

## HF Series

Compressed Air Filters

Models HF(grade)-52 through HF(grade)-92 Standard, High Pressure and Corrosion Resistant Models

FORM NO.: 4011208 REVISION: 10/2015

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



# General Safety Information

## 1. Pressurized devices

**⚠ WARNING**

- Do not exceed maximum operating pressure indicated on serial number tag.
- Make certain filter is fully depressurized before servicing.

## 2. Breathing Air

- Air treated by this equipment may not be suitable for breathing without further purification. Refer to OSHA standard 1910.134 for breathing air requirements.

## 3. Flammable gases

**⚠ WARNING**

The materials of construction used in this product are compatible physically with flammable gases, however, there are application limitations for this product when used with flammable gases. Each application (other than air or inert gas) should be carefully reviewed to minimize the chances of creating a fire or explosion hazard.

**IMPORTANT**

Tighten cartridges before use. Cartridges may have loosened during transit. To ensure a tight seal between the cartridge end cap(s) and inlet manifold, open vessel and turn cartridge clockwise (as seen from bottom) until hand tight. See Section 3.0, B for instructions on entering vessel.

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# Model Number Configuration



(1) Filter Grade
<b>11</b> - Mechanical Separator
<b>9</b> - Separator/Filter
<b>7</b> - Air Line Filter
<b>6</b> - Dry Desiccant Afterfilter
<b>5</b> - High Efficiency Oil Removal Filter
<b>3</b> - Maximum Efficiency Oil Removal Filter
<b>1</b> - Oil Vapor Removal Filter

(2) Housing		(3) Connection Sizes	
Number	Capacity scfm [ $m^3/hr$ ] @ 100 psig [7 kgf/cm <sup>2</sup> ]		
<b>52</b>	625 [1110]	<b>24</b> - 3" NPTM	<b>80</b> - DN 80 Flange
<b>54</b>	1000 [1700]	<b>24</b> - 3" NPTM	<b>80</b> - DN 80 Flange
<b>56</b>	1250 [2125]		
<b>60</b>	1875 [3158]	<b>24</b> - 3" NPTM	<b>80</b> - DN 80 Flange
<b>64</b>	2500 [4250]	<b>4F</b> - 4" ANSI Flange	<b>100</b> - DN 100 Flange
<b>68</b>	3125 [5310]		
<b>72</b>	5000 [8490]	<b>6F</b> - 6" ANSI Flange	<b>150</b> - DN 150 Flange
<b>76</b>	6875 [11,670]	<b>6F</b> - 6" ANSI Flange	<b>150</b> - DN 150 Flange
<b>80</b>	8750 [14,850]		
<b>84</b>	11,875 [20,175]	<b>8F</b> - 8" ANSI Flange	<b>200</b> - DN 200 Flange
<b>88</b>	16,250 [27,610]	<b>8F</b> - 8" ANSI Flange	<b>200</b> - DN 200 Flange
<b>92</b>	21,250 [36,100]	<b>10F</b> - 10" ANSI Flange	<b>250</b> - DN 250 Flange

(4) Features
<b>D</b> = Internal Automatic Drain Mechanism
<b>G</b> = Differential Pressure Gauge Indicator
<b>S</b> = Corrosion Proof Stainless Steel Element
<b>M</b> = Filter Monitor

- Filter Grade** is indicated in space (1).
- Housing Number** is indicated in space (2).
- Connection Size** is indicated in space (3)
- If optional corrosion proof stainless steel cores are included, an **S** is indicated in space (4). Corrosion resistant stainless steel cores are standard.

*Example:* A Grade 5 high efficiency oil removal filter with a capacity of 1250 scfm and 3" NPTM connections would be configured as: **HF 5-56-24-G**

## Grade Identification

Filter grade can be identified by the third digit of the model number. In addition, elements with a foam outer sleeve can be identified by color.

