HYDAC INTERNATIONAL

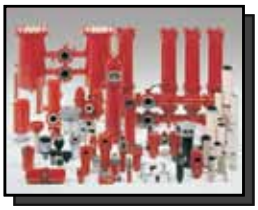
Hydraulic & Lube Oil Filters

Housings, Elements, Indicators, Sizing

About HYDAC

HYDAC stands for worldwide presence and accessibility to the customer. HYDAC has over 1000 distributor sales offices worldwide and more than 40 wholly owned subsidiaries. HYDAC has been active in the field of hydraulic and lube filtration for more than 30 years and has become one of the leaders in innovative filtration products in hydraulics and lube oil systems. Our know-how has evolved primarily from solving customers' problems, combined with the extensive experience of the whole HYDAC group.

HYDAC Products



Our product range extends from low pressure, low flow to high pressure, high flow filters. HYDAC has high, medium, and low pressure, suction, process, stainless steel, and specialty filters available for a large number of applications. HYDAC works hard to provide customer satisfaction by providing existing filter products or designing new filters to meet the demands of many application requirements.

HYDAC Quality

HYDAC stands for quality and customer satisfaction. We are certified to ISO 9001:2000 and can supply our products with certification if required. To ensure that our products are as innovative as possible, they are developed, manufactured, and tested by qualified personnel using advanced technology.

HYDAC Customer Service

Our internal staff and worldwide distribution network take care of the important matter of customer service. HYDAC values high standards, professional ethics, and mutual respect in all transactions with customers, vendors, and employees. We invest in our relationships by providing expertise, quality, dependability, and accessibility to foster growth and a sense of partnership. Our customer service representatives are committed to serving our customers' needs.

Energy and Environmental Technology

HYDAC Filtration plays a key role in providing innovative developments in hydroelectric, heating, wind, and waste power plants. HYDAC has vast expertise in solvent and waste water processing technologies.

Mobile Market

The aim of our engineers has always been to reduce volume and weight, resulting in increased product performance. HYDAC provides high performance filters for the Mobile Market, which can be found on construction, forestry, and agricultural equipment.

Process Technology

The core products of HYDAC process technology are electronics, filters, and filtration systems for the industrial and environmental processing industries. HYDAC filtration products are found in chemical, petrochemical, and plastics industries. Also, paper and dye production, foundries, steel manufacturing, and power plants.

Offshore Shipbuilding and Marine Technology

Maritime technology places special demands on material functionality and reliability. HYDAC filtration products meet these demands due to our high quality and test standards. HYDAC filters have been applied under the toughest conditions from drilling rigs to deep sea applications.

Industrial Engineering

Since we began, HYDAC has been involved in many industrial engineering applications. Our knowledge and expertise of many industries provides a comprehensive range of filters. HYDAC offers custom filtration solutions for machine tools, plastic injection molding machines, test equipment, presses, and welding robots. Other industrial applications include: steel and heavy industry, power transmissions, and paper mills.

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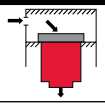
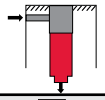
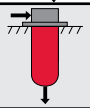
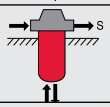
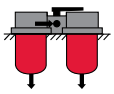
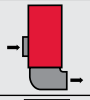
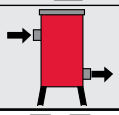
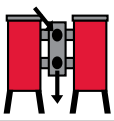
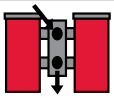
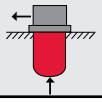
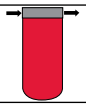
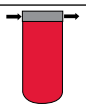
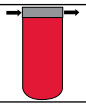
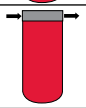
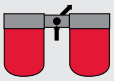
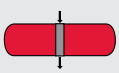
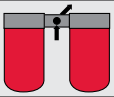
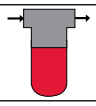
Low Pressure Filters

Filter Type	Maximum Pressure psi (bar)	Maximum Flow gpm (l/min)	Port Size Range (in)	Flow Path	Indicator D = Diff. S = Static	Filter Model Page	Features
Inside Tank	145 (10)	132 (500)	2		S	RFM...Set page 83	Revolutionary design places entire filter inside of the reservoir tank. Consult Factory.
	145 (10)	132 (500)	4		S	RFM...S page 83	Revolutionary design places entire filter inside of the reservoir tank. Consult Factory.
In-Tank	100 (7)	120 (454)	1 1/4 - 1 1/2		S	HF4R page 71	Meets automotive specs and uses industry standard-size elements. Threaded outlet permits in-line use on 18" & 27" only.
	145 (10)	211 (800)	3/4 - 2 1/2		S & Vac.	RKM page 75	Single filter functions as return line and charge pump filter in single housing. *(up to two change pumps)*
	145 (10)	225 (850)	3/4 - 2 1/2		S	RFM page 61	Sizes 75, 90, 150, 165, & 185 have a built-in breather. All sizes allow oil filling through element.
	100 (7)	26 (100)	hose barb			RFMP page 67	All polyamide.
	360 (25)	343 (1300)	1/2 - 4			RF page 41	HYDAC standard in-tank filters. Threaded or flanged outlets enable in-line use.
	360 (25)	450 (1700)	4		S (in-tank) D (in-line)	NF page 45	Configurable for in-tank or in-line applications. Low weight, water tolerant aluminum alloy.
In-Tank Duplex	360 (25)	343 (1300)	3/4 - 4		S	RFD page 51	For return lines in continuously operating systems; tank mounting and in-line.
	360 (25)	450 (1700)	4			NFD page 55	For return lines in continuously operating systems; tank mounting and in-line.
In-Line	725 (50)	35 (130)	3/4 - 1		D	MFX page 127	ECO-firendly, cost effective alternative to spin-on filters.
	360 (25)	150 (400)	1 1/4		D	FLN (DIN) page 95	HYDAC standard DIN low pressure filter. Low weight, water-tolerant aluminum alloy.
	500 (34.5)	450 (1700)	4		D	NFH page 99	Filters can be manifolded. Housings for high flow and/or high viscosity fluid *(e.g. in lube systems)*.
	360 (25)	350 (1300)	3,4		D	RFL Cast page 87	Back Mount single filter with with metric threads, API versions available.
	150 / 230 (10 / 16)	4000 (15000)	2-12		D	RFL Welded page 91	Floor mounted. Holds up to ten 2600 high capacity elements. ASME, CRN and API versions available. For High flow applications.
In-Line Duplex	230 / 580 (16 / 40)	340 (1300)	1-4		D	RFLD Cast page 103	Back mounted duplex filter with metric threads. Ball valve changeover. API versions available.
	150 / 230 (10 / 16)	3900 (15,000)	2-12		D	RFLD Welded page 107	Floor mounted. Holds up to ten 2600 high capacity elements per side. ASME, CRN and API versions available. For high flow applications. Large ball valve changeovers available.
	150 / 300 (10 / 20)	800 (3000)	2-6		D	RFLDH Welded page 111	Floor mounted. Holds up to 5 high cap. elements/side. ASME standard; API versions available. Ball valve changeover. Carbon & stainless steel.

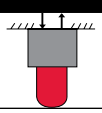
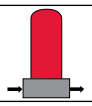
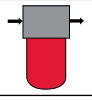
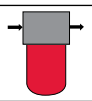
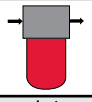
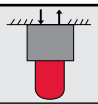
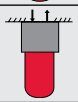
Low Pressure (cont.) & Spin-on Filters

Filter Type	Maximum Pressure psi (bar)	Maximum Flow gpm (l/min)	Port Size Range (in)	Flow Path	Indicator D = Diff. S = Static	Filter Model Page	Features
In-Line Duplex	360 (25)	105 (400)	1 1/2		D	FLND (DIN) page 117	Integrated equalization valve with transfer valve. Light weight.
	500 (34.5)	450 (1700)	4		D	NFHD page 121	Filters can be manifolded for high flow/ viscosity applications in continuously operating systems.
In-Tank Suction	100 (7)	120 (454)	1 1/4 - 1 1/2		Vacuum Gauge / Switch	HF4S page 71	Meets automotive specifications and uses industry standard size elements. Mounts on tank. Consult Factory.
	360 (25)	300 (1135)	2 - 4		Mechanical Bypass	SF page 137	Mounts on tank. Modified vacuum gauge indicators are available.
Single Element *(available in BSPP ports)*	120 (8)	7 (26)	3/8		N/A	MF 40 page 131	Standard length element. Not available with 3µm Betamicron elements.
	120 (8)	15 (57)	3/4 - 1		S	MF 80 page 131	Standard length element. Not available with 3µm Betamicron elements.
	120 (8)	25 (95)	3/4 - 1		S	MF 85 page 131	Extended length element. Same head as size 80. Paper elements only. 25 psid bypass standard.
	120 (8)	30 (113)	1 1/4 - 1 1/2		S	MF 160 page 131	Standard length element.
	250 (17)	15 (57)	3/4 - 1		D	MF 90 page 131	Standard length element. 250 psi rating minimizes leakage in case of flow surges.
	250 (17)	25 (95)	3/4 - 1		D	MF 95 page 131	Extended length element. 250 psi rating minimizes leakage in case of flow surges. Same head as size 90. 20µm Betamicron elements not available.
	120 (8)	30 (113)	1 1/4 - 1 1/2		D	MF 190 page 131	Standard length element. ΔP Sensing Indicators for applications where tank not vented to atmosphere.
	120 (8)	60 (227)	1 1/4 - 1 1/2		S	MF 180 page 131	Extended length element. Same head as size 160.
	120 (8)	60 (227)	1 1/4 - 1 1/2		D	MF 195 page 131	Extended length element. Same head as size 190. ΔP Sensing Indicators for applications where tank not vented to atmosphere.
Dual Elements	120 (8)	60 (227)	1 1/2		S	MFD 160 page 131	Parallel flow through two standard length elements mounted end to end.
	120 (8)	60 (227)	1 1/2 - 2		S	MFDS 160 page 131	Parallel flow through two standard length elements mounted side by side.
	120 (8)	120 (454)	1 1/2		S	MFD 180 page 131	Parallel flow through two extended length elements mounted end to end. Same head as MFD 160.
	120 (8)	120 (454)	1 1/2 - 2		S	MFDS 180 page 131	Parallel flow through two extended length elements mounted side by side. Same head as MFDS 160.

Medium Pressure Filters

Filter Type	Maximum Pressure psi (bar)	Maximum Flow gpm (l/min)	Port Size Range (in)	Flow Path	Indicator D = Diff. S = Static	Filter Model Page	Features
In-Line	1000 (69)	174 (660)	1/2 - 1 1/2		D	LPF page 141	Multiple uses: pressure lines, returns, off-line loops, and lube lines. Aluminum for low weight and water tolerance.
	1500 (100)	174 (660)	1/2 - 1 1/2		D	LF page 145	HYDAC standard filter. Aluminum for low weight and water tolerance.
	3000 (207)	100 (400)	1 1/2		D	FMND page 149	HYDAC standard DIN duplex high pressure filter.

High Pressure Filters

Filter Type	Maximum Pressure psi (bar)	Maximum Flow gpm (l/min)	Port Size Range (in)	Flow Path	Indicator D = Diff. S = Static	Filter Model Page	Features
In-Line	4000 (275)	25 (94)	3/4		D	HF2P page 161	Meets automotive specifications and uses industry standard-size elements. In-line configuration.
	4000 (275)	30 (113)	3/4		D	MFM page 173	Low cost in-line high pressure filter *(efficient design and construction).*
	5800 (400)	37 (140)	1 - 1 5/16		D	HFM page 177	In-line high pressure filter.
	5000 (345)	120 (454)	1 1/2		D	HF4P page 169	Meets automotive specifications and uses industry standard-size elements. Top loading in-line configuration.
	6000 (414)	120 (454)	1-2		D	HF3P page 165	Meets automotive specifications and uses industry standard-size elements. In-line configuration.
	6000 (414)	190 (720)	1/2-2		D	DF page 153	HYDAC standard high pressure filter. Wide choice of models and elements, and optional features.
	6090 (420)	250 (950)	2		D	DF/DFF 1500 page 157	HYDAC high pressure filter, available in bi-directional and single-flow configurations.
Manifold Mount	4000 (275)	25 (94)	2		D	HF2-P page 161	Meets automotive specifications and uses industry standard-size elements. Manifold configuration.
	4500 (310)	180 (1320)	8		D	DFP page 199	HYDAC standard manifold filter. Ports at top.
	4500 (315)	349 (1320)	9		D	DF...QE page 195	Side mount to manifold; upper inlet, lower outlet.
	5000 (345)	120 (454)	3		D	HF4-P page 169	Meets automotive specifications and uses industry standard-size elements. Manifold configuration.

High Pressure Filters *(cont.)*

Filter Type	Maximum Pressure psi (bar)	Maximum Flow gpm (l/min)	Port Size Range (in)	Flow Path	Indicator D = Diff. S = Static	Filter Model Page	Features
Manifold Cartridge	3000 (207)	12 (45)	1 5/16		NA	CP-C16 page 209	Circuit protector, high pressure manifold cartridge filter. Back-up protection for upstream pressure filters. Fits into standard C16-2 manifold port.
	3000 (207)	25 (94)	SAE-16, SAE-20		D	CF page 207	Disposable, high pressure manifold cartridge filter. Low weight, water-tolerant aluminum alloy.
	6000 (414)	30 (113)	SAE-10, SAE-16, SAE-24		D	CP-SAE page 211	Circuit protector, high pressure manifold cartridge filter. Back-up protection for upstream pressure filters. Fits into standard SAE o-ring port.
Modular Stacking In-line	4500 (310)	16 (60)	D03/D05 Patterns			DFZ page 203	Servo valve sandwich mount. Bowl on right or left side.
Duplex	4500 (315)	90 (340)	2		D	HFDK4P page 185	Meets automotive specifications and uses industry standard-size elements. Top loading duplex configuration.
	4500 (310)	90 (341)	3/4 - 2		D	DFDK page 181	HYDAC standard duplex for continuously operating systems.
In-line Reverse Flow	6000 (414)	250 (1000)	1 1/4 - 1 1/2		D	DFFH page 189	Filters in one direction; bypasses in reverse. Common use: hydrostatic circuit.
In-line Bi-Directional Flow	6000 (414)	250 (1000)	1 1/4 - 2		D	DFFHM page 189	Filters in both directions (reverse flow & bi-directional flow). Common use: hydrostatic circuit. See DFFH/DFFHM filter brochure.

Betafit® Elements

Description	Types of Elements
HYDAC supplies a wide range of elements that are dimensionally interchangeable with elements of other manufacturers. Elements are of the same media and quality construction as HYDAC proprietary elements. A list of available interchanges can be found under “Betafit Element Selector” at **www.hydacusa.com.**	• High efficiency depth, pressure and return • Betamicron/paper nominal, low pressure • Tank air-breather filters • Suction Strainers

Note to the Reader

The objective of our catalog is to provide the information and guidance you'll need to make informed and appropriate choices for your filtration needs.

Illustrated and easy to understand, Section 1 - Filtration Fundamentals serves as an effective "primer" on contamination control fundamentals. In this section, we also provide filtration information and guidance for selecting the optimal filter and element media for your application.

Section 1 also explains recent changes in industry standards regarding how fluid cleanliness is defined and measured. Recent technological advancements in the measurement of microscopic particles, coupled with the establishment of a new standard test dust for calibration purposes, necessitated these changes. Although the new standards may seem confusing at first, they enable more accurate sizing of dirt particles and reduce variability in output among different automatic particle counters. The end result is more reliable data for the user.

Sections 2 through 4 describe the types of filter products and accessories HYDAC offers. Whether your hydraulic system requires pressure filters, tank-mounted filters, return-line filters, or some combination of these, this catalog will help you find the right HYDAC filter to do the job. Of course, every filter comes with a HYDAC original element, available in a wide variety of media and micron ratings.

In Section 5, you'll find extensive technical data on HYDAC 's comprehensive collection of absolute filter medias, which combine high efficiency performance with low pressure drop and exceptional dirt holding capacity. HYDAC's design engineers have also given special attention to developing more environmentally friendly products, such as Ecomicron® elements. These elements contain little or no metal and are made of fully recyclable materials for environmentally safe disposal.

Visit Us Online...

HYDAC's web site, ***www.hydacusa.com***, now offers our Online Cross-Reference Guide to Betafit® replacement elements titled **Betafit Element Search**. With this user-friendly guide you can match filter elements from many other manufacturers with appropriate HYDAC Betafit® replacements.

CERTIFIED QUALITY MANAGEMENT SYSTEM ISO 9001:2008 ANAB ACCREDITED DNV

ISO Certification

HYDAC is a worldwide leader in hydraulics. We have earned that role by emphasizing quality, innovation, and excellence in everything we manufacture. As an ISO 9001:2008 registered company, HYDAC is committed to maintaining high standards of quality and services.

WARNING!

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from HYDAC, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

HYDAC does not assume the risk of and shall not be liable for failure due to fire. HYDAC offers fire safety devices and recommends their use.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by HYDAC Corporation and its subsidiaries at any time without notice.

Corporate Overview

HYDAC focuses on the filtration needs of our customers in the fluid power industry and is proud of our proven track record of providing quality filtration products over the last thirty years. The designs you see in this catalog are the result of thousands of hours of field testing and laboratory research and decades of experience.

HYDAC is a leader in filtration and fluid conditioning and the proof of our expertise lies in our broad mix of quality products.

HYDAC's goal is to be your filtration partner. Our expertise in filtration technology, our superior filter and element manufacturing capabilities, and our dedication to customer service and product support are the reasons we are considered a leader in the Filtration Supply Industry.

We are committed to providing the best available filter products to meet necessary cleanliness levels at a competitive price. As a cost-effective quality producer, we can work with your purchasing department to supply contamination control technology or develop long-range pricing programs that can improve your company's bottom line.

HYDAC's products, technical expertise, commitment to research and development, and ongoing improvements in manufacturing enable us to provide products and services that improve performance and efficiency in many major industries, including:

Capabilities

HYDAC has in place a strategically positioned international distribution network, supported by our professional and experienced sales and marketing team. Distributor personnel are trained in the important aspects of filter application by HYDAC in training sessions held at our factory and around the globe. The effectiveness of our product and service support is multiplied by utilizing HYDAC 's extensive distributor network.

Products

HYDAC's products are continually tested using the latest ISO, ANSI and NFPA test procedures in our contamination control lab. Our dynamic test stands are in constant operation, subjecting our filter housings to cyclic pressure to verify their rated fatigue pressures per NFPA Standard T2.6.1 or other international standards. Statistically sampled elements are tested to ensure fabrication integrity in the manufacturing process. They are also tested for efficiency, stability and dirt-holding capacity in a multi-pass test facility, equipped with characterization instruments with in-line particle counting capabilities, which are calibrated to ANSI standards. In addition, a flat media multi-pass test is used in our ongoing filter media development program.

Extensive testing is conducted to ensure compatibility with various hydraulic fluids, including the newest fire-resistant fluids, per ISO 2943 Standard. Flow fatigue tests are run to evaluate the structural strength of elements, per ISO 3724 Standard.

HYDAC Standard Tests Design and Testing Standards of HYDAC Filter Housings

Description	Standard
Burst Pressure Test	NFPA/T-2.6.1
Fatigue Testing	NFPA/T-2.6.1
Pressure Drop vs. Flow	NFPA/T-3.10.14

Design and Testing Standards of HYDAC High Efficiency Elements

Description	Standard
Element Collapse (Burst)	ISO 2941
Fabrication Integrity	ISO 2942
Material Compatibility	ISO 2943
Element Flow Fatigue	ISO 3724
Pressure Drop/Flow Rate	ISO 3968
Multi-Pass	ISO 16889

Contamination Control Fundamentals

Why Filter?

70% - 90% of all hydraulic system failures are caused by contaminants in the fluid. Even when no immediate failures occur, high contamination levels can sharply decrease operating efficiency.

Contamination is defined as any substance which is foreign to a fluid system and damaging to its performance. Contamination can exist as a gas, liquid or solid. Solid contamination, generally referred to as particulate contamination, comes in all sizes and shapes and is normally abrasive.

High contaminant levels accelerate component wear and decrease service life. Worn components, in turn, contribute to inefficient system operation, seizure of parts, higher fluid temperatures, leakage, and loss of control. All of these phenomena are the result of direct mechanical action between the contaminants and the system components. Contamination can also act as a catalyst to accelerate oxidation of the fluid and spur the chemical breakdown of its constituents.

Filtering a system's fluid can remove many of these contaminants and extend the life of system components.
Filtration = System Protection

How a System Gets Contaminated

Contaminants come from two basic sources: they either enter the system from outside (ingression) or are generated from within. New systems often have contaminants left behind from manufacturing and assembly operations. Unless they are filtered as they enter the circuit, both the original fluid and make-up fluid are likely to contain more contaminants than the system can tolerate. Most systems ingest contaminants through such components as inefficient air breathers and worn cylinder rod seals during normal operation. Airborne contaminants are likely to gain admittance during routine servicing or maintenance. Also, friction and heat can produce internally generated contamination.

Size of Solid Contaminants

The size of solid particle contaminants is commonly measured in micrometers, µm, (usually referred to as microns, µm). A micron is a unit of length equal to one millionth of a meter or about 0.00004 inch. Particles that are less than 40 µm cannot be detected by the human eye.

Figure 2 shows the sizes of some common substances. To gain some perspective, consider the diameters of the following substances:

Substance	Microns	Inches
Grain of table salt	100 µm	0.0039”
Human hair	80 µm	0.0027”
Talcum powder	10 µm	0.00039”
Bacteria (average)	2 µm	0.000078”

A micron rating identifies the size of particles that a particular filtration media is designed to remove. For instance, HYDAC 3µm Betamicron® filter media is rated at ß3 ≥200, meaning that it can remove particles of 3 µm and greater at 99.5% efficiency.

Figure 1. Typical Examples of Wear Due to Contamination

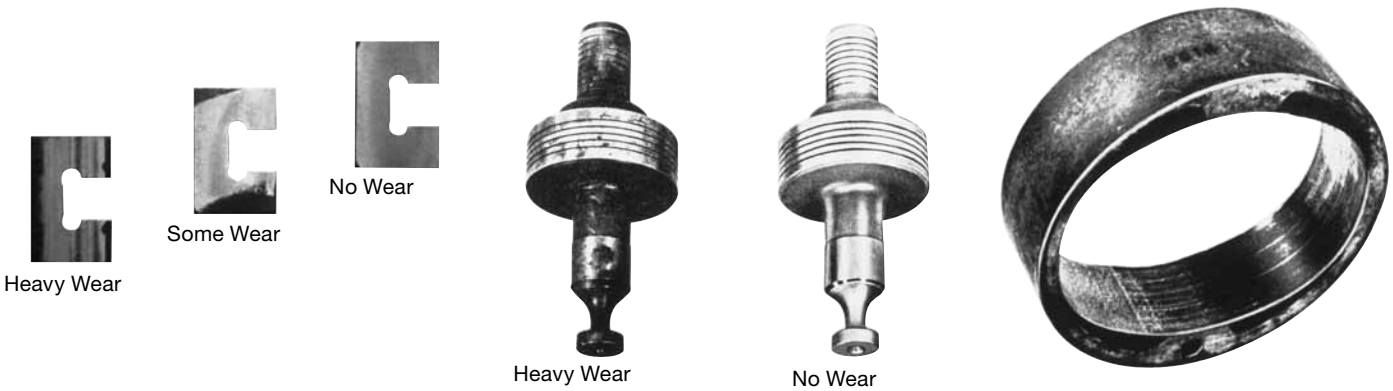
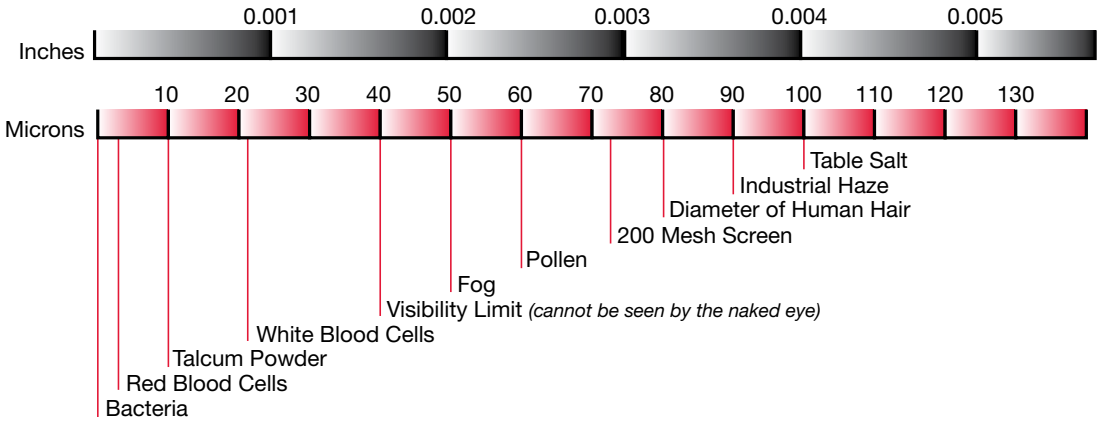


Figure 2. Sizes of known Particles in Inches and Microns



How Contaminants are Measured and Reported - Changes in the Industry

In hydraulic fluid power systems, power is transmitted and contained through a liquid under pressure within an enclosed circuit. These fluids all contain a certain amount of solid particle contaminants. The amount of particulate contaminants present in a hydraulic or lubrication system's fluid is commonly referred to as its cleanliness level.

Recent changes in measuring and defining the cleanliness of fluid systems have created a shift in the way the size and amount of solid contaminants are reported. In 1999, the International Standards Organization (ISO) introduced a series of new fluid cleanliness standards that reflect these changes. These standards are summarized in Table 1.

Table 1. Changes in Industry Standards

Previous	Current 1999	Description
ISO 4406	ISO 4406:1999	ISO Range Code
ISO 4402	ISO 11171	Automatic Particle Counter *(APC)* calibration procedures *(ACFTD to ISO MTD)*
ISO 4572	ISO 16889	Multi-pass test reports

The change in calibration procedures (ISO 4402 to ISO 11171) occurred for two reasons. First, the industry developed a new standard test dust for calibration fluid. This new ISO Medium Test Dust (ISO MTD) replaced the previously used AC Fine Test Dust (ACFTD), which is no longer available. Secondly, there has been a change in how particle sizes are measured. By way of newer technologies, particles are now measured in two dimensions, whereas in the past they had been measured using the largest dimension (chord). Older technology was not as precise as it is today, and particle sizes reported were less accurate. Table 2 shows that what used to be classified as a 2 µ particle is now classified as a 4.6 µ(c) particle. The (c) denotes that particle size measurements are certified using an Automatic Particle Counter (APC) which has been calibrated in accordance with ISO 11171.

ISO 11171 calls for the use of ISO MTD dust and changes the way we report the number of particles based on the new distribution of particles in the new standard reference material (SRM2806). Today, the ISO Medium Test Dust and the new calibration standard (11171) are used to synchronize all APC's. This change was made in an effort to reduce variability in tests conducted in different laboratories around the world.

How will these changes affect you?

In comparing the old standards to the new, the following have not changed:

- The amount and the size of solid contamination in your system is still the same!
- The filters still work the same way!

What has changed:

- The way particle size is specified has changed.

The new standards and reporting methods "move the measuring stick" to correct for the inaccurate calibration assumptions made over the past 40 years.

Particle Size Definitions - ISO 4402 vs. ISO 11171

This change in the way contaminants are measured had the net effect of changing the classification of the size of the particle.

Table 2. A Comparison of Particle Size Classification

ISO 4402 (ACFTD)	ISO 11171 (ISO MTD)
< 1.0 µm	4.0 µm(c)
1.0 µm	4.2 µm(c)
2 µm	4.6 µm(c)
3 µm	5.1 µm(c)
5 µm	6.4 µm(c)
10 µm	9.8 µm(c)
15 µm	13.6 µm(c)
20 µm	17.5 µm(c)
25 µm	21.2 µm(c)
Previous Size per ISO 4402	Current Size per ISO 11171

Note that the size of the particles is reported differently; i.e., a particle 1.0 µm in size under ISO 4402 is now considered to be 4.2 µm(c) in size. **Keep in mind that the particles are actually the same size they have always been; we are just using a different ruler.**

ISO Scale Numbers - ISO 4406 vs. ISO 4406:1999

ISO 4406:1999 provides guidelines for defining the level of contamination present in a fluid sample in terms of an ISO rating. Due to the change in the specification of particle sizes shown in Table 2, the definition of the ISO scale (or range) numbers needed to be redefined. Tables 3(a) and 3(b) provide a comparison of ISO scale numbers under ISO 4406 and 4406:1999, respectively.

Another change involved the addition of a third scale number to define an ISO rating. Under the old ISO 4406, the ISO scale numbers represented the number of particles greater than or equal to 5 µm and 15 µm in size. The new ISO 4406:1999 uses three scale numbers, representing the number of particles greater than or equal to 4 µm(c), 6 µm(c), and 14 µm(c) in size.

Figure 3(a) shows the graph used to plot particle counts per ISO 4406. When the count of particles ≥5 µm and ≥15 µm in size are plotted, the corresponding ISO rating can be determined graphically. Two micron (2 µm) levels are optional, as they are not a required part of the old ISO 4406 standard.

Similarly, Figure 3(b) shows the graph used to plot particle counts per ISO 4406:1999. This figure shows how 4406:1999 is different from the old ISO 4406 in that it plots the cleanliness level based on the number of particles at the 4 µm(c)/6 µm(c)/14 µm(c) sizes per 1 mL of fluid.

Also, filter companies previously measured the number of particles per 100 mL of sample fluid. Under ISO 4406:1999, we now report the number of particles per 1 mL of sample fluid.

It is important to note that net effect of all these changes keeps the ISO rating relatively unchanged.

Figure 3(a). Graphing Particle Counts per ISO 4406

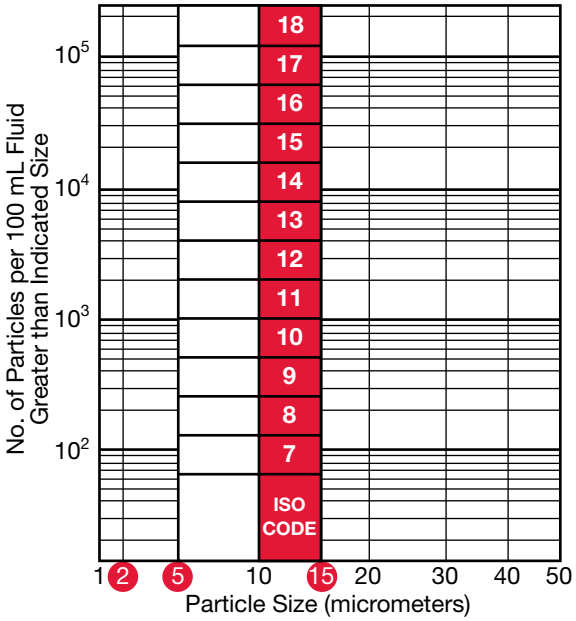


Figure 3(b). Graphing Particle Counts per ISO 4406:1999

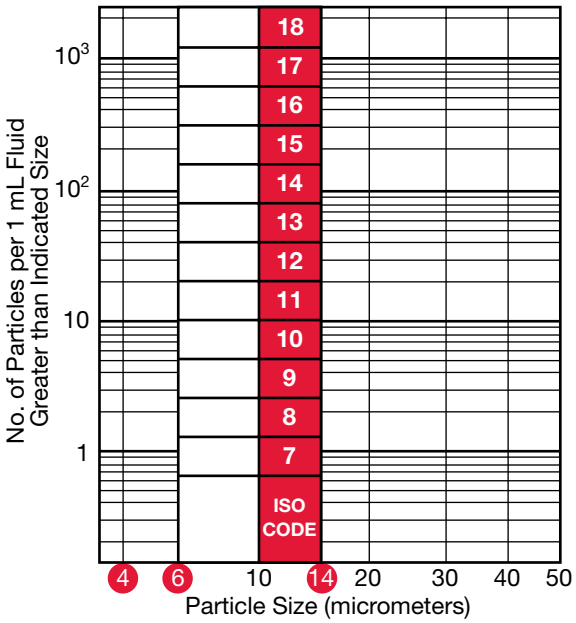


Table 3(a). ISO Code 4406 Hydraulic Fluid Power–Solid Contamination Code

Number of Particles per 100 mL of Fluid		Scale Number
More Than	Up to and Including	
8,000,000	16,000,000	24
4,000,000	8,000,000	23
2,000,000	4,000,000	22
1,000,000	2,000,000	21
500,000	1,000,000	20
250,000	500,000	19
130,000	250,000	18
64,000	130,000	17
32,000	64,000	16
16,000	32,000	15
8,000	16,000	14
4,000	8,000	13
2,000	4,000	12
1,000	2,000	11
500	1,000	10
250	500	9
130	250	8
64	130	7
32	64	6
16	32	5
8	16	4
4	8	3
2	4	2
1	2	1

Previous ISO codes are commonly made up of 2 scale numbers representing the number of particles ≥5 µm and ≥15 µm. Showing a third scale number, ≥2 µm is optional. The left number will always be larger. The scale numbers are defined such that each successive scale is generally a doubling of the previous scale. The particle count can be expressed as the number of particles per mL or per 100 mL, but the ISO range numbers and the ISO codes do not change.

Table 3(b). ISO 4406:1999 Hydraulic Fluid Power–Solid Contamination Code (New)

Number of Particles per 1 mL of Fluid		Scale Number
More Than	Up to and Including	
1,300,000	2,500,000	28
640,000	1,300,000	27
320,000	640,000	26
160,000	320,000	25
80,000	160,000	24
40,000	80,000	23
20,000	40,000	22
10,000	20,000	21
5,000	10,000	20
2,500	5,000	19
1,300	2,500	18
640	1,300	17
320	640	16
160	320	15
80	160	14
40	80	13
20	40	12
10	20	11
5	10	10
2.5	5	9
1.3	2.5	8
0.64	1.3	7
0.32	0.64	6
0.16	0.32	5
0.08	0.16	4
0.04	0.08	3
0.02	0.04	2
0.01	0.02	1
0.00	0.01	0

Current ISO codes are made up of 3 numbers representing the number of particles ≥4 µm(c), ≥6 µm(c) and ≥14 µm(c). The particle count is expressed as the number of particles per mL.

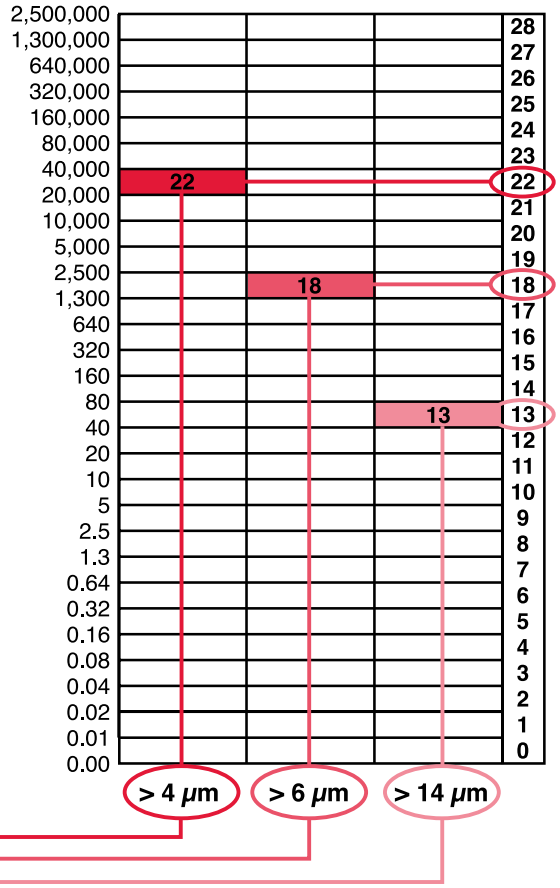
ISO 4406 Code

Cleanliness levels are defined by three numbers divided by slashes (/.) These numbers correspond to 4, 6, and 14 micron, in that order. Each number refers to an ISO Range Code, which is determined by the number of particles for that size (4,6, & 14µm) and larger present in 1 ml of fluid. Each range is double the range below. Refer to the chart below to see the actual ranges.

Example:

larger than 4µm = 22,340
larger than 6µm = 1,950
larger than 14µm = 43

ISO Code = 22 / 18 / 13



Achieving the appropriate cleanliness level in a system

The only way to achieve and maintain the appropriate cleanliness level in a hydraulic or lubrication system, is to implement a comprehensive filtration program. HYDAC offers all of the products that are needed to do just that! - They include:

Solid Contamination

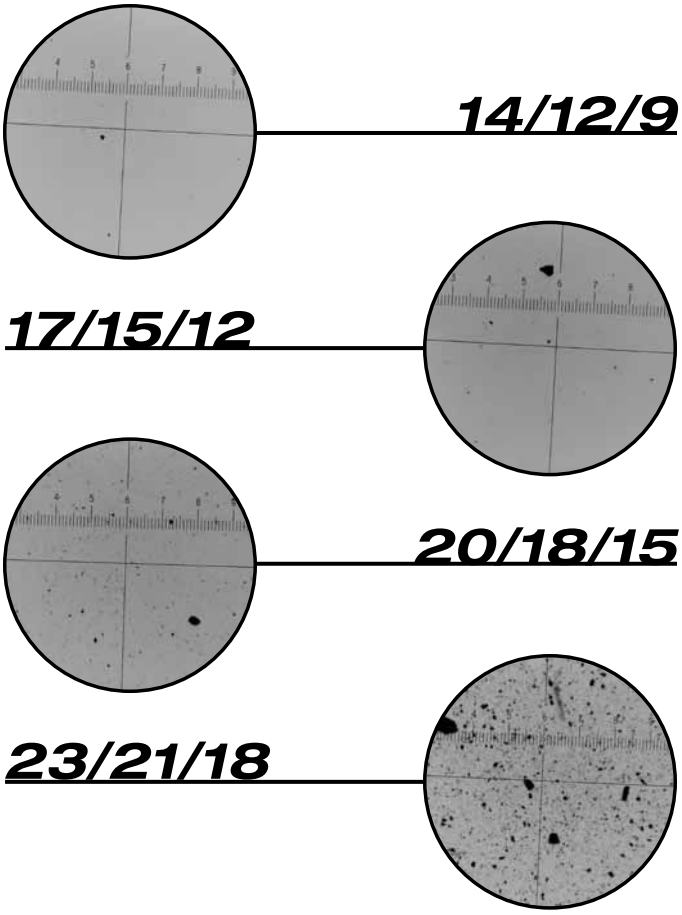
- pressure filters
- return line filters
- offline filtration loops
- oil transfer units for precleaning of new oil
- portable and online contamination monitors
- reservoir breathers and filler/breathers

Water Content

- water content sensors
- reservoir breathers with silica gel desiccant
- vacuum dehydration water removal units
- water removal elements

Fluid Analysis

- bottle sampling kits
- complete analysis kits



Cleanliness Levels - ISO 4406 vs. ISO 4406:1999

The following example shown in Figures 4(a) and 4(b) compares the cleanliness level, or ISO rating, of a typical petroleum-based fluid sample using both the previous ISO Code 4406 and the current ISO Code 4406:1999 rating systems.

The fluid sample contains a certain amount of solid particle contaminants, in various shapes and sizes. Figure 4(a) shows a 100 mL sample that contains 300,000 particles greater than 2 µm in size, 20,000 particles greater than 5 µm in size, and 1,500 particles greater than 15 µm in size.

Since the particle count for contaminants size 2 µm and greater falls between 250,000 and 500,000, the first *(optional)* ISO range *(or scale)* number is 19 using Table 3(a). The particle count falls between 16,000 and 32,000 for particles greater than 5 µm, so the second ISO range number is 15. The particle count falls between 1,000 and 2,000 for particles greater than 15 µm, so the third ISO range number is 11. Thus, the cleanliness level for the fluid sample shown in Figure 4(a) per ISO 4406 is ISO 19/15/11.

In Figure 4(b), note that 1 mL of fluid (not per 100 mL) is measured per ISO 4406:1999. Also, the amount of particles at the 4 µm(c)/6 µm(c)/14 µm(c) levels are measured instead of at the 2 µm/5 µm/15 µm levels.

The number of 4 µm(c) particles falls between 2500 and 5000, so the first ISO range number is 19 using Table 3(b). The count for 6 µm(c) particles falls between 160 and 320 particles, so the second ISO range number is 15. The 14 µm(c) particle counts falls between 10 and 20, so the third range number is 11. Therefore, the cleanliness level for the fluid sample shown in Figure 4(b) per ISO 4406:1999 is 19/15/11.

Although the ranges for the scale numbers have changed, the resulting ISO Code has not changed.

Figure 4(a). Determining the ISO Rating of a Fluid Using ISO 4406 **Previous**

Sample Fluid **100 mL**

Particle Size	Number of Particles
≥ 2 µm	300,000
≥ 5 µm	20,000
≥ 10 µm	4,000
≥ 15 µm	1,500
≥ 20 µm	1,000
≥ 30 µm	0.3

If Particle Count Falls Between	Scale Number is*
250,000-500,000	19
16,000-32,000	15
1,000-2,000	11

*Source: ISO/DIS 4406

The Sample Fluid is ISO 19/15/11.

optional

Figure 4(b). Determining the ISO Rating of a Fluid Using ISO 4406:1999 **Current 1999**

Sample Fluid **1 mL**

Particle Size	Number of Particles
≥ 4 µm(c)	3,000
≥ 5 µm(c)	700
≥ 6 µm(c)	200
≥ 10 µm(c)	
≥ 14 µm(c)	15
≥ 15 µm(c)	
≥ 20 µm(c)	10
≥ 30 µm(c)	3

If Particle Count Falls Between	Scale Number is*
250,000-500,000	19
16,000-32,000	15
1,000-2,000	11

*Source: ISO 4406:1999

The Sample Fluid is ISO 19/15/11.

Required Cleanliness Levels

The pressure of a hydraulic system provides the starting point for determining the cleanliness level required for efficient operation. Table 4 provides general guidelines for recommended cleanliness levels based on pressure.

Low pressure: 0-500 psi (35 bar)
Medium pressure: 500-1500 psi (35-100 bar)
High pressure: 1500 psi (100 bar) and above

Table 4. Cleanliness Level Guidelines Based on Pressure

System Type	Recommended Cleanliness Levels (ISO Code)
Low pressure – manual control	20/18/15 or better
Low to medium pressure – electro-hydraulic controls	19/17/14 or better
High pressure – servo controlled	16/14/11 or better

A second consideration is the type of components present in the hydraulic system. The amount of contamination that any given component can tolerate is a function of many factors, such as clearance between moving parts, frequency and speed of operation, operating pressure, and materials of construction. Tolerances for contamination range from that of low pressure gear pumps, which normally will give satisfactory performance with cleanliness levels typically found in new fluid (ISO 19/17/14), to the more stringent requirements for servo-control valves, which need oil that is eight times cleaner (ISO 16/14/11).

For your convenience, Table 5 provides a cross reference showing the approximate correlation between several different scales or levels used in the marketplace to quantify contamination. The table shows the code levels used for military standards 1638 and 1246A, as well as the new SAE AS4059 standard.

Table 5. ISO Cleanliness Level Correlation

ISO Code 4 µ(c)/6 µ(c)/14 µ(c)	Mil Std. 1638 (1967)	Mil Std. 1246A (1967)	ACFTD Gravimetric Level–mg/L	SAE AS4059 Standard
21/19/16	10			11
20/18/15	9			10
19/17/14	8	300		9
18/16/13	7		1	8
17/15/12	6			7
16/14/12		200		6
16/14/11	5			5
15/13/10	4		0.1	4
14/12/9	3			3
13/11/8	2			2
12/10/8		100		1
11/10/7	1			1
10/9/6			0.01	0
9/8/5				00

Finding the cleanliness level required by a system

Today, many fluid power component manufacturers are providing cleanliness level *(ISO code)* recommendations for their components. They are often listed in the manufacturer's component product catalog or can be obtained by contacting the manufacturer directly. Their recommendations may be expressed in desired filter element ratings or in system cleanliness levels *(ISO codes or other codes)*. Some typically recommended cleanliness levels for components are provided in table below.

1. Starting at the left hand column, select the most sensitive component used in the system.
2. Move to the right to the column that describes the system pressure and conditions.
3. Here you will find the recommended ISO class level, and recommended element micron rating.

