

INSTRUCTION MANUAL

Models HF(grade)-12 through HF(grade)-48

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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

While the materials of construction are compatible with many flammable gases, the following application limitations must be considered:

- Housing materials are slightly porous. The product must be used in a well ventilated area in the absence of sparks or ignition sources. Do not use in Class 1, Division 1, Group D environments.
- The type of area - forced exhaust system used (i.e., high or low level) would be dependent on the gas involved.
- Each application (other than for air or inert gas) must be reviewed to minimize fire or explosion hazard.



COMPRESSED

AIR

FILTERS

Model Number Configuration

HF

(1)

(2)

(3)

(4)

(1) Filter Grade
17 - Particulate filter
11 - Mechanical Separator
9 - Separator/filter
7 - Air Line Filter
5 - High Efficiency Oil Removal Filter
3 - Ultra High Efficiency Oil Removal Filter
1 - Oil Vapor Removal Filter

(2) Housing		(3) Connection Sizes	
Number	Capacity scfm [m^3/min] @ 100 psig [7 kgf/cm ²]		
12	20 [0.57]	3 - 3/8" NPTF or 4 - 1/2" NPTF	3B - 3/8" BSP or 4B - 1/2" BSP
16	35 [1.00]		
20	60 [1.72]		
24	100 [2.9]	6 - 3/4" NPTF or 8 - 1" NPTF	6B - 3/4" BSP or 8B - 1" BSP
28	170 [4.9]		
32	250 [7.2]	8 - 1" NPTF or 10 - 1-1/4" NPTF or 12 - 1-1/2" NPTF	8B - 1" BSP or 10B - 1-1/4" BSP or 12B - 1-1/2" BSP
36	375 [11]		
40	485 [14]		
44	625 [18]	16 - 2" NPTF or 20 - 2-1/2" NPTF	16B - 2" BSP or 20B - 2-1/2" BSP
48	780 [22]		

(4) Features
D - Internal Automatic Drain Mechanism
P - Differential Pressure Slide Indicator
G - Differential Pressure Gauge Indicator
L - Liquid Level Indicator
S - Corrosion Proof Stainless Steel Element
X - External Drain Adapter

- Filter Grade** is indicated in space (1).
- Housing Number** is indicated in space (2).
- Connection Size** is indicated in space (3)
- Features**
 D = Internal Automatic Drain Mechanism
 P = Differential Pressure Slide Indicator
 G = Differential Pressure Gauge Indicator
 L = Liquid Level Indicator
 S = Corrosion Proof Stainless Steel Element
 X = External Drain Adapter

Example: A Grade 5 high efficiency oil removal filter with a capacity of 100 scfm and 3/4" NPTF connections would be configured as: **HF 5-24-6DGL**

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
17	Particulate filter	One micron solid particulate filter	none
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
5	High efficiency oil removal filter	High efficiency (99.99+%) coalescer	Red
3	Ultra high efficiency oil removal filter	Ultra high efficiency (99.999+%) coalescer	Blue
1	Oil vapor removal filter	Activated carbon adsorber	Green

1.0 Installation

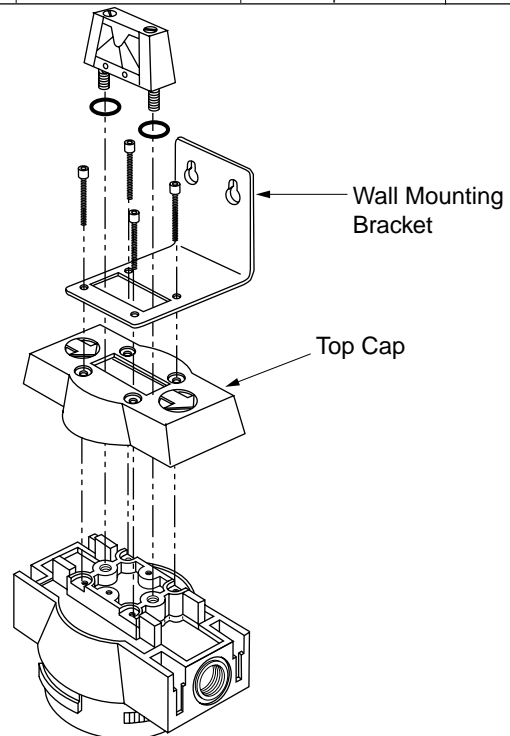
A. Where Used/Air Quality After Filtration

