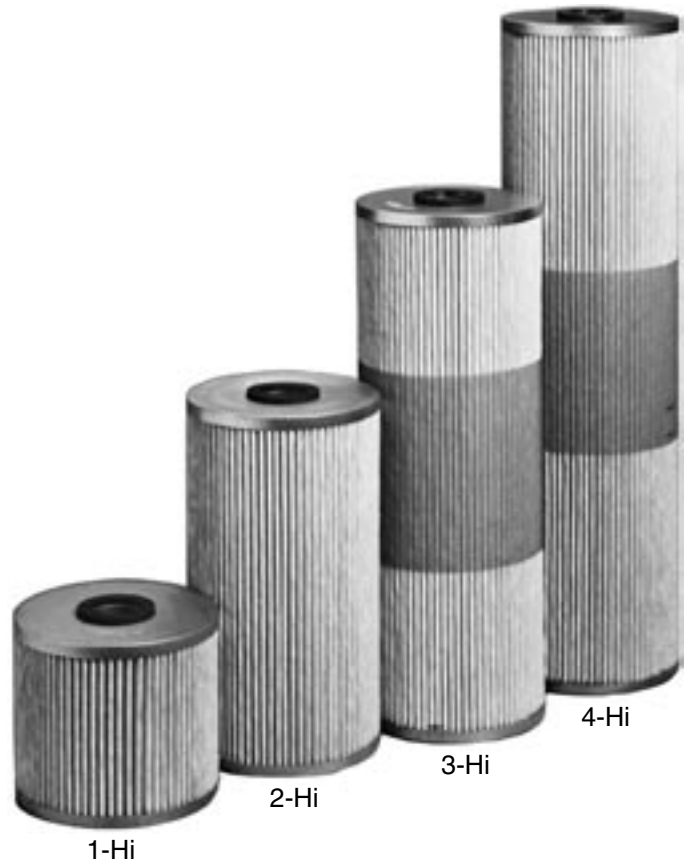
## *Aquacon*® 1-Hi, 2-Hi, 3-Hi, & 4-Hi

**High Performance Cartridges  
Remove Carbon and Water...**

**Bring Insulating Oil  
Into Specification with  
Major Cost Savings**

### FEATURES

- **35% or more savings** with single *Aquacon* cartridge replacement of multiple disk-type cartridges
- Positive CHANGE CARTRIDGE signal
- Choice of carbon removal efficiency
- Free and emulsified water removal
- Dissolved water removal with P4D Cartridges
- Messy disk-type element separation eliminated



### CARTRIDGE DESCRIPTION

*Aquacon* filter cartridges were originally developed to meet the demanding requirements of aviation fuel filtration. They remove dirt and water with very high efficiency. The AC-8 Series *Aquacon* Cartridges were developed specifically for use with insulating oils. These cartridges provide the most efficient, cost effective conditioning available for insulating and other oils. They have been field proven at numerous electrical utilities.

The *Aquacon* accordion pleated style design provides large surface areas of filter media in compact, small diameter cartridges. Glass microfiber filtration medias are combined with water removing super-absorbent polymers in four different configurations; **01**, **1/2**, **P3**, and **P4D**. These four cartridge styles fill a range of cost/performance requirements.



The four filter media styles are offered in integral **1-Hi**, **2-Hi**, **3-Hi**, and **4-Hi** cartridges, shown above, to replace one, two, three, or four conventional stacked disk-type cartridges. In the center photo, three disk cartridges are shown being replaced by a single *Aquacon* AC-8221/2 cartridge.

The compact, integral design makes these cartridges easier to install and replace than the disk-type. Heavy duty construction has eliminated the problems of used-element separation associated with the disk-type. These features, combined with the outstanding filtration performance of *Aquacon* cartridges, provide significant operating cost savings, reliability, and ease of use.

# Aquacon High Performance Cartridges

## CARTRIDGE SELECTION

**Aquacon AC-8 Series Insulating Oil Cartridges** have proven to be very effective for bringing oil into compliance with various specifications. Typically, this has included oil used in lower voltage (115kV) transformers and carbon generating air breathing devices like circuit breakers, tap changers and other switch gear. Typical dielectric voltages after one pass are 30kv and greater as measured by ASTM D-877 (flat disc electrodes). Cartridge filter media style choices include:

**1/2, 0.5 Micron Cartridges** are the most popular and cost effective for general field use. Carbon removal capacity and efficiency are greatly increased compared to the 1 micron design, making these a natural for circuit breakers, etc. Water capacity is reduced, but has proven adequate for most applications.