	Low/Medium Pressure Under 2000 psi (moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions[1])		Very High Pressure 3000 psi and over (high pressure with severe conditions[1])	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3[2]
Valves						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3[2]
Servo Valve	16/14/11	3[2]	16/14/11	3[2]	15/13/10	3[2]
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3[2]	15/13/10	3[2]
Test Stands	15/13/10	3[2]	15/13/10	3[2]	15/13/10	3[2]
Bearings						
Journal Bearings	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Industrial Gearboxes	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Ball Bearings	15/13/10	3[2]	not applicable	not applicable	not applicable	not applicable
Roller Bearings	16/14/11	3[2]	not applicable	not applicable	not applicable	not applicable

1. Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water
2. Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.

Element Technical Data

Performance Specifications / Filtration Rating

HYDAC filter elements meet a wide variety of requirements in today's workplace, from the simplest to the most sophisticated fluid power systems. Established industry standards enable users to select the optimal filter element for any application.

Filter elements are rated on the basis of their ability to remove contaminants of specific targeted sizes from a fluid, under specific operating conditions. Filtration ratings can be measured by analyzing three areas of performance:

(1) efficiency or absolute rating and percent efficiency,

(2) dirt holding capacity (DHC), and

(3) the pressure drop across the element at a specific absolute efficiency.

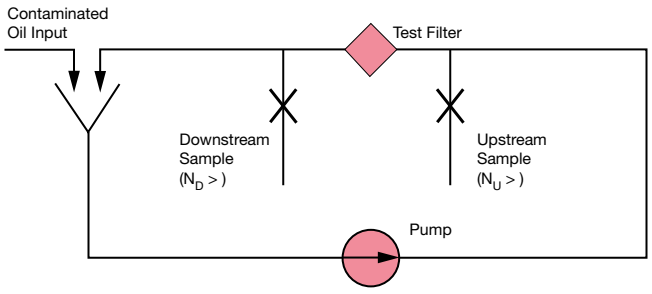
The Multi-Pass Test

Filter element efficiency ratings and capacities are determined by conducting a multi-pass test under controlled laboratory conditions. This is a standard industry test with procedure published by the International Standards Organization (ISO), the American National Standards Institute (ANSI), and the National Fluid Power Association (NFPA). The multi-pass test yields reproducible test data for appraising the filtration performance of a filter element including its particle removal efficiency under ideal conditions. These test results enable the user to: (1) compare the dirt removal efficiency, dirt holding capacity, and Beta stability characteristics of elements offered by various filter element suppliers and (2) helps one to select the proper filter element when also evaluating the structural integrity and pleat support system designed to obtain the optimal contamination control level for any particular system under dynamic operating conditions.

Hydraulic fluid *(Mil. Spec. 5606)* is circulated through a system containing the filter element to be tested. Additional fluid contaminated with ISO MTD Test Dust is introduced upstream of the element being tested. Fluid samples are then extracted upstream and downstream of the test element.

Dirt holding capacity is defined as the total grams of ISO MTD Test Dust added to the system to bring the test filter element to terminal pressure drop. *(Alarm Trip Point)*

Figure 5. Multi-Pass Test Schematic



Filtration Ratio (Beta) ISO 4572 vs. ISO 16889

Due to the changes in the way particles are measured and the fact that a new test dust (ISO MTD) is now utilized, a new standard for multi-pass testing was necessary. This now current standard, ISO 16889, replaces the old Multi-Pass Test Standard, ISO 4572.

The filtration ratio *(more commonly referred to as the Beta ratio)* is, in fact, a measure of the particle capture efficiency of a filter element.

ISO 4572 (Old)

$$\beta_x = \frac{\text{number of particles upstream} \geq x \text{ microns}}{\text{number of particles downstream} \geq x \text{ microns}}$$

where x is a specified particle size.

ISO 16889 (Current 1999)

$$\beta_{x(c)} = \frac{\text{number of particles upstream} \geq x(c) \text{ microns}}{\text{number of particles downstream} \geq x(c) \text{ microns}}$$

where x(c) is a specified particle size.

Example: $\beta_{10(c)} = \frac{7500}{100} = 75$

This particle capture efficiency can also be expressed as a percent by subtracting the number 1 from the Beta (in this case 4), dividing by Beta and multiplying it by 100:

$$\text{Beta}_{10(c)} \text{ efficiency} = 75 = \frac{(\beta - 1)}{\beta} \times 100$$

$$\text{Beta}_{10(c)} \text{ efficiency} = \frac{(75 - 1)}{75} \times 100 = 98.667\%$$

The example is read as "Beta ten is equal to 75, where 7500 particles, 10 microns and larger, were counted upstream of the test filter *(before)* and 100 particles, 10 microns and larger, were counted downstream of the test filter *(after)*."

The filter element tested was 98.667% efficient in removing particles 10 microns and larger.

Percent Efficiency

To calculate a filter element's percent efficiency, subtract 1 from the Beta, divide that answer by the Beta, then multiply by 100.

Example Per ISO 4572 (old):		Example Per ISO 16889 (new):
Step 1:	$\beta_{10} \geq 75$	$\beta_{10(c)} \geq 75$
Step 2:	75 -1 = 74	75 -1 = 74
Step 3:	74 ÷ 75 = 0.987	74 ÷ 75 = 0.987
Step 4:	0.987 x 100 = 98.7%	0.987 x 100 = 98.7%

Using a calculator with a % key, you can use the shortcut version.

Example Per ISO 4572 (old):		Example Per ISO 16889 (new):
Step 1:	$\beta_{10} \geq 200$	$\beta_{10(c)} \geq 200$
Step 2:	200 -1 = 199	200 -1 = 199
Step 3:	199 ÷ 200 = 99.5%	199 ÷ 200 = 99.5%

Filter Beta Rating

ISO 16889 replaces ISO 4572 as the International Standard for Multi-pass Testing. It provides a common testing format for filter manufacturers to rate filter element performance. For convenience, Betas are shown in this catalog for both old and new Multi-pass standards *(ISO 4572 and 16889, respectively.)*

According to ISO 16889, each filter manufacturer can test a given filter element at a variety of flow rates and terminal pressure drop ratings that fit the application, system configuration and filter element size. Results may vary depending on the configuration of the filter element tested and the test conditions.

Currently, there is no accepted ISO, ANSI, or NFPA standard regarding "absolute" ratings. Filter manufacturers have generally adopted an industry standard using $\beta_{x(c)} \geq 75$ (98.7% efficiency) as a minimum efficiency to rate an element as an high efficiency depth filter media. Filter manufacturers generally rate their high efficiency elements as $\beta_{x(c)} \geq 100$ (99.0% efficiency), $\beta_{x(c)} \geq 200$ (99.5% efficiency), or $\beta_{x(c)} \geq 1000$ (99.9% efficiency). Performance of HYDAC elements is typically a minimum rating of $\beta_{x(c)} \geq 1000$, with high dirt holding capacities and lower pressure drops in optimum balance to meet the dynamics and stresses of all applications.

Dirt Holding Capacity

Dirt holding capacity (DHC) is the amount of contaminant *(expressed in grams)* the element will retain before it goes into alarm *(terminal pressure)*. All other factors being equal, an element's DHC can provide indication of how long the element will last until full. This characteristic, taken into context with a structural and pleat support evaluation will provide good indication of what element should last longer in system operation.

Dirt holding capacity, sometimes called "apparent capacity," is a very important and often overlooked factor in selecting the right element for the application. The dirt holding capacity of an element is measured in grams of ISO medium test dust contaminant as determined from the multi-pass test *(ISO 16889)*, and measured at the terminal ΔP *(alarm point)*. When selecting filter elements, it is beneficial to compare the dirt holding capacities of elements with similar particle removal efficiencies and good structural and pleat support characteristics.

Pressure Drop

When sizing a filter, it is important to consider the initial differential pressure (ΔP) across the element and the housing. Elements offering a lower pressure drop at a high Beta efficiency are better than elements with a high ΔP at the same efficiency. At every level of filtration, HYDAC Betamicron® media elements offer a superior combination of high efficiency, high dirt holding capacity, and low pressure drop with the media support design that provides the highest levels of performance under dynamic fluid conditions.

Collapse Rating

The collapse rating of a filter *(determined by ISO 2941/ANSI B93.25)* represents the differential pressure across the element that causes the media to fail. The collapse rating of a filter element installed in a filter housing, with a bypass valve, should be at least two times greater than the full flow bypass valve pressure drop. The collapse rating for filter elements used in filter housings with no bypass valve should be at least the same as the setting of the system relief valve upstream of the high collapse element. When a collapsed element becomes clogged with contamination all functions downstream of the filter will become inoperative due to the release of high levels of contamination to the critical hydraulic components - **Loss of Protection**.

Element Selection

The Right Media for the Right Application = Job Matched Filtration

Filtration Application Guidelines

Selecting the proper HYDAC media for your application is easy if you follow these simple guidelines.

Step 1. Remember that the key to cost effective contamination control is to maintain the system's cleanliness at the tolerance level of the system's most sensitive component. So, the first step is to identify the most sensitive component.

Step 2. Determine the desired cleanliness level (ISO Code) for that component by referring to Table 5 on page 8 or by contacting the component manufacturer directly.

Step 3. Referring to Table 8 identify the HYDAC filter medium that will meet or exceed the desired cleanliness level.

Step 4. Remember to regularly check the effectiveness of the selected media through the use of contamination monitoring equipment.

Table 8. HYDAC Element Media Recommendations

Desired Cleanliness Levels (ISO Code)	HYDAC Media
20/18/15	20 µm
19/17/14	10 µm
18/16/13	5 µm
17/15/12	3 µm

Effect of Dirt Ingression

Filter element life varies with the true dirt holding capacity of the element under dynamic flow conditions and the amount of dirt introduced into the circuit. The rate of this dirt ingression in combination with the desired cleanliness level should be considered when selecting the media to be used for a particular application. Table 9 provides recommendations accordingly.

The amount of dirt introduced can vary from day to day and hour to hour, generally making it difficult to predict when an element will become fully loaded. This is why we recommend specifying a filter indicator.

Filter indicators provide a vital measure of protection for your system by indicating when the filter element needs to be changed or cleaned. HYDAC filters are available with visual, electrical and electrical-visual combination filter indicators. These indicators may also be purchased as separate items.

Table 9. Recommended HYDAC Media to Achieve Desired Cleanliness Levels

Desired Cleanliness Levels (ISO Code)	HYDAC Element Micron Rating
20/18/15	20 µm
19/17/14	10 µm
18/16/13	5 µm
17/15/12	3 µm

Amount of Fluid Filtered

To obtain the desired cleanliness level (ISO Code) using the suggested HYDAC filter medium, it is recommended that a minimum of one-third of the total fluid volume in the system pass through the filter per minute. If fluid is filtered at a higher flow rate, better results may be achieved. If only a lesser flow rate can be filtered, a more efficient media may be required.

Systems operating in a clean environment, with efficient air-breather filters and effective cylinder rod wiper seals, may achieve the desired results at a lower turnover rate. Systems operating in a severe environment or under minimal maintenance conditions should have a higher turnover. Turnover must be considered when selecting the location of the system's filter(s).

Sizing a Filter Element

Since the pressure drop versus flow data contained in our filter catalog is for fluids with a viscosity of 141 SUS (30 cSt), and a specific gravity of .86, we are often asked how to size a filter with a viscosity other than 141 SUS (30 cSt) or a specific gravity other than .86. In those instances where the viscosity or specific gravity is significantly higher, it may be necessary to use a larger element. To make this determination, we need to calculate the life of the element, using the following equation:

EL = IA – (H + E)

Where:

EL	=	Element Life (expressed in psi)
H	=	Housing pressure drop
IA	=	Indicator Alarm trip point
E	=	Element pressure drop

1. The housing pressure drop can be read directly from a graph. This value is not significantly affected by viscosity or the number of elements in the housing, since housing flow is turbulent.
2. The element pressure drop is directly proportional to viscosity, influenced by high pressure since element flow is laminar.

A "rule of thumb" for element life, as calculated from the above equation, is to work towards a filter assembly differential pressure drop that is typically no greater than 20% of alarm trip setting.

Typical targets are:

- ≤ 15 psid for pressure
- ≤ 6 psid for return
- 3 to 4 psid for lube systems

Filter assembly differential pressure should never exceed 50% alarm trip point even in most demanding applications.

The interval between element change-outs can be extended by increasing the total filter element area. Many HYDAC filters can be furnished with one, two, or three elements or with larger elements. By selecting a filter with additional element area, the time between servicing can be extended for minimal additional cost.

Fluid Compatability: Fire Resistant Fluids

HYDAC filters have been used successfully to filter a variety of fire resistant fluids. Filtering these fluids requires careful attention to filter selection and application. Your fluid supplier should be the final source of information when using these fluids. The supplier should be consulted for recommendations regarding limits of operating conditions, material and seal compatibility, and other requirements peculiar to the fluid being used within the conditions specified by the fluid supplier.

High Water Content Fluids

High water content fluids consist primarily of two types: water and soluble mineral base oil, and water with soluble synthetic oil. The oil proportion is usually 5%, but may vary from as low as 2% to as high as 10%.

Standard HYDAC Betamicron® elements are compatible with both types of high water content fluids. Filter sizing is accomplished the same as it is done with other mineral based hydraulic fluids. Some special factors that need to be considered in the selection process include the following:

- All aluminum in the filter housing should be high water based tolerant or anodized.
- Buna N or Viton seals are recommended.
- The high specific gravity and low vapor pressure of these fluids create a potential for severe cavitation problems. Suction filters or strainers should not be used with these fluids.

Invert Emulsions

Invert emulsions consist of a mixture of petroleum based oil and water. Typical proportions are 60% oil to 40% water. Standard HYDAC filters with 10 µm and 25 µm media elements are satisfactory for use with these fluids. Filters should be sized conservatively for invert emulsions. These fluids are non-Newtonian - their viscosity is a function of shear. We recommend up to twice the normal element area be used as space and other conditions permit.

Some special factors that need to be considered in the selection process include the following:

- Potential exists for cavitation problems with invert emulsions similar to high water based fluids.
- Buna N or Viton seals are recommended.

Water Glycols

Water glycols consist of a mixture of water, glycol, and various additives. HYDAC Betamicron® filter elements are compatible for use with these fluids. Some special factors that need to be considered in the selection process include the following:

- All aluminum in the filter should be water tolerant or anodized.
- Potential exists for cavitation problems with water glycols similar to high water based fluids.
- Buna N or Viton seals are recommended.

Phosphate Esters

Phosphate esters are classified as synthetic fluids. All HYDAC filters and elements can be used with most of these fluids. Sizing should be the same as with mineral based oils of similar viscosity. Some special factors that need to be considered in the selection process include the following:

- Use any Betamicron® media with EPR or Viton seals if required by fluid manufacturer for phosphate esters.
- Use S0103H *(low collapse)* or S0155H *(high collapse)*.

Pressure Drop Correction for Specific Gravity (filter housing)

Filter housing pressure drop curves shown in this catalog are predicated on the use of petroleum based fluid with a specific gravity of 0.860. The various fire resistant fluids discussed in this section have a specific gravity higher than 0.860, which affects pressure drop. Use the following formula to compute the correct pressure drop for the higher specific gravity:

Corrected pressure drop =

$$\frac{\text{Fluid specific gravity}}{0.860} \times \text{Catalog pressure drop}$$

Filter Selection Considerations

Filter Location

Pressure filtration: Pressure filters usually produce the lowest system contamination levels to assure clean fluid for sensitive high-pressure components and provide protection of downstream components in the event of catastrophic failures. Systems with high intermittent return line flows may need only be sized to match the output of the pump, where the return line may require a much larger filter for the higher intermittent flows. See Figure 6(a).

Return line filtration: Return line filters are often considered when initial cost is a major concern. A special concern in applying return line filters is sizing for flow. Large rod cylinders and other components can cause return line flows to be much greater than pump output. Return lines can have substantial pressure surges, which need to be taken into consideration when selecting filters and their locations. See Figure 6(b).

Re-circulating filtration: While usually not recommended as a system's primary filtration *(due to the high cost of obtaining adequate flow rates)* re-circulating, or off-line, filtration is often used to supplement on-line filters when adequate turnover cannot be obtained with the inline filter. It is also often an ideal location in which to use a water removal filter. Off-line re-circulating continuous depth filters normally do not provide adequate turnover flow rates to handle the high contamination loading resulting from component failures and/or inefficient maintenance practices. See Figure 6(c).

Suction filtration: High efficiency suction filters are not recommended for open-loop circuits. The cavitation these filters can cause far outweighs any advantage obtained by attempting to clean the fluid in this part of the system.

Breather filtration: Efficient filter breathers are required for effective contamination control on nonpressurized reservoirs and should complement the liquid filtration component.

Multiple filtration: For systems incorporating large total fluid volumes, it may be necessary to employ filters in more than one location. Multiple pressure filters, pressure and return line filters, and recirculating filters are examples of multiple filtration applications.

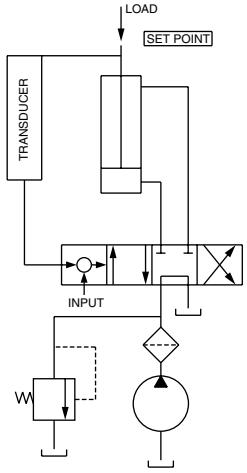


Figure 6(a). Pressure Filtration Circuit

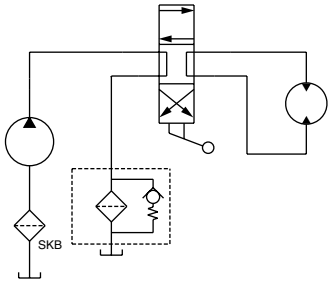


Figure 6(b). Return Line Filtration Circuit

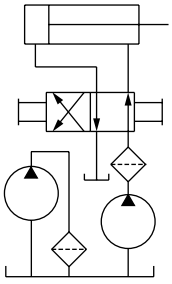
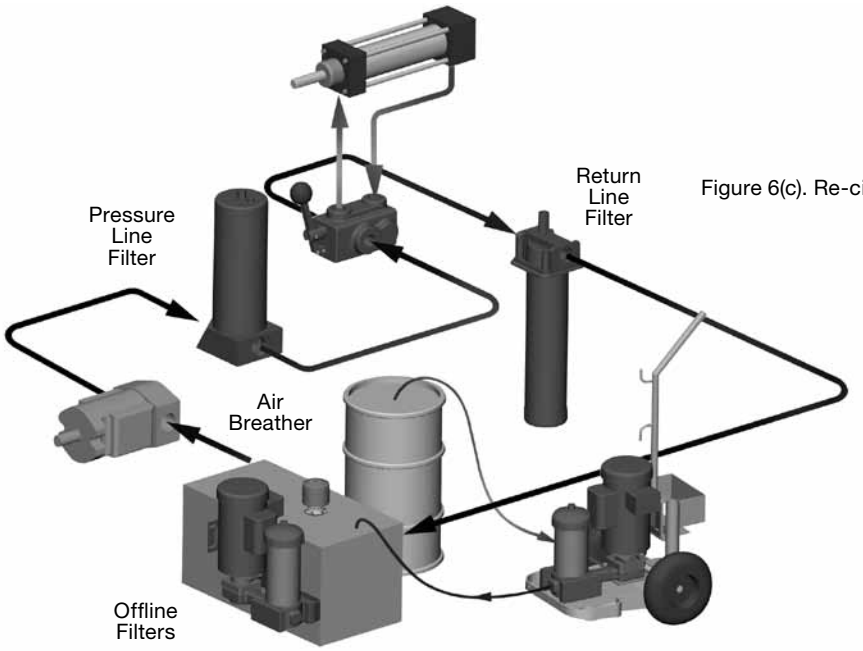


Figure 6(c). Re-circulating Filtration Circuit



Seven Steps to Selecting a Filter

It is important to keep in mind that all system components have some tolerance for contamination. The key to cost effective contamination control is to maintain the system's cleanliness level at the tolerance level of the most sensitive component. Once the desired cleanliness level (ISO code) is determined, selecting a cost effective filtration system can be readily accomplished.

1. Determining desired cleanliness level	Step 1. Determine the most sensitive component in the system. Then, determine the desired cleanliness level *(ISO code)* by using Tables 4 and 5 *(page 8)* or by contacting the manufacturer directly. Operating pressure levels also have a bearing on cleanliness requirements.
2. Selecting correct medium	Step 2. Using Table 9 *(on page 11, respectively)*, identify the proper HYDAC filter media to employ.
3. Where to filter	Step 3. Determine where to locate the filters, using the information on the previous page, "Filter Location."
4. Selecting filter housing	Step 4. Refer to Filter Products in the Table of Contents and the individual filter catalog pages to select the specific filter housing that will meet the requirements set forth in Steps 2 and 3 above, as well as the pressure and flow parameters at the particular filter's location. Consideration should also be given to installation convenience for your particular application. Use the selection charts shown on the catalog page to determine the specific filter model number for the desired media at the required flow rate.
5. Selecting filter breather	Step 5. For nonpressurized reservoirs, refer to the HYDAC Accessories Catalog to select the appropriate filter breather.
6. Contamination control practices	Step 6. Implement the appropriate manufacturing, assembly, and maintenance contamination control procedures. Effective contamination control is achieved through the conscientious use of sound manufacturing and maintenance practices. Some examples are: filtering make-up oil; controlling contamination ingestion during manufacturing, assembly, maintenance, and repair processes; and properly maintaining cylinder wiper seals.
7. Verifying results	Step 7. Check all filtration systems to determine if the results expected are obtained and maintained during system operation, as operating conditions and maintenance practices may not remain constant. HYDAC distributors and field representatives have access to contamination monitoring equipment that can determine the exact cleanliness level *(ISO code)* of your system on the spot. Contact your HYDAC distributor or phone us for complete details.

Rated Fatigue Pressure

The application of individual filters should take fatigue ratings into consideration when there are flow or pressure variations creating pressure peaks and shock loads.

Typical hydraulic systems that use highly repetitive operations include plastic injection molding machines, die-cast machines, and forging and stamping press systems. In these and other similar applications, rated fatigue pressure should be considered when selecting a filter.

It has been common practice in the fluid power industry to establish component ratings for maximum operating pressure based on the minimum yield pressure, which is usually one third of the minimum yield pressure for higher-pressure components and one fourth of the minimum yield pressure for lower-pressure components. This rating method has proved satisfactory for many years, but it does not directly address the subject of fatigue.

The National Fluid Power Association has introduced a method *(NFPA T2.6.1)* for verifying the fatigue pressure rating of the pressure-containing envelope of a metal fluid power component. In this method, components are cycled from 0 to test pressure for 1 million cycles *(10 million cycles is optional)*. The rated fatigue pressure *(RFP)* is verified by testing. We establish the desired RFP from design, then we calculate the cycle testing pressure *(CTP)*, and then conduct tests at CTP per 1,000,000 cycles.

The T2.6.1 Pressure Rating document is available from the National Fluid Power Association, 3333 N. Mayfair Road, Milwaukee, WI 53222-3219.

Sizing HYDAC Filter Assemblies

To properly size and calculate the pressure drop across a filter for a particular application the following procedures should be strictly followed:

Assembly pressure drop (ΔP) is the sum of the ΔP across the filter housing plus the ΔP across the filter element.
This simple formula is shown below:

ΔP Filter Assembly = ΔP Housing + ΔP Clean Element

To calculate a filter assembly ΔP we must first know the specifics of the application.

To calculate the ΔP across the housing we must know the flow rate and specific gravity of the fluid we wish to filter. A chart is provided in each of the product brochures that provides a curve outlining the pressure drop across the housing based upon the flow in GPM *(gallons per minute)*. This data must then be adjusted if the specific gravity is at a lower or higher point than standard Hydraulic Fluid (0.86). The formula for calculation of the housing ΔP is shown as follows:

$$\Delta P \text{ Housing} = \Delta P \text{ (From Curve on Literature)} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

To calculate the ΔP across the element additional information is required. This will include the **viscosity** of the fluid *(at operating temperature)*, required **filtration rating in µm** *(microns)*, **type of element** *(High collapse -BH or Low collapse -BN)*, and **K** *(coefficient)* factor from the attached conversion tables. With this information the following formula is used to calculate ΔP across the element. Again the specific gravity and viscosity *(standard hydraulic fluid figured at a viscosity of 141 SSU - Saybolt Universal Seconds - 30 centistrokes)* will change the ΔP.

$$\Delta P \text{ Clean Element} = \frac{\text{Flow Rate GPM} \times \text{Element K factor}}{\text{or } (\Delta P \text{ from element curve})} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity in SSU}}{141}$$

EXAMPLE - an application with the following criteria would be sized as shown.

Conditions:	**Fluid** – Hydraulic Oil	**Flow Rate** – 30 GPM
	Specific Gravity – 0.86	**Max. Operating Pressure** – 4,500 psi
	Viscosity – 141 SSU	**Normal Operating Pressure** – 4,000 psi
	Micron Rating - 10µm	**Bypass** - YES *(Low collapse element)*

Filter Type Selected

HYDAC Model No. DF BN/HC 240 G 10 D 1.1 / 12 V -B6

HOUSING

$$\Delta P \text{ Housing} = \Delta P \text{ Calculation (From Curve on Literature)} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

$$\Delta P \text{ Housing} = 1.0 \text{ psid} \times \frac{0.86}{0.86} = 1.0 \text{ psid}$$

ELEMENT

$$\Delta P \text{ Clean Element} = \Delta P \text{ Calculation} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 30 \text{ GPM} \times 0.196 \times \frac{0.86}{0.86} \times \frac{141 \text{ SSU}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 5.88 \times 1 \times 1 = 5.88 \text{ psid}$$

FILTER ASSEMBLY

ΔP Filter Assembly = ΔP Housing + ΔP Clean Element
1.0 psid + 5.88 psid = 6.88 psid

NOTE:
A change in the fluid can make a significant difference in the pressure drop across a filter assembly. A second calculation for the element (ΔP) should be done at the lowest temperature condition *(cold start)* to determine how the filter will operate under these sevear conditions with significantly higher viscosity.

EXAMPLE - an application with the following criteria would be sized as shown. *(Cold Start Condition)*

Conditions:

Fluid – Hydraulic Oil
Specific Gravity – 0.86
Viscosity – 400 SSU
Micron Rating - 10µm
Flow Rate – 30 GPM
Max. Operating Pressure – 4,500 psi
Normal Operating Pressure – 4,000 psi
Bypass - YES *(Low collapse element)*

Filter Type Selected

HYDAC Model No. **DF BN/HC 240 G 10 D 1.1 / 12 V - B6**

HOUSING

$$\Delta P \text{ Housing} = \Delta P \text{ Calculation } \textit{(From Curve on Literature)} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

$$\Delta P \text{ Housing} = 1.0 \text{ psid} \times \frac{0.86}{0.86} \text{ or } (1.0) = 1.0 \text{ psid}$$

ELEMENT

$$\Delta P \text{ Clean Element} = \Delta P \text{ Calculation} \times \frac{\text{Actual Specific Gravity}}{0.86} \times \frac{\text{Actual Viscosity}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 30 \text{ GPM} \times 0.296 \times \frac{0.86}{0.86} \times \frac{400 \text{ SSU}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 5.9 \times 1.0 \times 2.84 = 9.72 \text{ psid}$$

FILTER ASSEMBLY

$$\Delta P \text{ Filter Assembly} = \Delta P \text{ Housing} + \Delta P \text{ Clean Element}$$

$$1.0 \text{ psid} + 9.72 \text{ psid} = 10.72 \text{ psid}$$ *(More than 2 times normal clean assembly ΔP)*

Filter Applications Worksheet

*Name: _____ *Title: _____

*Company: _____ *Email: _____

*Address: _____ State: _____ Zip: _____

*Phone: _____ Mobile: _____ Fax: _____

End User System Application

*System Critical Components
(i.e. Servo's, Proportional Valves)

*System Operating Temperature Range

From:	°F
To:	°F

*Ingested Dirt Levels *(check one)*

☐ Heavy ☐ Medium ☐ Light

*Clean Filter Differential Pressure Limit

psid
(typically 40%-50% Indicator trip setting)

*ISO/NAS Cleanliness Target Level

*Maximum Operating Pressure

psi

*Nominal Operating Pressure

psi

*Filter Flow Rate Nominal / Maximum

gpm nominal

gpm maximum

*Hydraulic Fluid

Manufacturer		Type
Designation		
Viscosity	SUS	CS
Specific Gravity		

*Special Operating Requirements
(reverse flow, bidirectional flow duplex, or other special requirements)

Mounting Orientation & Port Configuration

Inlet

Outlet

Inlet/Outlet Configuration
(i.e. inline, side inlet/bottom outlet)

Filter Changeout Access *(i.e. top or bottom)*

Bypass Requirements

☐ 87 ☐ 43 ☐ 25 ☐ 15 ☐ 3 (psid) ☐ Non Bypass KB

*Indicator Requirements *(check one)*

☐ B ☐ BM ☐ C ☐ D ☐ E/ES ☐ F ☐ G ☐ GC
☐ GW ☐ H ☐ J ☐ J4 ☐ K ☐ LE ☐ LZ ☐ UE
☐ UF ☐ UG ☐ V

Supply Voltage *(LED for D Indicators)*:

☐ Diff. Pressure *(check one)* ☐ Static ☐ Vacuum Indication

*Filtration Rating Requirements

Micron Rating
Depth / Surface
Element Media
ISO Cleanliness Target

System Maintenance Comments
(Sampling/changeout frequency, maintenance practices)

*Required Information to properly quote.

Overview of Elements

Wire Mesh Element

- Corrosion protection due to stainless steel filter material and tin-plated or nickel-plated steel parts
- Cleanable
- Filtration ratings: 25µm, 50µm, 74µm, 100µm, 149µm, and 200µm nominal

Metal Fiber Element

- Safeguards high filtration efficiency even at extreme dynamic loads
- High contamination retention capacity due to deep filtering which results in a longer service life
- Low flow resistance
- Corrosion protection due to stainless steel filter material and tin-plated steel parts
- High differential pressure tolerance
- Economical due to cleanability
- High temperature range
- Filtration ratings: 3µm, 5µm, 10µm, and 20µm nominal / or absolute ratings - *Consult Factory*

Disposable Polyester Element

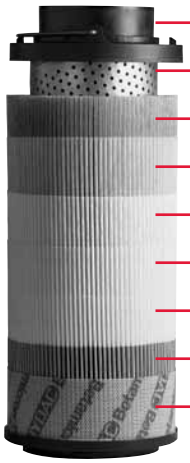
- Higher contamination retention capacity then cellulose due to deep filtration
- Low flow resistance
- Media supported on both sides with wire mesh
- Good fluid compatability due to media being free of bonding agent
- Filtration ratings: 10µm, and 20µm nominal
- Non cellulose media *(polyester)*- plastic coating eliminates swelling

Mobilemicron Element

- Extremely low ΔP across elements when utilized with high viscosity fluids or cold start conditions
- Melt blown fiberglass media construction
- Good dirt holding capacity
- High filtration efficiencies $\beta_{x(c)} \geq 200$
- Good beta stability
- Filtration Ratings: 10µm and 15µm absolute

Element Construction

Betamicron®



1 Conductive plastics end caps

2 Seam support tube

3 Inner screen to stabilize deep pleats

4 Support layer to back up active media layers

5 Final active depth layer to remove fine particles

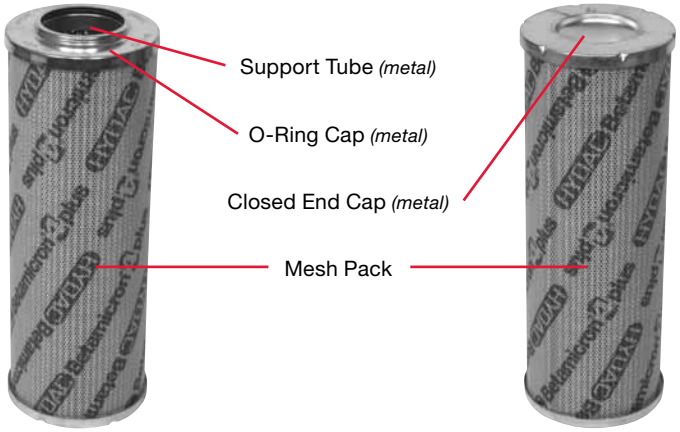
6 Pre-filter depth layer to remove course articles

7 Diffusion layer to equalize flow across surface

8 Outer screen to stabilize pleats *(under cover)*

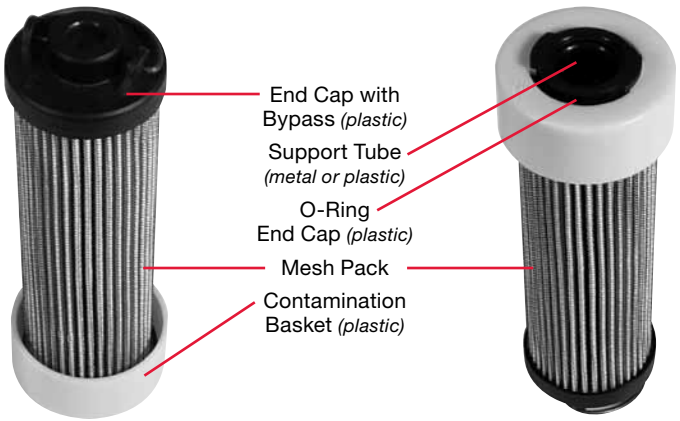
9 Multi-Protection cover *(for high pressure elements)*

Betamicron® Pressure



Betamicron® Return Element

Return filters include Bypass in the endcap - insures proper bypass operation at all times.



Betamicron® Elements

- BN4HC - Low Collapse (290 psid)
- BH4HC - High Collapse (3045 psid)

  - code designation
- Fiberglass
- 3, 5, 10, & 20 micron
- Filtration Rating $ß_{x(c)} \geq 1000$
- Structurally Designed for Dynamic Flow Conditions
- Depth Filtration
- Disposable

Betamicron / Aquamicron Combination Elements

- BN/AM - code designation
- Collapse Rating - 145 psid
- Undissolved (free) Water Removal ONLY!
- 3 & 10 micron
- Filtration Rating $ß_{x(c)} > 100$
- Disposable

Mobilemicron Elements

- MM - code designation
- Melt blown
- Low Clean Element ΔP Per Flow Rate for Cold Start
- Filtration Rating $ß_{x(c)} \geq 200$
- Good Beta Stability
- Good Dirt Holding Capacity
- Collapse Rating - 145 psid
- Depth Filtration
- Disposable

Polyester Elements

- P/HC - code designation
- Polyester
- Collapse Rating - 145 psid
- 10 & 20 micron
- Surface Filtration
- Disposable

ECOmicron® Element

- ECO/N - code designation
- Fiberglass
- All Plastic Construction
- Collapse Rating - 145 psid
- 3, 5, 10, & 20 micron
- Filtration Rating $ß_{x(c)} \geq 1000$
- Depth Filtration
- Disposable

Wire Screen Elements

- W/HC - code designation
- Wire Mesh
- Collapse Rating - 290 psid
- 25, 74, & 149 micron
- Surface Filtration
- Cleanable

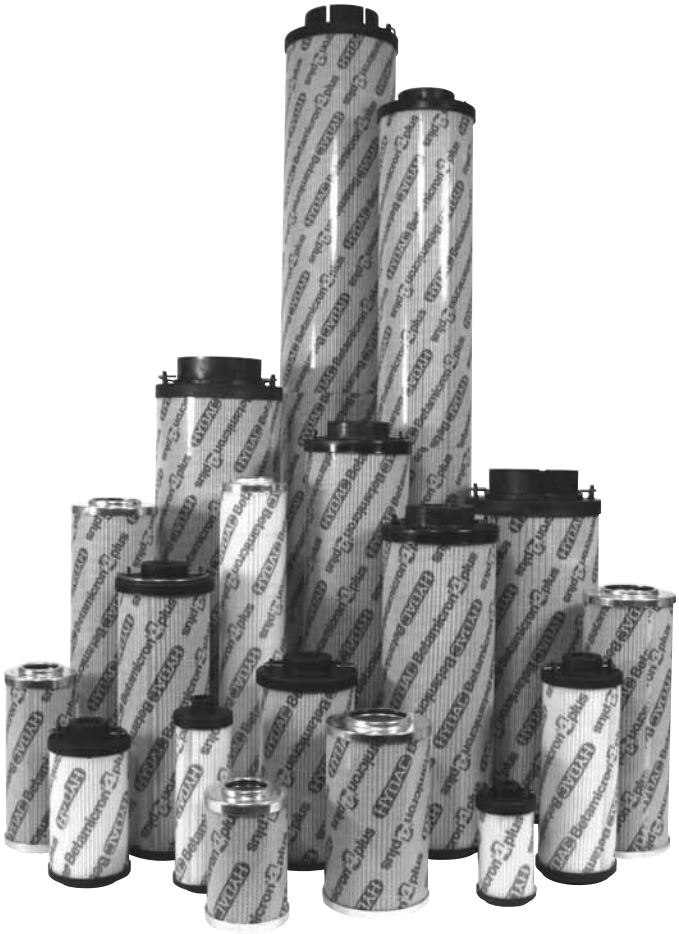
Aquamicron® Elements

- AM - code designation
- Collapse Rating - 145 psid
- Undissolved (free) Water Removal ONLY!
- 40 micron
- Filtration Rating $ß_{40(c)} \geq 100$
- Disposable

Metal Fiber Elements

- V - code designation
- Stainless Steel Media
- Collapse Rating - 3045 psid
- 5, 10, & 20 micron
- High Efficiency Rated available on request 1, 3, 5, 10, & 20 micron
- Depth Filtration
- Cleanable

Betamicron® Series
High Pressure and Return Filter Elements

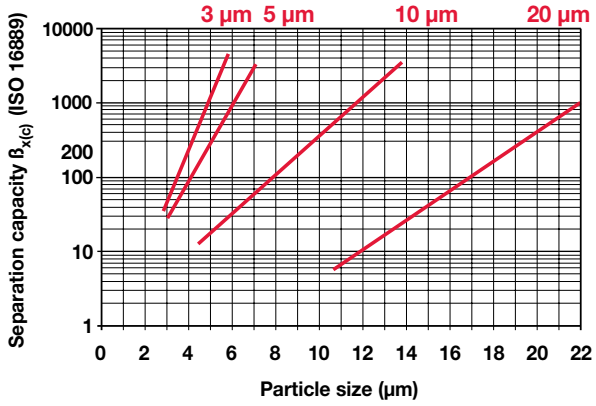


Optimized Two/Three Layer Filter Mesh Pack Structure with NEW Glass Fibers

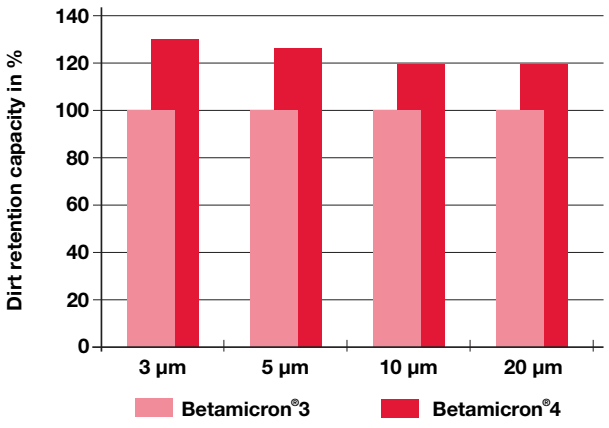
New filter medias were developed for the new Betamicron®4 filter elements. Due to the two or three stage filter media structures, highest contamination retention, highest Beta efficiencies and stability, and favorable Δp/Q characteristics are achieved.

Longer element service life and energy cost savings due to particularly low pressure losses across the element

Better component protection and longer system service life due to improved Beta efficiency
(with filter ratings 3 and 5 µm



Longer element service life and lower operating costs due to increase in the contamination retention capacity by up to 30% globally



Good. Better. Best Betamicron®4.

With the previous Betamicron®3 technology you were always on the leading edge of element performance:

High levels of fluid cleanliness over the long term for hydraulic and lubrication systems have always been achieved by Betamicron®3.

The new generation Betamicron®4 leaps ahead in system performance:

Excellent performance data resulting in reduced Life Cycle Cost.

The Key Innovations of Generation 4 are

- Optimized mesh pack structure with newly developed filter media, support, and transition layers
- Improved performance data (optimized Beta efficiency, contamination retention, Δp/Q characteristics, and Beta stability)
- Patented process for longitudinal seam bonding increases seam integrity
- Element plastic components have been made conductive to aid in static discharge
- Use of spiral lock seam support tubes lowers element weight
- Element outer wraps are made of plastic (polyester) to reduce environmental impact and improve fatigue resistance

Technical Data

- Collapse burst pressure
- Low pressure differential: 290 psid (17 bar) - BN4HC
- High pressure differential: 3045 psid (210 bar) - BH4HC
  Filter element ratings
- 3, 5, 10, 20 µm

Element Outer Wrap Protection

The star-shaped pleated filter mesh pack is enclosed by a stable outer wrap made of plastic (polyester). This outer wrap distributes the incoming fluid evenly over the mesh pack (diffusor). Moreover, the fluid does not flow directly through the mesh pack, since this outer wrap dampens the flow forces and protects the element from pulsating flows. This element has an extremely high flow fatigue strength. The mesh pack is naturally protected against mechanical damage, e.g. when elements are being installed. Outer wrap allows customer logos to be imprinted, and used as the advertising medium for OEMs, thus ensuring a higher percent capture of spare parts business. At the same time, the user can rely on the fact that he will always get a genuine spare part.

High operational reliability, because the sensitive filter mesh pack is protected against direct fluid flow forces and pulsations

Ease of handling, because the compact element is protected against damage in transit and during its installation

Protection against product piracy through “brand labeling”

Patented Longitudinal Seam Bonding Method

Due to an innovative bonding process of the longitudinal seam, a tight homogeneous integration of the open filter mesh pack ends is ensured, even in the case of varying loads. A particle transition from the dirt to the clean side is reliably prevented as well as down stream media migration.

High operational reliability, even under dynamic loads, due to tight longitudinal seam bonding.

Zinc Free Structure

To prevent the formation of zinc soap, which occurs mainly when water-containing fluids (HFA/HFC) and bio-oils are used and come in contact with zinc coated components, no zinc-containing components are employed.

High operational reliability, because elements cannot be blocked as a result of the formation of zinc soap

Savings in storage costs, because the filter elements can be used universally with all fluids.

Reduction of Life Cycle Costs
Life Cycle Cost – what does this mean?

Today the term **Life Cycle Cost** is a dominating topic among suppliers, machine builders and end users.

Life Cycle Costs are the total costs of a system, machine or component from procurement through to its scrapping.

The reduction of Life Cycle Cost is one of the **mega trends** in mechanical engineering. The **objective** is to communicate the **total cost** reduction impacts on Life Cycle Costs.

This creates a better basis for the customer to make the best buying decision.

Large end users are setting this trend.

Leading car makers, for example, require truthful information about the Life Cycle Costs and derived variables – e.g. costs for machine tools over 10 years, for presses up to 30 years. Decisions on new investments by machine manufacturers are based on the machine price and the Life Cycle Cost calculations offered.

This changed and holistic understanding of cost by leading end customers naturally results in new challenges for machine manufacturers. System concepts, subsystems and components used must also stand the test with regard to their influence on the Life Cycle Cost.