Grade	Description	Type	Outer foam color
11	Mechanical Separator	Impaction type separator	none
9	Separator/filter	Mechanical separator and 3 micron coalescer	none
7	General purpose air line filter	1 micron coalescer	none
6	Dry Desiccant Afterfilter	1 micron after-filter for desiccant dryers	none
5	High efficiency oil removal filter	High efficiency (99.99+%) coalescer	Red
3	Maximum efficiency oil removal filter	Maximum efficiency (99.999+%) coalescer	Blue
1	Oil vapor removal filter	Activated carbon adsorber	Green

# 1.0 Installation

## A. Where Used/Air Quality After Filtration

Grade	Where used	Solid particle removal (maximum size in microns)	Liquid removal efficiency (at rated conditions)	Maximum inlet liquid loading ppm w/w	Remaining oil content ppm w/w
11	Separator - downstream of an aftercooler Point-of-use - where no aftercooler is installed upstream	—	95% of water	30,000 bulk liquids	—
9	Separator - downstream of an aftercooler Point-of-use - where no aftercooler is installed upstream or as prefilter to refrigerated dryer	3	99+% of water	25,000 aerosols & bulk liquids	5
7	Prefilter - • Prefilter to Grade 3 & Grade 5 high efficiency coalescing filters Point-of-use - where aftercooler is installed upstream	1	100% of water	2, 000 aerosols	1 aerosols
6	Afterfilter - downstream of a pressure-swing (heatless) desiccant dryer • Downstream of an Activated Carbon or Desiccant Tower	1	No liquid should be present at inlet	No liquid should be present at inlet	—
5	Prefilter • Ahead of desiccant and membrane dryers Afterfilter • Downstream of refrigerated dryer • Downstream of pressure-swing (heatless) desiccant dryers for finer solid particle removal • Oil removal at point-of-use	0.01	99.99+% of oil	1, 000 aerosols	0.008 aerosols
3	Prefilter - ahead of desiccant and membrane dryers (use after Grade 7 to reduce liquid and solids load, prolong element life and ensure filtration efficiency) Afterfilter - downstream of refrigerated dryer	0.01	99.999+% of oil	100 aerosols	0.0008 aerosols
1	Afterfilter to Grade 3 & Grade 5 for true oil free applications	0.01	Removes vapors only	No liquid should be present	0.003 vapor

## B. Piping

1. Before installing, blow out pipe line to remove scale and other foreign matter.
2. Mounting (Grades 11, 9, 7, 5, 3) - mount so that inlet and outlet connections are horizontal (filter bowl vertical) to ensure proper liquid drainage.
3. Flow Direction - install so that the air flow is in the direction indicated on filter.

**NOTE:** Grade 6 flows from outside to inside of element. All other grades flow from inside to outside. Observe flow arrows on unit.

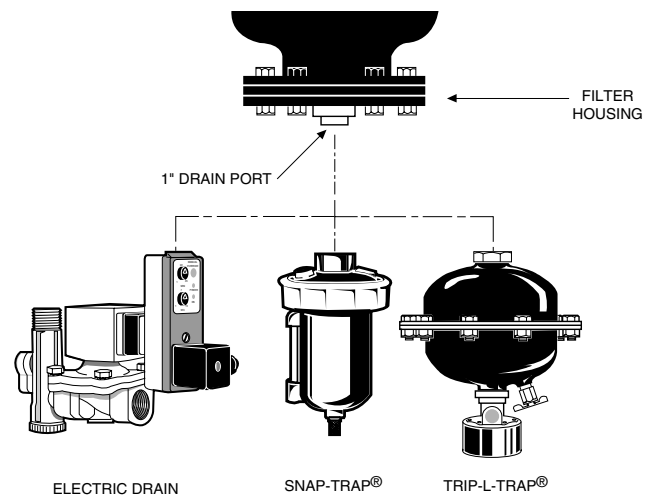
4. Isolation valves and by-pass piping - For ease of service, isolation and by-pass valves are desirable. In critical applications, two filters installed in parallel may be necessary to avoid interruption of air supply.

## C. Drain Provisions (Grades 11, 9, 7, 5, 3)

The bottom of the pressure vessel is provided with a drain plug for shipping purposes. Provision for manual or automatic draining is necessary for proper operation.

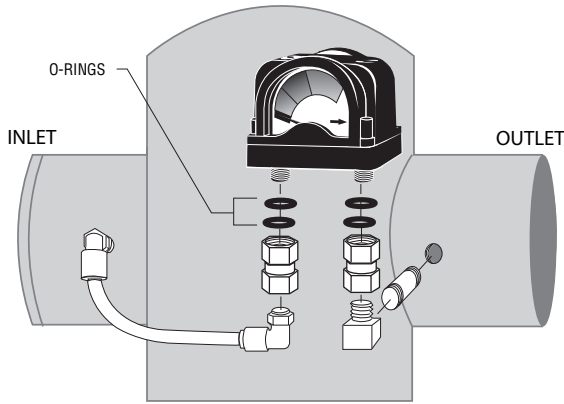
**WARNING** Do not attempt to remove drain plug if the unit is pressurized.