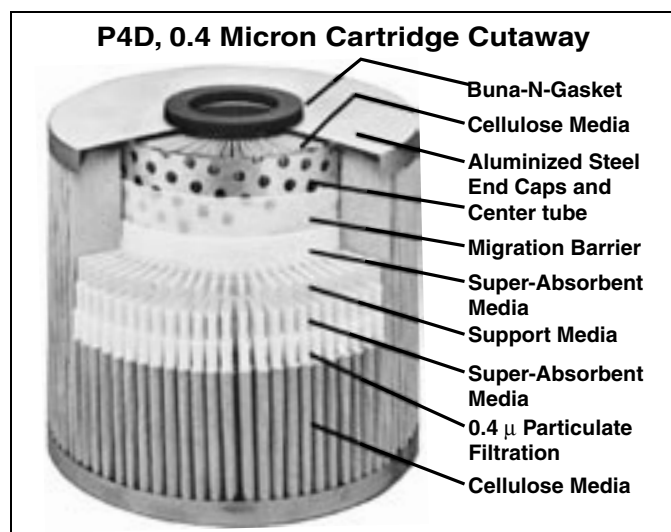
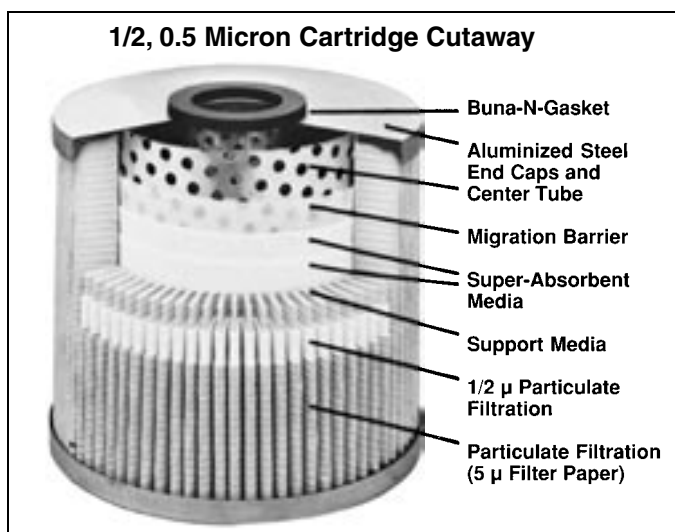
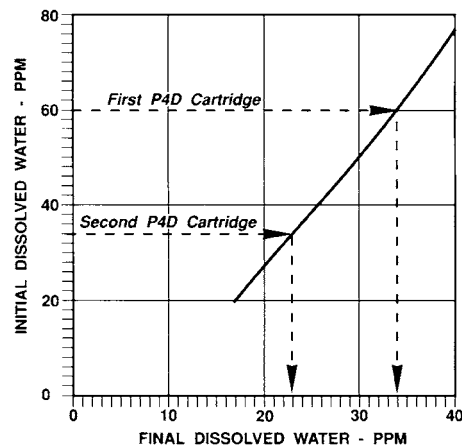
**1 Micron Cartridges** have maximum water capacity combined with moderate carbon removal capability. They are used where removing free and emulsified water is the primary concern.

**P3, 0.3 Micron Cartridges** are a variation of the 1/2 micron design. They contain a thin layer of 0.3 micron rated filter media sandwiched behind the same high carbon capacity filter media used in the 1/2 micron cartridge. This combination of filter medias results in a cartridge with excellent carbon capacity, suitable for applications where extra fine filtration is required.

**P4D, 0.4 Micron Cartridges** add dissolved water removing capability to the performance features. This results in lower total water concentrations as measured by ASTM D-1533 (Karl Fisher), and typically further improves D-1816 breakdown voltage (spherical, or "VDE", electrodes.)

P4D Cartridges have the greatest free and emulsified water removal capacity (over 800 ml), plus dissolved water removal capabilities. Carbon removal efficiency and capacity are much greater than 1 micron rated cartridges.

Graph shows the dissolved water removing capabilities of an AC-829P4D filtering 800 gallons of insulating oil. One cartridge lowers the dissolved water from 60 ppm to 34 ppm. Installing a second cartridge further reduces the concentration to 23 ppm.