Betamicron®4 elements are the winners in the “Life Cycle Cost Contest”

Cost	Minimized					
	Optimized Mesh Pack Structure	Optimized Longitudinal Seam	Zinc-free Structure	Spiral Lock Seam Support Tubes	Protective Outer Wrap	Discharge Capability
Energy	•					
Personnel	•	•			•	•
Logistics			•	•		
Failure	•	•	•		•	•
Production	•	•				•
Repair	•	•	•		•	•
Maintenance	•	•	•		•	•
Spare Parts	•	•	•		•	•
Waste Disposal				•		

"D" Pressure Elements Model Code

0060 D 010 BN4HC / V

Size
0030, 0035, 0055, 0060, 0075, 0095, 0110, 0140, 0160, 0240, 0280, 0300, 0330, 0450, 0500, 0650, 0660, 0900, 0990, 1320, 1500

Type
D

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN/HC, V
25, 50, 74, 100, 149, 200 = W/HC

Element Media
BH4HC = Betamicron®-H element *(High Collapse)*
BN4HC = Betamicron®-N element *(Low Collapse)*
V = Metal fiber
W/HC = Wire mesh

Supplementary Details

(omit)	=	standard
SO103H	=	Modification of BN/HC element for phosphate ester
SO155H	=	Modification of BH/HC element for phosphate ester
V	=	Fluoroelastomer (FPM) seals
W	=	Element suitable for oil-water emulsions (HFA), water polymer solutions (HFC) *(only for V and W elements)*

"DN" Pressure Elements Model Code

0063 DN 010 BH/HC /

Size
0040, 0063, 0100, 0160, 0250, 0400

Type
DN

Filtration Rating *(micron)*
3, 6, 10, 25 = BH/HC, BN/HC

Element Media
BH/HC = Betamicron®-H element *(High Collapse)*
BN/HC = Betamicron®-N element *(Low Collapse)*

Supplementary Details

(omit)	=	standard
V	=	Fluoroelastomer (FPM) seals

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Hydraulic Data

Permissable ΔP across element

- Betamicron®-H (BH/HC): 3045 psid (210 bar)
- Betamicron®-N (BN/HC): 290 psid (20 bar)
- Metal fiber (V): 3045 psid (210 bar)
- Wire mesh (W/HC): 290 psid (20 bar)

Temperature Range

- -22° to 250°F (-30° to 100°C) *(only possible with NBR seals)*

Compatibility with Hydraulic Media

- Suitable for use with mineral oils, lubrication oils, non-flamable fluids, synthetic and rapidly biodegradable oils.
  For use with water, please contact HYDAC

Flow Fatigue Stability to ISO 3724

- High fatigue resistance due to solid filter material supports on both sides and high inherent stability of filter elements

"R" Return Elements Model Code

0330 R 010 BN4HC / KB

Size
0030, 0060, 0075, 0090, 0110, 0150, 0160, 0165, 0240,
0330, 0500, 0660, 0850, 0950, 1300, 1700, 2600

Type
R

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N 10, 20 = P/HC 25, 50, 74, 100, 149, 200 = W/HC 10, 15, = MM

Element Media
BN4HC = Betamicron®-N element *(Low Collapse)* ECO/N = ECOmicron®
MM = Mobilemicron element *(Low Collapse)* P/HC = Polyester
W/HC = Wire mesh

Supplementary Details
(omit) = standard
SO103H = Modification of BN/HC and P/HC elements for phosphate ester
V = Fluoroelastomer (FPM) seals
W = Element suitable for oil-water emulsions (HFA), water polymer solutions (HFC) (only for V and W elements)
KB = without bypass
B1 = Cracking pressure of bypass valve 1 bar
B6 = Cracking pressure of bypass valve 6 bar

"RN" Return Elements Model Code

0040 RN 010 BN/HC /

Size
0040, 0063, 0100, 0160, 0250, 0400, 0630, 1000

Type
RN

Filtration Rating *(micron)*
3, 6, 10, 25 = BN/HC

Element Media
BN/HC = Betamicron®-N element *(Low Collapse)*

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

"RK" RKM Elements Model Code

0300 RK 010 MM / V

Size
0100, 0201, 0251, 0300, 0400, 0800

Type
RK

Filtration Rating *(micron)*
10, 15 = MM

Element Media
MM = Mobilemicron

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Hydraulic Data

Permissable ΔP across element
- Betamicron®-N (BN/HC): 290 psid (20 bar)
- Paper (P/HC): 145 psid (10 bar)
- Wire mesh (W/HC): 290 psid (20 bar)
- Betamicron®/Aquamicron® (BN/AM): 145 psid (10 bar)
- Aquamicron® (AM): 145 psid (10 bar)
- ECOmicron® (ECO/N): 145 psid (10 bar)
- Mobilemicron (MM/RK): 145 psid (10 bar)

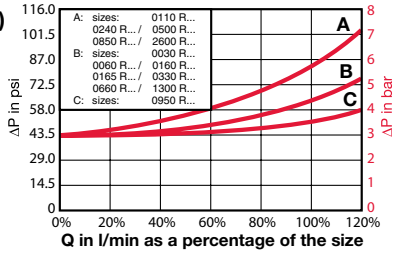
Temperature Range
- -22° to 250°F (-30° to 100°C) *(only possible with NBR seals)*

Compatibility with Hydraulic Media
- Suitable for use with mineral oils, lubrication oils, non-flammible fluids, synthetic and rapidly biodegradable oils. For use with water, please contact HYDAC

Flow Fatigue Stability to ISO 3724
- High fatigue resistance due to solid filter media supports on upstream and downstream sides and high inherent stability of filter lagers.

Cracking Pressure of Bypass Valve (..R.. only)
- ΔP = 3 bar + 0.5 bar

Graphs of Bypass Valve (..R.. only)
- The bypass valve graphs apply to mineral oils with a density of 0.86 kg/dm³. The differential pressure of the valves changes proportionally to the density.



ECOmicron® Series
Environmentally Compatible

Features

- All plastic construction
  Note: Bypass valve contains a metal spring for efficient operation. The spring can be popped out if the element is crushed.
- Standard HYDAC elements sizes 1300R and 2600R with absolute ratings of 3 and 10 micron are available
- Light weight for ease of handling during shipment and maintenance
- 43 psi (3 bar) bypass valve setting
- 145 psi (10 bar) element collapse rating

Benefits

- Compatible with most hydraulic and lubrication fluids. Please consult factory for synthetic fluid use.
- Compatible for water application use.
- Media seam welded with patented HYDAC ultra-sonic welding process, which prevents media migration.
- $B_{x(c)} \geq 1000$ absolute filtration rating

Technical Details

Temperature Range	-22° to 212°F (-30° to 100°C)
Flow fatigue stability to ISO 3724/76	High fatigue resistance due to solid filter material supports on both sides and high inherent stability of filter materials.
Cracking Pressure of Bypass Valve	Δpo = 43 psi ± 7 psi (3 bar ± 0.5 bar)

Model Code

1300 R 03 ECO/N / V

Element Size
0040, 0090, 0110, 0150, 0160, 0165, 0185, 0240, 0330, 0660, 0850, 0950

Type
R

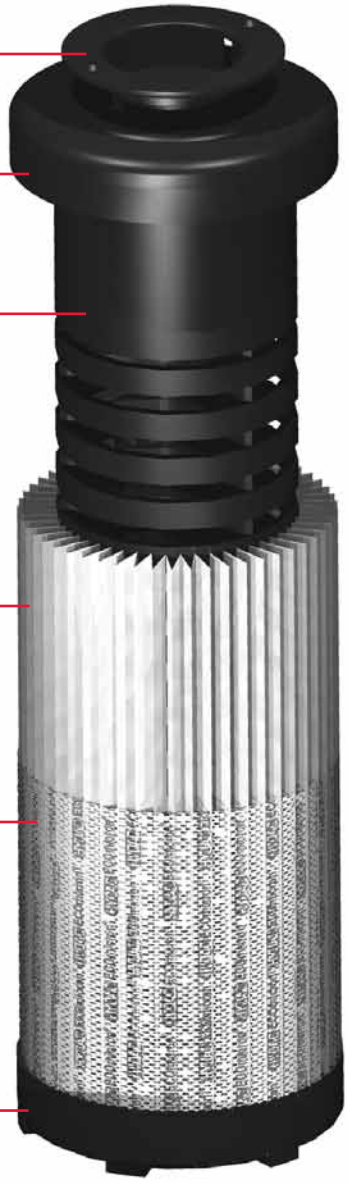
Filtration Rating *(micron)*
03 = 3 µm
05 = 5 µm
10 = 10 µm
20 = 20 µm

Element Media
ECO/N = ECOmicron®

Seals
V = Fluoroelastomer (FPM) *(standard)*

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

ECOmicron® Construction



Aquamicron® Series
Water Removal Elements

Description

Aquamicron® filter elements are specially designed to separate free water from mineral oils. They are only supplied in the dimensions of HYDAC return line filter elements from size 330 and larger. This means that they can be installed in all HYDAC filter housings from size 330 which are fitted with return line filter elements.

The increasing pressure loss in a filter element which is being saturated with water indicates, by means of standard clogging indicators, that it is time to change the element. When the Aquamicron® technique is employed, particle contaminants are also separated from the hydraulic medium as a by-product. This means that the Aquamicron® element doubles as a safety filter.

In order to guarantee the greatest efficiency, it is recommended that these elements be installed in an off-line recirculation loop configuration.

Note: All Aquamicron® elements are disposable.

How Water Does Damage

The presence of water in hydraulic systems cause many problems. For example, the saturation of very fine filters or jamming of valves. These problems are often wrongly attributed to high levels of particle contamination. Added to this, the build-up of rust and the reduction in lubricating properties on bearings and slides can lead to considerable impairment in the effective functioning of a system. This goes to show that water, too, represents a serious “contaminant” in a hydraulic system.

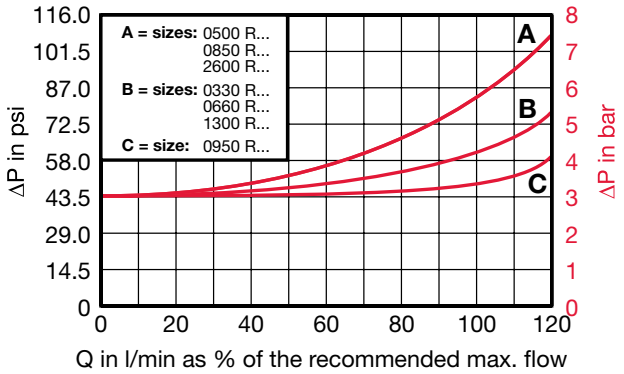
Previously, methods commonly used for extraction of water, have, on the whole, proven to be uneconomical in relation to the purchase price of a system. The HYDAC Aquamicron® technique offers an economically sound and yet an effective method of separating free water from hydraulic media.

Technical Details

Operating pressure	360 psi (25 bar)
Max permissible across element	145 psi (10 bar)
Temperature range	32° to 160°F (0° to 71°C)
Compatibility with hydraulic media	Mineral oils: Test criteria to ISO 2943 Lubricating oils: Test criteria to ISO 2943 Other media available on request
Opening pressure of by-pass valve	Δp0 = 43 psi ±7 psi Δp0 = 3 bar ±0.5 bar
By-pass valve curves	The by-pass valve curves apply to mineral oils with a specific gravity of 0.86. The differential pressure of the valve changes proportionally with the specific gravity.

By-pass valve curves

The by-pass valve curves apply to mineral oils with a specific gravity of 0.86. The differential pressure of the valve changes proportionally with the specific gravity.



Model Code

0330 R 040 AM / _

Size
0330, 0500, 0660, 0850, 0950, 1300, 2600

Type
R = Return Line Element

Filtration Rating *(microns)*
040

Element Media
AM = Aquamicron® water removal

Seal
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM) *(optional)*

Model Codes Containing Red are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Aquamicron® Element Size Recommendations

Size	Recommended Flow rate	Water retention capacity Cw at ΔP = 36 psi (2.5 bar) with an oil viscosity of 141 SUS (30mm2/sec)	Part No.
0330	3.4 gpm (13 l/min) advised 26.4 gpm (100 l/min) max.	0.27 quarts (260cm³) 0.19 quarts (180cm³)	00315268
0500	5 gpm (19 l/min) advised 40.9 gpm (155 l/min) max.	0.42 quarts (400cm³) 0.30 quarts (280cm³)	00315355
0660	7.4 gpm (28 l/min) advised 67.4 gpm (255 l/min) max.	0.60 quarts (570cm³) 0.42 quarts (400cm³)	00315356
0850	9.2 gpm (35 l/min) advised 75.6 gpm (286 l/min) max.	0.77 quarts (730cm³) 0.55 quarts (520cm³)	00315357
0950	10.3 gpm (39 l/min) advised 83 gpm (314 l/min) max.	0.85 quarts (800cm³) 0.60 quarts (570cm³)	00315358
1300	14.3 gpm (54 l/min) advised 115.4 gpm (437 l/min) max.	1.18 quarts (1120cm³) 0.83 quarts (790cm³)	00315269
2600	28.2 gpm (109 l/min) advised 229.9 gpm (870 l/min) max.	2.36 quarts (2230cm³) 1.66 quarts (1570cm³)	00316102

Betamicron® / Aquamicron® Series
Combination Filter Elements

Features

- High water retention capacity
- High dirt holding capacity
- Filtration rating $\beta_{x(c)} \geq 100$
- Stable β_x values over a wide differential pressure range *(high Beta stability)*

General

The presence of water in a hydraulic system causes many problems, such as the jamming of valves in fluid power systems. These problems are often incorrectly attributed to excessive levels of solid particle contamination. Sometimes these problems are caused by the build-up of rust and the reduction of the lubrication required for proper operation of bearings and slides. This can cause considerable degradation in the functioning of fluid power systems. In other words, along with solid particles, water is a serious "contaminant" in hydraulic systems.

Since methods usually employed to extract water often prove to be uneconomical when compared to the purchase price of the system, HYDAC BN/AM technology has been developed to provide an economically sound, yet effective, method of separating free water from hydraulic fluid. At the same time, this provides absolute filtration of solid particles down to 3 and 10 micron levels.

Technical Details

Collapse Pressure Rating	145 psid/10 bar
Temperature range:	32° to 160°F (0° to 71°C)
Compatibility with hydraulic media	Test criteria to ISO 2943
Flow fatigue resistance to ISO 3724	High fatigue resistance due to solid filter material supports on both sides and high inherent stability of the filter materials.
Cracking pressure of bypass valve	Δpo = 3 bar + 10% Δpo = 43 PSI + 10%

Description

BN/AM filter elements are specifically designed to absorb water and achieve high efficiency filtration of solid particles from mineral oils, HFD-R oils, and rapidly biodegradable oils. A super absorber reacts with the water present in the fluid and expands to form a gel from which the water can no longer be extracted, even by increasing the system pressure. These filter elements do not remove dissolved water below the saturation level of the hydraulic medium. Solid particle filtration *(3 µm, 10 µm absolute)* is achieved due to the Betamicron® filter construction.

Principles of the BN/AM combined filter elements.

- BN/AM disposable elements are designed with inorganic and water-absorbent fibers.
- Highly efficient absorption of free water from mineral oils with the aid of a "super absorber" embedded in the filter material
- Excellent adsorption of fine contamination particles over a wide differential pressure range *(3 µm, 10 µm absolute)*
- Excellent Beta stability over a wide differential pressure range
- High balanced dirt holding and water retention capacities
- Excellent fluid compatibility due to the use of epoxy resins for impregnation and bonding
- Dynamic Element integrity as a result of a high burst pressure resistance design *(e.g. during cold starts and dynamic differential pressure surges)*

Model Code

0660 R 010 BN/AM / V

Size
0330, 0660, 0950, 1300, 2600

Type
R

Filtration Rating *(microns)*
003
010

Element Media
BN/AM = combined Betamicron®/Aquamicron®

Seals
(omit) = Nitrile *(standard)*
V = Fluoroelastomer (FPM)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Water retention - Quick sizing table

Size	Recommended Filter flow rate in gpm / lpm	Water retention capacity* cm3 / qt
0330	3.4 / 13	190 / 0.2008
0660	7.4 / 28	400 / 0.4227
0950	10.3 / 39	560 / 0.5918
1300	14.3 / 54	790 / 0.8349
2600	28.8 / 109	1570 / 1.6592

*in cm3/qt when Δp = 2.5 bar / 36 psid and viscosity = 30 mm2 /s / 141 SUS

Filtration rating	Specification	Typical measured results *(when Δp = 2.5 bar / 36 psid)*
3µm	ß3(c) ≥ 100	ß3(c) ≥ 500
10µm	ß10(c) ≥ 100	ß10(c) ≥ 500

MA & MG Series
Spin-On Elements

Features

- HYDAC Beta Spin™ elements are available with Multi-Layer Betamicron® media with absolute ratings of 3, 5, 10, and 20 microns (Beta Ratio ≥ 200).
- Proper support of the filter media 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.
- Betamicron® filter media is firmly supported to acheiveflow fatigue resistance during significant pressure flow pulsations.
- High quality adhesive is used to bond the seam of the media and the endcaps to the media.
- Heavy gauge perforated support tubes are used to provide proper flow distribution and protection against element collapse

Technical Details

Construction Materials	Steel
Flow Capacity	
40	7 gpm (26 lpm)
80	15 gpm (57 lpm)
85	25 gpm (95 lpm)
90	15 gpm (57 lpm)
95	25 gpm (95 lpm)
160/190	30 gpm (114 lpm)
180/195	60 gpm (227 lpm)
Housing Pressure Rating	
Max. Operating Pressure	120 psi (8 bar)/250 psi (17 bar) (MF90/95)
Proof Pressure	180 psi (12.4 bar)/375 psi (25.8 bar) (MF90/95)
Fatigue Pressure	Contact HYDAC
Burst Pressure	Contact HYDAC
Element Collapse Pressure Rating	
BN, P, A	80 psid (5.5 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Bypass Valve Cracking Pressure	
ΔP = 3 psid (0.2 bar) + 10% *(for suction applications)*	
ΔP = 25 psid (1.7 bar) + 10% *(standard for nominal filters)*	
ΔP = 43 psid (3 bar) + 10% *(standard for absolute [BN] filters)*	
ΔP = 50 psid (3.4 bar) + 10% *(standard for absolute [BN] filters, MF 90/95/190/195)*	

Model Code

0080 MA 005 BN

Size

0040, 0080, 0090, 0160 = Standard Length Elements *(not available with 3 µm BN elements)*
0085 *(not available with BN or A elements)*
0095 *(not available with 20 µm BN elements)*
0180

Extended Length Elements

Type

MA = UN Tap Plate Thread *(standard)*

Size	Thread
0040	3/4" - 16 UN-2B
0080/0085	1"-12 UN-2B
0090/0095	1 1/2"-16UN-2B
0160/0180	1 1/2"-16UN-2B

MG = BSPP Tap Plate Thread *(special)*

Size	Thread
0080	3/4" BSPP
0160	1 1/4" BSPP

Not required for BSPP ported heads produced in the USA, MA elements used on USA port codes "2.0"

Filtration Rating *(microns)*

3, 5, 10, 20 = BN Filtration Rating ($\beta_{x(c)} \geq 200$)
010 = AM

3, 10, 25 = P

Element Media

BN = Betamicron® *(Low Collapse)*
P = Paper
AM = Aquamicron® Water Removal *(not available 0085)*

Supplementary Details

Bypass size 0040 only *(bypass in element)*
B1.3 = 18 PSID Bypass
B1.7 = 25 PSID Bypass

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Element K Factors

"D" Pressure Elements

Size	...D...BN4HC (Betamicron® Low Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030	3.504	2.374	1.251	0.618	0.176
0035	1.294	1.041	0.811	0.510	N/A*
0055	0.751	0.603	0.444	0.263	N/A*
0060	1.582	1.116	0.723	0.433	0.243
0075	0.510	0.411	0.290	0.170	N/A*
0095	0.411	0.329	0.225	0.132	N/A*
0110	0.819	0.585	0.361	0.205	0.397
0140	0.701	0.450	0.261	0.157	0.485
0160	0.718	0.480	0.252	0.193	0.595
0240	0.450	0.333	0.196	0.128	0.881
0280	0.220	0.171	0.092	0.071	1.631
0330	0.294	0.215	0.163	0.095	1.389
0500	0.181	0.132	0.081	0.058	2.183
0660	0.136	0.099	0.061	0.044	2.712
0990	0.090	0.066	0.040	0.029	3.285
1320	0.068	0.048	0.030	0.021	9.700
1500	0.069	0.058	0.032	0.018	N/A*

Size	...D...BH4HC (Betamicron® High Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030	5.000	2.780	1.989	1.042	0.287
0035	–	–	–	–	–
0055	–	–	–	–	–
0060	3.210	1.785	0.993	0.669	0.507
0110	1.394	0.819	0.488	0.307	0.816
0140	1.088	0.622	0.445	0.233	0.992
0160	0.919	0.569	0.322	0.240	0.992
0240	0.578	0.374	0.214	0.158	1.764
0280	0.313	0.184	0.097	0.090	2.932
0330	0.422	0.244	0.154	0.108	2.645
0500	0.232	0.143	0.083	0.065	3.814
0660	0.179	0.106	0.055	0.049	4.740
0990	0.119	0.072	0.043	0.033	N/A*
1320	0.089	0.054	0.031	0.024	9.700
1500	0.958	0.675	0.410	0.215	N/A*

Size	...D...V Elements				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030	1.011	0.740	0.411	0.200	0.331
0060	0.877	0.511	0.296	0.183	0.485
0110	0.452	0.304	0.182	0.118	0.793
0140	0.320	0.261	0.172	0.126	1.080
0160	0.251	0.177	0.123	0.079	1.146
0240	0.169	0.137	0.093	0.062	1.653
0280	0.126	0.093	0.064	0.041	3.064
0330	0.121	0.097	0.065	0.043	2.579
0500	0.081	0.065	0.044	0.028	3.858
0660	0.063	0.050	0.034	0.021	4.564
0990	0.043	0.034	0.023	0.015	N/A*
1320	0.032	0.026	0.018	0.012	N/A*

Size	...D...W/HC Elements 25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)
0030	0.166	N/A*
0060	0.042	2.624
0110	0.023	0.661
0140	0.018	0.838
0160	0.016	1.102
0240	0.010	1.455
0280	0.009	2.425
0330	0.008	2.138
0500	0.005	N/A*
0660	0.004	3.748
0990	0.003	7.496
1320	0.002	9.700

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

"DN" Pressure Elements

Size	...DN...BN/HC				
	3 µm	5 µm	10 µm	25 µm	Wgt. (lbs.)
0040	1.315	0.899	0.475	0.365	2.161
0063	0.819	0.541	0.330	0.256	0.331
0100	0.651	0.363	0.219	0.174	0.507
0160	0.439	0.306	0.202	0.143	N/A*
0250	0.275	0.178	0.111	0.091	1.411
0400	0.178	0.110	0.073	0.055	2.161

Size	...DN...BH/HC				
	3 µm	5 µm	10 µm	25 µm	Wgt. (lbs.)
0040	2.211	1.361	0.904	0.594	2.161
0063	1.590	1.359	0.895	0.452	0.838
0100	1.050	0.644	0.422	0.285	2.161
0160	0.439	0.274	0.219	0.143	N/A*
0250	0.292	0.183	0.151	0.107	0.705
0400	0.256	0.162	0.146	0.092	2.161

Pressure Elements for the Automotive Industry

Size	5.03.XXDBN				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
09	0.1680	0.1405	0.0788	0.0443	1.67
18	0.0800	0.0669	0.0375	0.0211	3.03
27	0.0517	0.0432	0.0242	0.0136	4.50

Size	5.03.XXDBH				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
09	0.2068	0.1457	0.0886	0.0465	10.450
18	0.0967	0.0681	0.0414	0.0217	19.026
27	0.0630	0.0444	0.0270	0.0142	27.139

Size	5.03.XXD W/HC	
	25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)
09	0.0073	1.71
18	0.0035	3.29
27	0.0023	N/A*

Size	1.11.XXDBN				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	0.5895	0.4999	0.2664	0.1531	0.69
08	0.2886	0.2413	0.1354	0.0761	1.02
13	0.1751	0.1464	0.0821	0.0462	1.51
16	0.1322	0.1105	0.0620	0.0348	1.89

Size	1.11.XXDBH				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	0.9366	0.6598	0.4012	0.2104	4.365
08	0.4553	0.3208	0.1951	0.1023	6.504
13	0.2738	0.1929	0.1173	0.0615	9.546
16	0.2060	0.1452	0.0883	0.0463	11.530

Size	1.07.XXDBN				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	2.0461	1.7350	0.9248	0.5313	0.26
08	0.9751	0.8152	0.4574	0.2571	0.39

Size	1.07.XXDBH				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
04	2.3965	1.6883	1.0266	0.5384	0.52
08	1.1652	0.8208	0.4991	0.2618	0.82

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

"R" Return Elements

Size	...R...BN4HC (Betamicron® Low Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt.
0030	3.749	2.407	1.470	0.808	0.070
0060	1.470	1.005	0.598	0.376	0.110
0075	1.209	0.780	0.445	0.241	0.240
0110	0.817	0.517	0.329	0.178	0.190
0140	N/A*	N/A*	N/A*	N/A*	N/A*
0160	0.522	0.323	0.208	0.159	0.320
0165	0.616	0.430	0.245	0.133	0.380
0185	0.485	0.334	0.179	0.097	N/A*
0210	0.214	0.145	0.096	0.060	N/A*
0240	0.338	0.208	0.142	0.096	0.380
0270	0.138	0.094	0.062	0.039	N/A*
0280	0.168	0.118	0.090	0.055	N/A*
0330	0.232	0.150	0.093	0.066	0.760
0500	0.162	0.104	0.069	0.044	1.040
0660	0.105	0.066	0.042	0.029	1.710
0850	0.082	0.055	0.036	0.023	2.364
0950	0.064	0.043	0.030	0.020	3.450
1300	0.045	0.032	0.024	0.014	4.050
1700	0.040	0.029	0.018	0.011	4.450
1800	0.036	0.030	0.016	0.009	N/A*
2600	0.023	0.016	0.011	0.007	6.500

Size	...R...ECO/N				
	3 µm	5 µm	10 µm	20 µm	Wgt.
0090	0.515	0.343	0.464	0.317	N/A*
0110	–	–	0.464	0.317	N/A*
0150	0.467	0.319	0.277	0.189	N/A*
0160	0.553	0.378	0.329	0.225	N/A*
0165	0.674	0.369	0.321	0.220	N/A*
0170	–	–	–	0.189	N/A*
0185	–	–	0.272	0.162	N/A*
0210	0.150	0.103	0.089	0.061	N/A*
0240	–	–	0.209	–	N/A*
0280	0.166	–	–	–	N/A*
0330	0.228	0.156	0.135	–	N/A*
0660	0.200	0.068	0.059	0.041	N/A*
0850	0.078	0.053	0.046	0.032	N/A*
0950	0.068	0.047	0.041	0.028	N/A*
1300	0.049	0.034	0.029	0.020	N/A*
1700	0.038	0.026	0.023	–	N/A*
2600	0.024	0.017	0.014	0.010	N/A*

Size	...R...BN/AM		
	3 µm	10 µm	Wgt.
0330	0.477	0.164	0.960
0660	0.192	0.066	1.991
0850	0.132	0.045	N/A*
1300	0.088	0.033	4.450
2600	0.052	0.019	8.100

Size	...R...MM		
	10 µm	15 µm	Wgt.
0060	0.420	0.263	0.110
0075	0.265	0.166	0.240
0090	0.252	0.118	N/A*
0110	0.199	0.124	0.190
0150	0.114	0.071	N/A*
0160	0.149	0.097	0.320
0165	0.146	0.091	0.380
0185	0.108	0.067	N/A*
0210	0.052	0.032	N/A*
0240	0.095	0.062	0.380
0270	0.032	0.020	N/A
0330	0.078	0.049	0.760
0500	0.052	0.032	1.040
0660	0.030	0.019	1.710
0850	0.023	0.015	2.364
0950	0.023	0.014	3.450
1300	0.016	0.010	4.050
1700	0.010	0.006	4.450
2600	0.008	0.005	6.500

Size	...R...P/HC (Paper)	
	10, 20 µm	Wgt.
0030	0.458	N/A*
0060	0.255	0.170
0075	0.156	0.320
0110	0.128	0.280
0160	0.077	0.290
0165	0.086	0.460
0240	0.049	0.627
0330	0.037	0.900
0500	0.024	0.805
0660	0.016	1.980
0850	0.012	2.500
0950	0.010	3.710
1300	0.007	4.450
1700	0.006	N/A*
2600	0.003	8.300

Size	...R...W/HC (Wire Screen)	
	25, 50, 74, 100, 149, 200 µm	Wgt.
0030	0.110	0.080
0060	0.055	0.175
0075	0.043	N/A
0110	0.030	0.290
0160	0.021	0.410
0165	0.020	0.520
0240	0.015	0.610
0330	0.010	0.960
0500	0.007	0.362
0660	0.005	1.980
0850	0.004	2.535
0950	0.003	3.520
1300	0.003	4.610
1700	0.002	N/A*
2600	0.001	8.300

* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

"RN" Return Elements

Size	...RN...BN/HC				
	3 µm	5 µm	10 µm	25 µm	Wgt.
0040	0.777	0.420	0.265	0.146	N/A*
0063	0.530	0.292	0.183	0.101	N/A*
0100	0.369	0.219	0.132	0.069	0.320
0160	0.184	0.137	0.095	0.055	0.810
0250	0.154	0.088	0.066	0.050	0.810
0400	0.119	0.076	0.056	0.047	0.980
0630	0.113	0.066	0.050	0.038	1.920
1000	0.038	0.027	0.022	0.014	N/A*

"AM"

Size	...AM...A	
	040A	Wgt.
0330	0.216	0.740
0500	0.138	1.023
0660	0.095	1.580
0850	0.074	1.990
0950	0.067	2.900
1300	0.048	3.550
2600	0.024	6.210

"RK"

Size	...RK...MM		
	10 µm	15 µm	Wgt.
0100	0.0964	0.0544	0.310
0201	0.0398	0.0268	0.650
0251	0.0379	0.0248	0.397
0300	0.0324	0.0161	1.220
0400	0.0299	0.0195	N/A*
0800	0.0207	0.0162	N/A*

Spin-Ons

Size	...MA...BN				
	3 µm	5 µm	10 µm	20 µm	Wgt.
0040	1.3914	1.1799	0.6289	0.3613	0.73
0080	0.5216	0.4423	0.2357	0.1354	1.35
0085	–	–	–	–	N/A*
0090	0.4841	0.3702	0.3451	0.1911	1.50
0095	0.2762	0.2112	0.1969	0.1090	2.04
0160	0.2372	0.1983	0.1113	0.0625	2.56
0180	0.1231	0.1029	0.0577	0.0325	3.69

Size	...MA...P			
	3 µm	10 µm	25 µm	Wgt.
0040	7.763	2.348	1.516	0.60
0080	1.606	0.486	0.314	1.08
0085	1.161	0.351	0.227	1.42
0090	1.594	0.482	0.311	1.29
0095	0.894	0.270	0.174	1.47
0160	0.839	0.192	0.145	2.15
0180	0.443	0.134	0.087	2.68

Size	...MA...A	
	010 µm	Wgt.
0080	0.513	1.35
0085	–	N/A
0090	0.507	1.50
0095	0.284	2.00
0160	0.233	2.50
0180	0.136	3.60

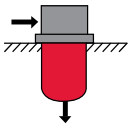
* Not Available at the time of publication. Please contact HYDAC for latest information.

All Element K Factors in psi / gpm.

RF Series

In-tank / Inline Filters

360 psi • up to 400 gpm



Features

- RF 30 filters constructed of polyamide plastic.
- RF 60 - 330 filters constructed of aluminum material. Aluminum alloy is water tolerant - anodization is not required for high water based fluids (HWBF).
- RF 660 - 1300 filters constructed of ductile iron.
- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Inlet/outlet port options include NPT, SAE straight thread O-ring boss, and SAE 4-bolt flange to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, EPDM) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water base fluids.
- Bolt-on lid requires minimal clearance for removal.
- Reusable contamination basket prevents loss of retained contaminants into the reservoir during element replacement.
- Clogging indicators can be serviced without interruption of the hydraulic system.
- Single piece casting provides rigidity for inline or in-tank mounting.

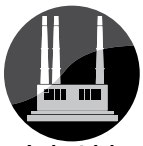
Applications

Agricultural

Automotive

Construction

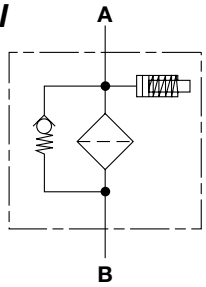
Gearboxes



Industrial

Steel / Heavy Industry

Hydraulic Symbol



Technical Details

Mounting Method	4 Mounting holes - filter housing	
Port Connections	Inlet / Outlet	
30	½" NPT / 0.71" Dia Smooth	
60/110	SAE-12 / SAE-12	
160/240	SAE-20 / SAE-20	
330	SAE-20 / 2" NPT	
	2" NPT / 2" NPT	
	2" SAE Flange, Code 61 / 2" NPT	
660	3" SAE Flange, Code 61 / 3" NPT	
	3" SAE Flange, Code 61 /	
	3" SAE Flange, Code 61	
950	3-1/2" SAE Flange, Code 61 /	
	3-1/2" SAE Flange, Code 61	
1300	4" SAE Flange, Code 61 /	
	4" SAE Flange, Code 61	
Direction of Flow	Inlet: Side	Outlet: bottom
Materials of Construction		
	Housing	Lid
30	Polyamide	Polyamide
60-330	Aluminum	Aluminum
660-1300	Ductile Iron	Ductile Iron
Flow Capacity		
30	8 gpm (30 lpm)	
60	16 gpm (60 lpm)	
110	29 gpm (110 lpm)	
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
330	87 gpm (330 lpm)	
660	174 gpm (660 lpm)	
950	251 gpm (950 lpm)	
1300	343 gpm (1300 lpm)	
Housing Pressure Rating		
Max. Oper. Press:	360 psi (25 bar); *(size 30 - 145 psi, 10 bar)*	
Proof Pressure:	217 psi (15 bar)	
Fatigue Pressure:	145 psi (10 bar) @ 1 million cycles	
Burst Pressure:	30	580 psi (40 bar)
	60/110	1080 psi (75 bar)
	160/240	1230 psi (85 bar)
	330	1440 psi (100 bar)
	660-1300	>1440 psi (100 bar)
Element Collapse Pressure Rating		
BN/HC, W/HC, ECO/N, BN/AM, P/HC, AM		290 psid (20 bar) 145 psid 10 bar)
V		3045 psid (210 bar)
Fluid Temperature Range		-22° to 250°F (-30° to 121°C)
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
	P = 29 psi (2 bar) -10% (standard)	
	P = 72 psi (5 bar) -10% (optional)	
Bypass Valve Cracking Pressure		
	ΔP = 43 psid (3 bar) +10% (standard)	
	ΔP = 87 psid (6 bar) +10% (optional)	

Model Code

RF BN/HC 330 D L 10 H 1 . X / 16 - V - B6

Filter Type
RF = Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®[1]
W/HC = Wire Screen

Size
30, 60, 110, 160, 240, 330, 660, 950, 1300

Pressure Rating
B = 145 psi (10 bar) *(size 30 only)*
D = 360 psi (25 bar)

Type of Connection
B = 1/2" NPT *(size 30)*
C = SAE 12 *(sizes 60, 110)* — NPT available w/Adapter
E = SAE 20 *(sizes 160 - 330)* — NPT available w/Adapter
G = 2" NPT *(size 330)*
L = SAE 32 Flange Inlet / 2" NPT Outlet *(size 330)*
M = SAE 48 Flange *(size 660)*
N = SAE 48 Flange Inlet / 3" NPT Outlet *(size 660)*
O = SAE 56 Flange *(size 950)*
P = SAE 64 Flange *(size 1300)*

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC, ECO/N
25, 74, 149 = W/HC
10, 20 = P/HC
40 = AM
3, 10 = BN/AM

Type of Static or ΔP Clogging Indicator
A, B/BM, C, D, H

Type Number
1 = Standard Connection

Modification Number *(latest version always supplied)*

Inlet Port Configuration
3 = NPT *(sizes 30 & 330)*
12 = SAE Straight Thread Inlet/Outlet Connections *(sizes 60, 110, 160, 240)*
16 = SAE Flange Code 61 Inlet Connections *(sizes 330 - 1300 only)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = 43 psid (3 bar) *(return line - standard)*
KB = No Bypass *(flushing system)* — not available with ECO/N
B6 = 87 psid (6 bar) *(return line)* — not available with ECO/N
B1 = 15 psid (1 bar) *(lubrication or coolant applications)*
B0.2 = 3 psid (0.20 bar) *(suction line)*

Supplementary
SO103H = Modification of BN4HC & W/HC Elements For Phosphate Ester Fluids
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
DE = ΔP Indicator *(sizes 660, 950, 1300)*

Replacement Element Model Code

0330 R 010 BN4HC / V

Size
0030, 0060, 0110, 0160, 0240, 0330, 0660, 0950, 1300

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
3, 10 = BN/AM
25, 74, 149 = W/HC
10, 20 = P/HC
40 = AM

Element Media
BN4HC, ECO/N, P/HC, BN/AM, W/HC, AM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VR 2 B . X /

Indicator Prefix
VR = Return Filters

Trip Pressure
2 = 29 psid (2 bar) *(return filters)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
H = Electric pressure switch

Modification Number

Supplementary Details

Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

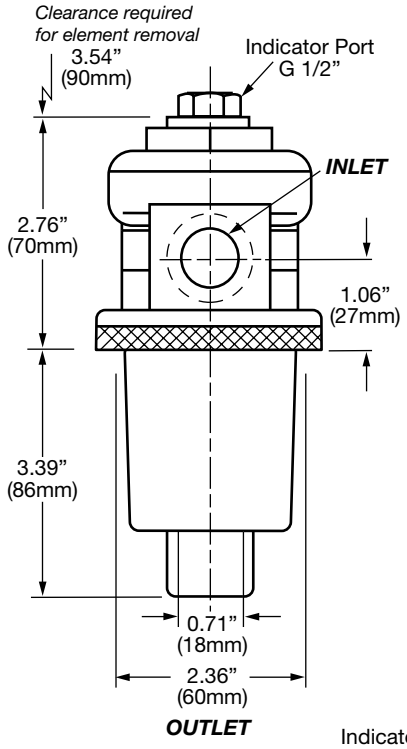
Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

(For additional details and options, see Clogging Indicators section.)

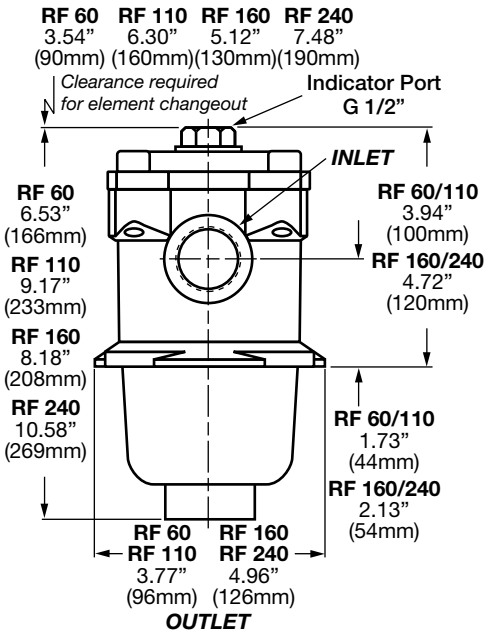
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions

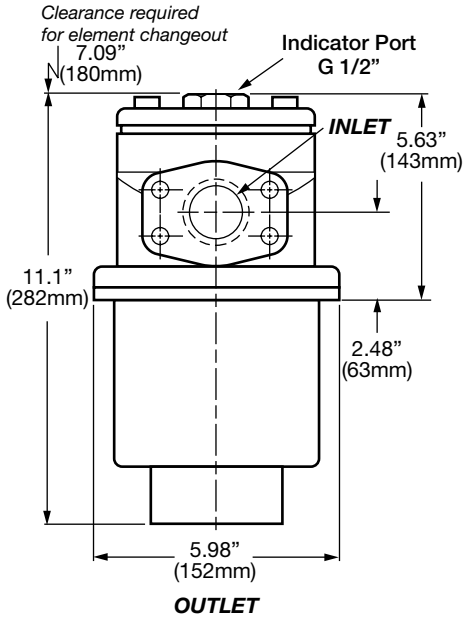
RF 30



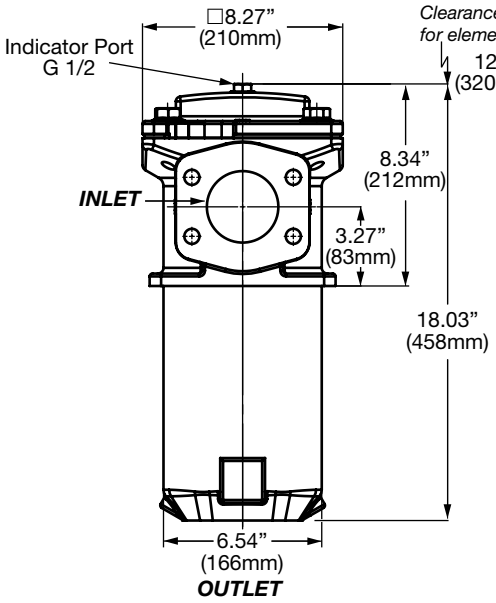
RF 60 - 240



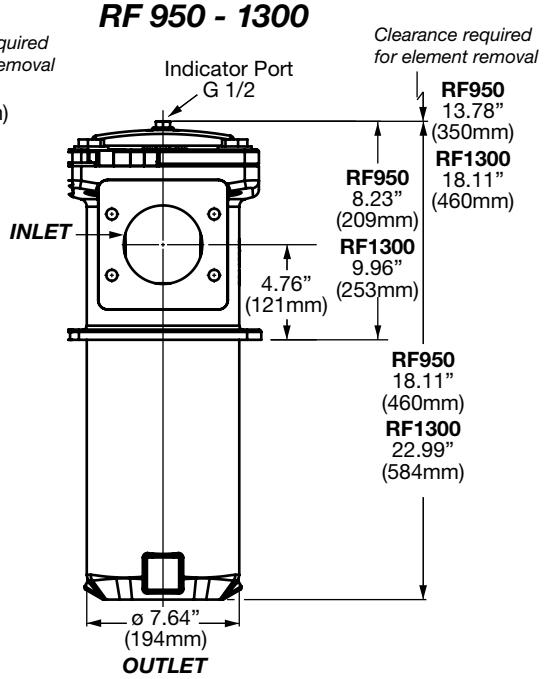
RF 330



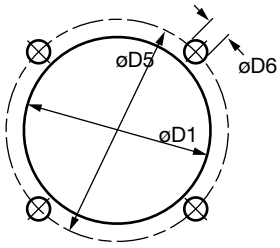
RF 660



RF 950 - 1300



Mounting Pattern



Size	øD1	øD5	øD6
30	2.35" (60mm)	3.07" (78mm)	0.20" (5mm)
60 / 110	3.15" (80mm)	3.94" (100mm)	0.26" (6.5mm)
160 / 240	4.17" (106mm)	5.32" (135mm)	0.30" (7.5mm)
330	5.31" (135mm)	6.9" (170mm)	0.35" (9mm)
660	6.89" (175mm)	8.66" (220mm)	0.55" (14mm)
950 / 1300	8.19" (208mm)	11.42" (290mm)	0.71" (18mm)

Size	30	60	110	160	240	330	660	950	1300
Weight (lbs.)	0.7	1.7	2.0	3.3	3.7	7.5	40.8	86	94.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly P = Housing P + Element P

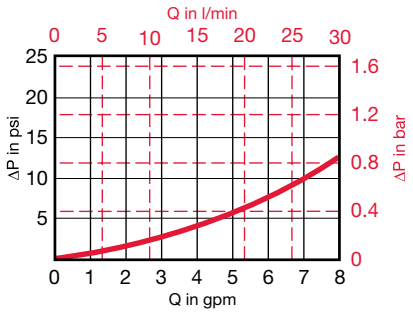
Housing Curve:

Pressure loss through housing is as follows:

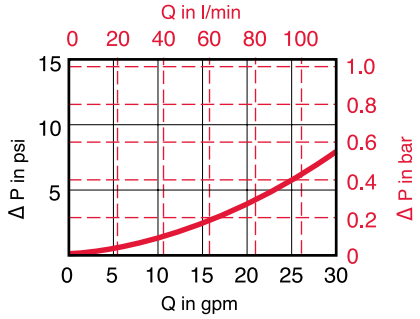
$$\text{Housing P} = \text{Housing Curve P} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

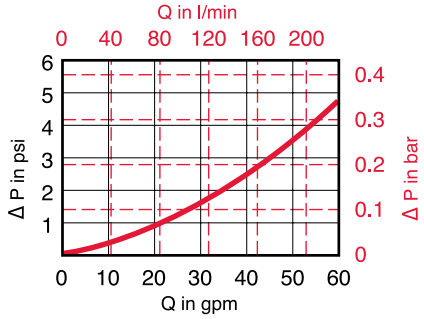
RF 30 HOUSING



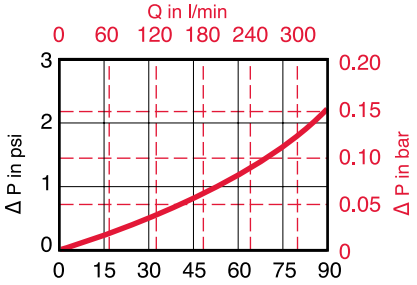
RF 60/110 HOUSING



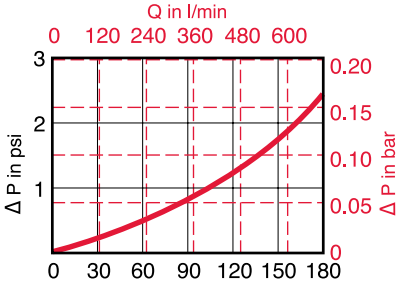
RF 160/240 HOUSING



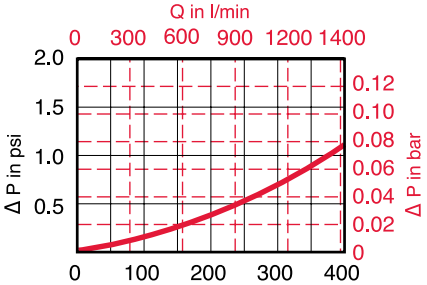
RF 330 HOUSING



RF 660 HOUSING



RF 950/1300 HOUSING



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	3.749	2.407	1.470	0.808
0060	1.470	1.005	0.598	0.376
0110	0.817	0.517	0.329	0.178
0160	0.522	0.323	0.208	0.159
0240	0.338	0.208	0.142	0.096
0330	0.232	0.150	0.093	0.066
0660	0.105	0.066	0.042	0.029
0950	0.064	0.043	0.030	0.020
1300	0.045	0.032	0.024	0.014

Size	...R...P/HC (Paper)
	10, 20 µm
0030	0.458
0060	0.255
0110	0.128
0160	0.077
0240	0.049
0330	0.037
0660	0.016
0950	0.010
1300	0.007

Size	...R...W/HC (Wire Screen)
	25, 50, 74, 100, 149, 200 µm
0030	0.110
0060	0.055
0110	0.030
0160	0.021
0240	0.015
0330	0.010
0660	0.005
0950	0.003
1300	0.003

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
0110	–	–	0.464	0.317
0160	0.556	0.378	0.329	0.225
0240	–	–	0.209	–
0330	0.228	0.156	0.135	–
0660	0.100	0.068	0.059	0.041
0950	0.068	0.0467	0.041	0.028
1300	0.049	0.034	0.029	0.020

Size	...R...BN/AM	
	3 µm	10 µm
0330	0.477	0.164
0660	0.192	0.066
0950	0.132	0.045
1300	0.088	0.033

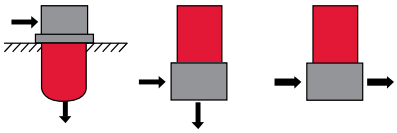
Size	...R...AM
	040A
0330	0.216
0660	0.095
0950	0.067
1300	0.048

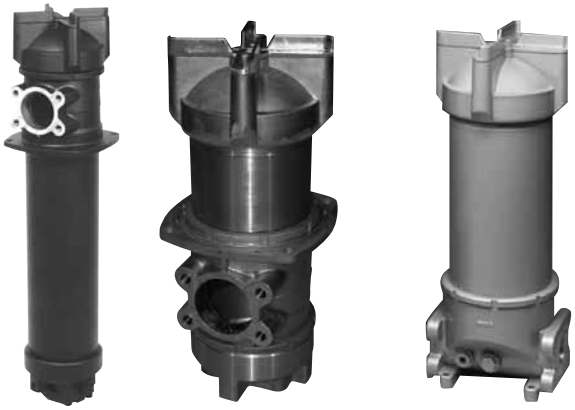
All Element K Factors in psi / gpm.