1. Manual Drain - When draining is performed manually on a regular, periodic basis, a simple (open/shut) valve may be used to drain the vessel. When draining manually, the valve should be opened slowly to avoid rapid depressurization and possible element damage.
2. Automatic Drain - Where regular manual draining is not performed, an automatic condensate drain should be used. A variety of drains is available from the manufacturer.

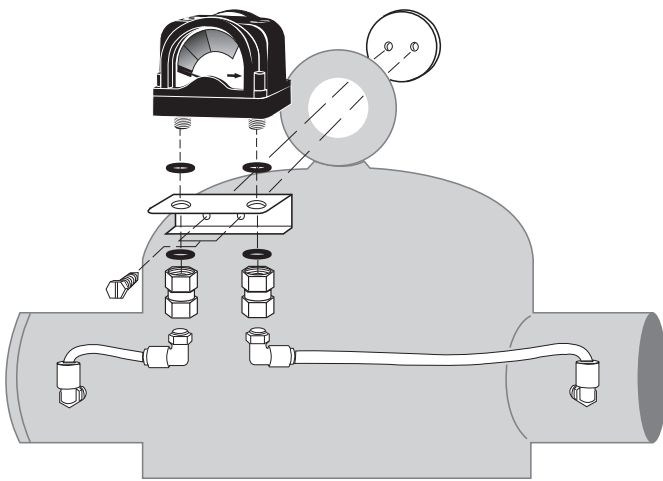


**D. Differential Pressure Gauge (DPG) - Grades 9, 7, 6, 5, 3**

On standard units, a gauge and installation kit are shipped separately packaged for field installation. Refer to diagram for proper installation. Gauge may be installed on filter housing or on a nearby wall using the wall mounting bracket supplied.



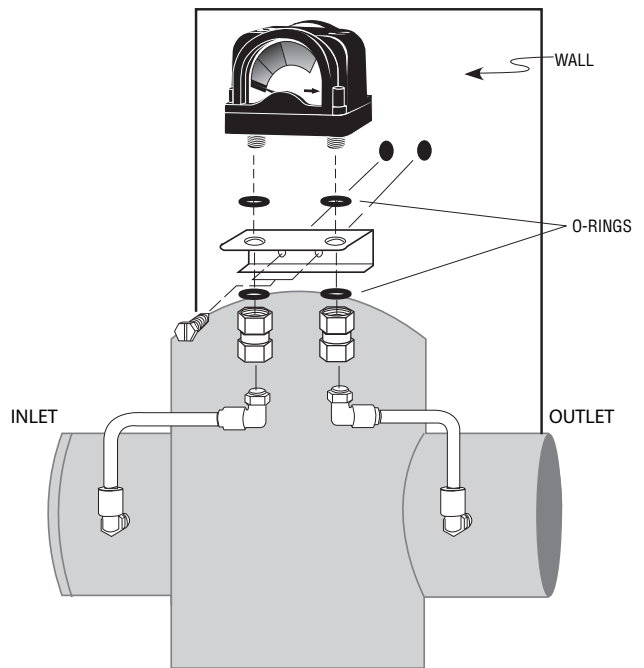
**Model 52 - Equipment Mounted**



**Model 54 and Larger - Equipment Mounted**

**NOTES:**

- 1) Make certain o-rings are in place on the bottom of the gauge body.
- 2) Connect the low pressure transmission bolt (bolt next to RED band on gauge) to the gauge port at the filter outlet (down-stream side of filter).
- 3) Connect the high pressure transmission bolt (bolt next to GREEN band on gauge) to the gauge port at the filter inlet (upstream side of filter).
- 4) Torque bolts to 25 +/- 5 inch oz. A flathead screwdriver with a 3/8" (1 cm) minimum blade width can be used to assemble/disassemble the gauge. Small blade widths will damage the bolt heads. **DO NOT OVER TIGHTEN**



**All Models - Wall Mounted**

## 2.0 Operation

**⚠ WARNING** Do not operate filter at pressures in excess of Maximum Working Pressure indicated on Serial Number Tag.

**NOTE:** Maximum Operating Temperature - 150°F, 66°C. Liquid filtration above 120°F, 49°C is not recommended since there is typically oil present in a vapor state which passes through the filter and condenses downstream.