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
17	Afterfilter - downstream of a desiccant dryer; 150°F (66°C) maximum inlet	1	No liquid should be present at inlet	No liquid should be present at inlet	Dependent on prefilter
11	Separator - downstream of an aftercooler Point-of-use - where no aftercooler is installed upstream	---	95% of water	25,000 aerosols	---
9	Separator - downstream of an aftercooler Point-of-use - where no aftercooler is installed upstream	3	99+% of water	25,000	5 aerosols
7	Prefilter - <ul style="list-style-type: none"> • Alone ahead of desiccant dryers if no oil is present • Ahead of Grade 3 Afterfilter - downstream of pressure-swing (heatless) desiccant dryers Point-of-use - where aftercooler is installed upstream	1	100% of water	2,000	1 aerosols
5	Prefilter - alone ahead of desiccant and membrane dryers if oil is present Afterfilter <ul style="list-style-type: none"> • Downstream of refrigerated dryer • Downstream of pressure-swing (heatless) desiccant dryers for finer solid particle removal 	0.01	99.99+% of oil	1,000	0.01 aerosols
3	Prefilter - ahead of desiccant and membrane dryers if oil is present (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	0.001 aerosols
1	Use a Grade 7 or Grade 5 ahead of Grade 1 to remove any liquid present	0.01	Removes vapors only	No liquid should be present	0.003 vapor

B. Mounting

1. Wall mounting brackets - Mount bracket to filter head:

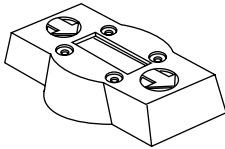
- (1) remove four (4) screws holding black plastic top cap to filter head
- (2) place bracket on head over plastic cap
- (3) install screws supplied with bracket.



C. Piping

1. Before installing, blow out pipe line to remove scale and other foreign matter.
2. This unit has DRYSEAL pipe threads; use pipe compound or tape sparingly to male threads only.
3. Mounting (Grades 11,9,7,5,3) - mount so that inlet and outlet connections are horizontal (filter bowl vertical) to ensure proper liquid drainage.
4. Flow Direction - install so that the air flow is in the direction of arrows on the filter head.

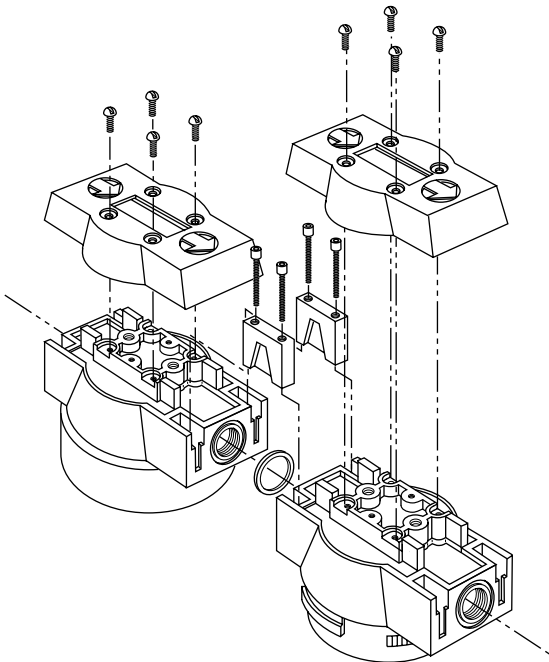
NOTE: Grade 17 flows from outside to inside of element. All other grades flow from inside to outside of element. Observe flow arrows on cap.



5. Direct filter-to-filter (modular) connection - Filter heads may be joined without using a pipe nipple

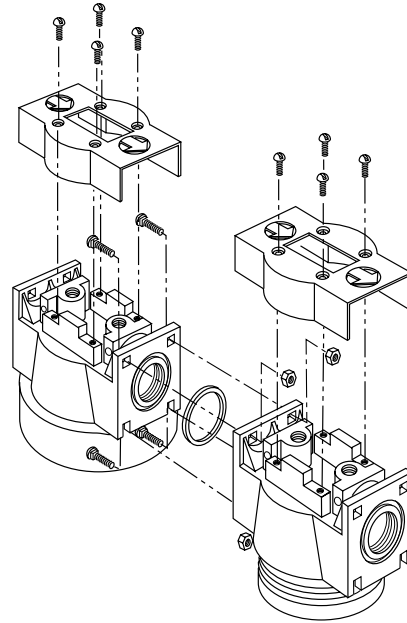
- a. Bayonet type heads - Use two (2) modular connectors, o-ring, and four (4) socket head cap screws (sold as kit)

Remove black plastic top cap, apply generous amount of lubricant to o-ring, install o-ring in groove, and insert connectors. Screw connectors to head using socket head cap screws.