## CARTRIDGE CARBON & WATER FILTRATION COMPARISON

<sup>(1)</sup> Micron ratings are nominal 98% based on gravimetric tests

| <b>Aquacon</b> |                                     | <b>Carbon</b>   |                   | <b>Free &amp; Emulsified Water</b> |                   | <b>Dissolved Water Removal</b> |
|----------------|-------------------------------------|-----------------|-------------------|------------------------------------|-------------------|--------------------------------|
| <b>Style</b>   | <b>Micron Rating <sup>(1)</sup></b> | <b>Capacity</b> | <b>Efficiency</b> | <b>Capacity</b>                    | <b>Efficiency</b> |                                |
| ...01          | 1                                   | Fair            | Fair              | Very Good                          | Excellent         | No                             |
| ...1/2         | 0.5                                 | Excellent       | Very Good         | Good                               | Very Good         | No                             |
| ...P3          | 0.3                                 | Excellent       | Excellent         | Good                               | Very Good         | No                             |
| ...P4D         | 0.4                                 | Very Good       | Very Good         | Excellent                          | Excellent         | Yes                            |

### CARTRIDGE REPLACEMENT

Unique filter medias in the cartridges incorporate super-absorbent polymers which chemically lock-in water so it cannot be squeezed out. When a cartridge reaches its free water-holding capacity, the media swells and restricts the flow. The resulting increase in differential pressure signals the operator to change the cartridge.

When an **Aquacon** cartridge is hit with a large slug of water, flow restriction can occur quickly causing a rapid increase in differential pressure. To prevent cartridge collapse, it is recommended that gear pumps have a pressure relief valve set at about 60 psi.

Cartridges should be changed **(a)** whenever differential pressure reaches 25 psi, **(b)** whenever there is a reduction in flow, or **(c)** after one year service, whichever occurs first. If these indicators are ignored, it is possible, under some conditions, to overcome the cartridge's flow restricting capabilities. For critical applications, a pressure shut-off switch should be installed.

### CARTRIDGE SELECTION TABLE

**IMPORTANT**– For maximum cost saving when replacing disk-type cartridges with Aquacon cartridges – use a single 2 Hi cartridge to replace two disk-types, one 3-Hi to replace three disk-types, and one 4-Hi to replace four disk-types.

| <b>Type</b> | <b>Model Number</b> | <b>Micron Rating</b> | <b>I.D. Inches</b>            | <b>O.D. Inches</b>            | <b>Lgth. Ind. Gaskets In.</b>   | <b>Interchange Information</b>   |
|-------------|---------------------|----------------------|-------------------------------|-------------------------------|---------------------------------|--|
| <b>1-Hi</b> | <b>AC-80701</b>     | 1                    | 2                             | 8                             | 7 <sup>3</sup> / <sub>8</sub>   | Replace single conventional 12" diameter disk cartridges (Alsop 12SS and 12SB Series, Cuno 45117, 45130, and 45218 Series) with one 1-Hi Aquacon cartridge |
|             | <b>AC-8071/2</b>    | 0.5                  | 2                             | 8                             | 7 <sup>3</sup> / <sub>8</sub>   |  |
|             | <b>AC-807P3</b>     | 0.3                  | 2                             | 8                             | 7 <sup>3</sup> / <sub>8</sub>   |  |
|             | <b>AC-807P4D</b>    | 0.4                  | 2                             | 8                             | 7 <sup>3</sup> / <sub>8</sub>   |  |
| <b>2-Hi</b> | <b>AC-81501</b>     | 1                    | 2                             | 8                             | 14 <sup>3</sup> / <sub>4</sub>  | Use one 2-Hi cartridge to replace two conventional 12" diameter disk cartridges  |
|             | <b>AC-8151/2</b>    | 0.5                  | 2                             | 8                             | 14 <sup>3</sup> / <sub>4</sub>  |  |
|             | <b>AC-815P3</b>     | 0.3                  | 2                             | 8                             | 14 <sup>3</sup> / <sub>4</sub>  |  |
|             | <b>AC-815P4D</b>    | 0.4                  | 2                             | 8                             | 14 <sup>3</sup> / <sub>4</sub>  |  |
| <b>3-Hi</b> | <b>AC-82201</b>     | 1                    | 2                             | 8                             | 22 <sup>1</sup> / <sub>8</sub>  | Use one 3-Hi cartridge to replace three conventional 12" diameter disk cartridges  |
|             | <b>AC-8221/2</b>    | 0.5                  | 2                             | 8                             | 22 <sup>1</sup> / <sub>8</sub>  |  |
|             | <b>AC-822P3</b>     | 0.3                  | 2                             | 8                             | 22 <sup>1</sup> / <sub>8</sub>  |  |
|             | <b>AC-822P4D</b>    | 0.4                  | 2                             | 8                             | 22 <sup>1</sup> / <sub>8</sub>  |  |
| <b>4-Hi</b> | <b>AC-82901</b>     | 1                    | 2                             | 8                             | 29 <sup>1</sup> / <sub>2</sub>  | Use one 4-Hi cartridge to replace four conventional 12" diameter disk cartridges   |
|             | <b>AC-8291/2</b>    | 0.5                  | 2                             | 8                             | 29 <sup>1</sup> / <sub>2</sub>  |  |
|             | <b>AC-829P3</b>     | 0.3                  | 2                             | 8                             | 29 <sup>1</sup> / <sub>2</sub>  |  |
|             | <b>AC-829P4D</b>    | 0.4                  | 2                             | 8                             | 29 <sup>1</sup> / <sub>2</sub>  |  |
| <b>2-Hi</b> | <b>AC-7131/2CR</b>  | 0.5                  | 1 <sup>1</sup> / <sub>2</sub> | 6 <sup>1</sup> / <sub>4</sub> | 12 <sup>9</sup> / <sub>16</sub> | Replace two conventional 8" diameter disk cartridges (Alsop 8SS and Cuno 45109 Series) with one 2-Hi cartridge   |
| <b>3-Hi</b> | <b>AC-71901CR</b>   | 1                    | 1 <sup>1</sup> / <sub>2</sub> | 6 <sup>1</sup> / <sub>4</sub> | 18 <sup>5</sup> / <sub>8</sub>  | Replace three conventional 8" diameter disk cartridges with one 3-Hi cartridge   |
|             | <b>AC-7191/2CR</b>  | 0.5                  | 1 <sup>1</sup> / <sub>2</sub> | 6 <sup>1</sup> / <sub>4</sub> | 18 <sup>5</sup> / <sub>8</sub>  |  |

