**APPLICATION**

HYDAC DFFH Reverse Flow Filter and DFFHM Bi-Directional Filter are designed for use on hydrostatic transmissions, hydraulic test equipment, and other applications in which the filter housing must provide two directions for fluid flow.

**PRODUCT FEATURES**

- **DFFH and DFFHM** Filters have a filter head of ductile iron and a screw-in bowl of cold formed steel.
- **DFFH** Reverse Flow models filter fluid in the forward direction and bypass the filter element when the flow is reversed.
- **DFFHM** Bi-Directional models allow fluid filtering in both directions. There is a filter element for both directions.
- Inlet/outlet port options include SAE 4-bolt flange (code 62), or SAE ports (DFFHM flange only) to allow easy installation without costly adaptors.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoro Rubber, and EPR) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water base fluids.
- Screw-in bowl mounted below the filter head requires minimal clearance to remove the element for replacement; contaminated fluid cannot be washed downstream when element is serviced.
- Clogging indicators have no external dynamic seal. This results in high reliability due to magnetic actuation which eliminates a leak point.
- A poppet-type bypass valve (optional) provides positive sealing during normal operation and fast opening during cold starts and flow surges.

**FILTER ELEMENTS**

DFFH & DFFHM Filters are available with disposable Betamicron® Low Collapse (BN3HC) elements having 250 psid and Betamicron® High Collapse (BH3HC) having 3000 psid collapse pressure and absolute ratings of 3, 5, 10, and 20 micron. For non-bypass applications, Betamicron® (BH3HC) or metal fiber (V) elements must be installed. If a bypass valve is used, Betamicron® (BN3HC) or wire screen (W/HC) elements can be installed. All filter media is supported to achieve flow fatigue resistance. Proper support of the filter media also provides high Beta Ratio values (particle removal efficiency) even at high differential pressures. The efficiency of many competitive elements drastically deteriorates as the element clogs and differential pressure increases. High quality epoxy adhesive is used to bond the end caps to the media and to bond the seam of the media.
**Model Code:** Filter Assembly DFFH and DFFHM

### Filter Type
- **DFFH** = Reverse Flow Filter
- **DFFHM** = Bi-Directional Filter

### Filter Media
- **BH3HC** = Betamicron® BH3HC High Collapse
- **BN3HC** = Betamicron® BN3HC Low Collapse
- **V** = Metal Fiber
- **W/HC** = Wire Screen

### Size and Nominal Connection
- **160 DFFH** = 1 1/4” SAE port or flange
- **240 DFFH** = 1 1/4” SAE port or flange
- **280 DFFH** = 1 1/4” SAE port or flange
- **330 DFFH** = 1 1/2” SAE port or 2” Flange
- **660 DFFH** = 1 1/2” SAE port or 2” Flange

### Type of Connection
- **G** = Threaded (Not Available For DFFHM)
- **F** = Flange

### Filtration Rating (micron)
- **3**
- **5**
- **10**
- **20**
- **3**
- **5**
- **10**
- **20**

- **Absolute Filtration Rating (βx ≥ 200)**
- **Nominal Filtration Rating**

### Type of Differential Pressure Clogging Indicator
- **A** = no clogging indicator
- **B** = visual (pop-up) clogging indicator (automatic reset)
- **BM** = visual (pop-up) clogging indicator (manual reset)
- **C** = electrical clogging indicator (electric switch)
- **D** = electrical/visual (lamp) clogging indicator (electric switch & light)
- **J** = electric switch (Brad Harrison, 5 pin mini)
- **J4** = electric switch (Brad Harrison, 4 pin micro)

Note: DFFHM filters require 2 indicators.

### Type Number
- **1** Modification Number
- **0**

### Port Configuration
- **12** = SAE Straight Thread O-Ring Boss Ports (available on DFFH only)
- **16** = SAE Flange Ports

### Seals
- **(omit)** = Nitrile (NBR) (standard)
- **V** = Fluoro Rubber (FKM)
- **EPR** = Ethylene Propylene (EPDM)

### Bypass Valve
- **(omit)** = Without Bypass (BH3HC or V elements required)
- **B6** = 87 psid Bypass (standard)

### Supplementary Details
- **SO103H** = Modification of BN3HC (Low Collapse) & W/HC Element For Phosphate Ester
- **SO155H** = Modification of BH3HC Element for Phosphate Ester Fluids
- **SO184** = G-1/2” Drain in Bowl Option For Sizes 160 - 280 (standard for sizes 330 & 660)
- **SO110** = Indicator with brass piston (for water based fluids) (sizes 160 - 280 only) (used with water glycol fluids)
- **(Consult factory on B & BM Indicators for thermal lockout)**