NF Series

In-Tank / Inline Filters

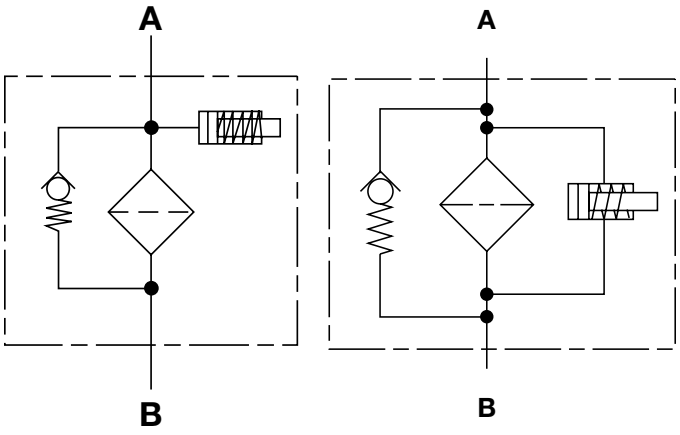
360 psi • up to 450 gpm





1.0 Version | 2.0 Version | 1350 / 2650

Hydraulic Symbol



1.0 Version | 2.0 Version

Features

- NF Filters have an extremely large filtration area and flow capacity of 450 gpm
- NF Filters can be configured for in-tank or in-line applications
- Vent and drain ports are standard
- Aluminum alloy is water tolerant - anodizing is not required for water based fluids (HWBF)
- Screw-on lid provides easy access to filter element for replacement
- Reusable contamination basket prevents re-entry of retained contaminants into the reservoir during element replacement
- Filters can be fitted with clogging indicators to monitor the contamination level of the element
- SIngle piece head design available in version 2.0 *(Contact HYDAC)*

Applications

Technical Details

Mounting Method	See drawings	
Port Connection	SAE-64 Flange Code 61 *(with metric bolts included on NF 1310 & 2610)*	
Flow Direction		
1.0 version	Inlet: Side	Outlet: Bottom
2.0 version	Inlet: Side	Outlet: Bottom
1350 / 2650	Inlet: Side	Outlet: Side
Construction Materials		
Head, Housing, Lid	Aluminum	
Elbows, Manifolds	Ductile Iron	
Flow Capacity		
1310	343 gpm (1300 lpm)	
2610, 5210, 7810, 10410	450 gpm (1700 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	360 psi (25 bar)	
Proof Pressure	540 psi (38 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	Contact HYDAC office	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10%	1.0 - Static	
ΔP = 72 psid (5 bar) -10%	2.0 - Differential	
Bypass Valve Cracking Pressure		
ΔP = 15 psid (1 bar) +10%		
ΔP = 43 psid (3 bar) +10%		
ΔP = 87 psid (6 bar) +10%		

Model Code

NF BN/HC 1310 D P 3 A 1.0 / _ _ _

Filter Type
NF = In-Tank Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®
ECO/N = ECOmicron® *(Low Collapse)*
P/HC = Polyester
AM = Aquamicron®
W/HC = Wire Screen

Size
1310, 1350, 2610, 2650, 5210, 7810, 10410

Operating Pressure
D = 360 psi (25 bar)

Type of Connection
P = SAE DN 100 (4") flange

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC, ECO/N
10, 20 = P/HC
3, 10 = BN/AM
25, 74, 149 = W/HC
40 = AM

Type of Static or ΔP Clogging Indicator
A, B/BM, C, D, H

Type Number / Modification Number
1.0 = In-Tank Filter - Static indicator *(1310/2610 only)*
2.0 = Inline Filter - ΔP indicator

Seals
(omit) = Nitrile (NBR) (standard)
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Cracking Pressure of Bypass Valve
(omit) = 43 psid (3 bar) *(return line - standard)*
KB = no bypass *(flushing system)*
B6 = 87 psid (6 bar) *(return line extended service life)*
B1 = 15 psid (1 bar) *(lubrication or coolant applications)*
not available with ECO/N

Supplementary Details
S0103H = Modification of BN4HC and W/HC Elements for Phosphate Ester Fluids
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*

Replacement Element Model Code

1300 R 010 BN4HC / V

Size
1300 - for housings: 1310, 1350
2600 - for housings: 2610, 2650, 5210, 7810, 10410

Type
R

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
40 = AM
3, 10 = BN/AM
10, 20 = P/HC
25, 74, 149 = W/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VR 2 B . X /

Indicator Prefix
VR = Return Filters *(1.0 version)*
VMF = Mobile Filters *(2.0 version)*

Trip Pressure
2 = 29 psid (2 bar) *(return filters)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
H = Electric pressure switch

Modification Number

Supplementary Details

Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

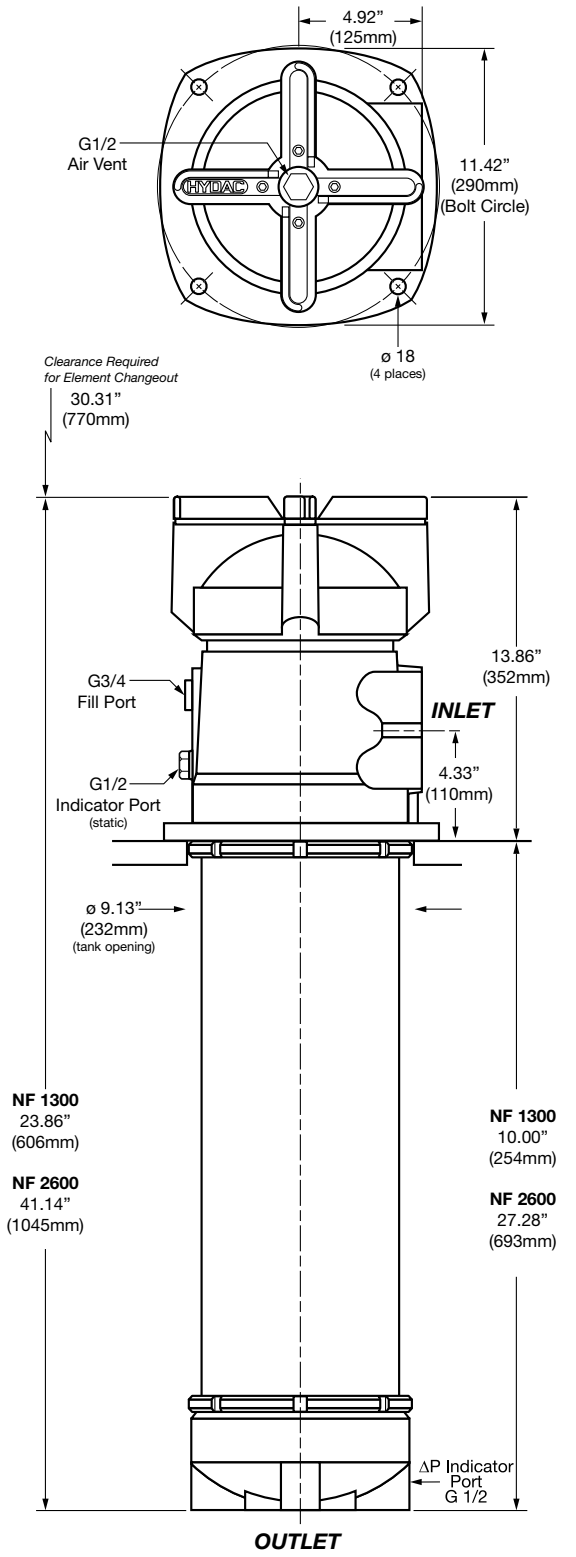
Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

(*For additional details and options, see Clogging Indicators section.*)

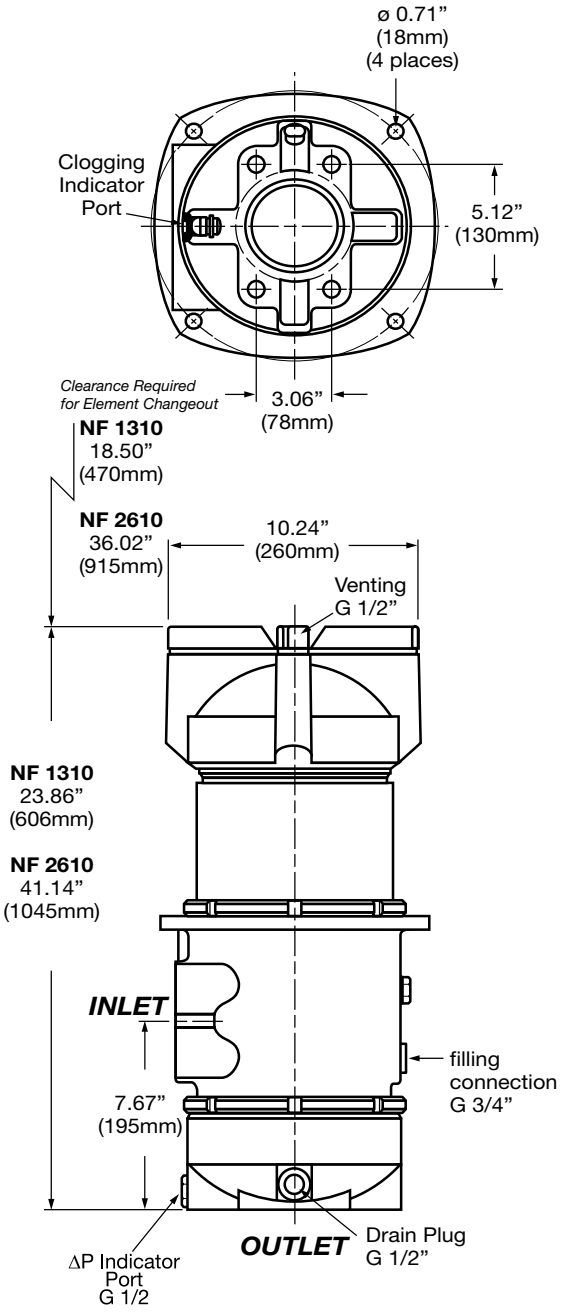
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions:

NF 1310 - 2610
1.0 Version



2.0 Version

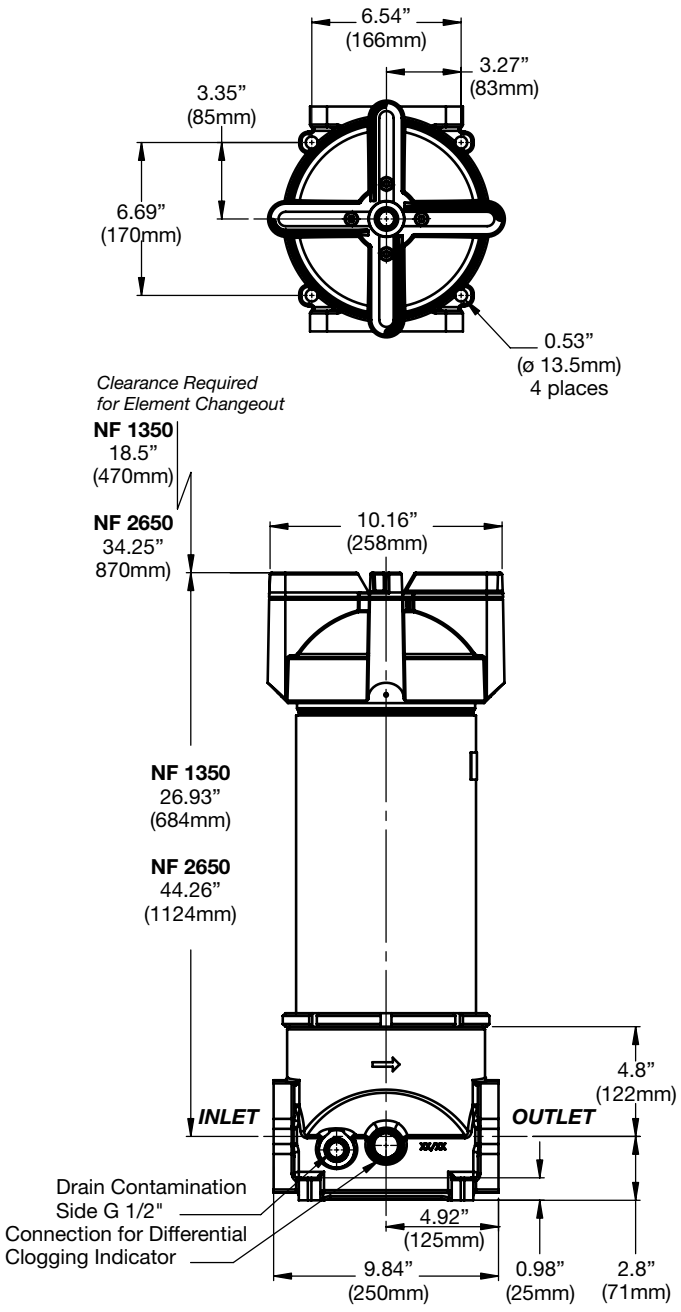


Size	1310	2610
Weight (lbs.)	37	50

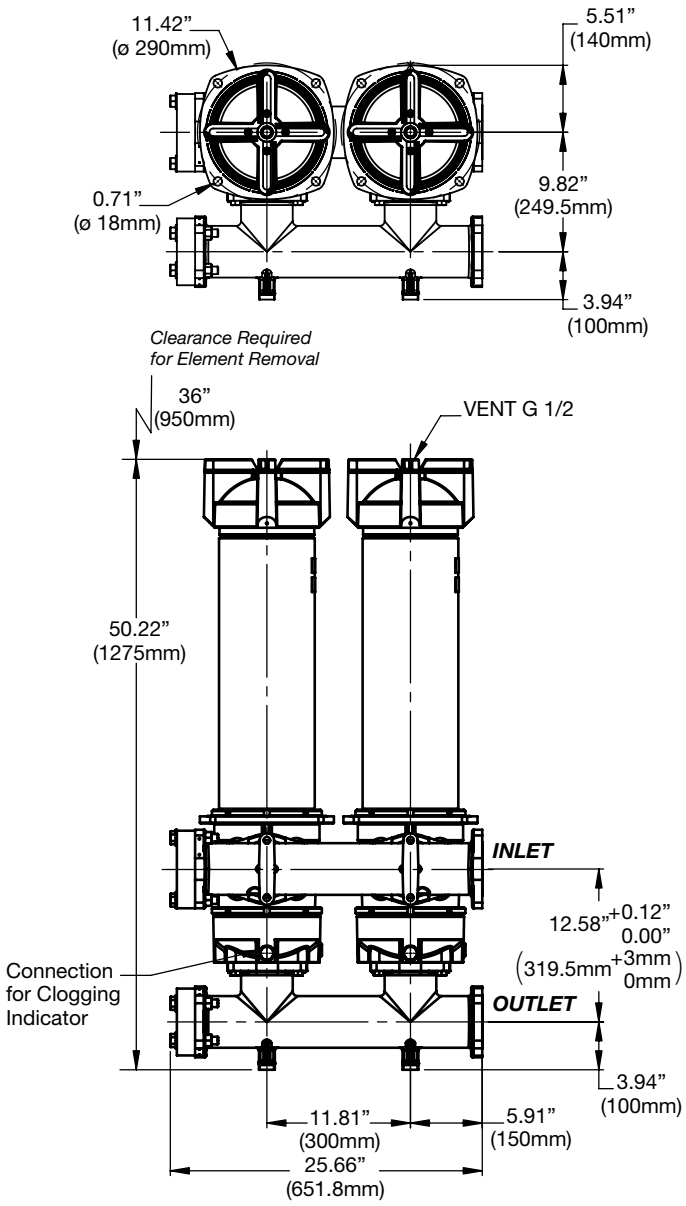
Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions:

NF 1350 / 2650
2.0 Version



NF 5210
2.0 Version

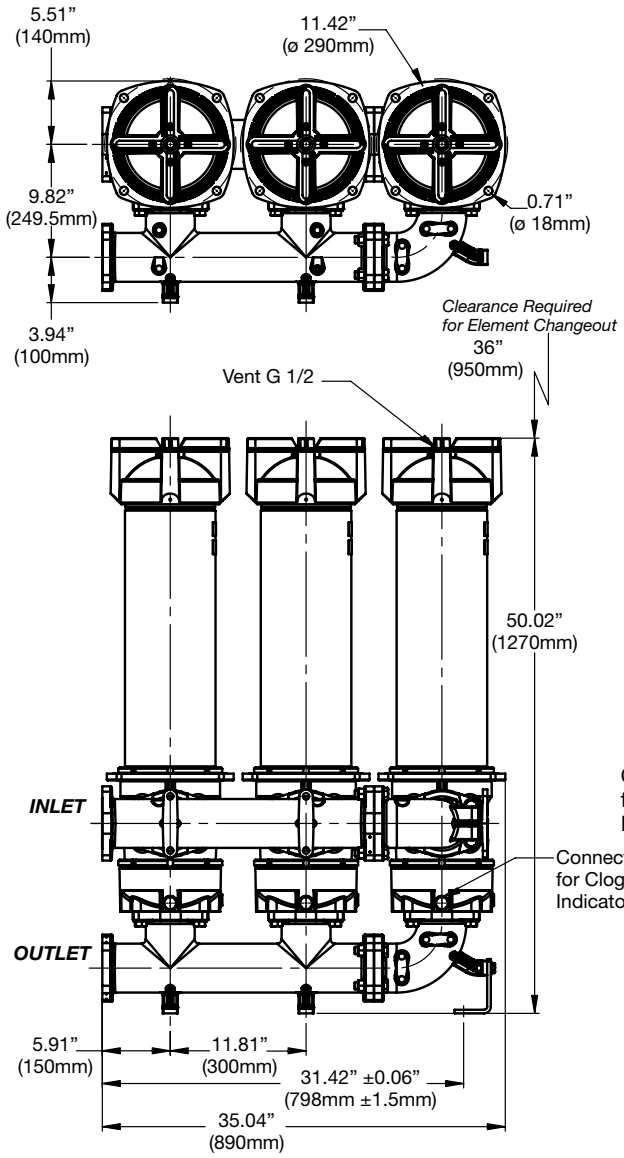


Size	1350	2650	5210
Weight (lbs.)	40	55	198

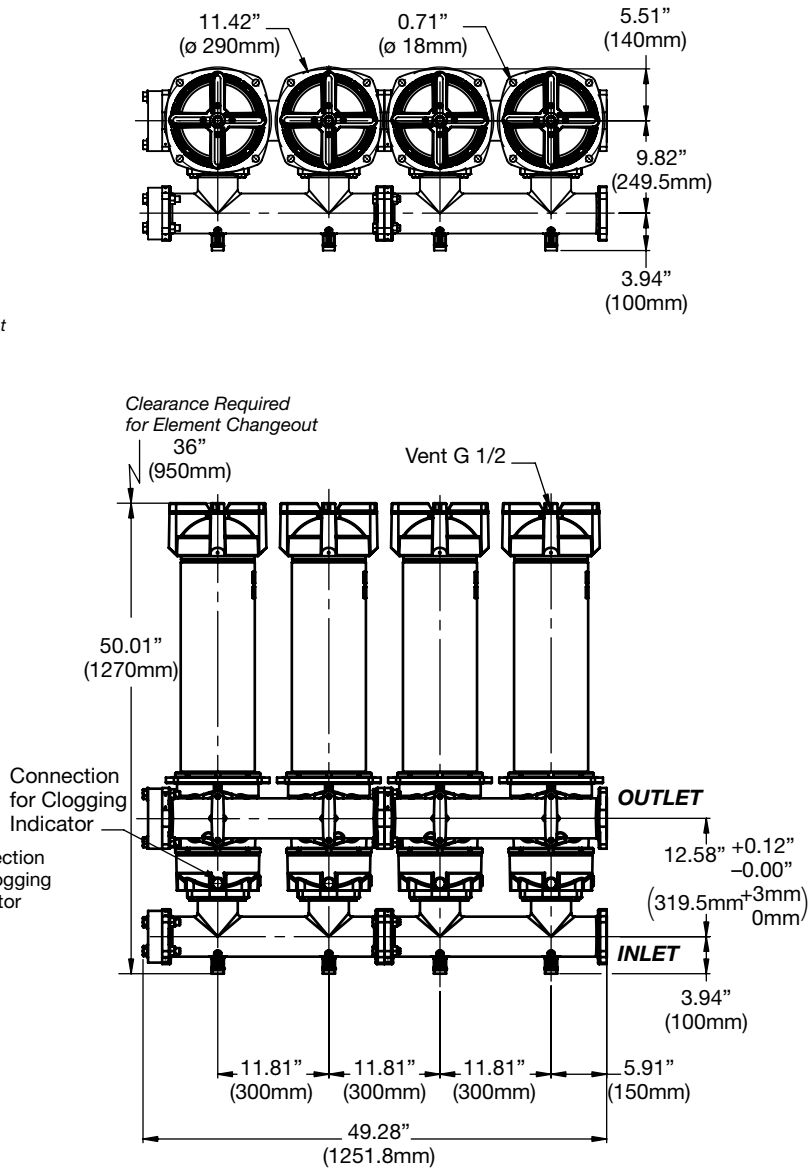
Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions

NF 7810
2.0 Version



NF 10410
2.0 Version



Size	7810	10410
Weight (lbs.)	275	397

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

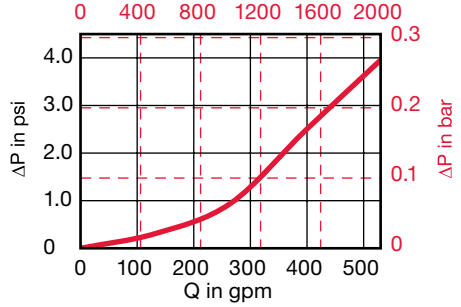
Housing Curve:

Pressure loss through housing is as follows:

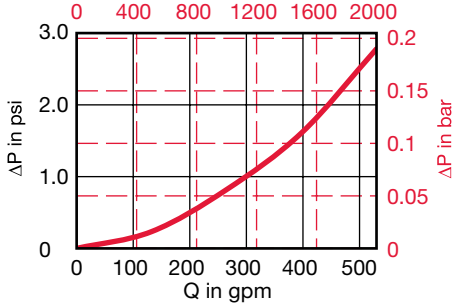
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

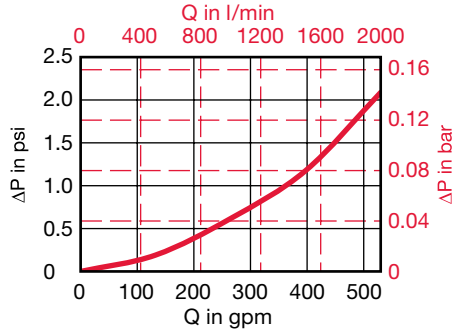
NF 1310-2650 HOUSING



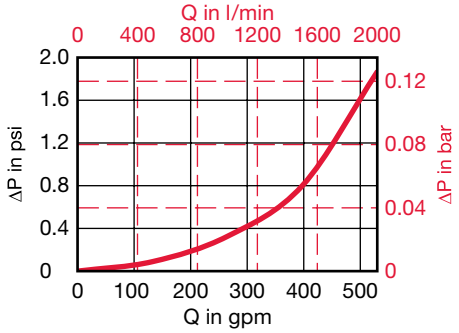
NF 5210 HOUSING



NF 7810 HOUSING



NF 10410 HOUSING



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
1310	0.045	0.032	0.024	0.014
2610	0.023	0.016	0.011	0.007

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
1310	0.049	0.034	0.029	0.020
2610	0.024	0.017	0.014	0.010

Size	...R...BN/AM	
	3 µm	10 µm
1310	0.088	0.033
2610	0.052	0.019

Size	...R...AM
	40 µm
1310	0.048
2610	0.024

Size	...R...P/HC (Polyester)	
	10 µm	20 µm
1310	0.0070	0.0070
2610	0.0034	0.0034

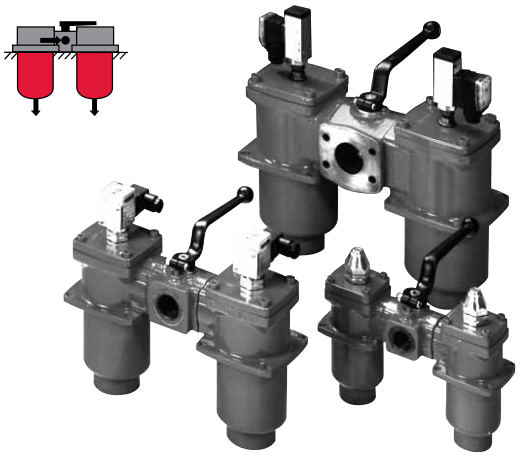
Size	...R...W/HC (Wire Screen)
	25, 50, 100, 200 µm
1310	0.0027
2610	0.0011

All Element K Factors in psi / gpm.

RFD Series

In-Tank / Inline Duplex Filters

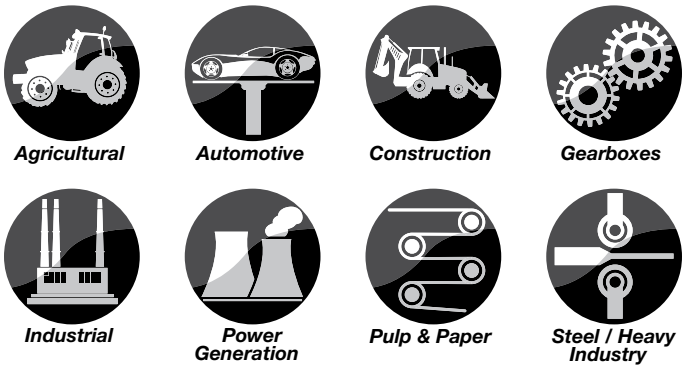
360 psi • up to 400 gpm



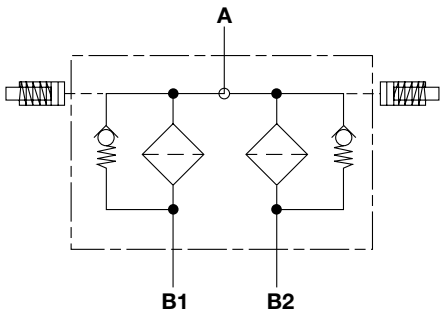
Features

- RFD 60 - 330 filters are constructed of aluminum.
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF).
- RFD 660 - 1300 filters are constructed of ductile iron.
- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Inlet/outlet port options include NPT (RFD 61-241 inlet only), SAE straight thread O-ring boss, and SAE 4-bolt flange to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, EPDM) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water base fluids.
- Bolt-on lid requires minimal clearance for removal.
- Reusable contamination basket prevents loss of retained contaminants into the reservoir during element replacement.
- Clogging indicators can be serviced without interruption of the hydraulic system.
- All RFD duplex filters have a ball-type selector valve to provide continuous filtration without system shut-down to change clogged elements.

Applications



Hydraulic Symbol



Technical Details

Mounting Method	4 Mounting holes in the filter housing		
Port Connections	Inlet / Outlet		
60/110	SAE-12 / SAE-12		
160/240	SAE-16 / SAE-20		
330	2” SAE Flange, Code 61 / 2”NPT		
660	3” SAE Flange, Code 61 / 3”NPT		
950	4” SAE Flange, Code 61 / 3-1/2” SAE Flange, Code 61		
1300	4” SAE Flange, Code 61 / 4” SAE Flange, Code 61		
Direction of Flow	Side Inlet and Bottom Outlet		
Materials of Construction			
	Housing	Lid	Transfer Valve
60 - 240	Aluminum	Aluminum	Steel
330	Aluminum	Aluminum	Aluminum
660-1300	Ductile Iron	Ductile Iron	Ductile Iron
Flow Capacity			
60	16 gpm (60 lpm)		
110	29 gpm (110 lpm)		
160	42 gpm (160 lpm)		
240	63 gpm (240 lpm)		
330	87 gpm (330 lpm)		
660	174 gpm (660 lpm)		
950	251 gpm (950 lpm)		
1300	343 gpm (1300 lpm)		
Housing Pressure Rating			
Max. Oper. Press:	360 psi (25 bar)		
Proof Pressure:	540 psi (38 bar)		
Fatigue Pressure:	360 psi (25 bar) @ 700,000 cycles		
Burst Pressure:	60/110	1080 psi (75 bar)	
	160/240	1230 psi (85 bar)	
	330	1440 psi (100 bar)	
	660-1300	>1440 psi (100 bar)	
Element Collapse Pressure Rating			
BN/HC, W/HC, ECO/N, BN/AM, P/HC, AM V		290 psid (20 bar) 145 psid (10 bar) 3045 psid (210 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)		
Fluid Compatability			
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.			
Indicator Trip Pressure			
P = 29 psi (2 bar) -10% (standard) P = 72 psi (5 bar) -10% (optional)			
Bypass Valve Cracking Pressure			
ΔP = 43 psid (3 bar) +10% *(standard)* ΔP = 87 psid (6 bar) +10% *(optional)*			

Model Code

RFD BN/HC 330 D A L 10 H 1 . X / 16 - V - B6

Filter Type
RFD = Duplex In-Tank Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®*
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®*
W/HC = Wire Screen

Size
60, 110, 160, 240, 330, 660, 950, 1300

Pressure Rating
D = 360 psi (25 bar)

Type of Changeover Valve
A = Ball Valve

Type of Connection
C = SAE 12 *(sizes 60, 110)*; 3/4" NPT w/ Adapter
D = SAE 16 Inlet / SAE-20 Outlet *(sizes 160, 240)*; 1" NPT w/Adapter
L = 2" SAE Flange Inlet / 2"NPT Outlet *(size 330)*
N = 3" SAE Flange Inlet / 3"NPT Outlet *(size 660)*
O = 4" SAE Flange Inlet / 3 1/2" SAE Flange Outlet *(size 950)*
P = 4" SAE Flange *(size 1300)*

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC, ECO/N
25, 74, 149 = W/HC
10, 20 = P/HC
40 = AM
3, 10 = BN/AM

Type of Static Clogging Indicator
A, B/BM, C, D, H

Type Number
1 = Standard Connection

Modification Number *(latest version always supplied)*

Port Configuration
3 = NPT *(sizes 60, 110, 160, 240)*
12 = SAE Straight Thread Inlet/Outlet Connections *(sizes 60, 110, 160, 240)*
16 = SAE Flange Code 61 Inlet Connections *(sizes 330 - 1300 only)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = 43 psid (3 bar) *(return line standard)*
KB = No Bypass *(flushing system)*
B6 = 87 psid (6 bar) *(return line)*
B1 = 15 psid (1 bar) *(lubrication or coolant applications)*
B0.2 = 3 psid (0.20 bar) *(suction line)*
not available with ECO/N

Supplementary
SO103H = Modification of BN4HC & W/HC Elements For Phosphate Ester Fluids
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*

* Only available in sizes 330, 660, 950, and 1300.

Replacement Element Model Code

0330 R 010 BN4HC / V

Size
0060, 0110, 0160, 0240,
0330, 0660, 0950, 1300

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
3, 10 = BN/AM
40 = AM
10, 20 = P/HC
25, 74, 149 = W/HC

Element Media
BN4HC, ECO/N, P/HC, W/HC, BN/AM, W/HC, AM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VR 2 B . X /

Indicator Prefix
VR = Return Filters

Trip Pressure
2 = 29 psid (2 bar) *(return filters)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
H = Electric pressure switch

Modification Number

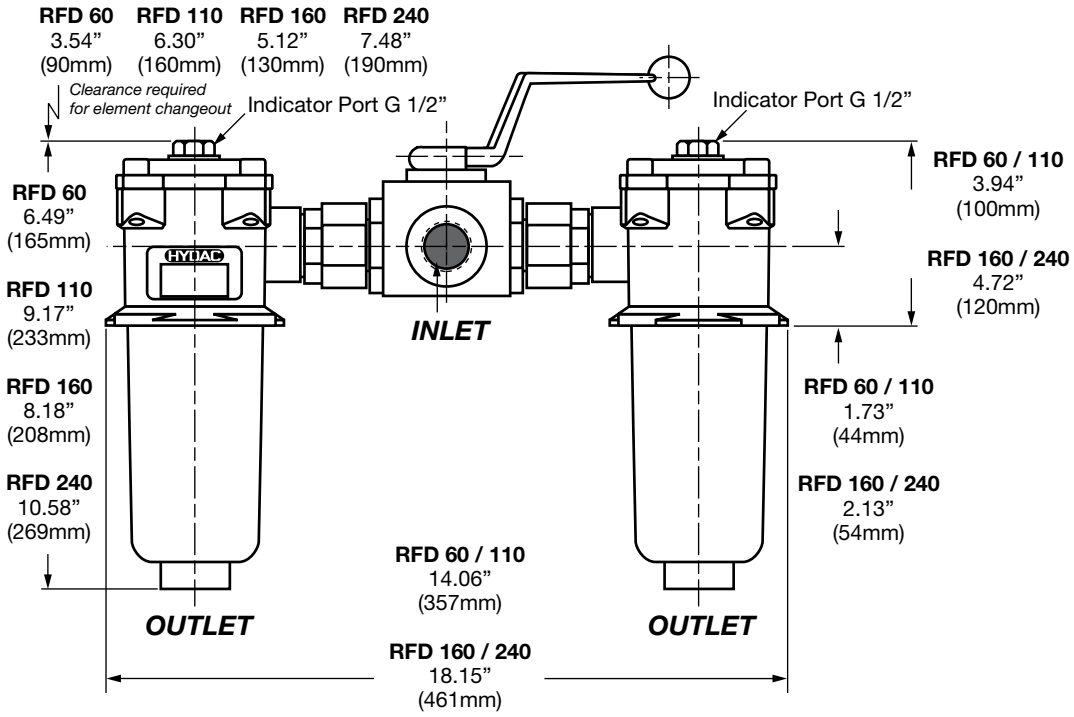
Supplementary Details
Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

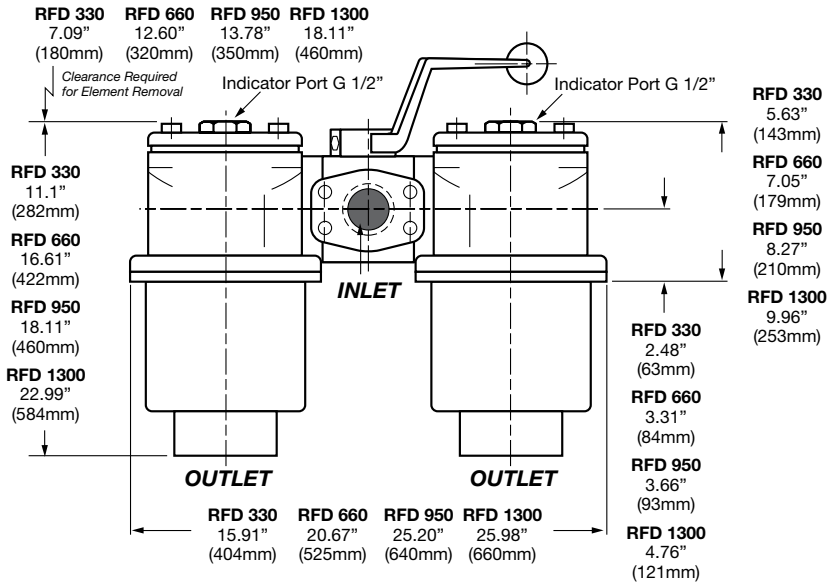
(For additional details and options, see Clogging Indicators section.)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

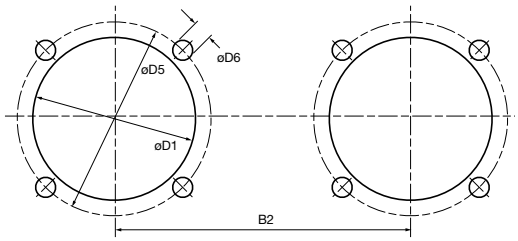
Dimensions
RFD 60 - 240



RFD 330 - 1300



Mounting Pattern



Size	øD1	øD5	øD6	B2
60 / 110	3.15" (80mm)	3.94" (100mm)	0.26" (6.5mm)	10.26" (260.5mm)
160 / 240	4.17" (106mm)	5.32" (135mm)	0.30" (7.5mm)	13.21" (335.5mm)
330	5.31" (135mm)	6.9" (170mm)	0.35" (9mm)	10.00" (254mm)
660	6.89" (175mm)	8.66" (220mm)	0.55" (14mm)	12.99" (330mm)
950	8.19" (208mm)	11.42" (290mm)	0.71" (18mm)	13.35" (390mm)
1300	8.19" (208mm)	11.42" (290mm)	0.71" (18mm)	16.14" (410mm)

Size	60	110	160	240	330	660	950	1300
Weight (lbs.)	7.0	8.2	13.4	15.6	29.5	112.2	215	238

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

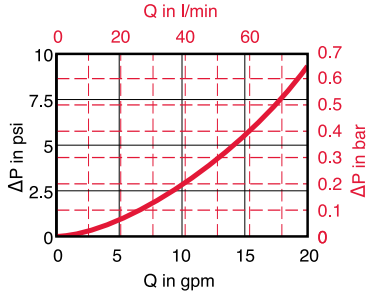
Housing Curve:

Pressure loss through housing is as follows:

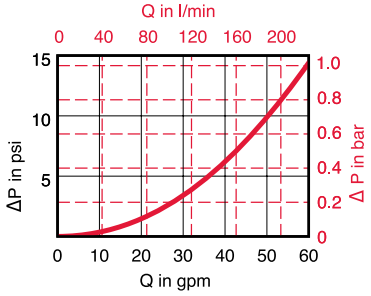
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

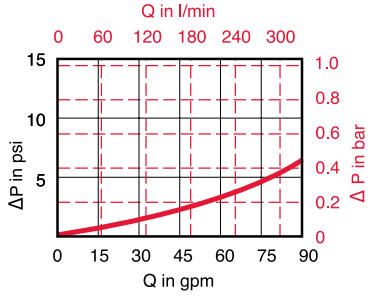
RFD 60/110 HOUSING & TRANSFER VALVE



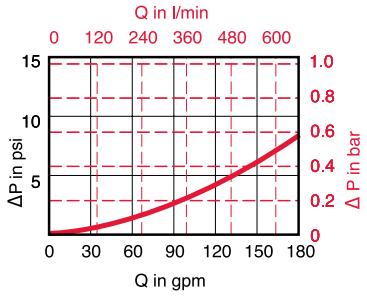
RFD 160/240 HOUSING & TRANSFER VALVE



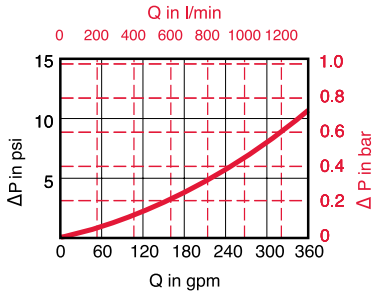
RFD 330 HOUSING & TRANSFER VALVE



RFD 660 HOUSING & TRANSFER VALVE



RFD 950/1300 HOUSING & TRANSFER VALVE



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0110	0.817	0.517	0.329	0.178
0160	0.522	0.323	0.208	0.159
0240	0.338	0.208	0.142	0.096
0330	0.232	0.150	0.093	0.066
0660	0.105	0.066	0.042	0.029
0950	0.064	0.043	0.030	0.020
1300	0.045	0.032	0.024	0.014

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
0110	–	–	0.464	0.317
0160	0.556	0.378	0.329	0.225
0240	–	–	0.209	–
0330	0.228	0.156	0.135	–
0660	0.100	0.068	0.059	0.041
0950	0.068	0.0467	0.041	0.028
1300	0.049	0.034	0.029	0.020

Size	...R...P/HC (Paper)
	10, 20 µm
0060	0.255
0110	0.128
0160	0.077
0240	0.049
0330	0.037
0660	0.016
0950	0.010
1300	0.007

Size	...R...W/HC (Wire Screen)
	25, 50, 74, 100, 149, 200 µm
0060	0.055
0110	0.030
0160	0.021
0240	0.015
0330	0.010
0660	0.005
0950	0.003
1300	0.003

Size	...R...BN/AM	
	3 µm	10 µm
0330	0.477	0.164
0660	0.192	0.066
0950	0.132	0.045
1300	0.088	0.033

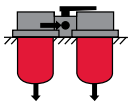
Size	...R...AM
	040A
0330	0.216
0660	0.095
0950	0.067
1300	0.048

All Element K Factors in psi / gpm.