**NOTE:** Grade 1 - If operated above 100°F, 38°C, a Grade 1 filter may experience less than 1000 hours of life because of greater oil vapor content.

### A. Operational Checkpoints

#### Grades 11,9,7,6,5,3

1. Grades 9,7,6,5,3 - Check pressure drop across the filter
  - a. Pressure differential in excess of 6 psi (0.42 kgf/cm<sup>2</sup>) - pressure indicator in red area - indicates that the filter sleeve or element should be replaced.

**NOTE:** Element should be changed annually or when indicator changes to red, whichever occurs first.

**NOTE:** Pressure drop should never exceed 15 psi (1.0 kgf/cm<sup>2</sup>).

**NOTE:** Grades 9, 7, 5, 3 - Pressure drop may temporarily increase when flow is resumed after flow stoppage. Pressure drop should return to normal within one hour.

- b. Check for sudden reduction in pressure drop. This might indicate:
    - (1) Possible leak across element o-ring seal
    - (2) Leak through the element due to physical damage
2. Check flow, pressure, and temperature to make certain filter is being operated within design conditions.
3. Grades 11, 9, 7, 5, 3 - Check to see that filter is installed level to insure proper drainage.
4. Grades 11, 9, 7, 5, 3 - Check that manual drains are drained periodically or that automatic drains are functioning.

#### Grade 1

1. Check for an oily smell by opening the manual valve. If an oily smell exists, the following should be checked:
  - a. Filter element adsorption capacity exhausted
  - b. Leak across element o-ring seal
  - c. Leak through element due to physical damage

- d. Presence of liquids because of lack of or failure of prefilters
- e. Flow, pressure and temperatures outside design conditions
- f. Presence of gaseous impurities which cannot be adsorbed by activated carbon

**⚠ CAUTION** Methane, carbon monoxide, carbon dioxide and various inorganic gases cannot be removed by a Grade 1 filter.

### C. Flow Capacity

Maximum air flow for the various filters at 100 psig (7 kgf/cm<sup>2</sup>) is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig (7 kgf/cm<sup>2</sup>), multiply flow from Table 1 by air flow correction factor from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

**NOTE:** Filters should not be selected by pipe size. Select using flow rate and operating pressure only.

**Table 1 - Maximum Flow @100 psig [7 kgf/cm<sup>2</sup>]**

Housing	scfm	[m <sup>3</sup> /hr]
<b>52</b>	625	[1110]
<b>54</b>	1000	[1700]
<b>56</b>	1250	[2125]
<b>60</b>	1875	[3158]
<b>64</b>	2500	[4250]
<b>68</b>	3125	[5310]
<b>72</b>	5000	[8490]
<b>76</b>	6875	[11,670]
<b>80</b>	8750	[14,850]
<b>84</b>	11,875	[20,175]
<b>88</b>	16,250	[27,610]
<b>92</b>	21,250	[36,100]

**Table 2 - Air Flow Correction Factor**

Maximum Inlet Pressure	psig	20	30	40	60	80	100	125	150	175	200
	kgf/cm <sup>2</sup>	1.4	2.1	2.8	4.2	5.6	7.0	8.8	10.6	12.3	14.1
Correction Factor		0.30	0.39	0.48	0.65	0.82	1.00	1.22	1.43	1.65	1.87

Maximum Inlet Pressure	psig	250	300	350	400	450	500	550	600	650	700
	kgf/cm <sup>2</sup>	17.6	21.1	24.6	28.1	31.6	35.2	38.7	42.2	45.7	49.2
Correction Factor		2.31	2.74	3.18	3.62	4.05	4.49	4.92	5.36	5.80	6.23

### 3.0 Maintenance

#### A. When to Replace Filter Element

**NOTE:** Grades 7,6,5,3,1 - complete element is replaced; Grade 9 - unless separator core is damaged outer sleeve only is replaced.