### Model Codes Containing Red are non-stock items — Contact HYDAC for availability
**Element Size**

<table>
<thead>
<tr>
<th>Element Size</th>
<th>Housing Size</th>
<th>Housing Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0160</td>
<td>DFFH 160</td>
<td>DFFHM 160</td>
</tr>
<tr>
<td>0240</td>
<td>DFFH 240</td>
<td>DFFHM 240</td>
</tr>
<tr>
<td>0280</td>
<td>DFFH 280</td>
<td>DFFHM 280</td>
</tr>
<tr>
<td>0330</td>
<td>DFFH 330</td>
<td>DFFHM 330</td>
</tr>
<tr>
<td>0660</td>
<td>DFFH 660</td>
<td>DFFHM 660</td>
</tr>
</tbody>
</table>

**High Pressure Element**

**Filtration Rating** *(micron)*

- 003 = 3 µm
- 005 = 5 µm
- 010 = 10 µm
- 020 = 20 µm

- 003 = 3 µm  *(BH3HC or BN3HC)*
- 005 = 5 µm  *(V)*
- 010 = 10 µm  *(V)*
- 020 = 20 µm  *(V)*

- 025 = 25 µm  *(W/HC)*
- 074 = 74 µm  *(W/HC)*
- 149 = 149 µm  *(W/HC)*

**Absolute Filtration Rating** *(ß ≥ 200)*

**Filter Element Material**

- BH3HC = Betamicron® BH3HC High Collapse *(Disposable)*
- BN3HC = Betamicron® BN3HC Low Collapse *(Disposable)*
- V = Metal Fiber *(Cleanable)*
- W/HC = Wire Screen *(Cleanable)*

**Seals**

- *(omit)* = Nitrile (NBR) *(standard)*
- V = Fluoro Rubber (FKM)
- EPR = Ethylene Propylene (EPDM)

**Supplementary Details**

- SO103H = Modification of BN3HC & W/HC Elements for Phosphate Ester Fluids
- SO155H = Modification of BH3HC Element for Phosphate Ester Fluids

*Model Codes Containing Red are non-stock items — Contact HYDAC for availability*
**Engineering Data: DFFH/DFFHM Reverse Flow & Bi-Directional**

<table>
<thead>
<tr>
<th>Model</th>
<th>With Element(s)</th>
<th>Without Element(s)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>lbs.</td>
<td>kg.</td>
</tr>
<tr>
<td>DFFH 160</td>
<td>25.8</td>
<td>11.7</td>
</tr>
<tr>
<td>DFFH 240</td>
<td>29.0</td>
<td>13.2</td>
</tr>
<tr>
<td>DFFH 280</td>
<td>38.2</td>
<td>17.3</td>
</tr>
<tr>
<td>DFFH 330</td>
<td>61.4</td>
<td>27.9</td>
</tr>
<tr>
<td>DFFH 660</td>
<td>79.1</td>
<td>35.9</td>
</tr>
<tr>
<td>DFFHM 160</td>
<td>59.5</td>
<td>27.0</td>
</tr>
<tr>
<td>DFFHM 240</td>
<td>65.9</td>
<td>29.9</td>
</tr>
<tr>
<td>DFFHM 280</td>
<td>74.3</td>
<td>33.7</td>
</tr>
<tr>
<td>DFFHM 330</td>
<td>140.0</td>
<td>63.5</td>
</tr>
<tr>
<td>DFFHM 660</td>
<td>175.4</td>
<td>79.6</td>
</tr>
</tbody>
</table>

**Weights:**

**Design:** Inline Pressure Filter

**Mounting Method:**
- 4 Mounting holes in filter head (DFFH)
- 8 mounting holes in filter heads (DFFHM)

**Connections:**
- size 160/240/280: SAE - 20 port (1 5/8 - 12 UN - 2B) or SAE - 20 Flange, Code 62
- size 330/660: SAE - 24 port (1 7/8 - 12 UN - 2B) or SAE - 32 Flange, Code 62

**Direction of Flow:**
- Inlet: Side
- Outlet: Side

**Housing Pressure Ratings:**
- Operating: 6000 psid (420 bar)
- Proof: 9000 psid (620 bar)
- Fatigue: Contact HYDAC office
- Burst: Contact HYDAC office

**Element Collapse Pressure Ratings:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Rating</th>
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<tbody>
<tr>
<td>Standard</td>
<td>250 psid (17 bar)</td>
</tr>
<tr>
<td>W/HC</td>
<td>250 psid (17 bar)</td>
</tr>
<tr>
<td>High Collapse</td>
<td>3000 psid (207 bar)</td>
</tr>
<tr>
<td>V</td>
<td>3000 psid (207 bar)</td>
</tr>
</tbody>
</table>

**Fluid Temperature Range:**
- -15°F to +250°F (-26°C to 121°C)
- Based on Nitrile Seals under maximum continuous operating pressure.