NFD Series

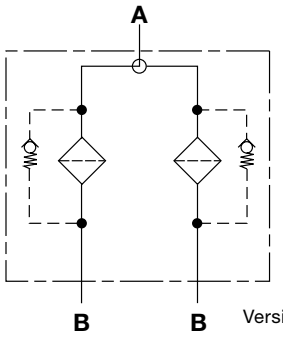
In-Tank / Inline Duplex Filters

360 psi • up to 450 gpm

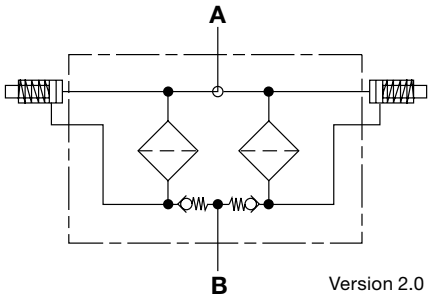


Version 2.0 pictured

Hydraulic Symbol



Version 1.0



Version 2.0

Features

- NFD Filters have an extremely large filtration area and flow capacity of 450 gpm.
- NFD Filters can be configured for in-tank or inline applications
- Vent and drain ports are standard
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF)
- Screw-on lid provides easy access to filter element for replacement
- Reusable contamination basket prevents re-entry of retained contaminants into the reservoir during element replacement
- Filters can be fitted with clogging indicators to monitor the contamination level of the element
- NFD duplex filters have a ball-type selector valve to provide continuous filtration and eliminate the need to shut-down the system during element changeout

Applications

Agricultural

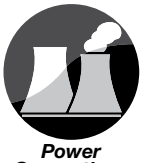
Automotive

Construction

Gearboxes

Industrial

Offshore



Power Generation

Pulp & Paper

Technical Details

Mounting Method	See drawings	
Port Connection	SAE-64 Flange Code 61	
Flow Direction		
1.0 version	Inlet: Side	Outlet: Bottom
2.0 version	Inlet: Side	Outlet: Side
Construction Materials		
Head, Housing, Lid	Aluminum	
Elbows, Manifolds	Ductile Iron	
Flow Capacity		
1310	343 gpm (1300 lpm)	
2610, 5210, 7810, 10410	450 gpm (1700 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	360 psi (25 bar)	
Proof Pressure	540 psi (38 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	Contact HYDAC office	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10%	1.0 - Static	
ΔP = 72 psid (5 bar) -10%	2.0 - Differential	
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10%		
ΔP = 87 psid (6 bar) +10%		

Model Code

NFD BN/HC 1310 D A P 3 A 1.0 / A

Filter Type
NFD = Duplex In-Tank Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collaspe)*
BN/AM = Betamicron® Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collaspe)*
AM = Aquamicron®
W/HC = Wire Screen

Size
1310, 2610, 5210, 7810, 10410

Operating Pressure
D = 360 psi (25 bar)

Type of Change Over
A = Ball valve

Type of Connection
P = SAE DN 100 (4") flange

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC, ECO/N
10, 20 = P/HC
3, 10 = BN/AM
25, 74, 149 = W/HC
40 = AM

Type of Static Clogging Indicator
A, B/BM, C, D, H

Type Number / Modification Number
1.0 = In-Tank Filter - Static indicator
2.0 = Inline Filter - ΔP indicator

Flow Path *(facing connecting manifold)*
(omit) = *(sizes 1310 and 2610 version 1.0 only)*
A = Front inlet, Front outlet
B = Rear inlet, Rear outlet *(sizes 5210 - 10410 only)*
C = Front inlet, Rear outlet
D = Rear inlet, Front outlet *(sizes 5210 - 10410 only)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Cracking Pressure of Bypass Valve
(omit) = 43 psid (3 bar) *(standard)*
KB = no bypass
B6 = 87 psid (6 bar)
B1 = 15 psid (1 bar)
not available with ECO/N

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
LED = 2 light emitting diodes for up to 24V DC
S0103H = Modification of BN4HC and W/HC Elements for Phosphate Ester Fluids

Replacement Element Model Code

1300 R 010 BN4HC / V

Size
1300 - for housings: 1310
2600 - for housings: 2610, 5210, 7810, 10410

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
40 = AM
25, 74, 149 = W/HC
3, 10 = BN/AM
10, 20 = P/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VR 2 B . X /

Indicator Prefix
VR = Return Filters *(1.0 version)*
VMF = Mobile Filters *(2.0 version)*

Trip Pressure
2 = 29 psid (2 bar) *(return filters)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
H = Electric pressure switch

Modification Number

Supplementary Details

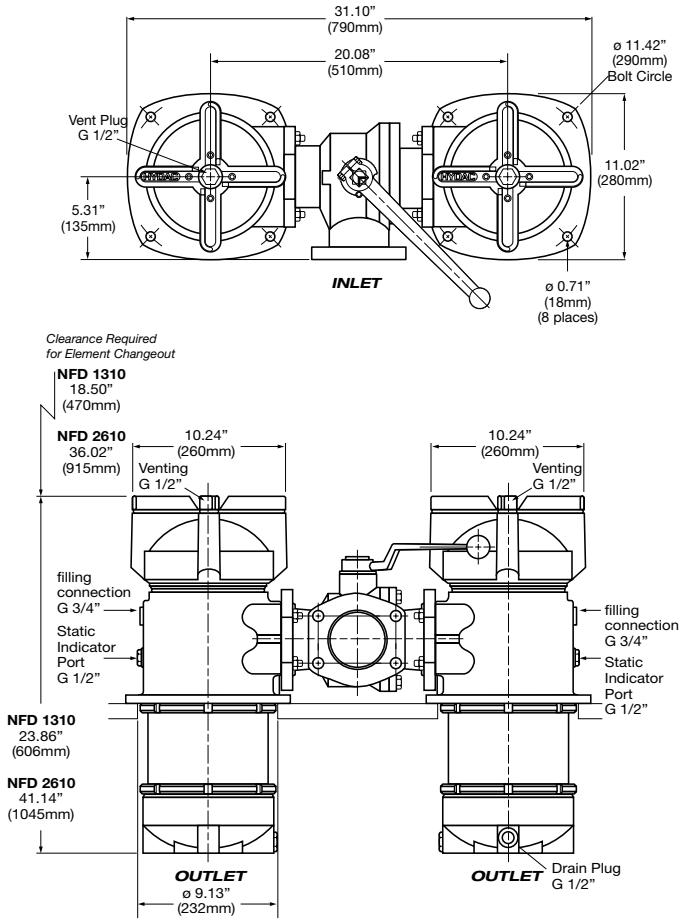
Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

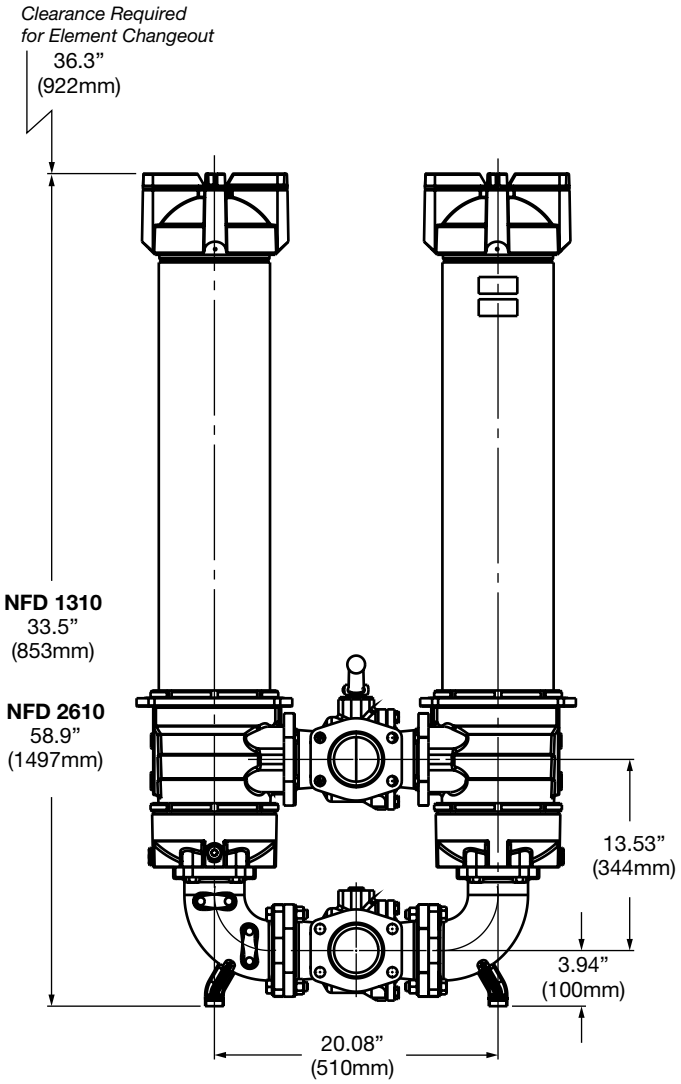
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

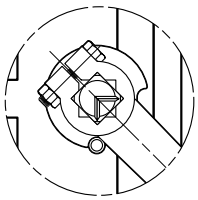
Dimensions
NFD 1310 / 2610 – 1.0 Version



NFD 1310 / 2610 – 2.0 Version



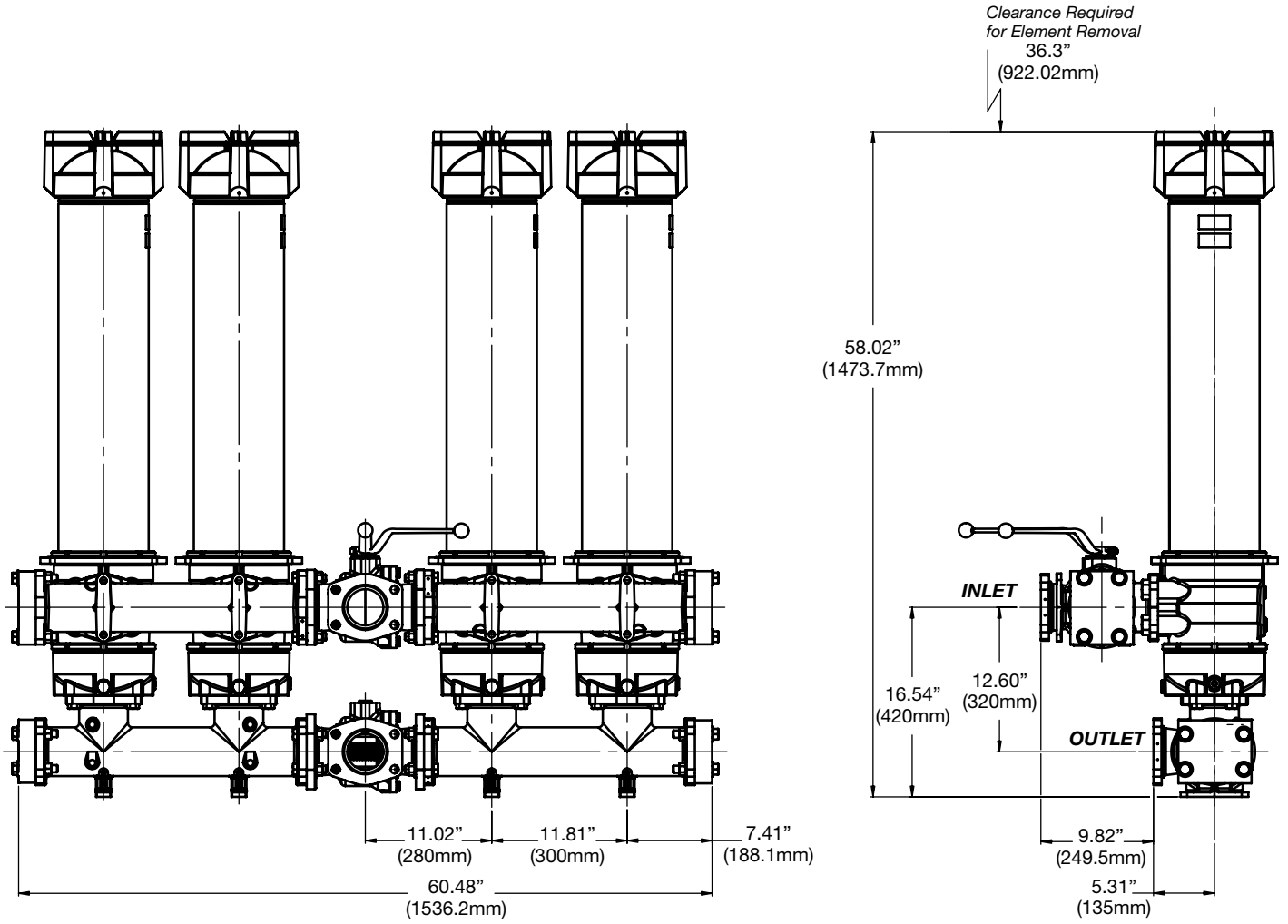
Handle Enlargement – Both Versions



Size	Version 1.0	1310	2610	Version 2.0	1310	2610
Weight (lbs)		154	176		227	254

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

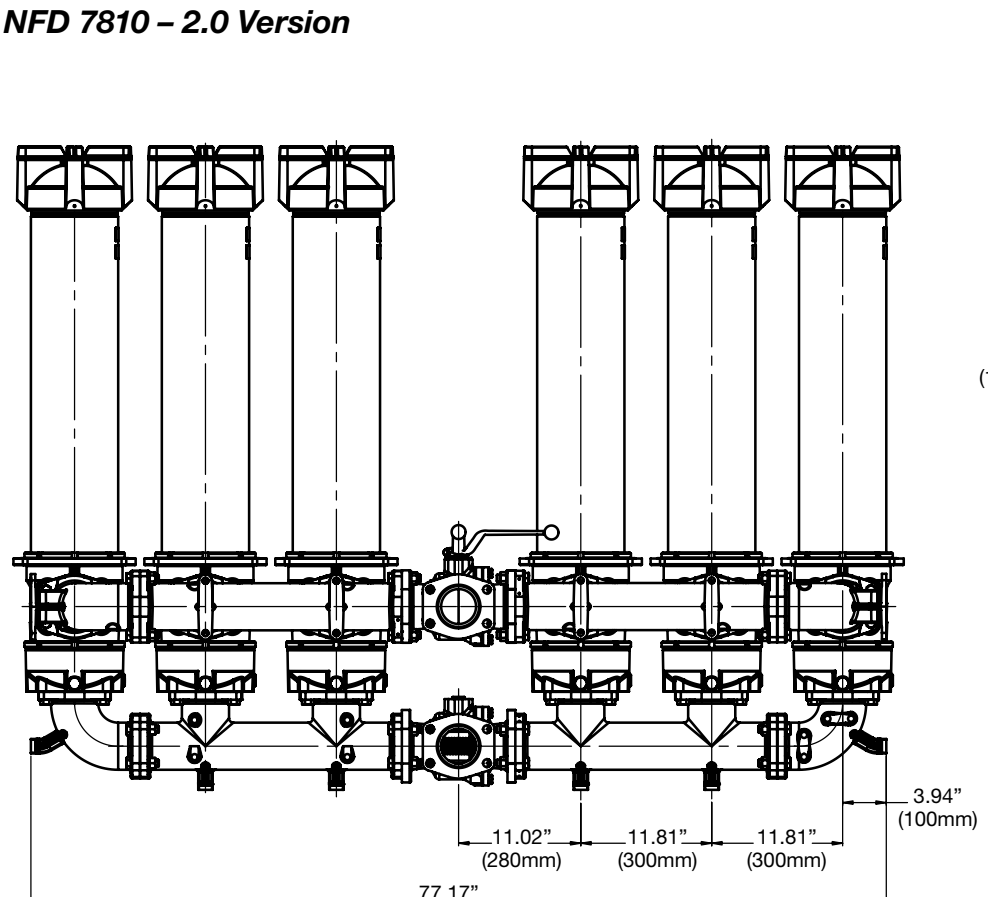
NFD 5210 – 2.0 Version



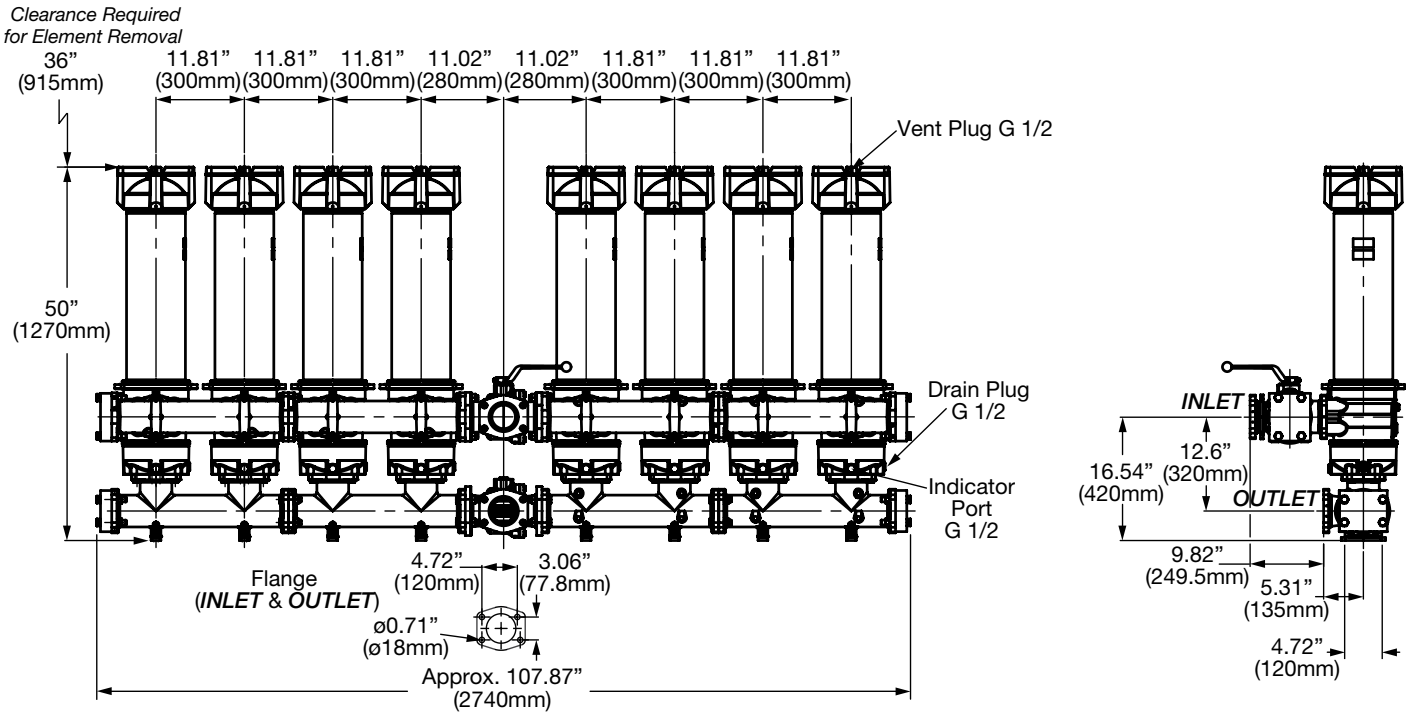
Size	5210 Version 2.0
Weight (lbs.)	610

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

NFD 7810 – 2.0 Version



NFD 10410 – 2.0 Version



Size	7810 Version 2.0	10410 Version 2.0
Weight (lbs.)	863	1125

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

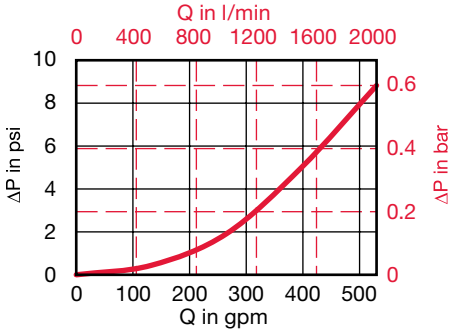
Housing Curve:

Pressure loss through housing is as follows:

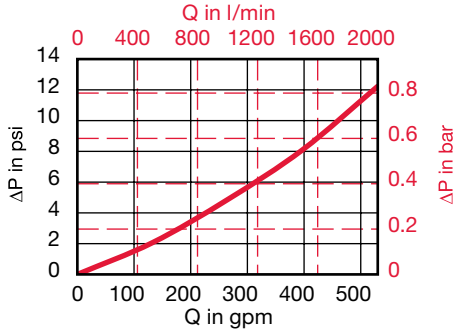
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

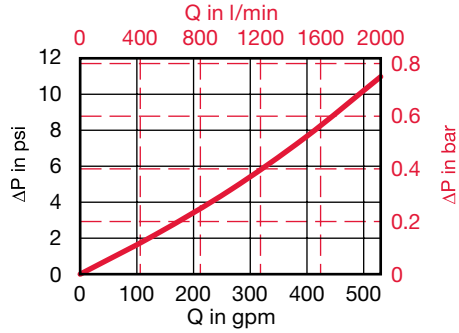
NFD 1310-2610 ...1.X HOUSING



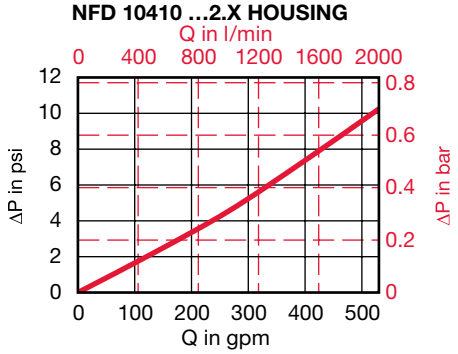
NFD 5210 ...2.X HOUSING



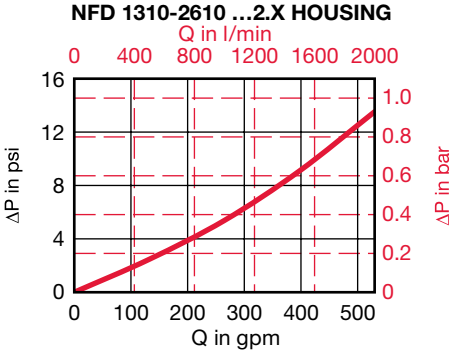
NFD 7810 ...2.X HOUSING



NFD 10410 ...2.X HOUSING



NFD 1310-2610 ...2.X HOUSING



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
1300	0.045	0.032	0.024	0.014
2600	0.023	0.016	0.011	0.007

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
1300	0.049	0.034	0.029	0.020
2600	0.024	0.017	0.014	0.010

Size	...R...BN/AM	
	3 µm	10 µm
1300	0.088	0.033
2600	0.052	0.019

Size	...R...AM
	40 µm
1300	0.048
2600	0.024

Size	...R...P/HC (Polyester)	
	10 µm	20 µm
1300	0.0070	0.0070
2600	0.0034	0.0034

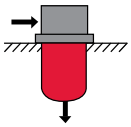
Size	...R...W/HC (Wire Screen)
	25, 50, 100, 200 µm
1300	0.0027
2600	0.0011

All Element K Factors in psi / gpm.

RFM Series

In-Tank Return Line Filters

145 psi • up to 224 gpm



Features

- The compact and lightweight design make RFM filters especially suitable for mobile applications.
- RFM filters are constructed of polyamide plastic housing and lid.
- RFM 90/150/210/270 drop replacement for “Tank Topper” filters.
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF).
- The filter bowl on models 75 - 270 also serves as a contamination basket - removed to change element.
- Models 330, 500, 661, and 851 have filter elements equipped with separate, reusable contamination baskets.
- Cavities for clogging indicators are standard.

NEW!

- Sizes 75/90/150/165/185 available with 4- or 2-bolt tank flange.

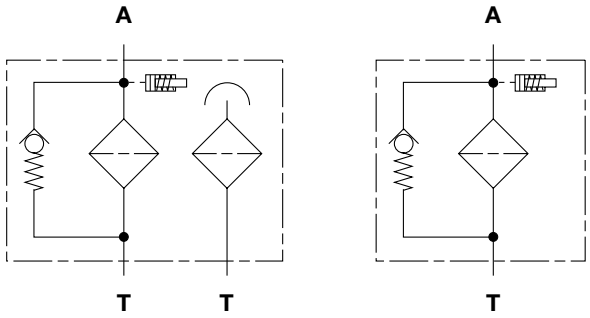
Applications

Agricultural

Automotive

Construction

Hydraulic Symbol



Technical Details

Mounting Method			
75/90/150/165/185	2 mounting holes - filter housing		
75/90/150/165/185/210/270/330/500/661/851	4 mounting holes - filter housing		
Port Connections	Inlet / Outlet		
90/150	SAE-12 / 1”		
75/165/185	SAE-16 / 1.26” Smooth Port		
210/270	SAE-20 / Open Bottom		
330/500	SAE-24 / 2” NPT 1 1/2” SAE Flange, Code 61 / 2” NPT		
661/851	2 1/2” SAE Flange, Code 61 / G 2 1/2” BSPP		
Direction of Flow	Side inlet and bottom outlet.		
Mat. of Construc.	Head	Bowl	Lid
90/150/75/165/185	Aluminum	Plastic	Plastic
210/270	Aluminum	Steel	Plastic
330/500/661/851	Aluminum	Plastic	Aluminum
Flow Capacity			
75	20 gpm (75 lpm)		
90	24 gpm (90 lpm)		
150	40 gpm (150 lpm)		
165	43 gpm (165 lpm)		
185	49 gpm (185 lpm)		
210	55 gpm (210 lpm)		
270	71 gpm (270 lpm)		
330	87 gpm (330 lpm)		
500	132 gpm (500 lpm)		
661	174 gpm (660 lpm)		
851	225 gpm (850 lpm)		
Housing Pressure Rating			
Max. Oper. Press:	145 psi (10 bar)		
Proof Pressure:	218 psi (15 bar)		
Fatigue Pressure:	145 psi (10 bar) @ 1 million cycles		
Burst Pressure:	60-500	>580 psi (40 bar)	
	660/851	536 psi (37 bar)	
Element Collapse Pressure Rating			
BN/HC, W/HC	290 psid (20 bar)		
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)		
V	3045 psid (210 bar)		
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)		
Fluid Compatability			
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.			
Indicator Trip Pressure			
P = 29 psi (2 bar) -10% *(standard)* P = 72 psi (5 bar) -10% *(optional)*			
Bypass Valve Cracking Pressure			
ΔP = 43 psid (3 bar) +10% *(standard)* ΔP = 87 psid (6 bar) +10% *(optional)*			

Model Code

RFM BN/HC 330 B F F 3 D 1 . X / 12 - V - __ - L24

Filter Type
RFM = In-Tank Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collaspe) (not for sizes 90 & 150)*
ECO/N = ECOmicron® *(Low Collaspe) (not for sizes 210/270)*
BN/AM = Betamicron® Aquamicron® MM = Mobilemicron *(Low Collaspe)*
AM = Aquamicron® W/HC = Wire Screen

Size
75, 90, 150, 165, 185, 210, 270, 330, 500, 661, 851

Working Pressure
B = 145 psid (10 bar)

Optional Second Inlet Connection
(omit) = no second port
F = 1 1/2" (SAE-24) *(sz. 330 & 500 only)*
K = 1 1/2" SAE Flange (code 61) *(sz. 330 & 500 only)*
M = 2 1/2" SAE Flange (code 61) *(sz. 661 & 851 only)*
V = 2 x 1 (SAE 16) *(sz. 210 & 270 only)*

Inlet Connection/Port Size *(1 Inlet)*
C = 3/4 (SAE-12) *(sz. 90 & 150 only)*
D = 1 (SAE-16) *(sz. 75, 165 & 185 only)*
E = 1 1/4 (SAE-20) *(sz. 210 & 270 only)*
F = 1 1/2 (SAE-24) *(sz. 210, 270, 330, & 500 only)*
K = 1 1/2" SAE Flange (code 61) *(sz. 330 & 500 only)*
M = 2 1/2" SAE Flange (code 61) *(sz. 661 & 851 only)*
Z = Customer Specific

Filtration Rating *(microns)*
3, 5, 10, 20 = BN4HC, ECO/N 10, 20 = P/HC 3, 10 = BN/AM
25, 74, 149 = W/HC 40 = AM 10, 15 = MM

Type of Clogging Indicator
A, B, BM, C, E, F, FD

Type Number
0 = no indicator, no ports 1-3 = clogging indicator positions *(see chart)*

Modification Number *(latest version always supplied)*

Inlet Port Configuration
12 = SAE Straight Thread O-Ring Boss Ports *(RFM 60-500)*
16 = SAE Code 61 Flange *(sizes 330-851)*

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM)

Bypass
(omit) = 43 psid *(standard)*
B6 = Bypass 87 psid (6 bar)
KB = No Bypass
not available with ECO/N

Supplementary
T = Filter Breather *(RFM 75, 90, 150, 165, & 185 only)*
DTxx = Down tube *(xx length in inches - up to 12 inches)*
DSxx = Dip stick *(xx length in inches)*
SO103H = Modification of BN4HC Elements for Phosphate Esters
4L = 4 bolt *(sizes 90-185)*
2M0 = Indicator with Deutsch Connector *(FD indicator only)*

Replacement Element Model Code

0330 R 010 BN4HC / V

Size
0075, 0090, 0150, 0165, 0185,
0210, 0270, 0330, 0500, 0660, 0850

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N 10, 20 = P/HC
3, 10 = BN/AM 25, 74, 149 = W/HC
40 = AM 10, 15 = MM

Element Media
BN4HC, ECO/N, P/HC, BN/AM, W/HC, AM, MM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VR 2 B . X / __ __

Indicator Prefix
VR = Return Filters *(sizes 330 to 851)*
VMF = Mobile Filters *(sizes 75 to 270)*

Trip Pressure
2 = 29 psid (2 bar)
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
E = Visual pressure gauge
F = Electric pressure switch
FD = Electric pressure switch w/Deutsch Connector

Modification Number

Supplementary Details
2M0 = Deutsch Connector *(male)*

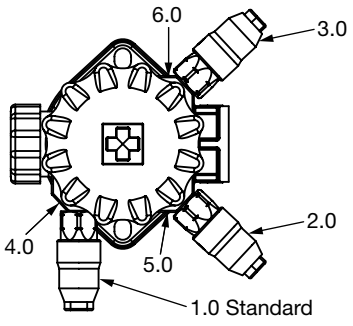
Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

(*For additional details and options, see Clogging Indicators section.*)

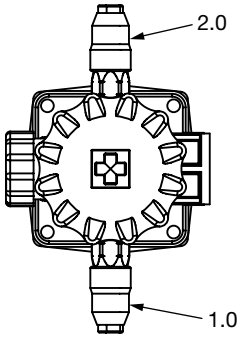
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Clogging Indicator Locations

RFM 75/165/185

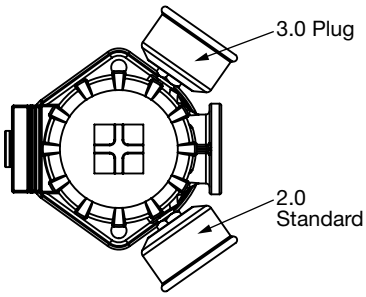


RFM 75/165/185/-4L

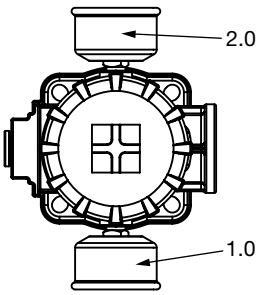


Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left back 90° to Inlet	VMF...
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...
4.X	Clogging Indicator left back 135° to Inlet	VMF...
5.X	Clogging Indicator left front 90° to Inlet	VMF...
6.X	Clogging Indicator right front 90° to Inlet	VMF...

RFM 90/150

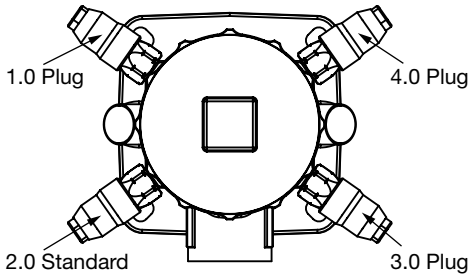


RFM 90/150/-4L



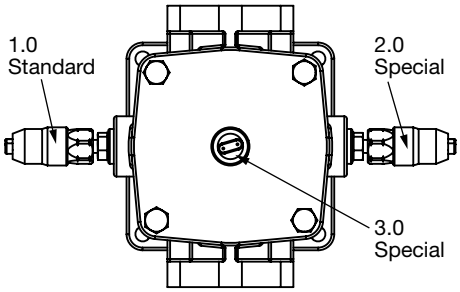
Type No.	Location of Clogging Indicator	Indicator Model
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...

RFM 210/270



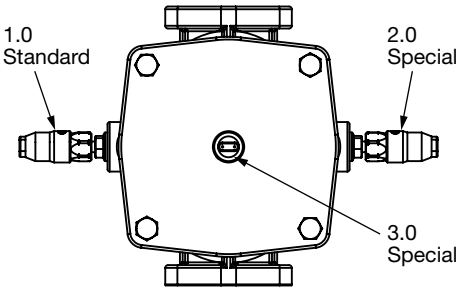
Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left back 45° to Inlet	VMF...
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...
4.X	Clogging Indicator right back 45° to Inlet	VMF...

RFM 330/500



Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left 90° to Inlet	VR...
2.X	Clogging Indicator right 90° to Inlet	VR...
3.X	Clogging Indicator on Top	VR...

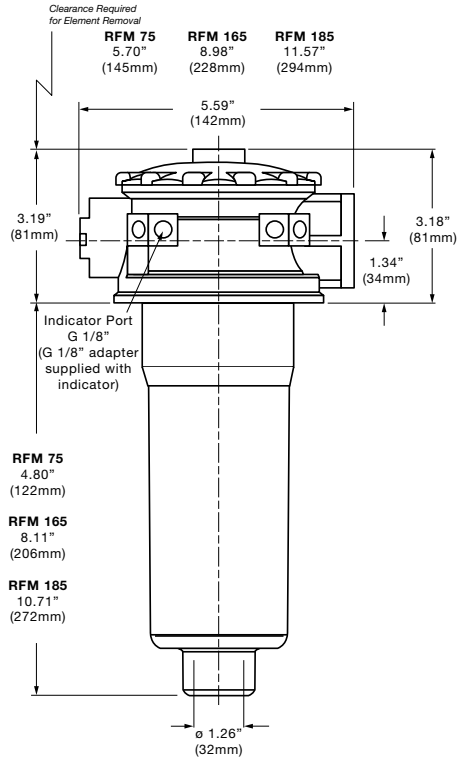
RFM 661/851



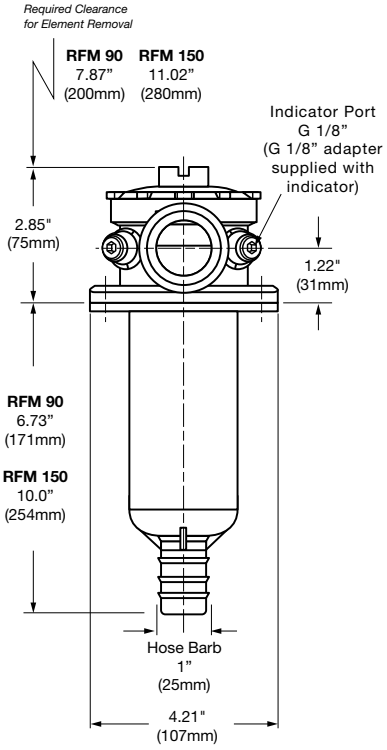
Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left 90° to Inlet	VR...
2.X	Clogging Indicator right 90° to Inlet	VR...
3.X	Clogging Indicator on Top	VR...

Dimensions

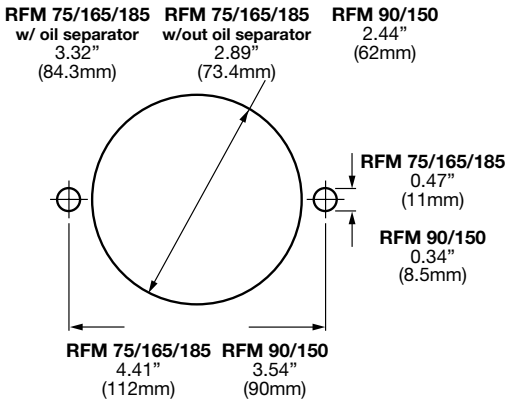
RFM 75/165/185



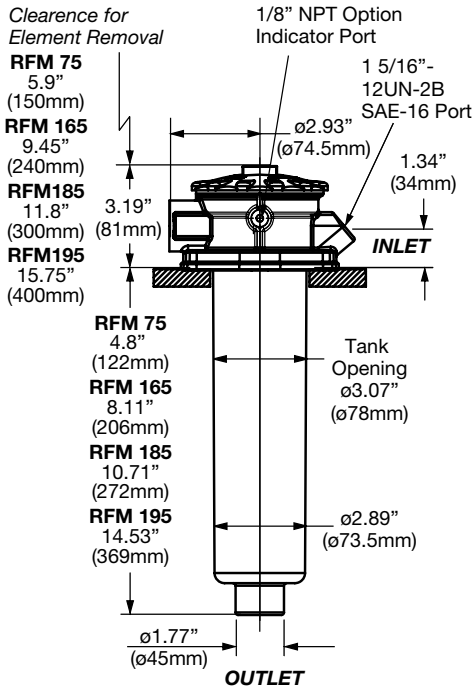
RFM 90/150



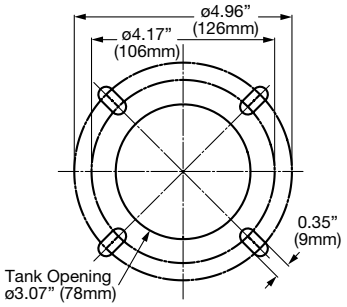
Mounting Pattern



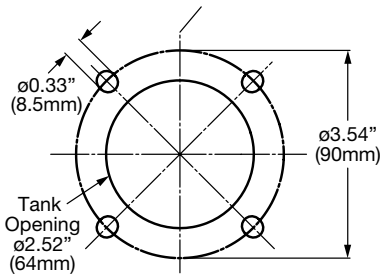
RFM 75/165/185/-4L



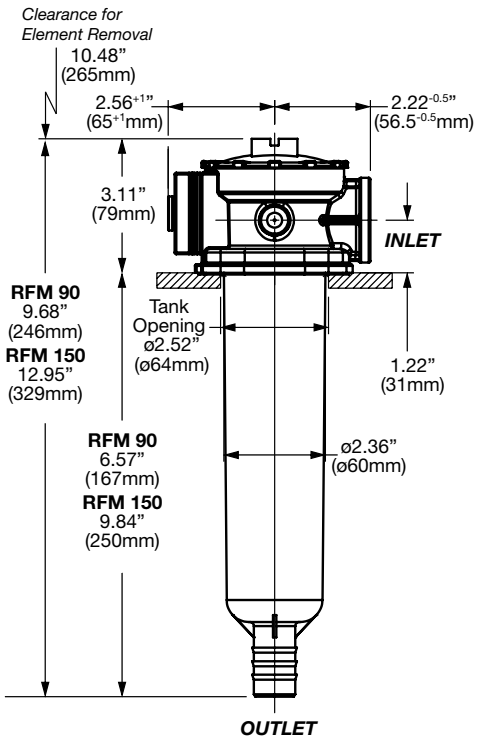
Mounting Pattern RFM 75/165/185/-4L



Mounting Pattern RFM 90/150/-4L



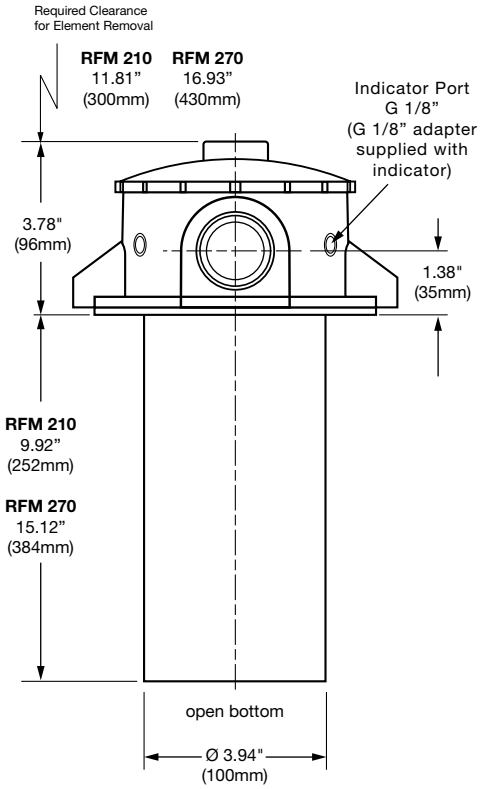
RFM 90/150/-4L



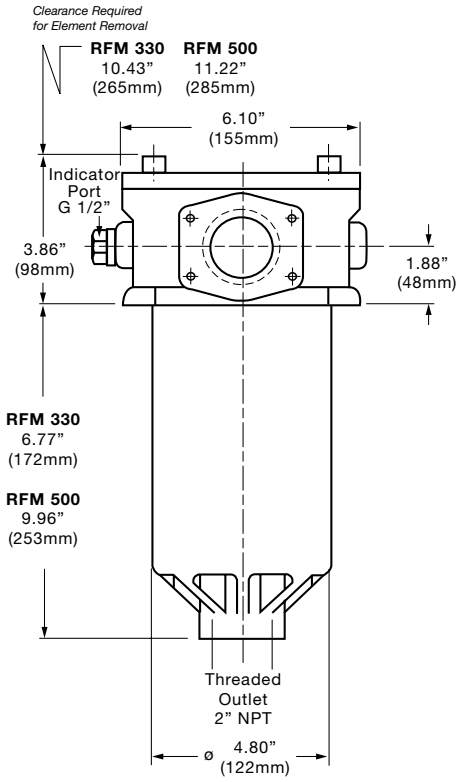
Size	75	90	150	165	185	210	270	330	500	661	851
Weight (lbs.)	1.3	0.9	1.0	1.5	1.6	6.8	7.9	6.8	7.3	13.2	14.2

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

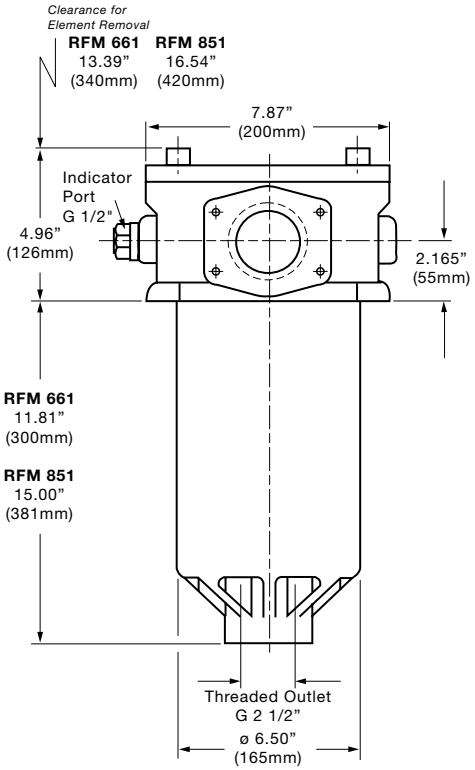
Dimensions
RFM 210/270



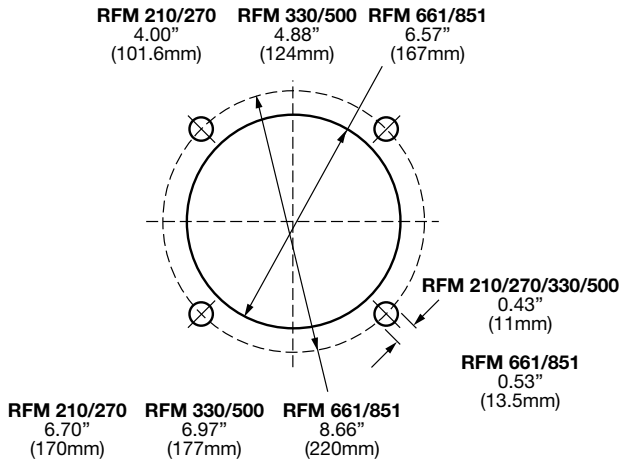
RFM 330/500



RFM 661/851



Mounting Pattern



Size	75	90	150	165	185	210	270	330	500	661	851
Weight (lbs.)	1.3	0.9	1.0	1.5	1.6	6.8	7.9	6.8	7.3	13.2	14.3

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

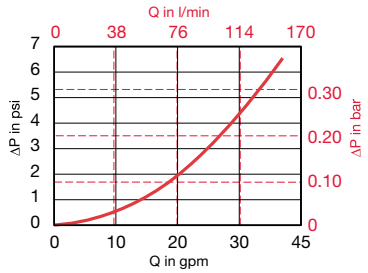
Housing Curve:

Pressure loss through housing is as follows:

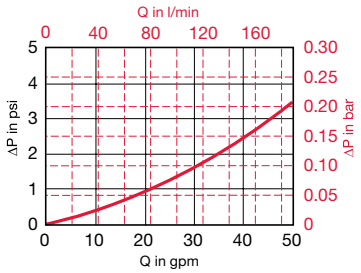
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

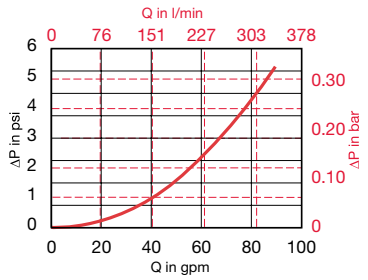
RFM 90/150 & RFM 90/150/-4L Housing



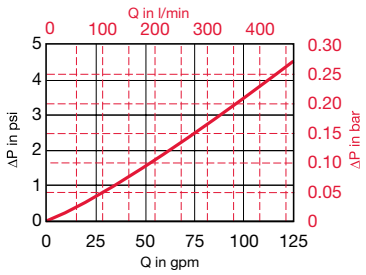
RFM 75/165/185 & RFM 75/165/185/-4L Housing



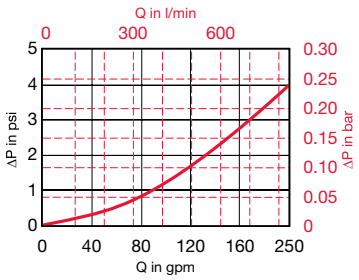
RFM 210 / 270 Housing



RFM 330/500 Housing



RFM 661/851Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0075	1.209	0.780	0.445	0.241
0165	0.616	0.430	0.245	0.133
0185	0.485	0.334	0.179	0.097
0210	0.214	0.145	0.096	0.060
0270	0.138	0.094	0.062	0.039
0330	0.232	0.150	0.093	0.066
0500	0.162	0.104	0.069	0.044
0660	0.105	0.066	0.042	0.029
0850	0.082	0.055	0.036	0.023

Size	...R...MM	
	10 µm	15 µm
0075	0.265	0.166
0090	0.252	0.118
0150	0.114	0.071
0165	0.146	0.091
0185	0.108	0.067
0210	0.052	0.032
0270	0.032	0.020
0330	0.078	0.049
0500	0.052	0.032
0660	0.030	0.019
0850	0.023	0.015

Size	...R...ECO/N (ECOmicron®)			
	3 µm	5 µm	10 µm	20 µm
0090	0.515	0.343	0.464	0.317
0150	0.467	0.319	0.277	0.189
0165	0.674	0.369	0.321	0.220
0185	0.303	0.207	0.272	0.162
0330	0.228	0.156	0.135	–
0660	0.100	0.068	0.059	0.041
0850	0.078	0.053	0.046	0.032

Size	...R...W/HC (Wire Screen)
	25, 50, 74, 100, 149, 200 µm
0075	0.043
0165	0.020
0330	0.010
0500	0.007
0660	0.005
0850	0.004

Size	...R...P/HC (Paper)
	10, 20 µm
0075	0.156
0110	0.128
0165	0.086
0330	0.037
0500	0.024
0660	0.016
0850	0.012

Size	...R...AM
	040A
0330	0.216
0500	0.138
0660	0.095
0850	0.074

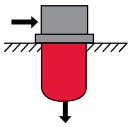
Size	...R...BN/AM	
	3 µm	10 µm
0330	0.477	0.164
0660	0.192	0.066

All Element K Factors in psi / gpm.