1. Grades 6 (dry desiccant afterfilter)  
Initial drop: 1 psi (0.07 kgf/cm<sup>2</sup>). Pressure drop increases as element loads with solid particles. Replace when pressure drop reaches 10 psi (0.7 kgf/cm<sup>2</sup>) (indicator in red area) or annually, whichever occurs first.
2. Grade 11 (mechanical separator)  
Element should not require replacement unless physically damaged. If sludge accumulates, element can be removed and cleaned with soap and water.
3. Grades 9, 7, 5, 3 (coalescing filters)
  - a. Initial (dry) pressure drop: 1 psi (0.07 kgf/cm<sup>2</sup>) to 2 psi (0.14 kgf/cm<sup>2</sup>)
  - b. Operating pressure drop: As filter becomes liquid loaded (wetted), pressure drop will increase to 2 to 6 psi (0.14 to 0.42 kgf/cm<sup>2</sup>). Further pressure drop occurs as element loads with solid particles.

FOR MAXIMUM FILTRATION EFFICIENCY, REPLACE ELEMENT WHEN PRESSURE DROP REACHES 6 PSI (0.42 KG/CM<sup>2</sup>) (INDICATOR IN RED AREA) OR ANNUALLY, WHICHEVER OCCURS FIRST.

**NOTE:** Pressure drop may temporarily increase when flow is resumed after flow stoppage. Pressure drop should return to normal within one hour.

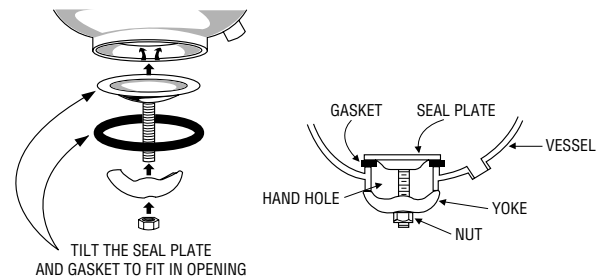
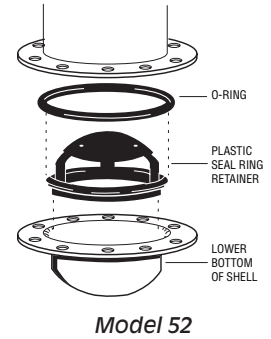
**NOTE:** Grades 5 and 3 - During normal operation bottom of foam sleeve will have a band of oil. Spotting above the band indicates that liquids are accumulating faster than they can be drained and that prefiltration is required.

4. Grade 1 (activated carbon filters)
  - a. Adsorption capacity - 1000 hours at rated capacity. Element life is exhausted when odor can be detected downstream of the filter.

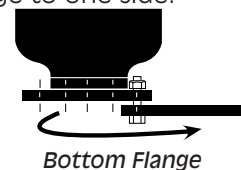
#### B. Procedure for Element Replacement

**⚠ WARNING** THIS FILTER IS A PRESSURE CONTAINING DEVICE. DEPRESSURIZE BEFORE SERVICING.

1. By-pass the filter to permit servicing.
2. Depressurize the filter assembly slowly by opening blowdown valve.
3. Open pressure vessel
  - 3A. Model 52 - Remove flange bolts. Lower bottom shell, o-ring, and seal ring retainer.
  - 3B. Models with handhole
    - a. Remove nut and yoke
    - b. Lift seal plate and turn so that seal plate and seal plate gasket can be removed.
  - 3C. Models with flanged bottom
    - a. Loosen bottom blind flange bolts.
    - b. Remove all but one bolt.
    - c. Swing flange to one side.



*Handhole*



*Bottom Flange*

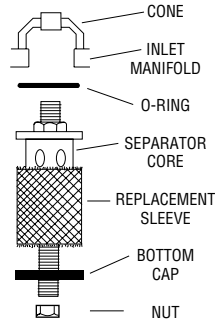
4. Starting in the center, unscrew the filter elements and remove the filter elements and element o-rings.



5. Grades 7, 6, 5, 3, 1 - Discard old elements and o-rings.

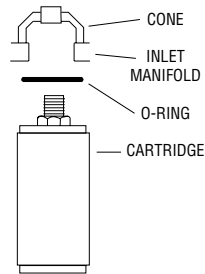
5A. Grade 9

- a. Remove nylon nut and bottom cap
- b. Slide disposable filter sleeve down over separator core.
- c. If necessary, clean separator core with soap and water.
- d. Slide new filter sleeve over separator core and replace bottom cap and nylon nut.