- b. Threaded heads

Use four carriage bolts, nuts and o-ring (sold as kit). Remove black plastic top caps, apply generous amount of lubricant to o-ring, install o-ring in groove, and install bolts and nuts.



NOTE: Make certain flow direction through filters is correct (observe pin hole used for aligning top caps). Models 11,9,7,5,3,1 - when hole is on side closest to you, inlet is to left. Model 17 - when hole is on the side farther from you, inlet is to left.

NOTE: Lubricate o-ring with generous amount of lubricant before installation.

6. 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.
- D. Drain provisions

1. Internal Automatic Drains - Drain line
The bottom of internal automatic drains are provided with 1/8" (inside threads) for connection of a drain line if desired.
2. External Auto Drains - External auto drains may be added as follows:

Models with housings 34 through 48 - remove internal drain and install adapter (available from factory). Adapter outlet connection is 1/8" (inside threads).

WARNING Discharge is at system pressure; anchor drain line.

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 may experience less than 1000 hours of life because of greater oil vapor content.

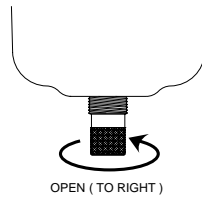
A. Liquid Draining - Grades 11, 9, 7, 5, 3

NOTE: Collected liquids must be removed to ensure proper operation.

NOTE: Depressurize slowly, to avoid filter element damage.

1. Manual Drain - Turn to your right (clockwise) to open and to your left (counterclockwise) to close.
2. Automatic Drain - Liquids will automatically discharge when sufficient accumulation occurs.
 - a. Internally Mounted Auto Drains - These drains may be manually drained by turning to your right (clockwise) to open and to your left (counterclockwise) to close.

NOTE: Manually drain internal auto drains daily to verify drain function.



B. Operational Checkpoints

All Grades

Check flow, pressure, and temperature to make certain filter is being operated within design conditions.

Grades 17,11,9,7,5,3

Check pressure drop across the filter

1. Pressure differential in excess of 10 psi (0.7 kgf/cm²) - 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 50 psi (3.5 kgf/cm²).

2. Check for sudden reduction in pressure drop. This might indicate:
 - a. Possible leak across element o-ring seal
 - b. Leak through the element due to physical damage

Grades 11,9,7,5,3

1. Check to see that filter is installed level to insure proper drainage.
2. Check that manual drains are drained periodically or that automatic drains are functioning.
3. On models with Liquid Level Sight glass - Check that liquid level is below top of Sight glass.

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

⚠ CAUTION Methane, carbon monoxide, carbon dioxide and various inorganic gases cannot be removed by an activated carbon filter.

C. Flow Capacity

Maximum air flow for the various filters at 100 psig (7 kgf/cm²) is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig (7 kgf/cm²), 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/cm²]

Housing	scfm [m ³ /min]
12	20 [0.57]
16	35 [1.00]
20	60 [1.72]
24	100 [2.9]
28	170 [4.9]
32	250 [7.2]
36	375 [11]
40	485 [14]
44	625 [18]
48	780 [22]

Table 2 - Air Flow Correction Factor

Minimum Inlet Pressure	psig	20	30	40	60	80	100	120	150	200	250	300
	kgf/cm ²	1.4	2.1	2.8	4.2	5.6	7.0	8.4	10.6	14.1	17.6	21.1
Correction Factor		0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

3.0 Maintenance

A. When to Replace Filter Element

NOTE: Grades 17,7,5,3,1 - complete element is replaced; Grade 9 - unless separator core is damaged outer sleeve only is replaced.

1. Grade 17 (particulate filter)
Initial drop: 1 psi (0.07 kgf/cm²). Pressure drop increases as element loads with solid particles. Re place when pressure drop reaches 10 psi (0.7 kgf/cm²) (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
 - a. Initial (dry) pressure drop: 1 psi (0.07 kgf/cm²) to 2 psi (0.14 kgf/cm²)
 - 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/cm²). Further pressure drop occurs as element loads with solid particles.
 - c. FOR MAXIMUM FILTRATION EFFICIENCY, REPLACE ELEMENT WHEN PRESSURE DROP REACHES 10 PSI (0.7 KGF/CM²) (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. If filter has not been depressurized before disassembly, an audible alarm will sound when the bowl begins to be removed from the head. If this occurs, stop disassembly, isolate and completely depressurize filter before proceeding.