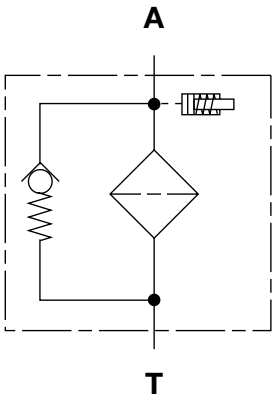
RFMP Series

In-Tank Return Line Filters

100 psi • up to 26 gpm



Hydraulic Symbol



Features

- The compact and lightweight design make RFMP filters especially suitable for mobile applications.
- RFMP filters integratethe head and bowl into a single one piece polyamide housing. This makes for a more leak-tight housing.
- The housing is designed so that a down tube can be attached to the outlet spout.

Applications

Agricultural

Construction

Technical Details

Mounting Method		
165	4 mounting holes - filter housing	
Port Connections	Inlet / Outlet	
165	1” Hose Barb / 1.26” smooth port	
Direction of Flow	Side inlet and bottom outlet.	
Mat. of Construc.	Housing	Lid
165	Plastic	Plastic
Flow Capacity		
165	26 gpm (100 lpm)	
Housing Pressure Rating		
Max. Oper. Press:	100 psi (7 bar)	
Element Collapse Pressure Rating		
BN/HC		290 psid (20 bar)
ECO/N, P/HC, MM		145 psid (10 bar)
Fluid Temperature Range		-22˚ to 212˚F (-30˚ to 100˚C)
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with NBR seals.		
Indicator Trip Pressure		
P = 29 psi (2 bar) -10% *(standard)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(standard)*		

Model Code

RFMP BN/HC 165 Y HB 10 A 1 . X / - 4L

Filter Type
RFMP = In-Tank Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collaspe) (not for sizes 90 & 150)*
ECO/N = ECOmicron® *(Low Collaspe) (not for sizes 210/270)*
MM = Mobilemicron *(Low Collaspe)*
P/HC = Polyester

Size
165

Working Pressure
Y = 100 psid (7 bar)

Inlet Connection
HB = Hose Barb

Filtration Rating *(microns)*
3, 5, 10, 20 = BN4HC, ECO/N
10, 20 = P/HC
10, 15 = MM

Type of Clogging Indicator
A, B/BM, C, F, FD

Type Number
1 = clogging indicator positions *(see chart)*

Modification Number *(latest version always supplied)*

Mounting Method
4L = 4 hole tank flange

Supplementary
DTxx = Down tube *(xx length in inches - up to 12 inches)*

Replacement Element Model Code

0165 R 010 BN4HC / V

Size
0165

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N 10, 20 = P/HC
10, 15 = MM

Element Media
BN4HC, ECO/N, P/HC, MM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VMF 2 B . X /

Indicator Prefix
VMF = Mobile Filters

Trip Pressure
2 = 29 psid (2 bar)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
F = Electric pressure switch
FD = Electric pressure switch w/Deutsch Connector

Modification Number

Supplementary Details
2M0 = Deutsch Connector *(male)*

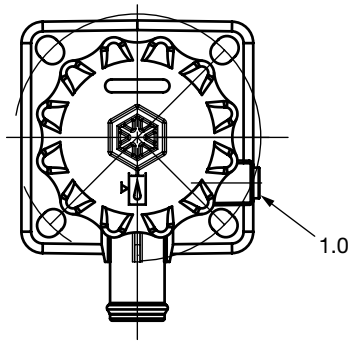
Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

(*For additional details and options, see Clogging Indicators section.*)

Note: Requires Adapter (P/N 0270244)

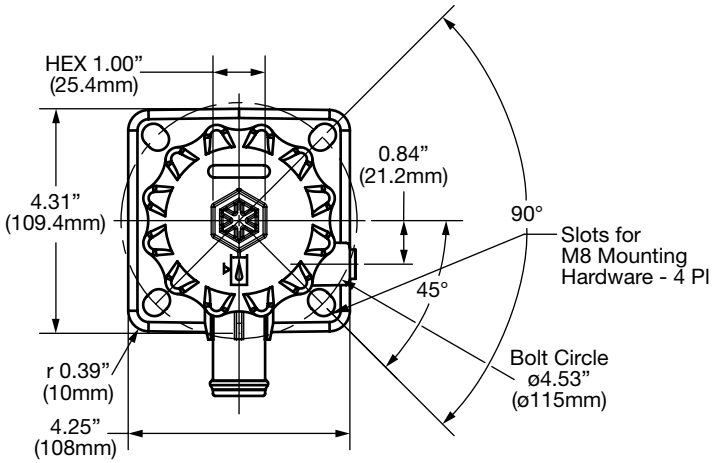
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

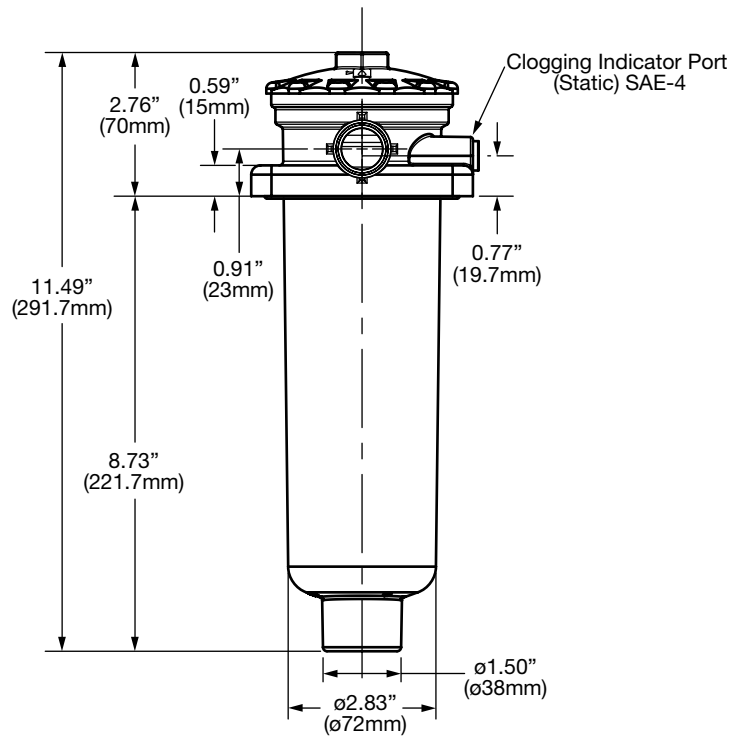
Clogging Indicator Location

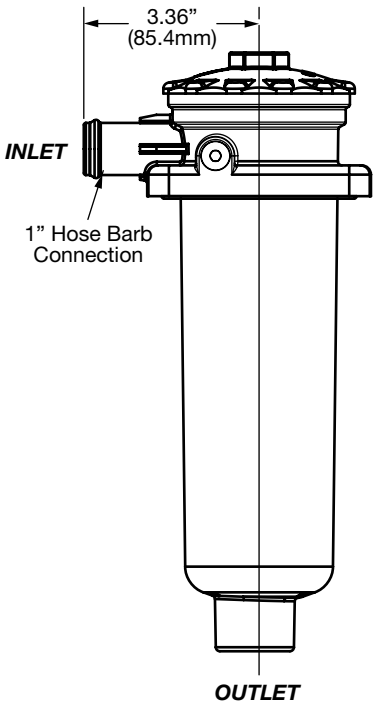


Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator right front with adapter 90° to Inlet	VMF...

Dimensions
RFMP 165







Size	165
Weight (lbs.)	1.7

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

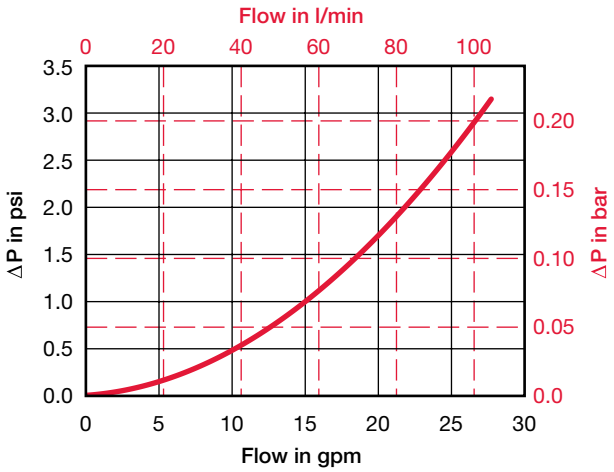
Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

RFMP 165 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0165	0.616	0.430	0.245	0.133

Size	...R...MM	
	10 µm	15 µm
0165	0.146	0.091

Size	...R...ECO/N (ECOmicron®)			
	3 µm	5 µm	10 µm	20 µm
0165	0.674	0.369	0.321	0.220

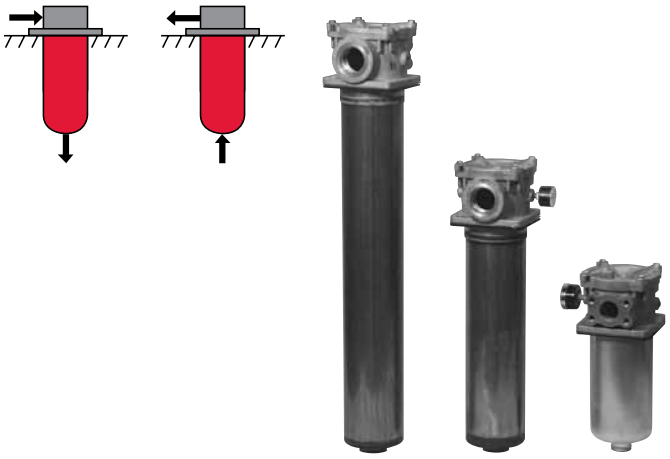
Size	...R...P/HC (Paper)
	10, 20 µm
0165	0.086

All Element K Factors in psi / gpm.

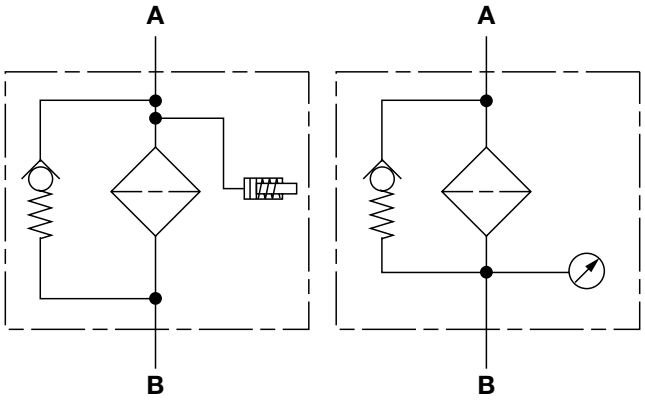
HF4R(S) Series

In-Tank Return Line / Suction Filters

100 psi • up to 120 gpm



Hydraulic Symbol



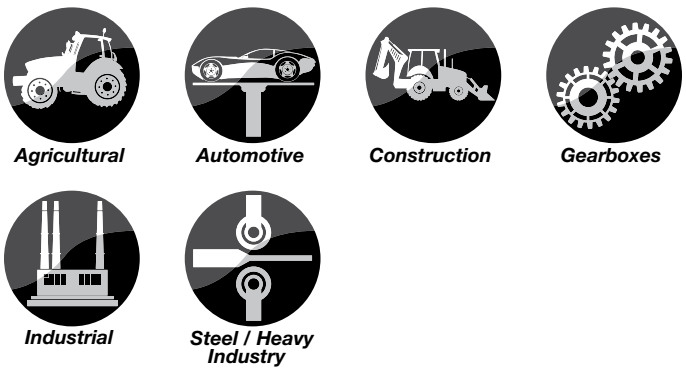
Features

- Designed to meet and comply with HF4 Automotive standard and SAE J2066 standard.
- Inlet port options include SAE straight thread O-ring boss, SAE Flange, and NPT ports to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of Nitrile, Fluoroelastomer or EPR O-ring material provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and water base fluids.
- In-tank design requires minimal space for installation.
- Provision is made for an additional inlet port to allow two return lines to be connected to the same filter.
- 9” filters include 1 1/2” hose barb outlet.
- 18” and 27” filters include 1 1/2” threaded NPT outlet.

Technical Details

Mounting Method	4 mounting holes - filter housing	
Port Connection		
Inlet	SAE-24, 1 1/2” NPT, 1 1/4” BSPP, 1 1/2” Flange, Code 61	
Outlet		
HF4R09	1 1/2” Hose Barb	
HF4R18/27	1 1/2” NPT male	
Flow Direction	Inlet	Outlet
HF4R	Side	Bottom
HF4S	Bottom	Side
Construction Materials		
Head, Lid	Aluminum	
Bowl	Steel	
Flow Capacity		
HF4R09	50 gpm (189 lpm)	
HF4R18	100 gpm (378 lpm)	
HF4R27	120 gpm (454 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	100 psi (7 bar)	
Proof Pressure	150 psi (10.3 bar)	
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
BN, W, P/HC	150 psid (10 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
P = 1 psi (0.08 bar) -10%	P = 20 psi (1.4 bar) -10%	
P = 10 psi (0.8 bar) -10%	P = 29 psi (2 bar) -10%	
Bypass Valve Cracking Pressure		
ΔP = 3 psid (0.2 bar) +10%	ΔP = 25 psid (1.7 bar) +10%	
ΔP = 15 psid (1 bar) +10%	ΔP = 43 psid (3 bar) +10%	

Applications



Model Code

HF4R BN 09 G 3 A 1.1 / 3 __ B3 __ O

Filter Type
- HF4R = In-tank return filter
- HF4S = In-tank suction filter

Element Media
- BN = Betamicron® *(Low Collapse)*r
- W = Wire screen

Element Length
- 09 = Single Element Length (9”)
- 18 = Double Element Length (18”)
- 27 = Triple Element Length (27”)

Type of Connection
- G = Threaded
- F = Flanged
- FG = Flanged and Threaded

Filtration Rating *(microns)*
- 3, 5, 10, 20 = BN
- 20 = BN *(suction element)*
- 149 = W *(suction element)*
- 25, 74, 149 = W

Type of Clogging Indicator *(static)*
- A, C, E, G

Type Modification Number
- 1 = Single inlet Connection
- 2 = Dual Inlets *(matching threaded ports only except 1 1/2” SAE code 61 & SAE 32 Threaded)*

Port Configuration
- 0 = BSPP 1 1/4”
- 3 = NPT 1 1/2”
- 12 = SAE-24 Straight Thread O-ring Boss
- 16 = SAE 1 1/2” Code 61 flange
- 16-12 = SAE 1 1/2” Code 61 flange and SAE 32 straight thread

Seals
- *(omit)* = Nitrile (NBR) *(standard)*
- V = Fluoroelastomer (FPM)

Bypass Valve
- B3 = 43 psid bypass *(standard)*
- B1 = 15 psid bypass
- B1.7 = 25 psid bypass
- B0.2 = 3 psid *(suction application)*

Supplementary
- S0103H = Modification of BN elements for phosphate ester fluids
- S0150H = Anodized filter head for water based fluids

Outlet Configuration
- O = Open end outlet *(1 1/2” Hose Barb.) (9” model only)*
- C = Outlet check valve *(1/2 psid cracking pressure) (available on 18” & 27” models only)*
- T = Threaded outlet connection *(1 1/2” NPT male) (standard 18” & 27” models only)*
- DT = 12” Down Tube *(outlet) (9” model only)*

Replacement Element Model Code

5 . 03 . 09 D 03 BN / V

Length *(nominal inches)*
- 09, 18, 27

Type
- D = HF4R *(return)*
- S = HF4S *(suction)*

Filtration Rating *(micron)*
- 3, 5, 10, 20 = BN
- 25, 74, 149, = W

Element Media
- BN, W

Supplementary Details
- *(omit)* = standard
- V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VMF 2 B . X / __

Indicator Prefix
- VMF = Mobile Filters

Trip Pressure
- 2 = 29 psid (2 bar) *(return filters)*
- 1.7 = 25 psid (1.7 bar) *(optional)*

Note - 15 psid (1 bar) & 3 psid (0.2 bar) also available

Type of Indicator
- A = no indicator, plugged port
- C = Electric switch
- E = Gauge
- G = Electric pressure switch (AC/DC)

Modification Number

Supplementary Details

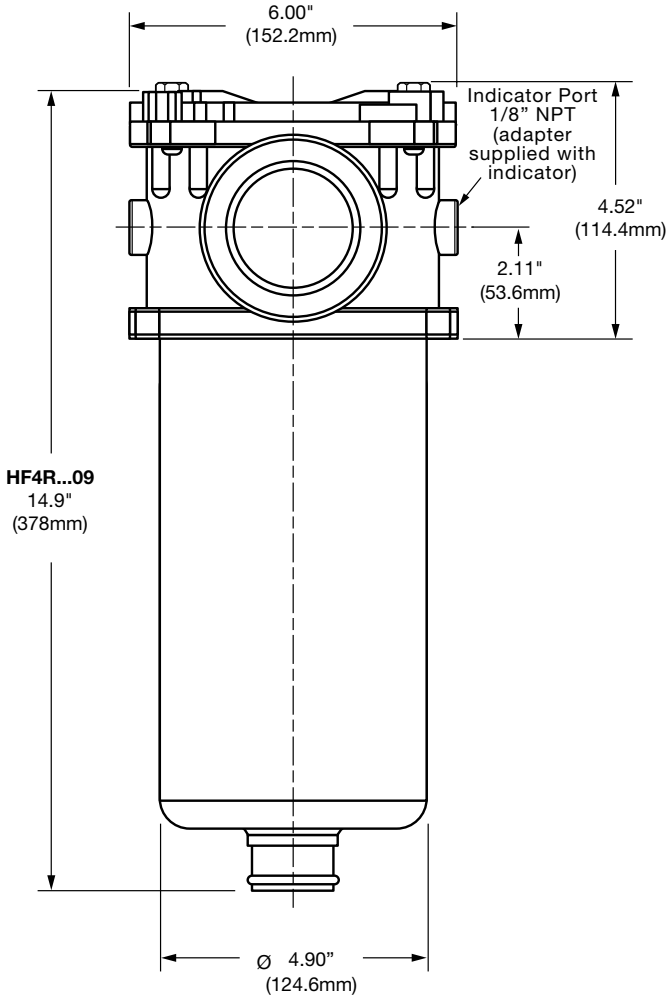
Light Voltage *(D type indicators only)*
- L24 = 24V
- L110 = 110V

Seals
- *(omit)* = Nitrile (NBR) *(standard)*
- V = Fluoroelastomer (FPM)

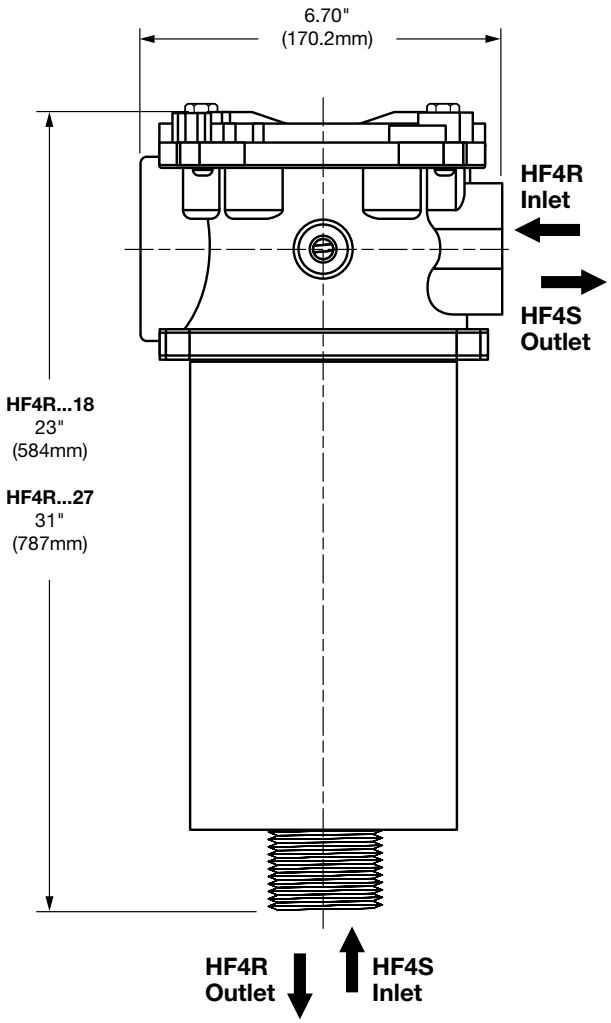
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

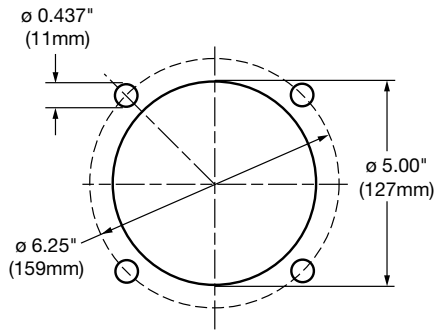
Dimensions
HF4R…09



HF4R…18 / 27



Mounting Pattern



Size	09	18	27
Weight (lbs.)	10.0	14.5	18.6

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

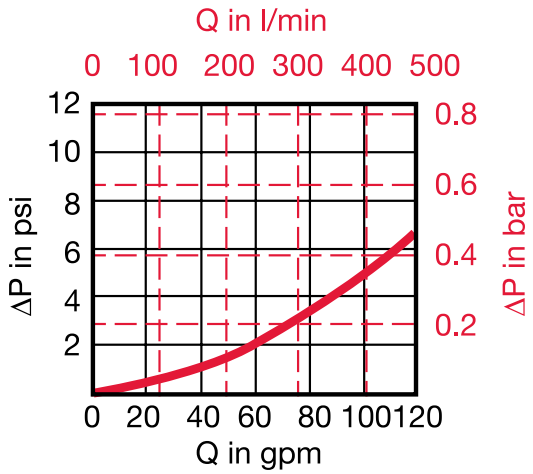
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

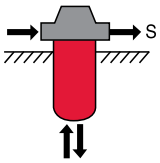
$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	5.03.XXDBN			
	3 µm	5 µm	10 µm	20 µm
09	0.1680	0.1405	0.0788	0.0443
18	0.0800	0.0669	0.0375	0.0211
27	0.0517	0.0432	0.0242	0.0136

Size	5.03.XXD W/HC 25, 50, 74, 100, 149, 200 µm
09	0.007
18	0.004
27	0.002

All Element K Factors in psi / gpm.

RKM Series
Multi-functional Filters
145 psi • up to 210 gpm



Features

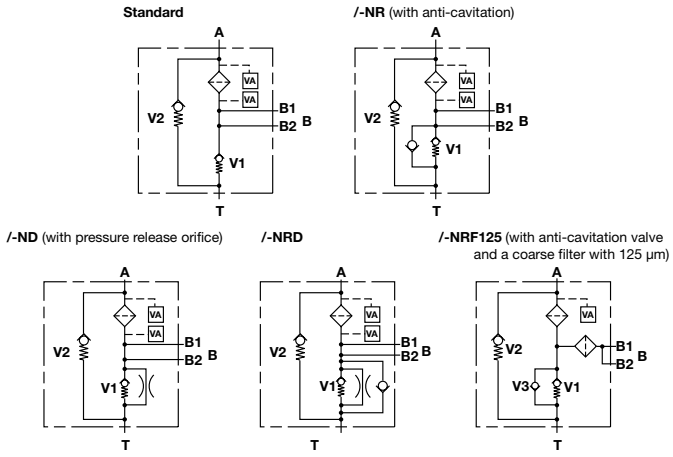
- RKM is a combination open loop return and closed loop suction boost filter in one housing.
- The return line flow of the operating hydraulics is fed to the filter via port A *(inlet)* and is cleaned by the filter element *(full flow return line filtration)*. A pressure (standard = 7psi) is applied by the back-pressure valve V1. This insures that the filtered, precharged return line flow is available to the hydrostatic feed pump via ports B *(full flow suction boost filtration)*. Excess fluid drained via the back-pressure valve to the tank *(port T)*.
- A bypass valve V2 *(standard = 36 psi)* is incorporated to relieve excessive back-pressures in the element *(important on cold starts)*. Flow from the tank can be drawn via the anti-cavitation valve to the suction side for a short time *(emergency function)*.
- Full flow finest filtration *(10 µm, 15 µm absolute)* of return line and hydrostatic feed pump which extends the service life of your components.
- Outstanding cold start characteristics due to precharge via back pressure valve *(standard = 7 psi)*.
- Due to the advanced RKM element technology and specially developed bypass valves, the lowest back-pressures can be achieved across the filter even at very low temperatures.
- One tank cutout for up to 6 suction and 3 return lines.
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF).

Applications

Agricultural

Construction

Hydraulic Symbol



Technical Details

Mounting Method	100	2 mounting holes
	201 - 800	4 mounting holes
Port Connection	Inlet / Outlet	
100	SAE-12 or 16 / SAE-12 or 16	
201/251	SAE-20 / 2 x SAE-16	
300	1 1/2" CS, Code 61-Split Flange (SF) / 2 x 1 1/4" CS, Code 61-(SF)	
350	SAE-16 Suction / SAE-24 Return	
400/800	2 1/2" SAE Flange, Code 61 / Various	
Flow Direction	Inlet: Side	Outlet: Side & bottom
Construction Materials		
Head	Aluminum	
Housing	Steel (100/201/251/350/400/800) Plastic (300)	
Lid	Plastic (100/201/251/350) Alum. (300/400/800)	
Flow Capacity		
100	26 gpm (100 lpm)	
201	52 gpm (200 lpm)	
251	66 gpm (250 lpm)	
300	79 gpm (300 lpm)	
350	92 gpm (350 lpm)	
400	105 gpm (400 lpm)	
800	211 gpm (800 lpm)	
Housing Pressure Rating		
Max. Oper. Press.	145 psi (10 bar)	
Proof Pressure	218 psi (15 bar)	
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
MM	145 psid (10 bar)	
Fluid Temp. Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	P = 29 psi (2 bar) -10% *(standard)* P = 72 psi (5 bar) -10% *(optional)*	
Bypass Valve Cracking Pressure	ΔP = 36 psid (2.5 bar) +10% *(standard)* ΔP = 87 psid (6 bar) +10% *(optional)*	
Back Pressure Valve Cracking Pressure	ΔP = 7 psid (0.5 bar) +10% *(standard)* ΔP = 43 psid (3 bar) +10% *(optional)*	

Model Code

RKM MM 300 B T F 10 A 0 . X / 12-NR

Filter Type
RKM = Low pressure multifunction

Element Media
MM = Mobilemicron® *(Low Collaspe)*

Size
100, 201, 251, 300, 350, 400, 800

Operating Pressure
B = 145 psi

Type of Port / Size of Suction Line Port
T = 2x CS 1 1/4" Code 61 Split Flange *(size 300 only)*
V = 2x SAE-16 *(sizes 201 & 251 only)*
X = 1x SAE-16 *(size 100 & 350 only)*
Y = 1x SAE-12 *(size 100 only)*
Z = According to customer specification

Type of Port / Size of Return Line Port
C = SAE-12 *(size 100 only)*
D = SAE-16 *(size 100 only)*
E = SAE-20 *(sizes 201 & 251 only)*
F = CS 1 1/2" *(Code 61) (size 300 only)*
G = SAE-24 *(size 350 only)*
Z = According to customer specification
For Sizes 400/800, see below. Other port sizes on request.

Filtration Rating *(microns)*
10, 15 = MM

Type of Clogging Indicator
A, E, F

Type Code
0 = no indicator
1-8 = see Clogging Indicator Locations *(next page)*

Modification Number *(the latest version is always supplied)*

Supplementary Details
(omit) = standard *(without anti-cavitation valve; seals in NBR, bypass valve 2.5 bar, back-pressure valve 0.5 bar)*
12 = SAE O-Ring Boss Ports
NR = with anti-cavitation valve
ND = with pressure release orifice
NRD = with anti-cavitation valve and with pressure release valve
NRF125 = with anti-cavitation valve and course filter strainer 125µm
UT = suitable for use when submersed in oil
V = Fluroelastomer (FPM)
MP4 = RKM Multi-port 2x SAE-16 + 1x SAE-20 Return Ports, 2x SAE-Suction Ports

Replacement Element Model Code

0300 RK 010 MM / V

Size
0100, 0201, 0251, 0300,
0350, 0400, 0800

Type
RK

Filtration Rating *(micron)*
10, 15 = MM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VMF 2 B . X /

Indicator Prefix
VMF = Mobile Filters
VM = Differential pressure indicators *(size 350)*

Trip Pressure
2 = 29 psid (2 bar) *(return filters)*
1.7 = 25 psid (1.7 bar) *(optional)*
Note: 15 psid (1 bar) & 3 psid (0.2 bar) also available

Type of Indicator
A = no indicator, plugged port
E = Pressure gauge
F = Pressure switch

Modification Number

Supplementary Details
Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

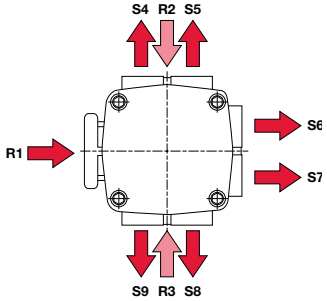
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Sizes 400/800

The identification of the port configuration is done by a nine digit code in the supplementary details. You determine the requested ports by entering an "X" for the required port in the individual cells of the table below, which has been illustrated with an example. Not configured *(closed)* ports are indicated by a "0". R = Return Line; S = Suction Line *(Contact factory for availability).*

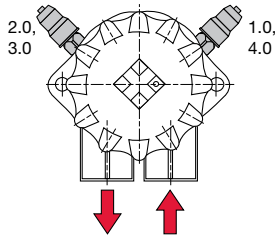
Position in Code	1	2	3	4	5	6	7	8	9
Port	**R1**	**R2**	**R3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**
SAE 2"	1								
SAE 2 1/2"	2								
1"		1	1	A	A	1	1	A	A
1 1/4"		2	2	B	B	2	2	B	B
1 1/2"		3	3	C	C	3	3	C	C



Example according to the table above: **RKM BN/HC 400 BZZ 15 A 1.0 / -12-102CC2200**

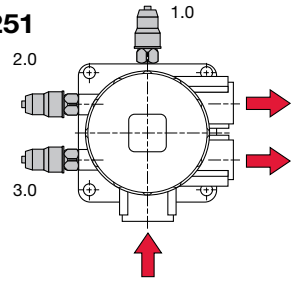
Clogging Indicator Locations

Size 100



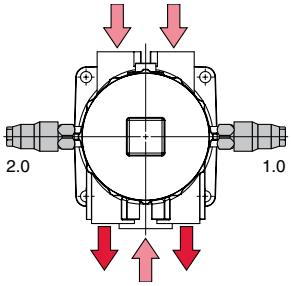
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – right-hand side, bottom	return line	before the filter element
2.0	on the filter inlet – left-hand side, bottom	return line	before the filter element
3.0	on the filter outlet – right-hand side, top	vacuum	after the filter element
4.0	on the filter outlet – left-hand side, top	vacuum	after the filter element

Size 201/251



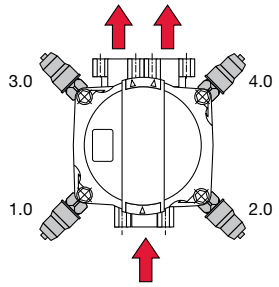
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – opposite side	return line	before the filter element
2.0	on the filter inlet – left-hand side	return line	before the filter element
3.0	on the filter outlet – right-hand side	vacuum	after the filter element

Size 201/251/-MP1



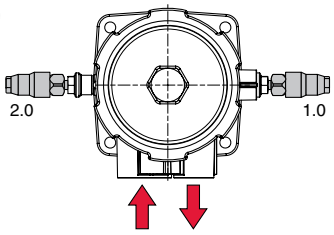
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter outlet – right-hand side	return line	before the filter element
2.0	on the filter outlet – left-hand side	return line	before the filter element

Size 300



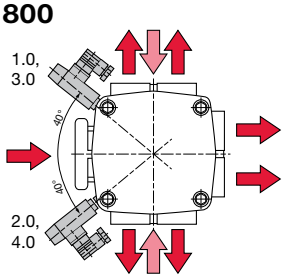
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – left-hand side	return line	before the filter element
2.0	on the filter inlet – right-hand side	return line	before the filter element
3.0	on the filter outlet – left-hand side	vacuum	after the filter element
4.0	on the filter outlet – right-hand side	vacuum	after the filter element

Size 350



Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – right-hand side	differential pressure	before and after element
2.0	on the filter inlet – left-hand side	return line	before and after element

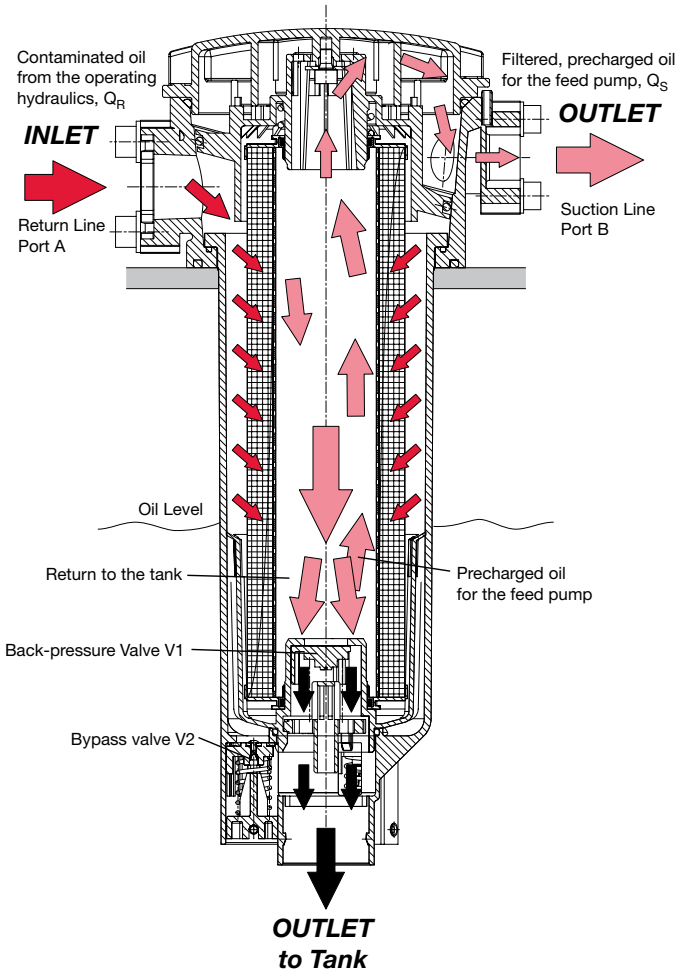
Size 400 / 800



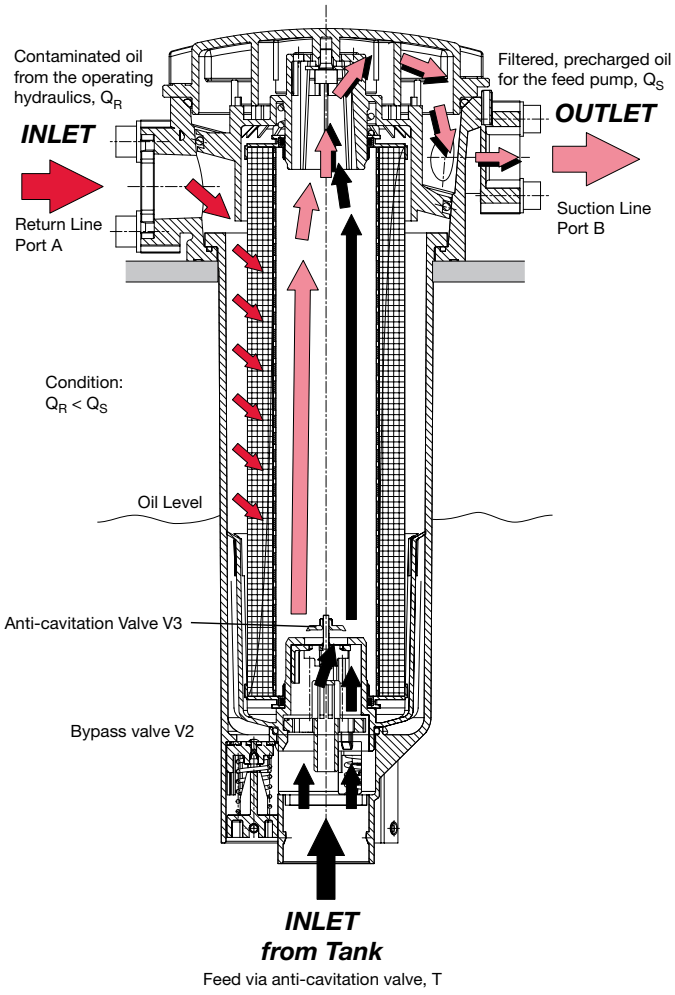
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – left-hand side, bottom	return line	before the filter element
2.0	on the filter inlet – right-hand side, bottom	return line	before the filter element
3.0	on the filter inlet – left-hand side, top	vacuum	after the filter element
4.0	on the filter inlet – right-hand side, top	vacuum	after the filter element

For other configurations, please consult factory.