Grade 9 - Sleeve Replacement

6. Clean face of inlet manifold with a mild detergent using a long-handled brush or clean rag attached to a rod. Manifold face must be free of all dirt and grease to insure proper o-ring seal between new filter element top cap and inlet manifold.



All Grades - Element Replacement

7. Install new o-rings in the o-ring grooves in each filter element top cap.
8. Starting from the outside (filter element closest to the vessel wall), screw new filter elements into inlet manifold connections. A cone in the manifold will guide the element bolt into the female threads.

**NOTE:** Grades 5, 3 and 1 - Do not handle elements by outside foam cover. Handle by plastic packaging and bottom end cap only.

**NOTE:** It is only necessary to finger tighten the filter element to insure a seal. **DO NOT WRENCH TIGHTEN**

9. Close vessel

- 9A. Model 52 - Reassemble bottom shell, o-ring and seal-ring retainer to housing. Make sure seal-ring retainer provides a backup for the o-ring as shown in drawing.

9B. Models with hand hole

- a. Reinsert seal plate and seal plate gasket into vessel and position on lip as shown in drawing.

**NOTE:** Do not reuse gasket if gasket is torn or gasket surface is damaged.

- b. Reinstall yoke and nut.
- c. Tighten nut making sure that gasket is properly positioned under seal plate.

9C. Models with flanged bottom

- a. Swing blind bottom flange into position.
- b. Rebolt after inspecting flange gasket to ensure its integrity.

10. Pressurize unit slowly by slowly opening inlet valve, then opening outlet valve, and finally closing by-pass valve.



## **WARRANTY**

The manufacturer warrants the product manufactured by it, when properly installed, operated, applied, and maintained in accordance with procedures and recommendations outlined in manufacturer's instruction manuals, to be free from defects in material and workmanship for a period of one (1) year from date shipment to the buyer by the manufacturer or manufacturer's authorized distributor provided such defect is discovered and brought to the manufacturer's attention within the aforesaid warranty period.

The manufacturer will repair or replace any product or part determined to be defective by the manufacturer within the warranty period, provided such defect occurred in normal service and not as a result of misuse, abuse, neglect or accident. Normal maintenance items requiring routine replacement are not warranted. The warranty covers parts and labor for the warranty period. Repair or replacement shall be made at the factory or the installation site, at the sole option of the manufacturer. Any service performed on the product by anyone other than the manufacturer must first be authorized by the manufacturer.

Unauthorized service voids the warranty and any resulting charge or subsequent claim will not be paid.

Products repaired or replaced under warranty shall be warranted for the unexpired portion of the warranty applying to the original product.

The foregoing is the exclusive remedy of any buyer of the manufacturer's product. The maximum damages liability of the manufacturer is the original purchase price of the product or part.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, OR STATUTORY, AND IS EXPRESSED IN LIEU OF THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE MANUFACTURER SHALL NOT BE LIABLE FOR LOSS OR DAMAGE BY REASON OF STRICT LIABILITY IN TORT OR ITS NEGLIGENCE IN WHATEVER MANNER INCLUDING DESIGN, MANUFACTURE OR INSPECTION OF THE EQUIPMENT OR ITS FAILURE TO DISCOVER, REPORT, REPAIR, OR MODIFY LATENT DEFECTS INHERENT THEREIN.

THE MANUFACTURER, HIS REPRESENTATIVE OR DISTRIBUTOR SHALL NOT BE LIABLE FOR LOSS OF USE OF THE PRODUCT OR OTHER INCIDENTAL OR CONSEQUENTIAL COSTS, EXPENSES, OR DAMAGES INCURRED BY THE BUYER, WHETHER ARISING FROM BREACH OF WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

The manufacturer does not warrant any product, part, material, component, or accessory manufactured by others and sold or supplied in connection with the sale of manufacturer's products.

**AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.**

**SERVICE DEPARTMENT: (724) 746-1100**

## HF SERIES

Compressed Air Filters

Models HF(grade)-52 through HF(grade)-92  
Standard, High Pressure and Corrosion  
Resistant Models

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