**Flow Fatigue Resistance:**
- Filter medium is supported to achieve flow fatigue resistance.
- Contact HYDAC office for information.

**Trip Pressure of Differential Pressure Indicator:**
- ΔP = 72 psid (5 bar) - 10% (Standard)
- Optional trip pressures available, contact HYDAC office for information.

**Cracking Pressure of Bypass Valve:**
- ΔP = 87 psid (6 bar) + 10% (Standard)
- Optional trip pressures available, contact HYDAC office for information.

**Hydraulic Symbols:**

**Weights:**

```
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```
Housing Curves

The housing curve is based on test results using mineral oil with a specific gravity of 0.86. Differential pressure increases in proportion to specific gravity of applicable fluid.

\[ \Delta P_{\text{Housing}} = \Delta P_{\text{Chart}} \times \frac{\text{Actual Specific Gravity}}{0.86} \]

Filtration Efficiency: Multi-Pass Filtration Efficiency

Ratings to ISO 4572 for Betamicron® Elements

For all micron ratings (3, 5, 10, & 20), both High and Low Collapse Betamicron® Elements

- Absolute Filtration Rating = \( \beta \times 200 \)
- Terminal \( \Delta P \) Across Element = 72 psid (5 bar)

Housing Curves

The housing curve is based on test results using mineral oil with a specific gravity of 0.86. Differential pressure increases in proportion to specific gravity of applicable fluid.

Bypass Valves Curves

Curves shown are applicable for mineral oil with a specific gravity of 0.86. Differential pressure increases in proportion to the specific gravity of the fluid.

\[ \Delta P_{\text{Valve}} = \Delta P_{\text{Curve}} \times \frac{\text{Actual Specific Gravity}}{0.86} \]
Element ∆P Calculations:
All element curves are based on test results using mineral oil with a kinematic viscosity of 141 SUS and a specific gravity of 0.86. The differential pressure across the element changes proportionally to the viscosity and specific gravity.

\[ \Delta P_{\text{Element}} = \Delta P_{\text{Curve}} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity}}{141} \]

Wire Screen Elements:
To find ∆P across clean wire screen element divide application flow by maximum recommended flow and find percentage; then read ∆P from graph.

\[ \frac{\text{Application Flow}}{\text{Max. Recommended Flow}} \times 100 = \% \text{ of Flow} \]

Example:
25 Wire Mesh, 26 gpm, Size 160

26 gpm = 63% of Flow
42 gpm
63% of flow = 1 psi ∆P for 0160D025W/HC elements

Betamicron® 3 Plus & Metal Fiber Elements:
To find ∆P across clean Betamicron® & Metal Fiber elements, use the equation below with the K Factors from the charts

\[ \Delta P_{\text{Element}} = K \text{ Factor} \times \text{Flow (gpm)} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity}}{141} \]

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. Recommended Flow (gpm)</th>
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</thead>
<tbody>
<tr>
<td>DFFH/DFFHM 160</td>
<td>42</td>
</tr>
<tr>
<td>DFFH/DFFHM 240</td>
<td>63</td>
</tr>
<tr>
<td>DFFH/DFFHM 280</td>
<td>63</td>
</tr>
<tr>
<td>DFFH/DFFHM 330</td>
<td>87</td>
</tr>
<tr>
<td>DFFH/DFFHM 660</td>
<td>174</td>
</tr>
</tbody>
</table>

Betamicron® Low Collapse

| K Factors for ...D...BN3HC Elements |
|---|---|---|---|---|
| Size | 3µm | 5µm | 10µm | 20µm |
| 0160 | 0.80327 | 0.46082 | 0.36675 | 0.22615 |
| 0240 | 0.48056 | 0.34364 | 0.19840 | 0.12695 |
| 0280 | 0.24889 | 0.15763 | 0.11511 | 0.06992 |
| 0330 | 0.14097 | 0.25519 | 0.15847 | 0.08921 |
| 0660 | 0.16517 | 0.12362 | 0.07676 | 0.04321 |

Betamicron® High Collapse

| K Factors for ...D...BH3HC Elements |
|---|---|---|---|---|
| Size | 3µm | 5µm | 10µm | 20µm |
| 0160 | 1.01859 | 0.62163 | 0.60323 | 0.32134 |
| 0240 | 0.61757 | 0.39648 | 0.33622 | 0.18932 |
| 0280 | 0.36155 | 0.19190 | 0.17375 | 0.07937 |
| 0330 | 0.11525 | 0.08232 | 0.07134 | 0.04281 |
| 0660 | 0.16517 | 0.12362 | 0.07676 | 0.04321 |

Metal Fiber

| K Factors for ...D...V Elements |
|---|---|---|---|---|
| Size | 3µm | 5µm | 10µm | 20µm |
| 0160 | 0.24696 | 0.17562 | 0.12622 | 0.07683 |
| 0240 | 0.17561 | 0.13171 | 0.10427 | 0.06037 |
| 0280 | 0.08232 | 0.06586 | 0.05488 | 0.02744 |
| 0330 | 0.11525 | 0.08232 | 0.07134 | 0.04281 |