1. Isolate filter (close inlet and outlet valves if installed) or shut off air supply.
2. Depressurize filter by slowly opening manual drain valve.
3. Remove bowl
 - a. For models 12 through 28 - bayonet mount - push bowl up, turn bowl 1/8th turn to your left, and pull bowl straight down
 - b. For models 32 through 48 - threaded bowls - unscrew bowl from head using hand, strap wrench or C spanner.
4. Clean filter bowl
5. Replace element

- a. Replacing complete element
 - 1) Pull off old element and discard.
 - 2) Make certain o-ring inside top of replacement element is in place and push element onto filter head. For Housing sizes 40 to 48, place element in bowl and secure with centering device.

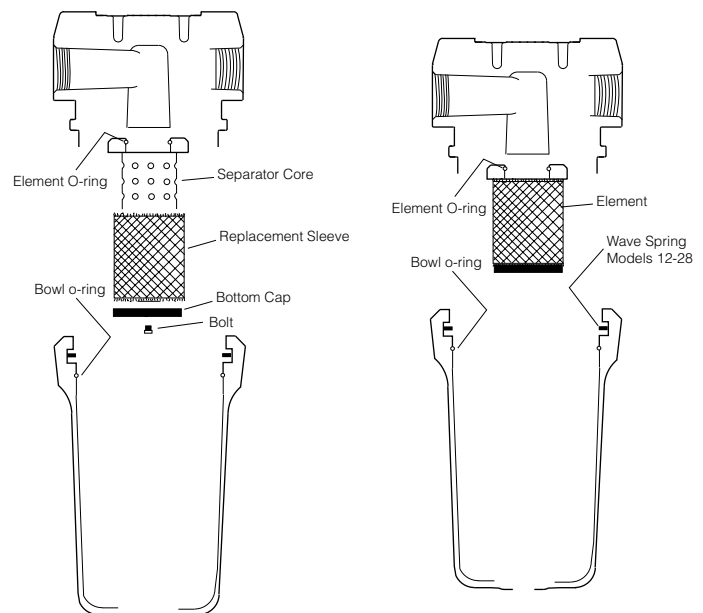
NOTE: Grades 5, 3, and 1 - Do not handle elements by outside foam cover. Handle by bottom end cap only.

- b. Grade 9 - replacing sleeve only
 - 1) Pull element straight down to remove.
 - 2) Remove bolt and bottom cap and remove disposable filter sleeve.
 - 3) Clean separator core with soap and water if necessary.
 - 4) Slide new filter sleeve over separator core and replace bottom cap and hand tighten bolt.
 - 5) Make certain o-ring inside top of element is in place and push element onto filter head.
6. After making certain that o-ring inside top of bowl (and on bayonet mount heads, wave spring) are in place, reassemble bowl to head.

NOTE: Make certain o-ring is generously lubricated.

NOTE: Wave spring ends should be pointed down to prevent the wave spring from interfering with reassembly.

NOTE: Threaded bowl to head connection, generously lubricate threads with a high grade/temperature lubricant good for 150°F, 66°C.