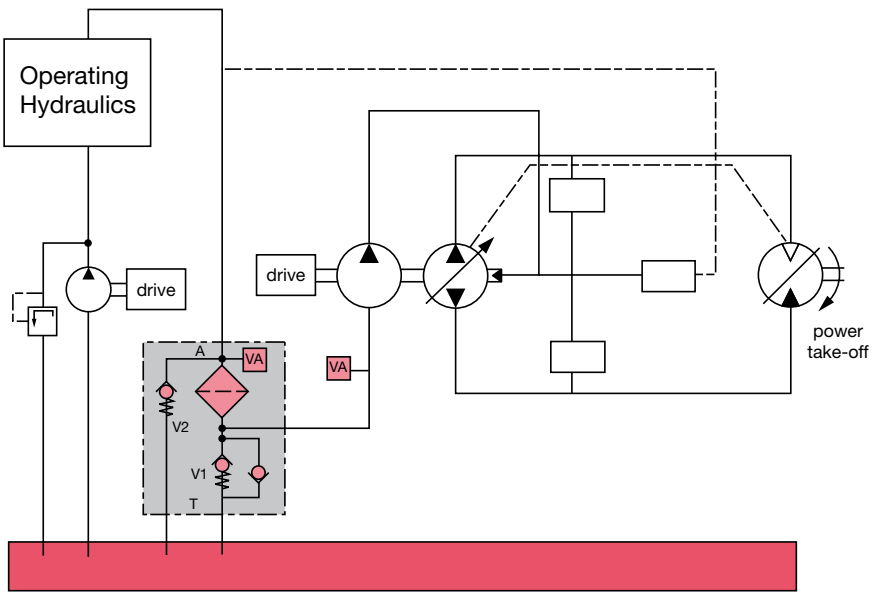
Function Diagram



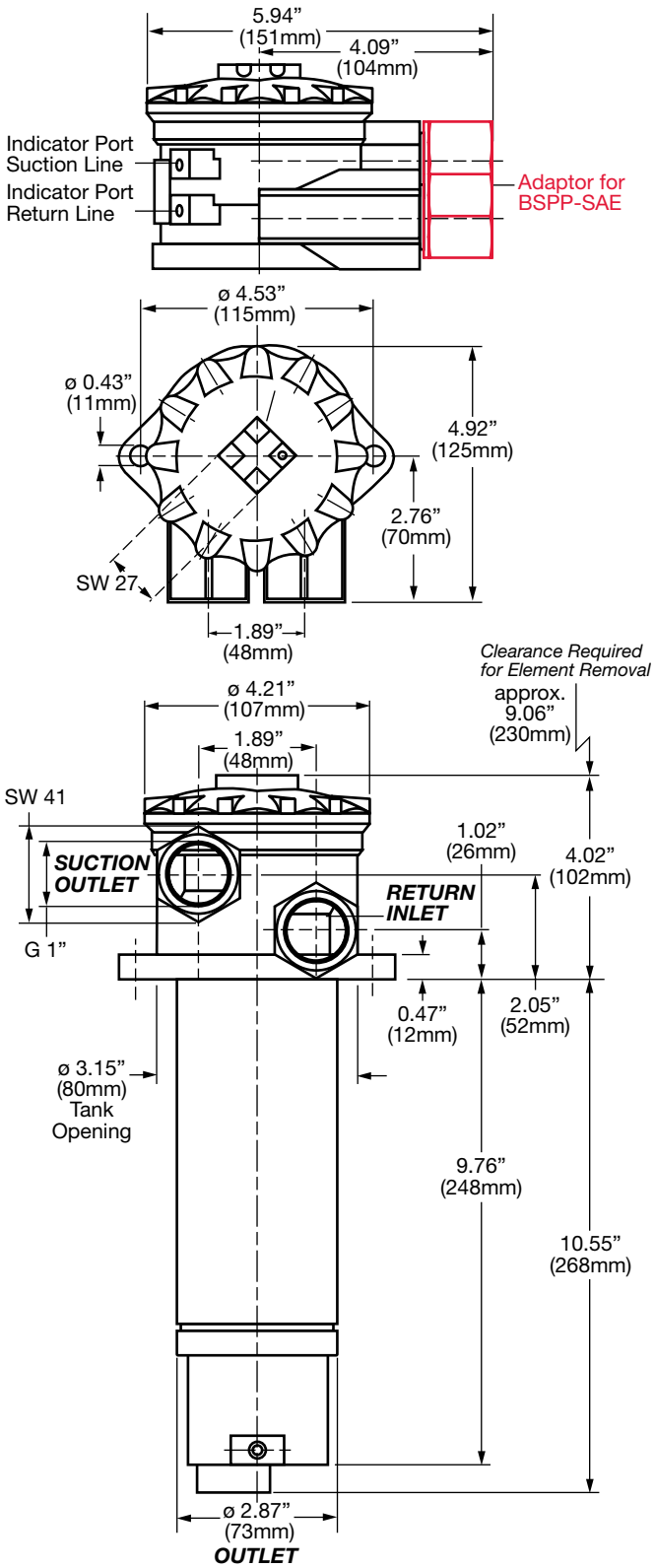
Anti-cavitation



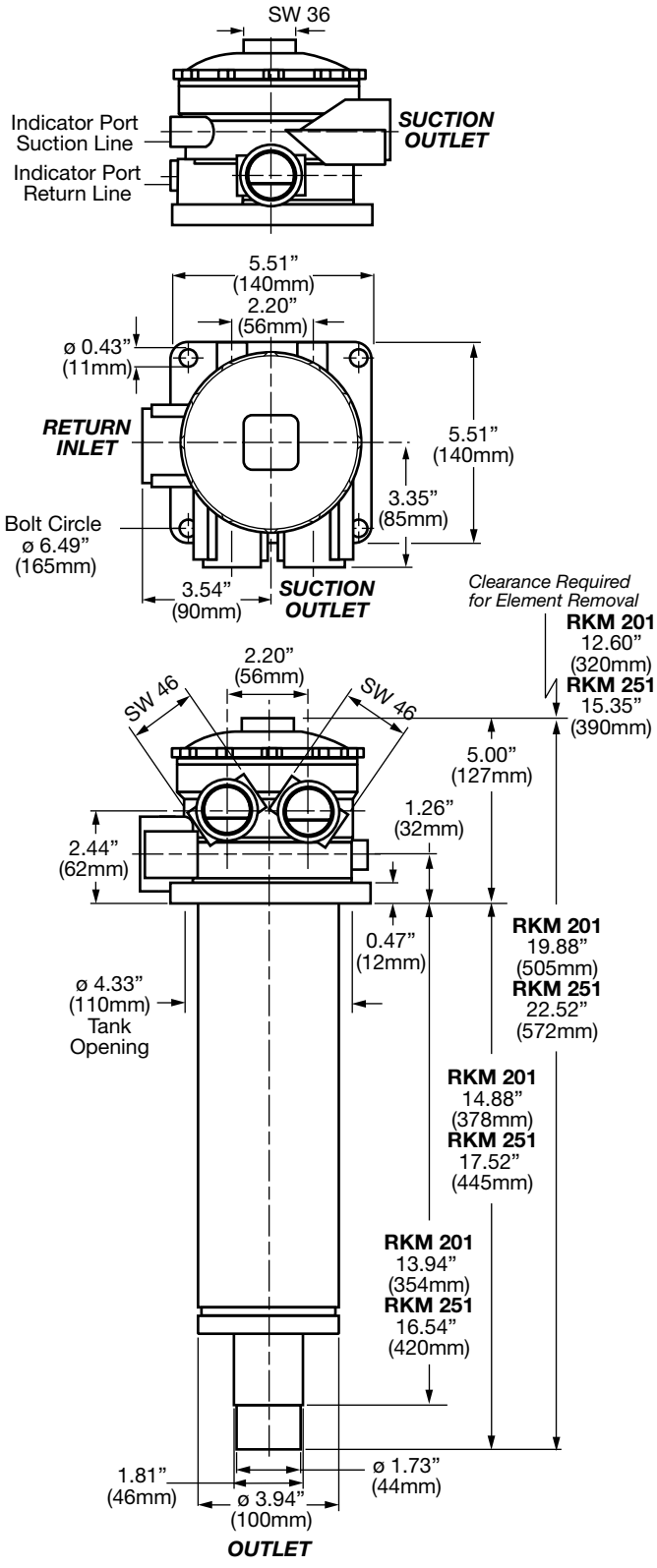
Circuit Example:



Dimensions RKM 100



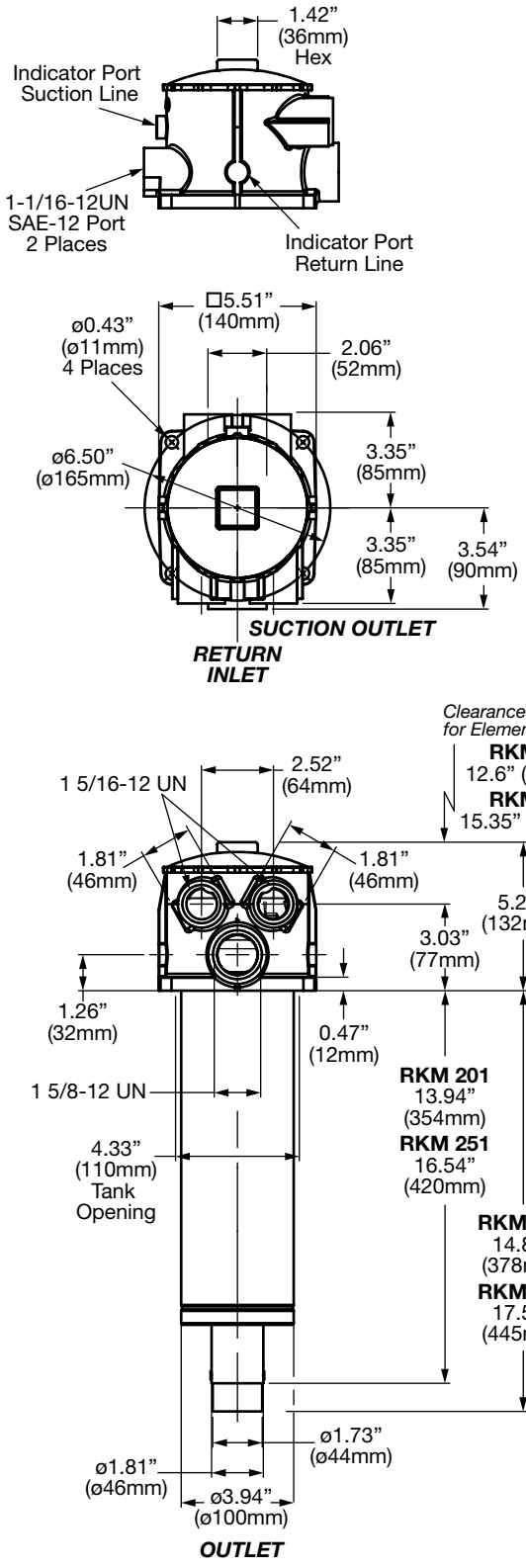
RKM 201 / 251



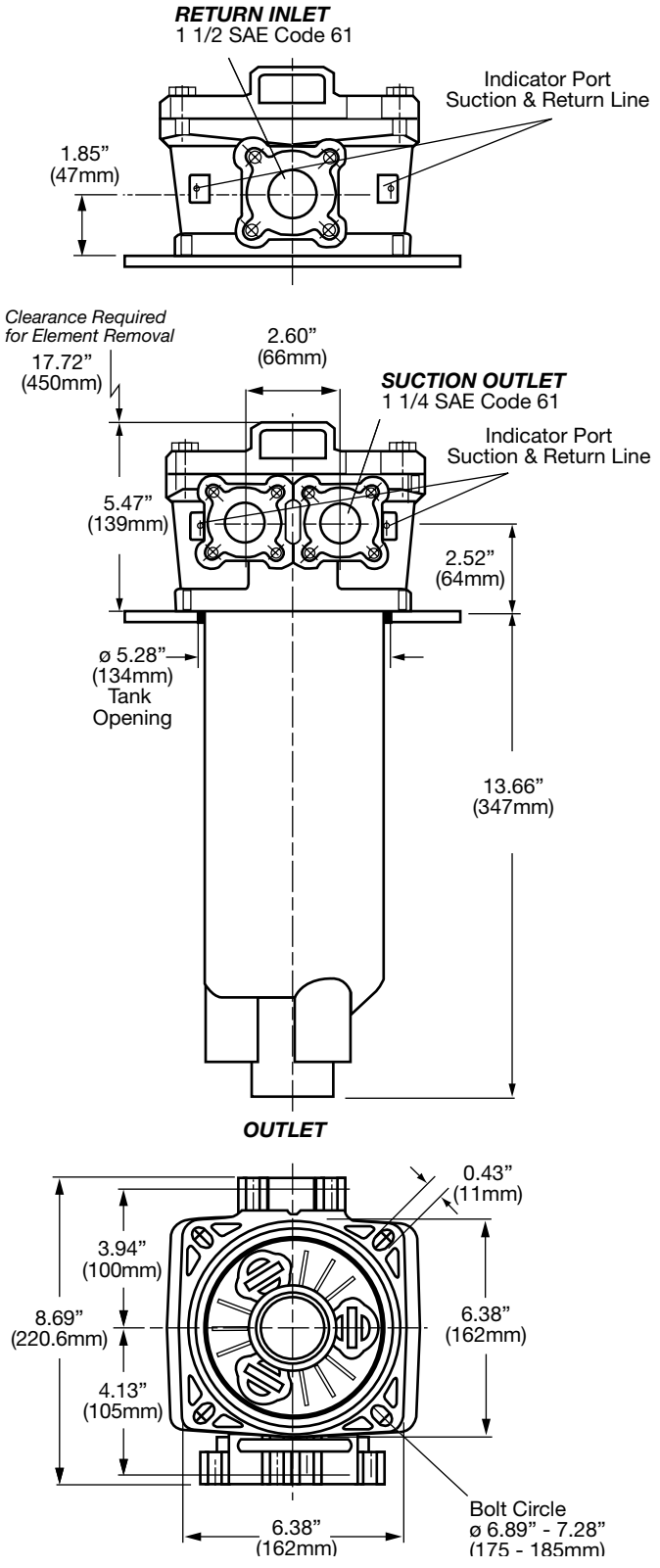
Size	100	201	251
Weight (lbs.)	3.7	8.2	8.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

RKM 201 / 251 / -MP1



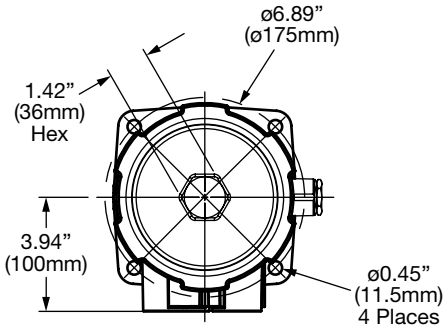
RKM 300

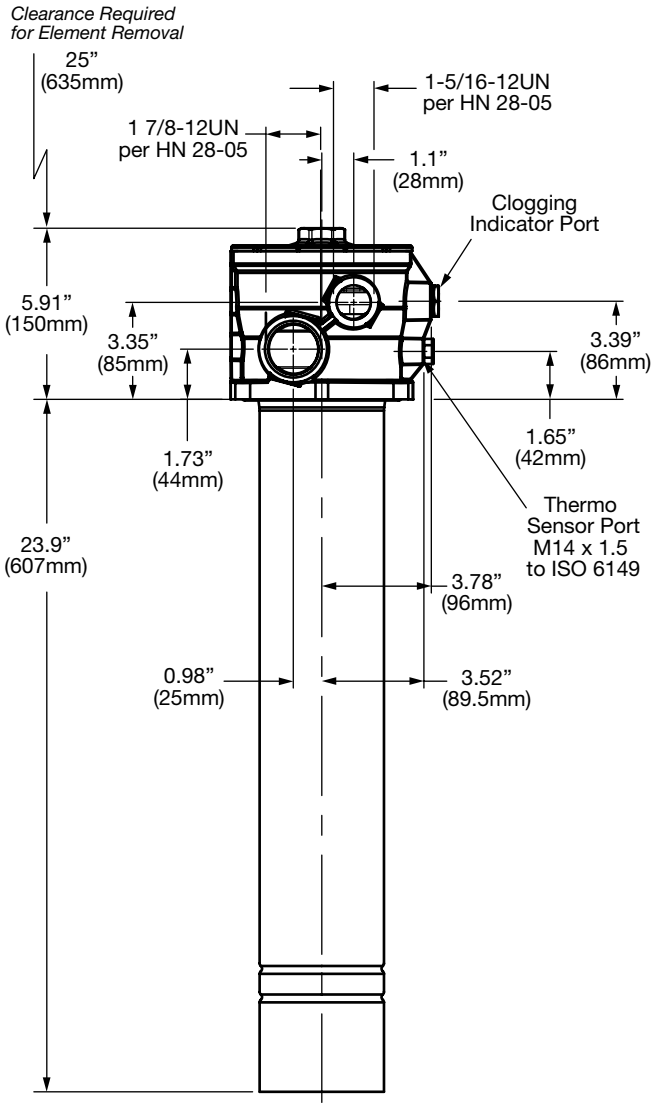


Size	201	251	300
Weight (lbs.)	8.2	8.8	10.1

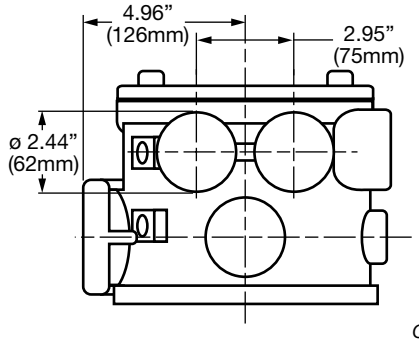
Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

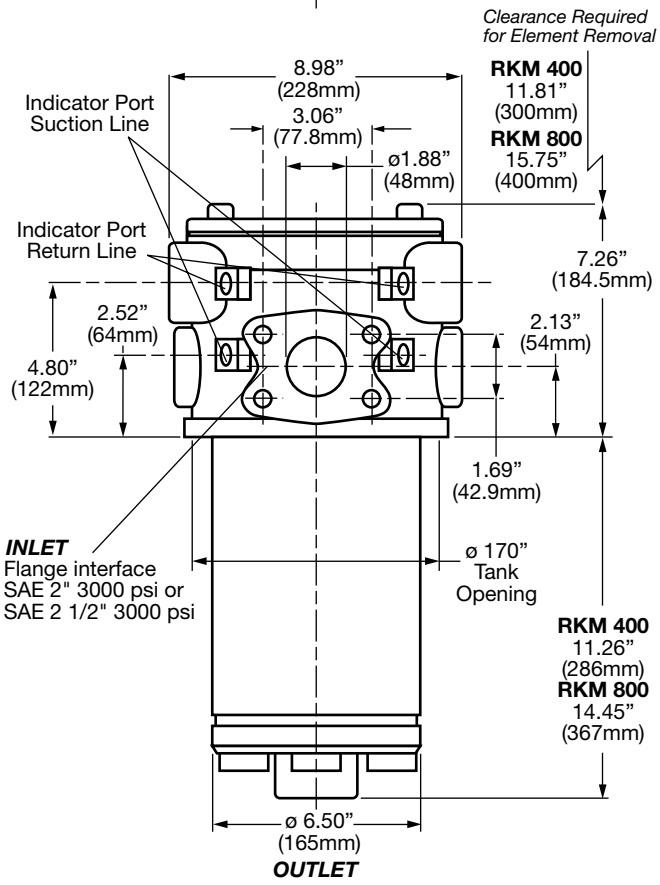
RKM 350

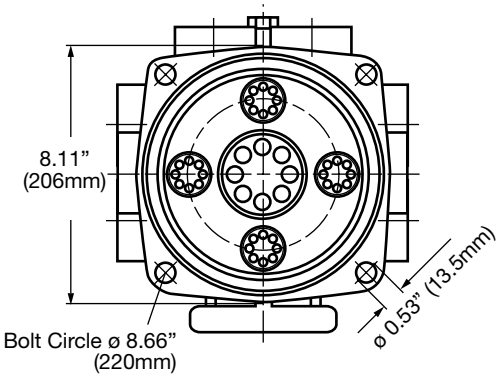




RKM 400 / 800







Size	350	400	800
Weight (lbs.)	13.9	14.3	16.5

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

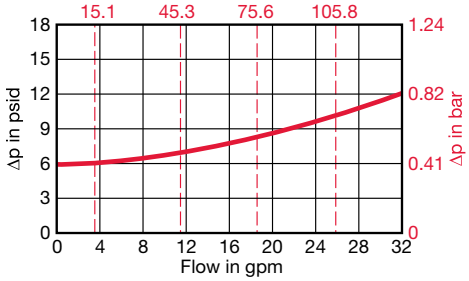
Housing Curve:

Pressure loss through housing is as follows:

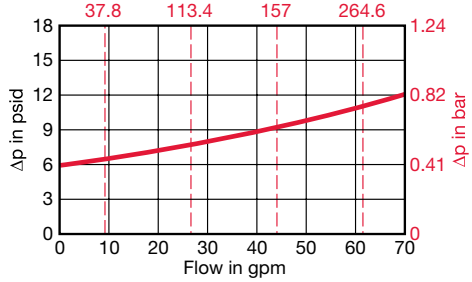
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

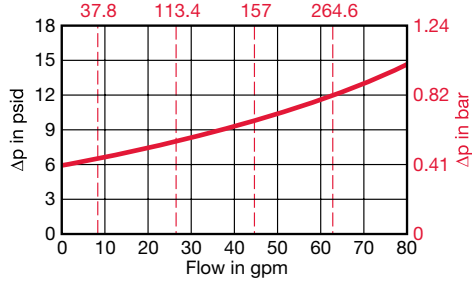
RKM 100



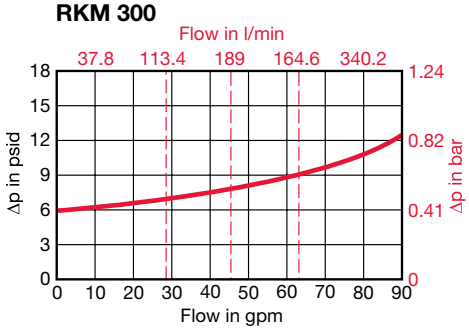
RKM 201 / 201 MP



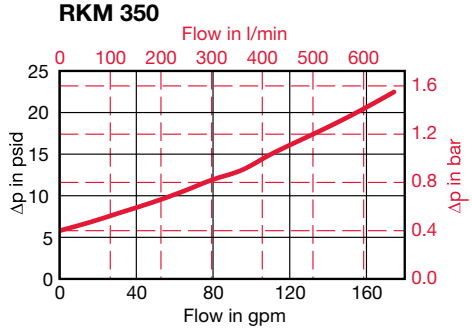
RKM 251 / 251 MP



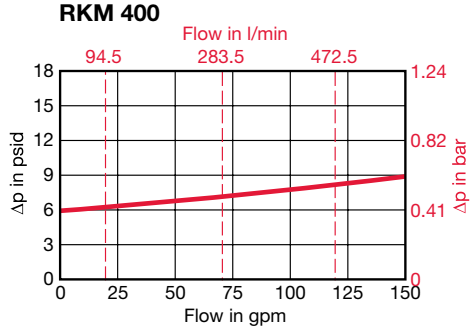
RKM 300



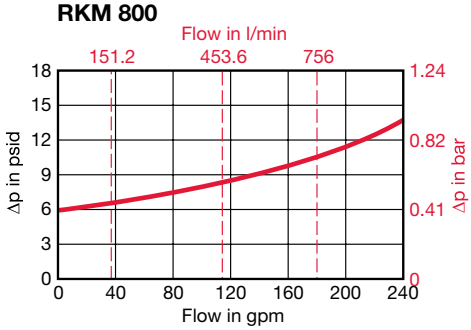
RKM 350



RKM 400



RKM 800



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...RK...MM	
	10 µm	15 µm
0100	0.0964	0.0544
0201	0.0398	0.0268
0251	0.0379	0.0248
0300	0.0324	0.0161
0350	0.0165	0.0110
0400	0.0299	0.0195
0800	0.0207	0.0162

All Element K Factors in psi / gpm.

RFM...S & RFM...Set Series

Inside Tank Return Line Filters

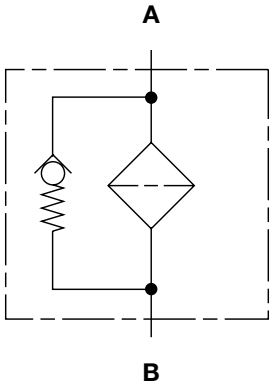
145 psi • up to 132 gpm

RFM...S

RFM...Set

Typical Installation of Both Models

Hydraulic Symbol



Features

- Unique design allows filter to be installed completely inside of the reservoir tank. This saves space, protects the filter, reduces leak points and reduces overall installation cost.
- Lightweight unit requiring no filter head reduces pressure drop while decreasing cost.
- Excellent option for low overhead clearance applications.
- Allows pre-filtration of new make-up oil assuring cleanliness of system.
- Contamination Basket prevents filtered contamination from re-entering the tank during element changeout on 330 & 500 size models.
- Simplifies element changeout procedure in the field.
- RFM Set configuration (tank plenum) allows for multiple returns to enter plenum without manifolding.

Installation

RFM...SET: Inside Tank Filters are installed into a separate chamber *(see tank cutaway to the right)* built into the reservoir tank via the filter ring and 4 bolts. More than one filter may be installed in the chamber if required for capacity. This procedure will require a hole to be cut into the top of the reservoir tank and an access cover fastened to the tank for each filter installed. The inlet piping for return should be connected through the tank wall into the separate chamber. A clip installed on the filter ring holds the element in place during filtration operations, and facilitates easy removal for element change out. A static pressure clogging indicator, to warn of high upstream pressure *(element clogged),* can be attached to the access cover. For additional information, consult factory.

RFM...S: Inside Tank Filters are installed to the top of the tank by welding the inner chamber to the tank cover *(see tank cutaway to the right)*. This procedure will require a hole to be cut into the top of the reservoir tank and an access cover fastened to the tank. A smaller hole must be cut somewhere in the tank for the return line piping to pass through. The hole located in the side of the inner chamber must be directed towards the return line piping. The inlet piping for return should then be welded through the tank wall and to the inner chamber. The spring located between the element and the access cover provides force to hold element in place during filter operation. A static pressure indicator to warn of high upstream pressure, and if element is clogged can be attached to the access cover. Multiple filters can be installed in the tank. For additional installation information, consult factory.

Technical Details

Mounting Method	See Installation at left	
Port Connection	Outlet	
75/165/185	1.26” Smooth Port	
330/500	2” NPT	
Flow Direction	Inlet: Side	Outlet: Bottom
Construction Materials		
Chamber	Steel (75/165/185)	
Bowl	Plastic	
Ring	Aluminum (330/500)	
Flow Capacity		
75	20 gpm (75 lpm)	
165	43 gpm (165 lpm)	
185	49 gpm (185 lpm)	
330	87 gpm (330 lpm)	
500	132 gpm (500 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	145 psi (10 bar)	
Proof Pressure	218 psi (15 bar)	
Fatigue Pressure	145 psi (10 bar)	
Burst Pressure	> 580 psi (40 bar)	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10%		
ΔP = 87 psid (6 bar) +10%		

Model Code

RFM BN/HC 75 S 3 W 1.0 __ __

Series
RFM = In-Tank Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
MM = Mobilemicron *(Low Collapse)*
ECO/N = ECOmicron® *(Low Collapse)*
W/HC = Wire Screen

Size
75
165
330
500
Not available in the SET Style

Type of Mounting Connection
S = Inside Tank with shroud for welding and spring for element hold-down
SET = Inside Tank with Ring for bolt mounting and clip for element hold-down

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC, ECO/N
10, 15 = MM
10, 20 = P/HC
25, 74, 141 = W/HC

Clogging Indicator
W = Without Indicator *(Indicators are installed on access cover on top of tank)*
(*For additional details and options, see Clogging Indicators section.*)

Modification Number *(latest version always supplied)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

Supplementary Details
SO103H= Modification of Elements for use with Phosphate Ester Fluids

Replacement Element Model Code

0330 R 010 BN4HC / V

Size
0075, 0165, 0330, 0500

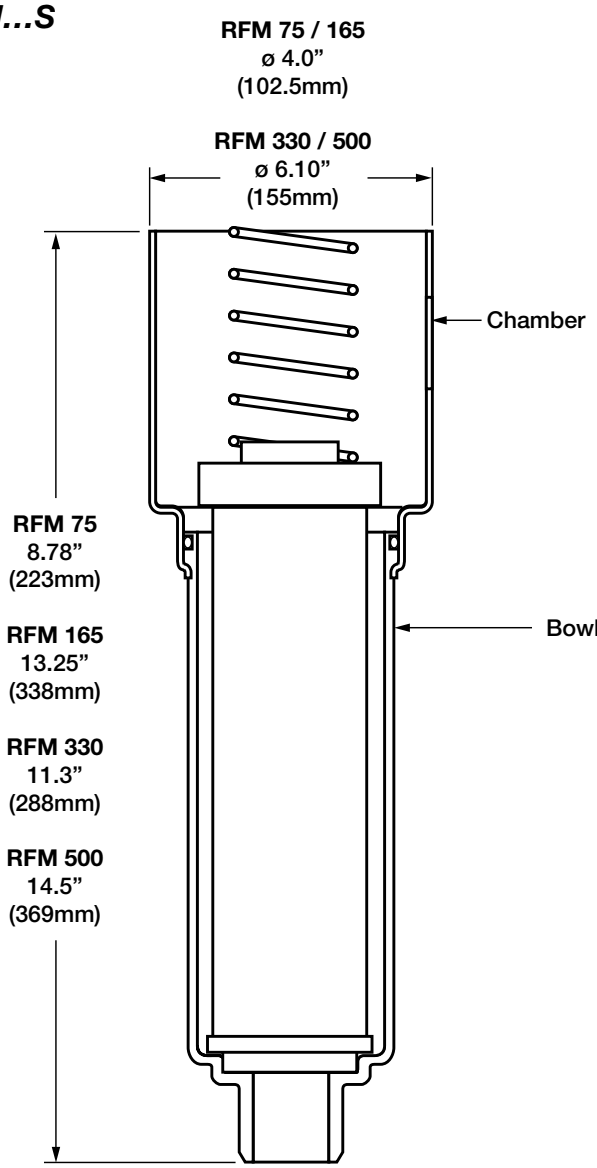
Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
10, 15 = MM
25, 74, 141 = W/HC

Element Media
BN4HC, ECO/N, P/HC, W/HC, MM

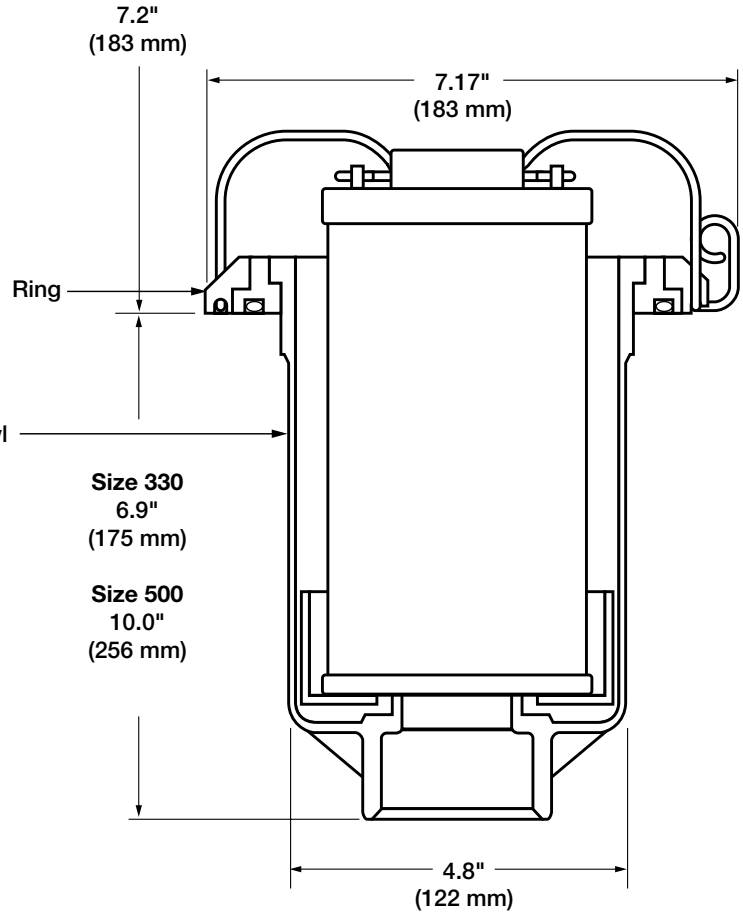
Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

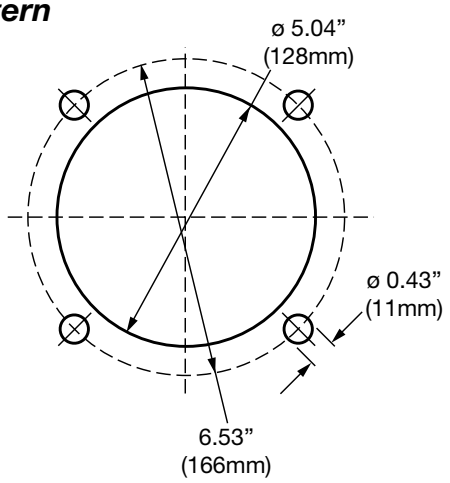
Dimensions RFM…S



RFM…Set



Mounting Pattern



Size	75 S	165 S	330 S	500 S	330 Set	500 Set
Weight (lbs.)	1.81	2.24	4.42	4.88	4.41	4.85

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0075	1.209	0.780	0.445	0.241
0165	0.616	0.430	0.245	0.133
0330	0.232	0.150	0.093	0.066
0500	0.162	0.104	0.069	0.044

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
0165	0.674	0.369	0.321	0.220
0330	0.228	0.156	0.135	–

Size	...R...P/HC (Paper)
	10, 20 µm
0075	0.156
0165	0.086
0330	0.037
0500	0.024

Size	...R...W/HC (Wire Screen)
	25, 50, 74, 100, 149, 200 µm
0075	0.043
0165	0.020
0330	0.010
0500	0.007

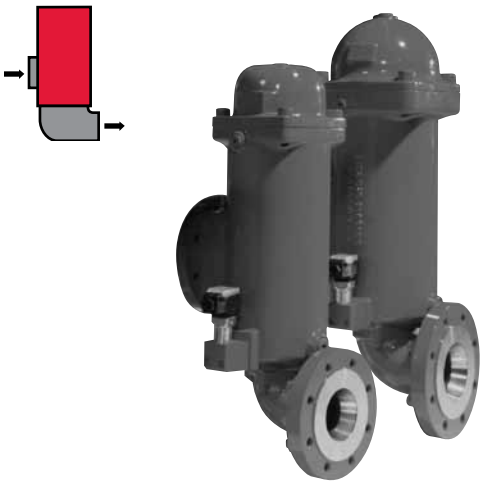
Size	...R...MM	
	10 µm	15 µm
0075	0.265	0.166
0165	0.146	0.091
0330	0.078	0.049
0500	0.052	0.032

All Element K Factors in psi / gpm.

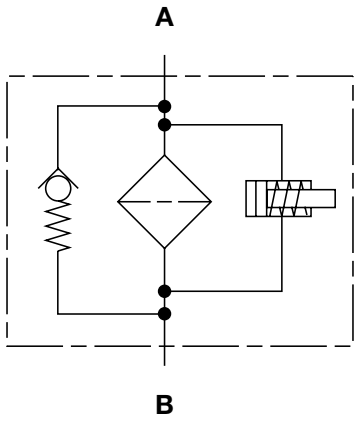
RFL Cast Series

Inline Filters

360 psi • up to 350 gpm



Hydraulic Symbol



Features

- Models 851 and 1301 are made of ductile cast iron and consist of a two part filter housing with bolt-on cast iron lid. The two part construction makes it possible to arrange the inlet and outlet either one above the other on one side or, by turning the base part 180°, on opposite sides of the housing.
- Inlet/outlet ports for models 851 and 1301 comply with SAE 4-bolt flange Code 61 configuration.
- Clogging indicators have no external dynamic seal. High reliability is achieved and magnetic actuation eliminates a leak point.

Technical Details

Mounting Method	Support by means of pipe clamps	
Port Connection		
851	SAE-48 Flange, Code 61	
1301	SAE-64 Flange, Code 61	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head, Lid, Elbow	Ductile iron	
Flow Capacity		
851	225 gpm (850 lpm)	
1301	343 gpm (1300 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	360 psi (25 bar)	
Proof Pressure	540 psi (38 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	> 1440 psi (100 bar)	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10%		
ΔP = 72 psid (5 bar) -10%		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10%		
ΔP = 87 psid (6 bar) +10%		

Applications

Model Code

RFL BN/HC 851 D P 3 A 1 . X / V

Filter Type
RFL = Inline Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®
W/HC =Wire Screen

Size
851 = SAE 48 Flange
1301 = SAE 64 Flange
with metric threads

Operating Pressure
D = 363 psi (25 bar)

Type of Connection
N = SAE DN 80 3" *(size 851)*
P = SAE DN 100 4" *(size 1301)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N
10, 20, = P/HC
3, 10 = BN/AM
25, 74, 149 = W/HC
40 = AM

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(latest version always supplied)*

Seals
(omit) = Buna N (NBR)*(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Bypass Valve Cracking Pressure
(omit) = 43 psid (3 bar) *(return line - standard)*
KB = no bypass *(flushing system)*
B6 = 87 psid (6 bar) *(return line - extended service life)*
B1 = 15 psid (1 bar) *(lubrication or coolant application)*
B0.2 = 3 psid (0.2 bar) *(pump inlet)*
not available with ECO/N

Supplementary
W = Indictor with brass piston *(for water base fluids)*
SO103H = Modification of BN4HC Elements for Phosphate Ester Fluids
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*

Replacement Element Model Code

0850 R 010 BN4HC / V

Size
0850, 1300

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
3, 10 = BN/AM
40 = AM10, 20, = P/HC
25, 74, 149 = W/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar)
5 = 72 psid (5 bar)
(optional)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

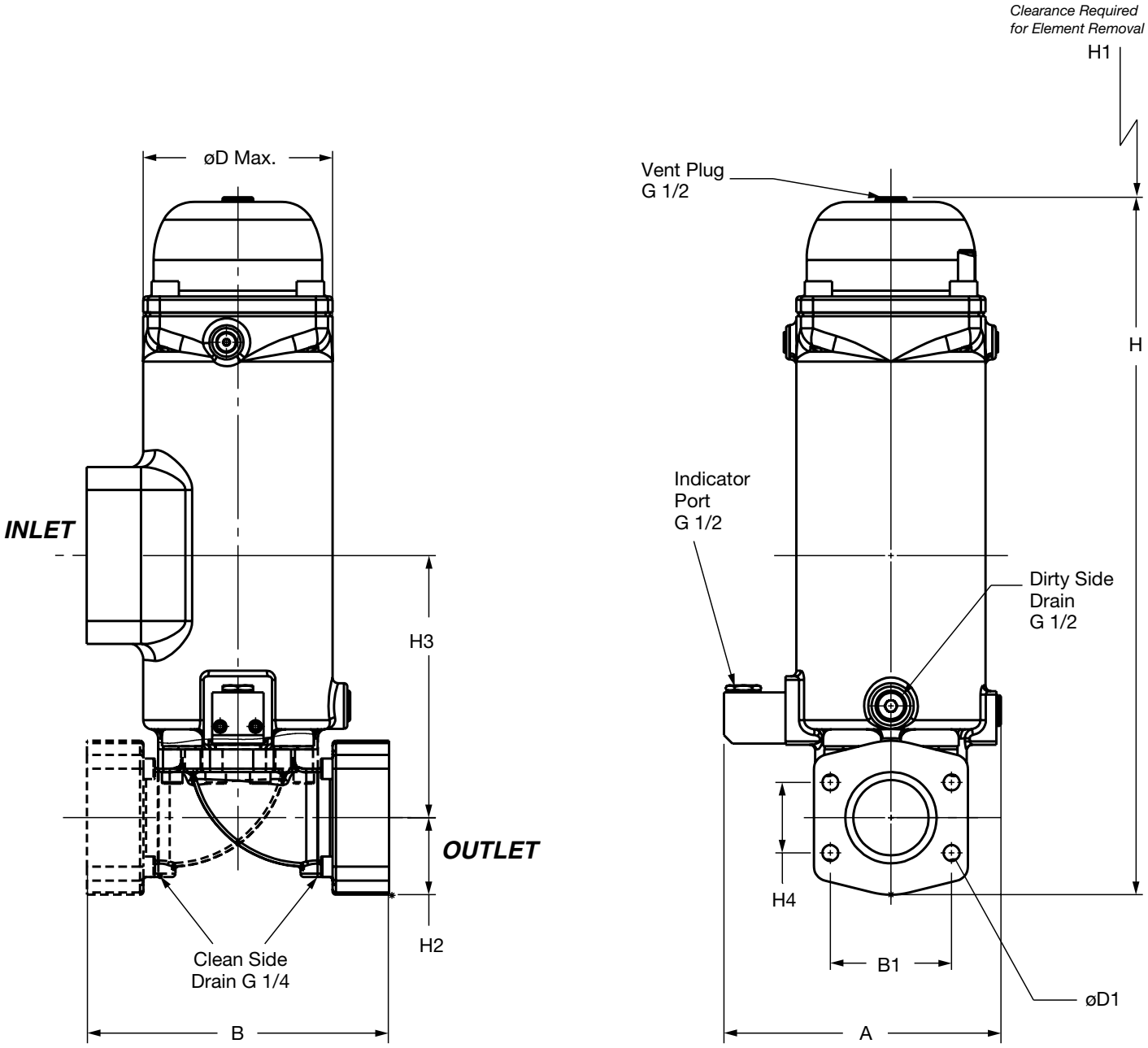
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



Size	A	B	B1	H	H1	H2	H3	H4	D	D1	Weight (lbs)
RFL 851	7.56" (192mm)	10.47" (266mm)	4.18" (106.4mm)	24.1" (612mm)	16.5" (420mm)	2.66" (67.5mm)	9" (230mm)	2.44" (61.9mm)	6.77" (172mm)	M16	84.7
RFL 1301	8.78" (223mm)	11.26" (286mm)	5.13" (130.2mm)	27.99" (711mm)	19.69" (500mm)	3.18" (81mm)	9.84" (250mm)	3.06" (77.8mm)	8.66" (220mm)	M16	122.1

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

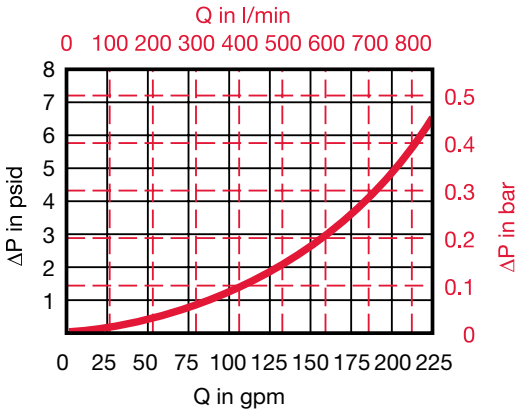
Housing Curve:

Pressure loss through housing is as follows:

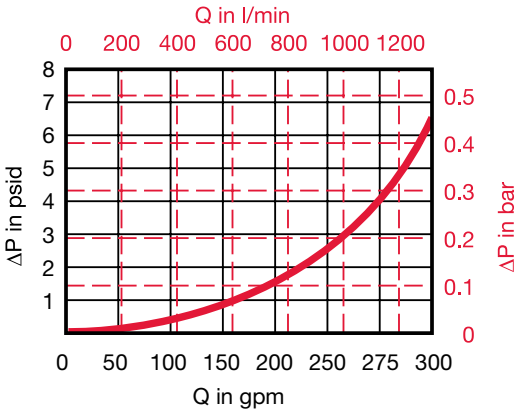
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

RFL 851 HOUSING



RFL 1301 HOUSING



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0850	0.082	0.055	0.036	0.023
1300	0.045	0.032	0.024	0.014

Size	...R...ECO/N (ECOmicron®)			
	3 µm	5 µm	10 µm	20 µm
0850	0.078	0.053	0.046	0.032
1300	0.049	0.034	0.029	0.020

Size	...R...P/HC (Polyester)	
	10 µm	20 µm
0850	0.012	0.012
1300	0.007	0.007

Size	...R...W/HC (Wire Screen)
	25, 74, 149 µm
0850	0.0038
1300	0.0027

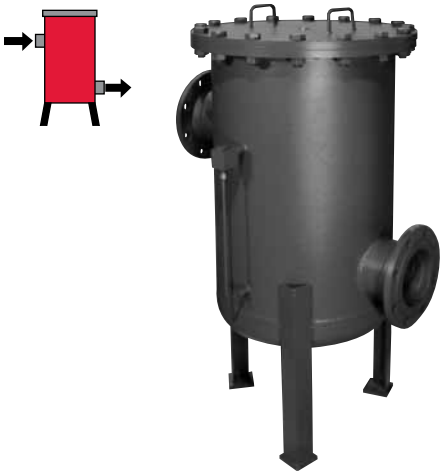
Size	...R...BN/AM (Betamicron®/Aquamicron®)	
	3 µm	10 µm
1300R	0.088	0.033

All Element K Factors in psi / gpm.

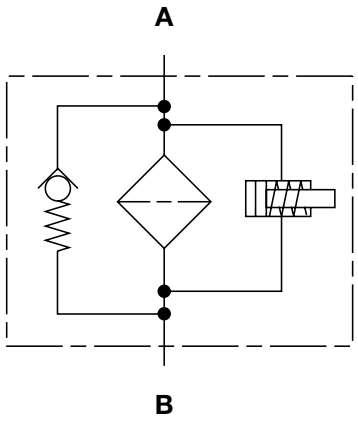
RFL Welded Series

Inline Filters

230 psi • up to 3900 gpm



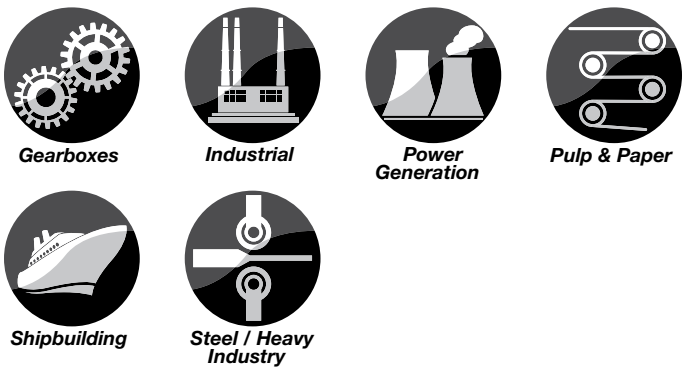
Hydraulic Symbol



Features

- Models 1300 to 15000 are made of rolled steel housings with bolt-on steel lids; Stainless steel models are available.
- ANSI flange connections for each filter size provide maximum connection flexibility eliminating additional adapters and intermediate flanges.
- Inlet and outlet connections are located on opposite sides of the housings.
- Clogging indicators have no external dynamic seal. High reliability is achieved and magnetic actuation eliminates a leak point.