# Aquacon 1-Hi, 2-Hi, 3-Hi, & 4-Hi

## APPLICATIONS

Transformer Oil  
Circuit Breaker Oil  
Tap Changer Oil  
Switchgear Oil  
Askarel Oil  
Turbine Oil  
Hydraulic Oil  
Silicone Dielectric Oil

## CARTRIDGE GENERAL SPECIFICATIONS

- Coated steel center tube and end cap
- ¼ inch Buna-N gaskets bonded to end caps
- Center tube wraps to prevent media migration
- 75 psi minimum collapse pressure
- 250°F maximum operating temperature
- Contain no asbestos

**Aquacon** filter cartridges are shipped in sealed plastic bags. P4D cartridges are oven dried and packaged with desiccant material inside two sealed bags.

## Recommended Maximum Flow Rates

For typical mineral base insulating oils, initial pressure drop will be 5 psi or less.

| <u>Cartridge</u> | <u>GPM</u> |
|------------------|------------|
| 1-Hi             | 13         |
| 2-Hi             | 25         |
| 3-Hi             | 39         |
| 4-Hi             | 50         |

## CONVERSION NOTE

For 8 and 12-inch filter housings built by Cuno, and 8-inch housing built by Alsop, the **Aquacon** replacement cartridge fits with no adapters required. For Alsop 12-inch housings, a small spacer is required to ensure proper cartridge sealing. (See photo and table at right.) Spacers are supplied at no charge.

## CONVERSION TABLE

| <u>Cartridge</u> | <u>Spacer*</u> |
|------------------|----------------|
| 1-Hi             | G-0131         |
| 2-Hi             | G-0134         |
| 3-Hi             | S08-478        |
| 4-Hi             | S08-463        |

\* 1 required for Alsop 12-inch housings

## HOUSINGS

Velcon Filters, Inc. manufactured housings have welded carbon steel heavy-duty construction with swing bolt closures, Buna-N O-ring gaskets, and white polyester powder coat paint. See below for housing/cartridge table.

| <b>Housing Model Number</b> | <b>Cartridge Model Number</b> | <b>Qty</b> |
|-----------------------------|-------------------------------|------------|
| VF-1215                     | AC-815                        | 1          |
| VF-1222                     | AC-822                        | 1          |
| VF-1229                     | AC-829                        | 1          |



Velcon products are sold and serviced by a world-wide representative network. To order, contact Headquarters or your **LOCAL REPRESENTATIVE**:

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