| 0660 | 0.16517 | 0.12362 | 0.07676 | 0.04321 |
Dimensions: DFFH 160-280

Dimensions are in inches/millimeters.
Dimensions are for general information only.
Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.
**Dimensions: DFFH 330-660**

![Diagram of DFFH 330-660 dimensions]

- **DFFH 330**
  - 6.14" (156mm)
  - 10.74" (273mm)
  - 3.75" (95mm)
- **DFFH 660**
  - 12.85" (326mm)
  - 17.45" (443mm)
- **Hex 7/8"**
  - 22.2mm
- **Hex 1 7/16"**
  - 36mm
- **1/2 - 20 UNF x 0.67"**
  - 25.4mm
- **3/4 - 10 UNC - 2B IN. x 1.00 Deep**
  - 17mm
- **Clearance required for element removal**

Dimensions are in inches/millimeters. Dimensions are for general information only. Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.
Dimensions: DFFHM 160-280

Dimensions are in inches/millimeters.
Dimensions are for general information only.
Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.
**Dimensions: DFFHM 330-660**

- **DFFHM 330**: 13.17" (334.5 mm)
- **DFFHM 660**: 19.88" (505 mm)

**Detail A-A**

- 1/2 - 20 UNF - 2B x 0.67" deep, 17 mm
- 3/4 - 16 UNF Indicator Cavity

**Dimensions are in inches/millimeters.**

**Due to constant development and updating of details, we ask that all critical dimensions be verified by requesting a certified print.**
Filtration Solutions For Mobile Equipment

Although there is great diversity in mobile equipment designs, the common demand in the industry for improved performance has resulted in systems growing in complexity and cost. Precision hydraulic components – variable displacement pumps and motors, load control valves, and proportional controls – are increasingly applied to enhance machine power, speed and versatility. Higher operating pressures – in excess of 6,000 psi – are increasing in usage in order to generate higher force and torque from a smaller and lighter package. As fluid power systems are built to function more precisely at higher pressures, protection against wear and malfunction becomes vital. HYDAC’s range of filtration products are designed to provide the necessary level of protection to maintain the efficiency, useful life and safety of high performance fluid power systems.

BETAFIT® Filter Elements

HYDAC manufactures high quality filter elements that are dimensionally similar to other manufacturer’s elements and will fit interchangeably into their filter housings. This catalog lists the interchange elements and the models which they replace and is organized by manufacturer. Even when your hydraulic or lube oil system doesn’t have a HYDAC filter assembly, it doesn’t mean that you cannot benefit from our Betamicron® Element technology. The high beta ratios and leading dirt holding capacities of these elements extend service life and provide a greater price to maintenance cost ratio than elements from other manufacturers.

Condensed Filter Catalog

This condensed catalog serves as a quick reference guide for selecting HYDAC filters. The models are divided into high, medium, and low pressure groups. Charts then describe each filter in the group. Each model description includes mounting method, maximum operating pressure, maximum flow rates, number of sizes and connection size range, flow path, clogging indicator type, and a brief description of features and benefits. General information about clogging indicators, element types, breathers, and filler breathers is also included.

Filtration Technology

HYDAC Filter Technology is the result of many years of research, development and performance evaluation both in test stands and actual applications. HYDAC’s Filter Division produces a complete range of filters. This range includes in-line, in-tank, inside-tank, direct mount, and manifold mount, modular stacking filters. Also available are duplex models for systems requiring continuous operation. This catalog provides a general overview and photos of HYDAC filter families with information on pressure and flow ratings, and mounting types. It serves as a handy reference to select the appropriate series of filter(s) for the application in need of filtration. More detailed literature that includes specific technical data and dimensioned drawings is available for all models.