Grade 9 - Sleeve Replacement

All Grades - Element Replacement

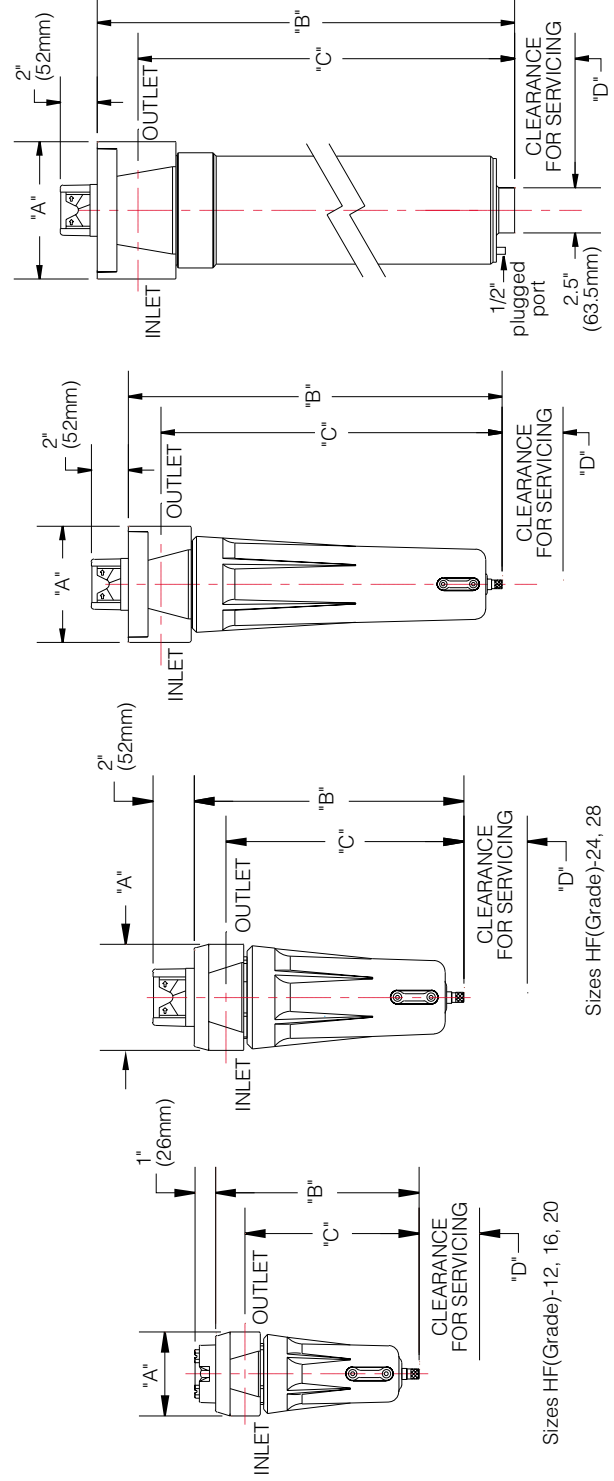
C. Auto Drain Mechanism

It is recommended that drain mechanism be replaced annually.

Dimensions and Weights

Filter Type	HF(Grade)-	12	16	20	24	28	32	36	40	44	48
Replacement Element	E(Grade)-	12 or 12S	16 or 16S	20 or 20S	24 or 24S	28 or 28S	32 or 32S	36 or 36S	40 or 40S	44 or 44S	48 or 48S
Nominal Air Flow scfm @100 psig (m ³ /min @ 7.0 bar)		20 (.57)	35 (1.00)	60 (1.72)	100 (2.9)	170 (4.9)	250 (7.2)	375 (11)	485 (14)	625 (18)	780 (22)
In/Out Connection	NPT or BSP	3/8, 1/2	3/8, 1/2	3/8, 1/2	3/4, 1	3/4, 1	1, 1-1/4, 1-1/2	1, 1-1/4, 1-1/2	2, 2-1/2	2-1/2	2-1/2
"A"		4.13 (105)	4.13 (105)	4.13 (105)	5.25 (133)	5.25 (133)	6.44 (164)	6.44 (164)	7.63 (194)	7.63 (194)	7.63 (194)
"B"		8.15 (207)	10.05 (255)	12.40 (316)	13.32 (338)	17.57 (446)	20.80 (528)	25.29 (642)	29.08 (739)	34.83 (885)	40.96 (1040)
"C"		6.40 (163)	8.59 (224)	10.97 (285)	11.74 (298)	15.99 (406)	18.98 (482)	23.47 (596)	26.83 (681)	32.58 (827)	38.71 (983)
"D"		3.00 (76)	3.00 (76)	3.00 (76)	3.50 (89)	3.50 (89)	4.00 (102)	4.00 (102)	4.00 (102)	4.00 (102)	4.00 (102)
Weight		4.14 (1.88)	8.1 (3.67)	8.5 (3.86)	6.3 (2.9)	6.9 (3.1)	10.2 (4.63)	11.3 (5.13)	28 (12.70)	33 (14.97)	38 (17.24)
Maximum Working Pressure		Housing - 300 psig, 21.1 kgf/cm ² Models with Internal Drain or Liquid level indicator - 250 psig, 17.6 kgf/cm ²									
Maximum Operating Temperature		150°F, 66°C									
Head Material		Zinc		Aluminum		Aluminum		Aluminum		Steel	
Bowl Material		Aluminum	Zinc	Aluminum		Aluminum		Aluminum		Steel	
Liquid Level Indicator Material		Isoplast		Isoplast		Isoplast		Isoplast		-----	

NOTE: Dimensions and Weights are for reference only. Request certified drawings for construction purposes.



Sizes HF(Grade)-12, 16, 20

Sizes HF(Grade)-24, 28

Sizes HF(Grade) 32, 36

Sizes HF(Grade) 40, 44, 48

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.

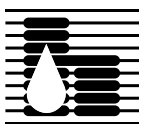
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AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.

SERVICE DEPARTMENT: (724) 746-1100



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