Applications



Technical Details

Mounting Method	Floor mounted legs
Port Connection	
1300/1320	4” ANSI 150# Flange
2500/2520	6” ANSI 150# Flange
4000/4020	8” ANSI 150# Flange
5200 - 7820	10” ANSI 150# Flange
15000/15020	12” ANSI 150# Flange
Flow Direction	Inlet & Outlet: Side
Construction Materials	
Housing, Lid	Steel
Note: Please contact factory for available stainless steel models.	
Flow Capacity	
1300/1320	350 gpm (1300 lpm)
2500/2520	650 gpm (2500 lpm)
4000/4020	1050 gpm (4000 lpm)
5200/5220	1400 gpm (5200 lpm)
6500/6520	1700 gpm (6500 lpm)
7800/7820	2050 gpm (7800 lpm)
15000/15020	4000 gpm (15000 lpm)
Housing Pressure Rating	
Max. Operating Pressure	150 psi (10 bar) *(standard)* 230 psi (16 bar) *(optional)*
Proof Pressure	345 psi (24 bar)
Fatigue Pressure	Contact HYDAC
Burst Pressure	Contact HYDAC
Element Collapse Pressure Rating	
BN/HC, W/HC	290 psid (20 bar)
ECO/N	145 psid (10 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 29 psid (2 bar) -10% *(standard)* ΔP = 72 psid (5 bar) -10% *(optional)*	
Bypass Valve Cracking Pressure	
ΔP = 43 psid (3 bar) +10% *(standard)* ΔP = 87 psid (6 bar) +10% *(optional)*	

Model Code

RFL BN/HC 1300 C T 10 D 1 . 1 / S 150 V _ DH

Filter Type

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®
W/HC = Wire Screen

Size
1300/ 1320/ 2500/ 2520/ 4000/ 4020/ 5200/ 5220/
6500/ 6520/ 7800/ 7820/ 15000/ 15020

Operating Pressure
B = 150 psi (10 bar)
C = 230 psi (16 bar)

Type of Connection
2 = 2" ANSI Flange *(sizes 1300)*
4 = 3" ANSI Flange *(sizes 1300 & 1320)*
5 = 4" ANSI Flange *(sizes 1320 & 2520)*
7 = 6" ANSI Flange *(sizes 2500 & 2520)*
8 = 8" ANSI Flange *(sizes 4000 & 4020)*
9 = 10" ANSI Flange *(sizes 5000 - 7820)*
10 = 12" ANSI Flange *(sizes 15000 & 15020)*
L = DN 50 *(sizes 1300 - 2520)*
S = SAE/DIN DN 80 *(sizes 1300 - 5220)*
T = SAE/DIN DN 100 *(sizes 1300 - 7820)*
V = DN 150 *(sizes 2500 - 7820)*
W = DN 200 *(sizes 4000 - 15020)*
X = DN 250 *(sizes 5200 - 15020)*
Y = DN 300 *(sizes 15000 & 15020)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N
10, 20 = P/HC
3, 10 = BN/AM
25, 74, 149 = W/HC
40 = AM

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(latest version always supplied)*

Country of Installation
(omit) = standard *(non coded)*
S = ASME Coded with "U" Stamp

Flange
(omit) = DIN Flange Connection to DIN 2501/1
150 = 150 lbs ANSI Flange

Seals
(omit) = Buna-N
V = Fluoroelastomer (FPM)

Bypass Valve Cracking Pressure
(omit) = 43 psid (3 bar) *(return line - standard)*
B6 = 87 psid (6 bar) *(return line - extended service life)*
KB = no bypass
not available with ECO/N

Supplementary
(omit) = Cover Lifting Device *(Handle only)*
DH = Cover Lifting Device *(Davit lifting mechanism for sizes 4000 and larger, style may vary)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = Indictor with brass piston *(for water base fluids)*
SO103H = Modification of BN4HC Elements for Phosphate Ester Fluids

Replacement Element Model Code

1300 R 010 BN4HC / V

Size
0850, 1300, 1700, 2600

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
3, 10 = BN/AM
40 = AM
10, 20 = P/HC
25, 74, 149 = W/HC

Element Media
BN4HC, ECO/N, P/HC, BN/AM, W/HC, AM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

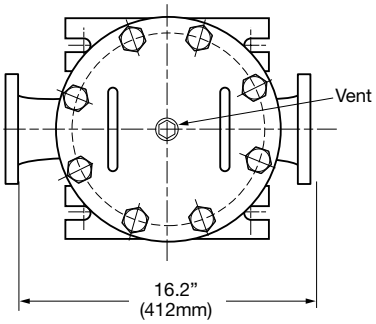
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

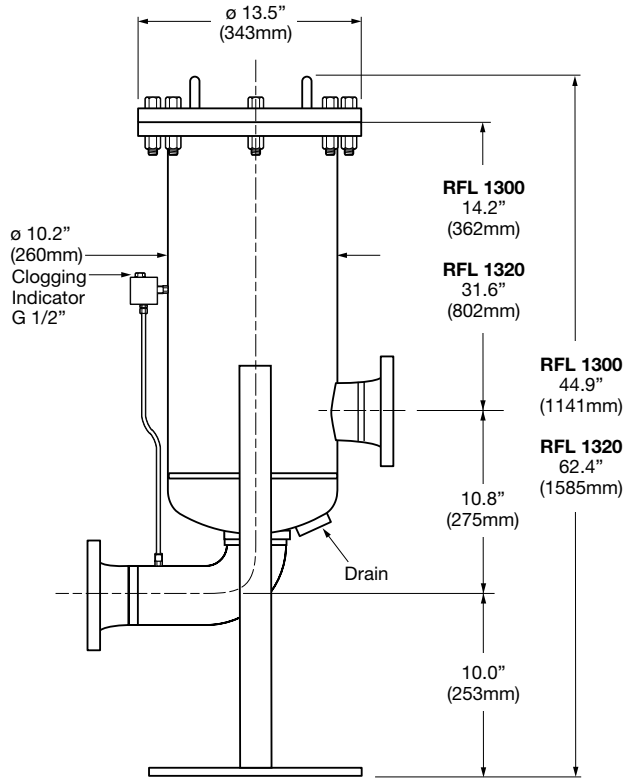
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

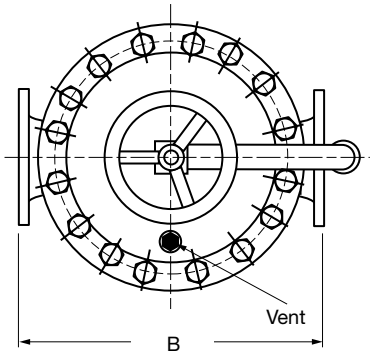
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

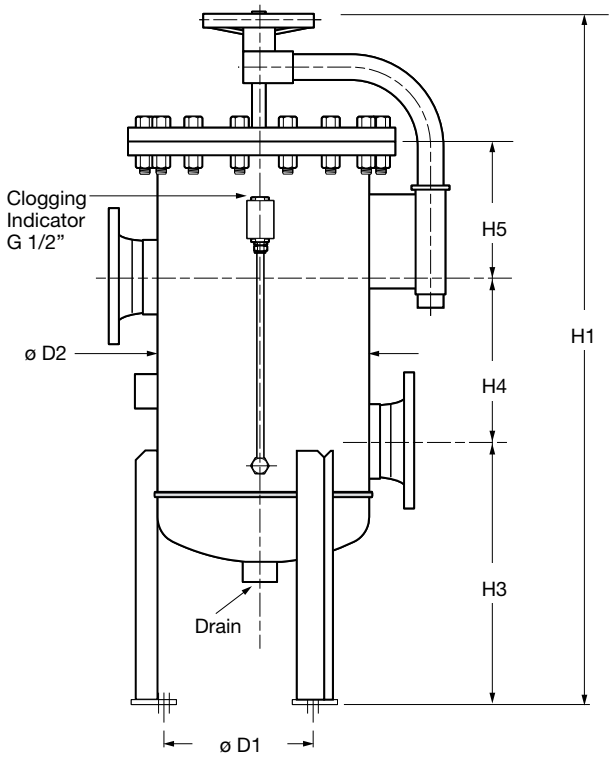
Dimensions
RFL 1300 - 1320





RFL 2500 - 15020





Size	Weight	B	D1	D2	H1	H3	H4	H5
2500 / 2520	340 / 400	18.3” (466mm)	9.8” (250mm)	10.7” (273mm)	47.98/63.33” (1218.6/1608.6mm)	17.2” (438mm)	14.4” (365mm)	6.9/25.8” (175/565mm)
4000 / 4020	570 / 675	23.6” (600mm)	13.0” (330mm)	14.0” (356mm)	54.04/69.39” (1372.6/1762.6mm)	20.7” (525mm)	14.4” (365mm)	9.3/24.6” (235/625mm)
5200 / 5220	790 / 970	26.0” (660mm)	15.0” (380mm)	16.0” (406mm)	58.6/76.09” (1492.6/1932.6mm)	22.0” (560mm)	17.7” (450mm)	9.3/26.6” (236/676mm)
6500 / 6520 7800 / 7820	1040 / 1255 1055 / 1290	30.7” (780mm)	18.9” (480mm)	20.0” (508mm)	60.97/78.29” (1548.6/1988.6mm)	23.6” (600mm)	17.7” (450mm)	9.8/27.2” (250/690mm)
15000 / 15020	2085 / 2470	39.4” (1000mm)	27.2” (690mm)	28.0” (711mm)	65.5/82.82” (1663.6/2103.6mm)	26.4” (670mm)	20.3” (515mm)	9.3/26.6” (235/675mm)

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

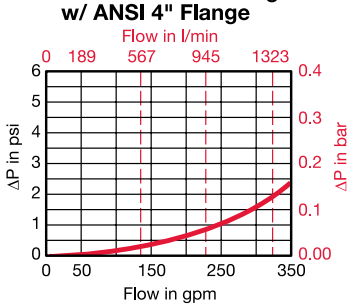
Housing Curve:

Pressure loss through housing is as follows:

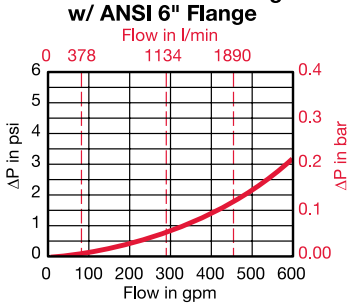
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

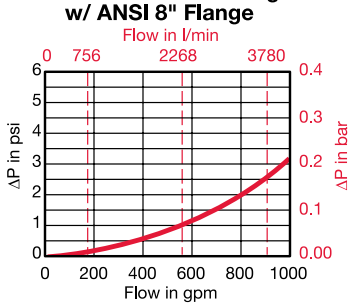
RFL 1300/1320 Housing w/ ANSI 4" Flange



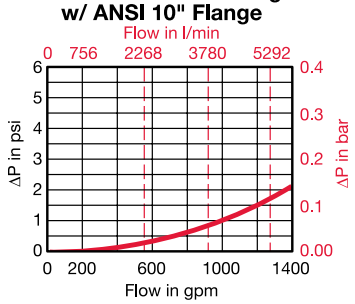
RFL 2500/2520 Housing w/ ANSI 6" Flange



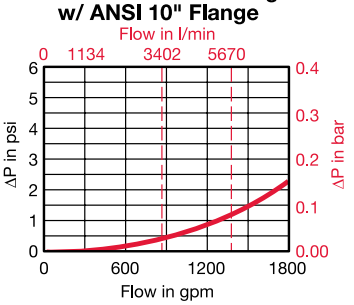
RFL 4000/4020 Housing w/ ANSI 8" Flange



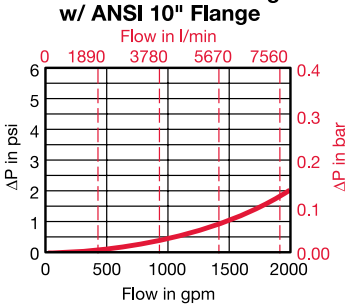
RFL 5200/5220 Housing w/ ANSI 10" Flange



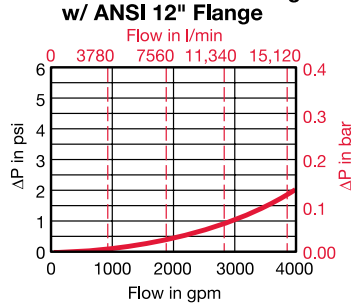
RFL 6500/6520 Housing w/ ANSI 10" Flange



RFL 7800/7820 Housing w/ ANSI 10" Flange



RFL 15000/15020 Housing w/ ANSI 12" Flange



Required Element Per Housing

Housing Size	Element Size	Elements per Side
1300 / 1320	1300 / 2600	1 / 1
2500 / 2520	0850 / 1700	3 / 3
4000 / 4020	0850 / 1700	5 / 5
5200 / 5220	1300 / 2600	4 / 4
6500 / 6520	1300 / 2600	5 / 5
7800 / 7820	1300 / 2600	6 / 6
15000 / 15020	1300 / 2600	10 / 10

Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0850	0.082	0.055	0.036	0.023
1300	0.045	0.032	0.024	0.014
1700	0.040	0.029	0.018	0.011
2600	0.023	0.016	0.011	0.007

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
0850	0.078	0.053	0.046	0.032
1300	0.049	0.034	0.029	0.020
1700	0.038	0.026	0.023	–
2600	0.024	0.017	0.014	0.010

Size	...R...BN/AM	
	3 µm	10 µm
1300	0.088	0.033
2600	0.052	0.019

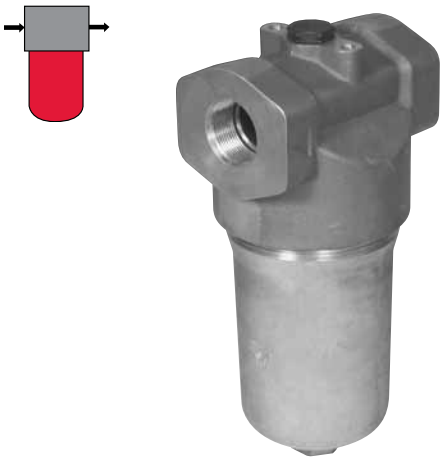
Size	...R...W/HC (Wire Screen)
	25, 50, 74, 100, 149, 200 µm
0850	0.004
1300	0.003
1700	0.002
2600	0.001

Size	...R...AM
	040A
0850	0.074
1300	0.048
2600	0.024

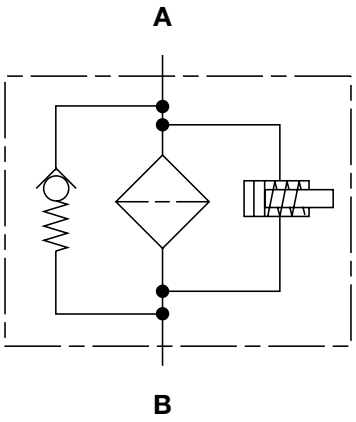
Size	...R...P/HC (Paper)
	10, 20 µm
0850	0.012
1300	0.007
1700	0.006
2600	0.003

All Element K Factors in psi / gpm.

FLN Series
Inline Filters
360 psi • up to 100 gpm



Hydraulic Symbol



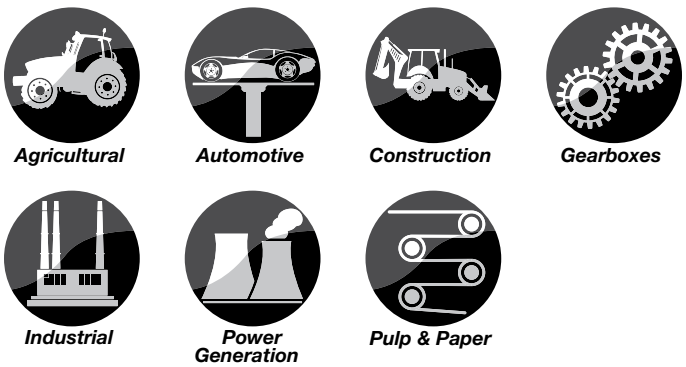
Features

- Aluminum alloy is water tolerant - anodization is not required for high water based fluids (HWBF).
- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- SAE straight thread O-ring boss porting to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing.
- Screw-in bowl mounted below the filter head requires minimal clearance to remove the element for replacement, and contaminated fluid cannot be washed downstream when element is serviced.
- Differential Pressure Indicators. HYDAC indicators have no external dynamic seal. This results in a high system reliability due to magnetic actuation, thus eliminating a potential leak point.
- A poppet-type bypass valve (optional) is mounted in-line between the inlet and outlet ports to provide positive sealing during normal operation and fast opening during cold starts and flow surges.

Technical Details

Mounting Method	2 mounting holes in the filter head	
Port Connection	SAE-20 (1-5/8-12UN)	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head, Bowl	Aluminum	
Flow Capacity		
160	43 gpm (160 lpm)	
250	66 gpm (250 lpm)	
400	150 gpm (400 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	360 psi (25 bar)	
Proof Pressure	540 psi (38 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	Contact HYDAC office	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10%		
ΔP = 72 psid (5 bar) -10%		
ΔP = 116 psid (8 bar) -10%		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10%		
ΔP = 102 psid (7 bar) +10%		

Applications



Model Code

FLN BN/HC 250 D E 10 A 1 . X / 12 - V - B3

Filter Type
FLN = Inline filter

Element Media
BN/HC = Betamicron® *(Low Collapse)* W/HC = Wire Mesh

Size
160, 250, 400

Operating Pressure
D = 360 psi (25 bar)

Port Type / Size
E = SAE-20 (1 1/4")

Filtration Rating *(micron)*
3, 6, 10, 25 = BN/HC 25, 50, 100, 200 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(the latest version is always supplied)*

Port Configuration
12 = SAE straight thread inlet/outlet connections

Seals
V = Fluoroelastomer (FPM) *(standard)*

Bypass Valve
(omit) = no bypass *(optional)*
B3 = 43 psid (3 bar) *(standard)*
B7 = 101.5 psid (7 bar) *(optional)*

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = suitable for oil-water emulsions (HFA, HFC), NBR seals, *(refers exclusively to the type of clogging indicator)*
A2.2 = 32 psi (2.2 bar) Indicator trip setting
30C = 86°F (30°C) Indicator thermal lockout
SO184 = Bowl drain plug

Replacement Element Model Code

0160 DN 010 BN4HC /

Size
0160, 0250, 0400

Type
DN

Filtration Rating *(micron)*
3, 6, 10, 25 = BN4HC
25, 50, 100, 200 = W/HC

Element Media
BN4HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

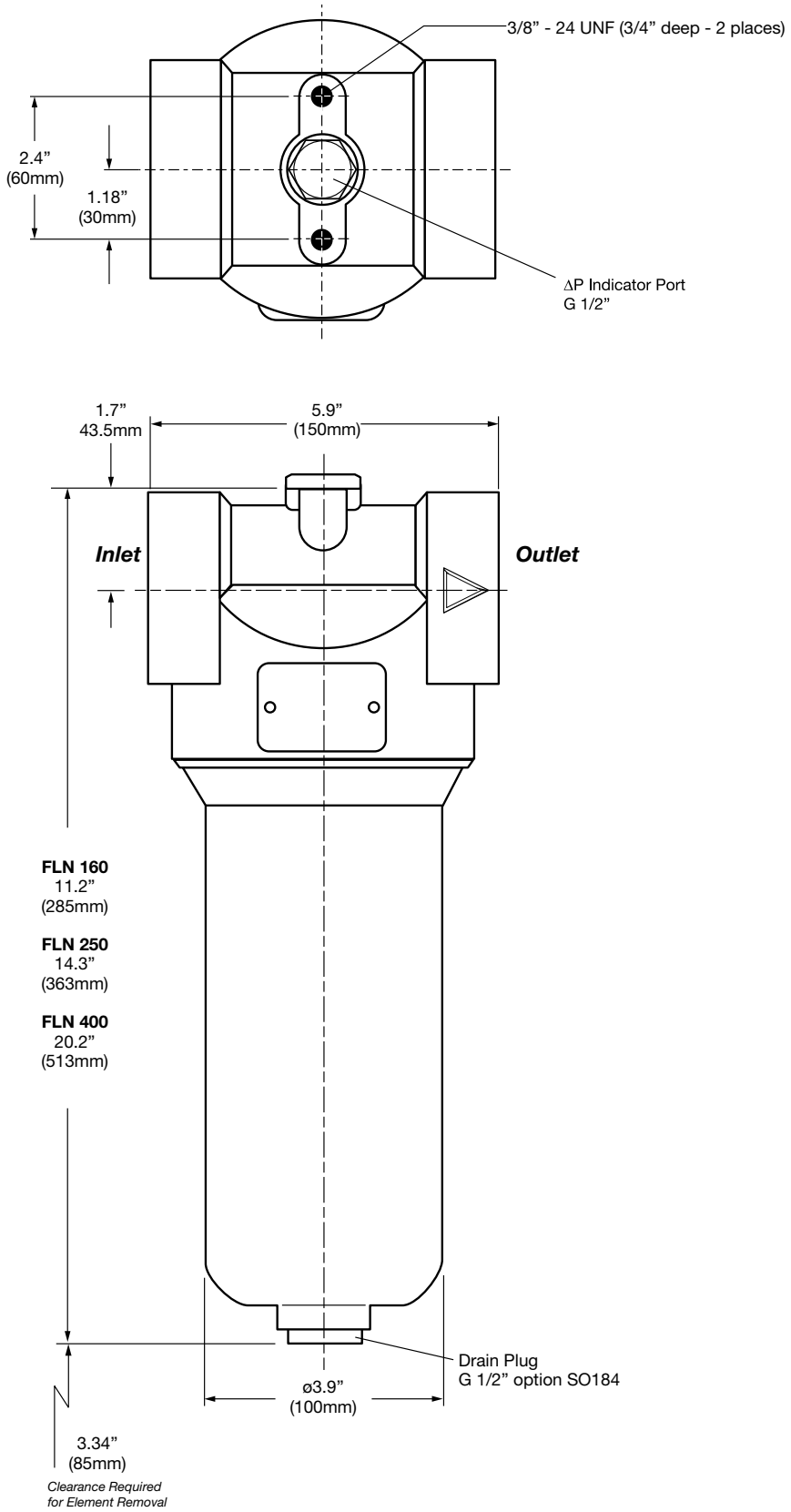
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



Size	160	250	400
Weight (lbs.)	4.3	4.9	5.9

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

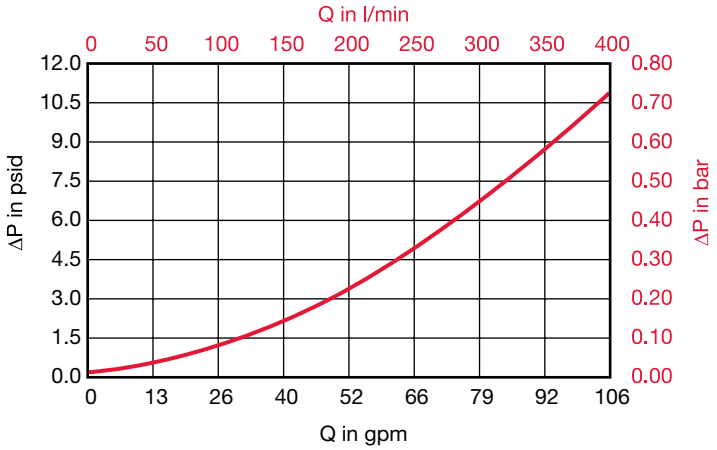
Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

FLN 160/250/400 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...DN...BN/HC			
	3 µm	5 µm	10 µm	25 µm
0160	0.439	0.306	0.202	0.143
0250	0.275	0.178	0.111	0.091
0400	0.178	0.110	0.073	0.055

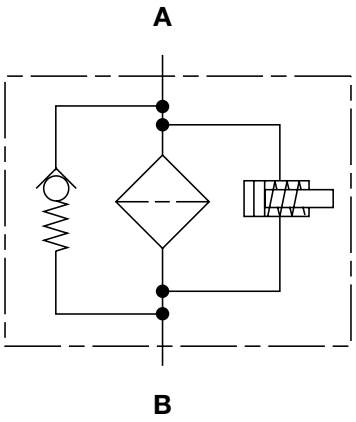
All Element K Factors in psi / gpm.

NFH Series

Modular Inline Return Line Filters

500 psi • up to 450 gpm

Hydraulic Symbol



Features

- Top access for easy element changeout.
- All models have an air bleed valve (vent) installed in the lid.
- Single large element with no leak points for highest efficiency and dirt capacity
- Lid with swing bolts for fast servicing without tools
- Drain port (Far side) SAE 12 (3/4")
- Clogging Indicator for local and/or remote signals
- Easily banked in parallel (manifolded) for high viscosity applications.
- Available with Betafit elements - consult HYDAC.`

Technical Details

Mounting Method		
NFH	2 mounting holes - filter head	
NFH Manifold	Floor mounting brackets	
Port Connection	SAE-64 Flange Code 61	
Flow Direction	Inlet: Side	Outlet: Bottom
Construction Materials		
Head, Lid, Elbows, Manifolds	Ductile Iron	
Housing	Steel	
Flow Capacity		
1300	343 gpm (1300 lpm)	
2600, 5200, 7800, 10400	450 gpm (1700 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	500 psi (35 bar)	
Proof Pressure	750 psi (52 bar)	
Fatigue Pressure	500 psi (35 bar)	
Burst Pressure	> 1440 psi (100 bar)	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(standard)*		
ΔP = 72 psid (5 bar) -10% *(optional)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10%		
ΔP = 87 psid (6 bar) +10%		

Applications

Model Code

NFH BN/HC 5200 E P 5 C 1 . 1 / 16 A V B1 T70

Filter Type
NFH = In-line Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron® Aquamicron®
W/HC = Wire Screen

Size
1300 = Single NFH
2600 = Single NFH
5200 = Manifold: 2 size 2600 Housings
7800 = Manifold: 3 size 2600 Housings
10400 = Manifold: 4 size 2600 Housings

Operating Pressure
E = 500 psi (34 bar)

Type of Connection
P = SAE DN 100 (4") flange

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N
25, 74, 149 = W/HC
10, 20 = P/HC
40 = AM
3, 10 = BN/AM

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1

Modification Number *(latest version always supplied)*

Port Configuration
16 = SAE-64, (4") Code 61 Flange

Flow Path *(facing connecting manifold)*
(omit) = Sizes 1300 and 2600 only
A = Left inlet, Left outlet
B = Right inlet, Right outlet
(sizes 5200 - 10400 only)
C = Left inlet, Right outlet
D = Right inlet, Left outlet
(sizes 5200 - 10400 only)

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = 43 psid Bypass *(standard)*
B1 = 15 psid Bypass
B6 = 87 psid Bypass
KB = No Bypass
not available with ECO/N

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D only)*
S0103H = Modification of BN4HC and P/HC Elements for Phosphate Esters

Replacement Element Model Code

1300 R 010 BN4HC / V

Size
1300, 2600

Type
R

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
40 = AM
25, 74, 149 = W/HC
3, 10 = BN/AM
10, 20 = P/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar)
5 = 72 psid (5 bar)
(optional)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

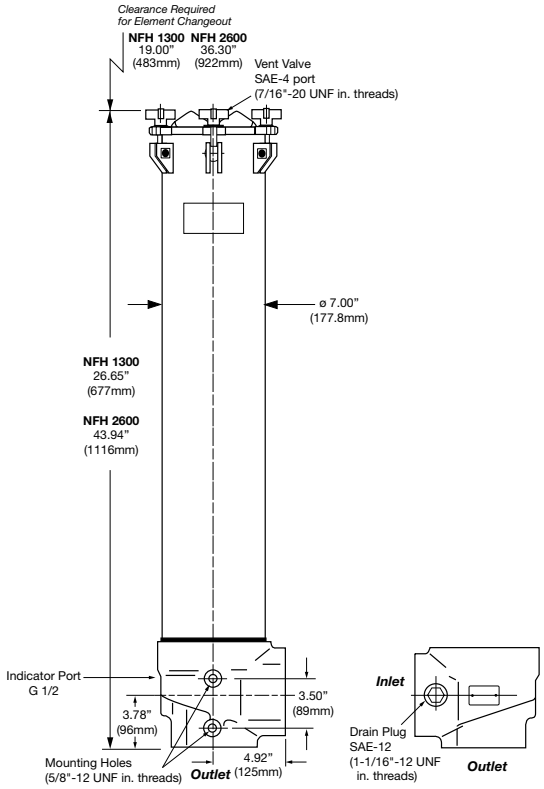
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

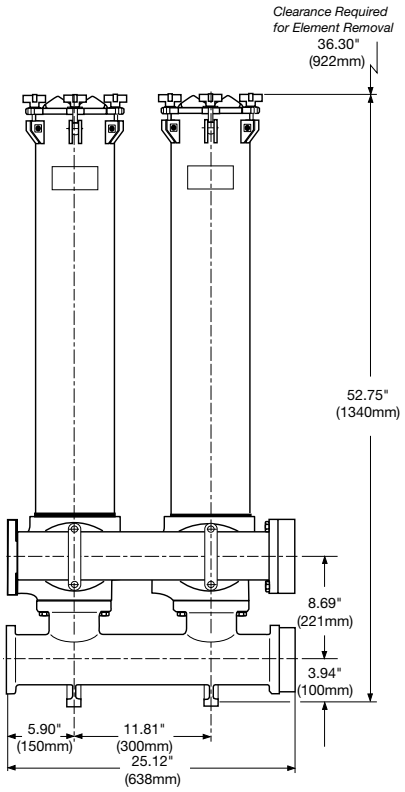
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

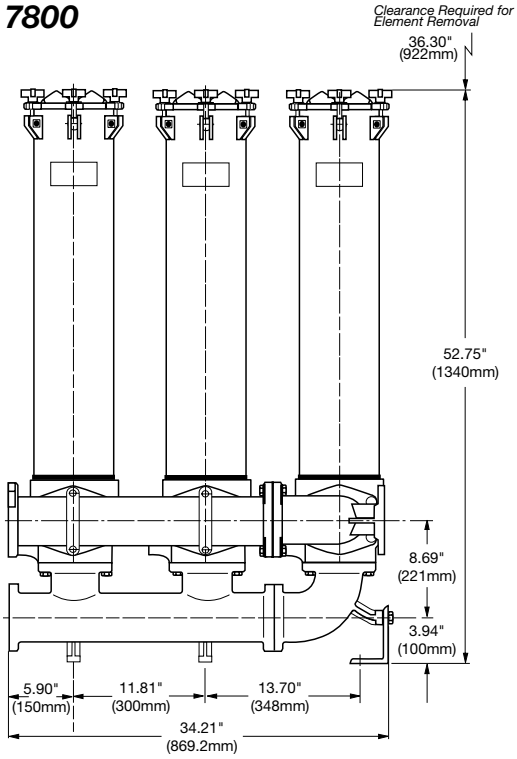
Dimensions
NFH 1300 / 2600



NFH 5200



NFH 7800



NFH 10400 *(Consult HYDAC)*

Size	1300	2600	5200	7800	10400
Weight (lbs.)	83	109	343	458	658

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

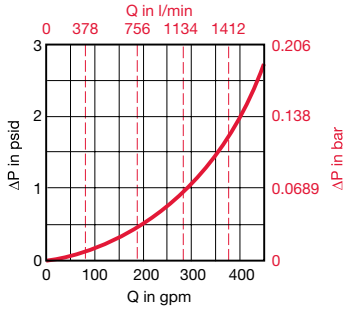
Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

The curve below shows the clean ΔP through the Housing for a single filter. To determine Clean ΔP for manifolds with multiple housings, multiply the Clean ΔP curve value by the percentage values in the table.

ΔP Housing
NFH 1300 / NFH 2600



NFH System	Multiplier
5200	73%
7800	61%
10400	48%

Example

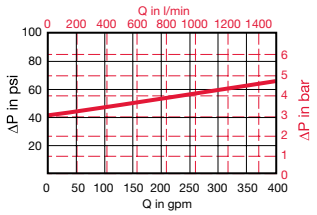
Conditions	
400 gpm flow	
NFH 5200 manifold specified	
ΔP Curve	= 2 psid
ΔP 5200	= 2 psid X 0.73
	= 1.5 psid $_{\text{Piping \& Housing}}$
ΔP Total System = 1.5 psid + ΔP Element	

Bypass Valve Curve:

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.

$$\Delta P \text{ Valve} = \Delta P \text{ Curve} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

1300 / 2600 Bypass Valve



Element ΔP Calculations:

Sizing (K) Flow Factors below show the pressure drops across clean elements *(excluding housings and piping)*. (K) Factors are calculated from mineral based fluid at viscosity of 141 SUS and specific gravity of 0.86. To determine clean ΔP for NFH manifolds with more than one housing, use the adjusted (K) factors below and multiply by total flow rate.

Example

Conditions
Lube system Viscosity of 1,000 SUS Specific gravity 0.86 75 gpm flow Low pressure drop essential 10 µm Betamicron® filter element
Selection
An NFH 2600 filter gives an Adjusted Clean element ΔP as follows: Clean ΔP = 75 gpm x 0.011 = 0.825 psid Clean $\Delta P_{adj.}$ = 0.825 x $\frac{1000}{141}$ = 5.85 psid

Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Housing Size	# of Elements	Size	...R...BN4HC (Betamicron® Low Collapse)				...R...ECO/N (ECOmicron®)			
			3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
1300	1	1300	0.045	0.032	0.024	0.014	0.049	0.034	0.029	0.020
2600	1	2600	0.023	0.016	0.011	0.007	0.024	0.017	0.014	0.010
5200	2	2600	0.012	0.008	0.006	0.004	0.012	0.009	0.007	0.005
7800	3	2600	0.008	0.006	0.004	0.002	0.008	0.006	0.005	0.003
10400	4	2600	0.006	0.004	0.003	0.002	0.006	0.004	0.004	0.003

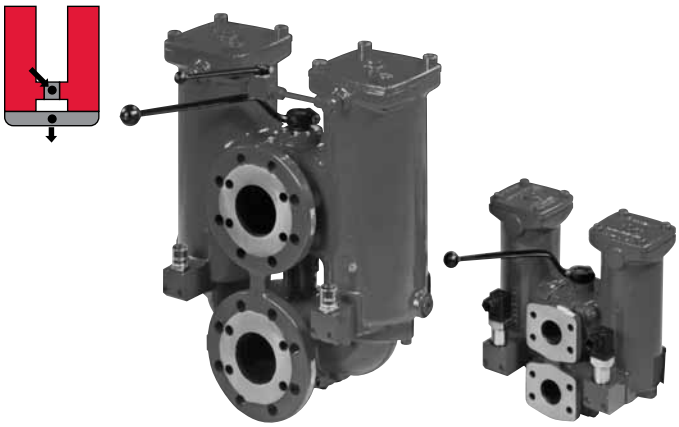
Housing Size	# of Elements	Size	...R...BN/AM		...R...P/HC (Paper)	...R...W/HC (Wire Screen)
			3 µm	10 µm	10 µm	25, 50, 100, 200 µm
1300	1	1300	0.088	0.033	0.007	0.0027
2600	1	2600	0.052	0.019	0.003	0.0011
5200	2	2600	0.026	0.010	0.002	0.0005
7800	3	2600	0.017	0.006	0.001	0.0004
10400	4	2600	0.013	0.005	0.0008	0.0003

All Element K Factors in psi / gpm.

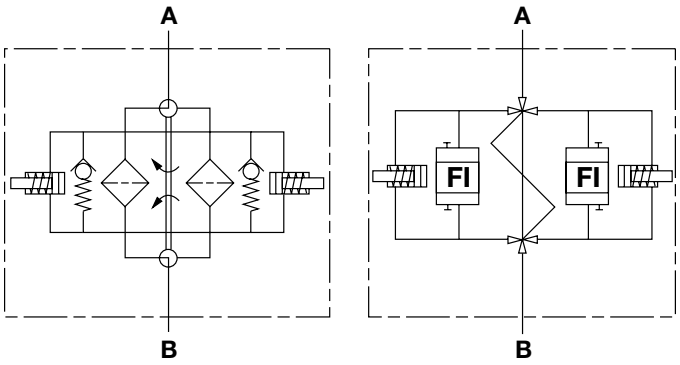
RFLD Cast Series

Inline Duplex Filters

580 psi • up to 340 gpm



Hydraulic Symbol



Features

- Inlet and outlet connections are located on the same side of the transfer valve. Inlet on top and the outlet on bottom.
- Inlet and outlet connections are available with SAE flanged or NPT connections (sizes 111 & 241 only).
- Transfer valve and pressure equalization line allows easy changeover between filter housings without costly system shutdown. (standard with 851 & 1301)
- Clogging indicators have no external dynamic seal. High reliability is achieved and magnetic actuation eliminates a leak point.

Technical Details

Mounting Method	Mounting holes on rear of transfer valve	
Port Connection	With metric threads	
111	1” SAE 16 (DN25)	
241	1 1/2” SAE 24 (DN40)	
501	2” SAE 32 (DN50)	
851	2 1/2” SAE 40 (DN65) 3” SAE 48 (DN80)	
1301	3” SAE 48 (DN80) 4” SAE 64 (DN100)	
Flow Direction	Inlet: Front Top	Outlet: Front Bottom
Construction Materials		
Head, Lid, Elbow	Ductile iron	
Flow Capacity		
111	29 gpm (110 lpm)	
241	63 gpm (240 lpm)	
501	132 gpm (500 lpm)	
851	225 gpm (850 lpm)	
1301	343 gpm (1300 lpm)	
Housing Press. Rating	**111 - 241**	**501 - 1301**
Max. Oper. Pressure	580 psi (40 bar)	360 psi (25 bar)
Proof Pressure	870 psi (60 bar)	540 psi (38 bar
Fatigue Pressure	580 psi (40 bar)	360 psi (25 bar)
Burst Pressure	>2320 psi (160 bar)	>1440 psi (100 bar)
Element Collapse Pressure Rating		
BN/HC, W/HC		290 psid (20 bar)
ECO/N, BN/AM, P/HC, AM		145 psid (10 bar)
Fluid Temp. Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% ΔP = 72 psid (5 bar) -10%		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% ΔP = 87 psid (6 bar) +10%		

Applications

Model Code

RFLD BN/HC 1301 D A T 10 D 1 . X / V _ _

Filter Type
RFLD = Duplex Inline Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®
W/HC = Wire Screen

Sizes
111, 241, 501, 851, 1301

Operating Pressure
D = 25 bar *(sizes 501, 851, 1301)*
E = 40 bar *(sizes 111, 241)*

Type of Change-over
A = ball type change-over valve

Type of Connection / Connection Sizes
I = SAE DN 25 1" *(size 111 only)*
K = SAE DN 40 1 1/2" *(sizes 241, 501)*
L = SAE DN 50 2" *(sizes 501 only)*
M = SAE DN 65 2 1/2" *(size 851 only)*
S = SAE DN 80 3" *(sizes 851, 1301)*
T = SAE DN 100 4" *(size 1301 only)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N
40 = AM
3, 10 = BN/AM
25, 74, 149 =W/HC
10, 20 = P/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(latest version always supplied)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene Rubber (EPDM)

Bypass Valve Cracking Pressure
(omit) = 43 psid (3 bar) *(return line - standard)*
KB = no bypass *(flushing system)*
B6 = 87 psid (6 bar) *(return line - extended service life)*
B1 = 15 psid (1 bar) *(lubrication or coolant application)*
B0.2 = 3 psid (0.2 bar) *(pump inlet)*
[not available with ECO/N

Supplementary
W = Indicator with brass piston *(for high water base fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
SO103H = Modification of BN4HC Elements for Phosphate Ester Fluids
DE = Dual Indicator Option *(one indicator per duplex side)*

Replacement Element Model Code

0110 R 010 BN4HC / V

Size
0110, 0240, 0500, 0850, 1300

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
40 = AM
25, 74, 149 = W/HC
3, 10 = BN/AM
10, 20, = P/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X / _ _ _ _

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

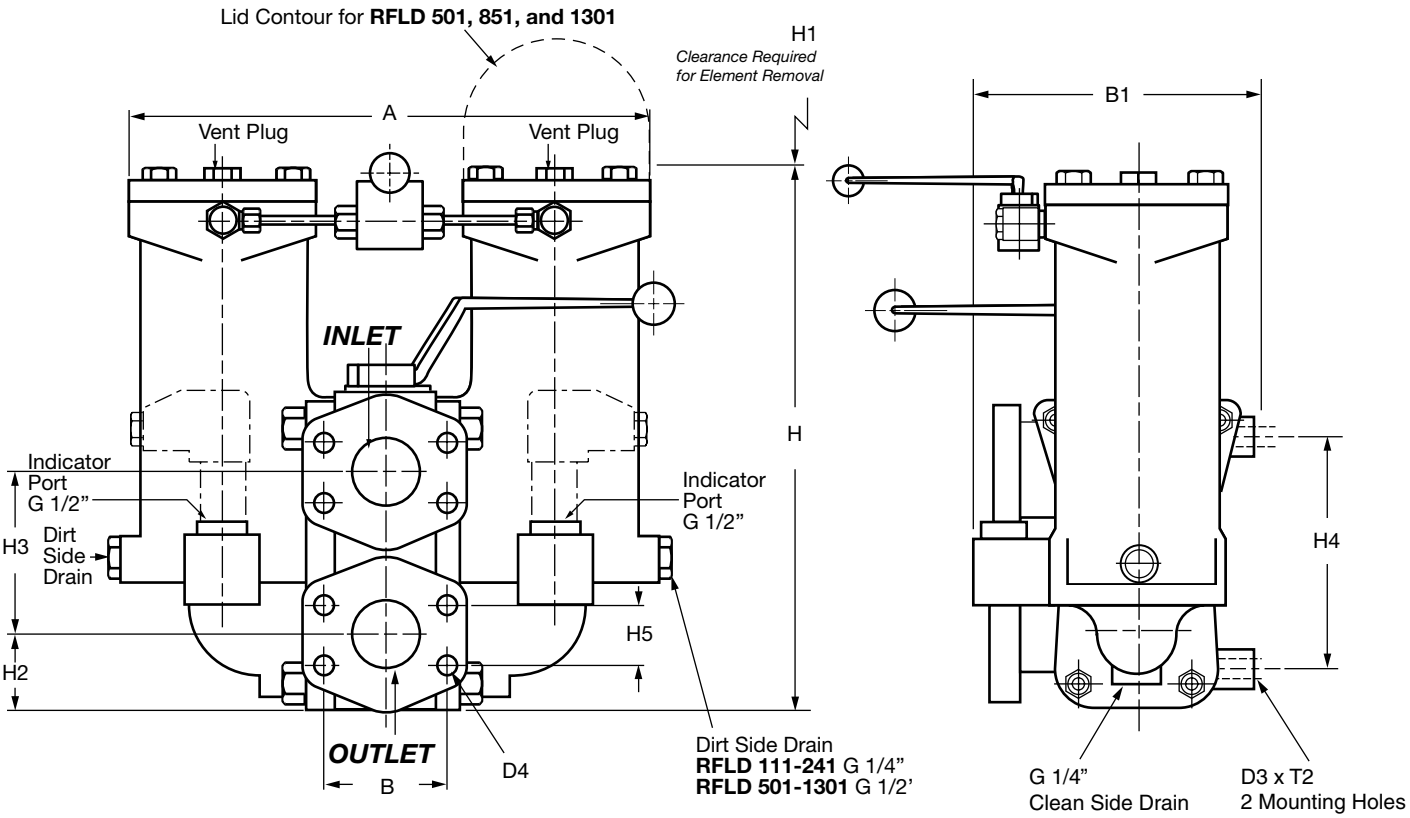
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



Size	A	B	B1	H	H1	H2	H3	H4	H5	D3	D4	T2	Wgt. (lbs)
RFLD 111 EAI	9.17" (233mm)	2.06" (52mm)	6.30" (160mm)	10.55" (268mm)	7.28" (185mm)	1.30" (33mm)	3.15" (80mm)	3.15" (80mm)	1.03" (26mm)	M 12	M 10	0.98" (25mm)	35
RFLD 241 EAK	11.89" (302mm)	2.75" (70mm)	7.09" (180mm)	12.48" (317mm)	8.46" (215mm)	1.73" (44mm)	3.74" (95mm)	5.51" (140mm)	1.41" (36mm)	M 12	M12	0.71" (18mm)	57
RFLD 501 DAL	14.57" (370mm)	3.06" (78mm)	8.07" (205mm)	16.14" (410mm)	11.22" (285mm)	2.09" (53mm)	4.33" (110mm)	6.50" (165mm)	1.69" (43mm)	M 12	M 12	0.71" (18mm)	82
RFLD 851 DAS	19.52" (496mm)	4.19" (106mm)	9.64" (245mm)	25.67" (652mm)	16.93" (430mm)	3.94" (100mm)	9.06" (230mm)	9.06" (230mm)	2.44" (62mm)	M 12	M 16	0.91" (23mm)	185
RFLD 1301 DAT	21.85" (555mm)	5.13" (130mm)	10.83" (275mm)	29.76" (756mm)	19.68" (500mm)	4.65" (118mm)	9.84" (250mm)	9.84" (250mm)	3.06" (78mm)	M 16	M 16	0.91" (23mm)	262

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

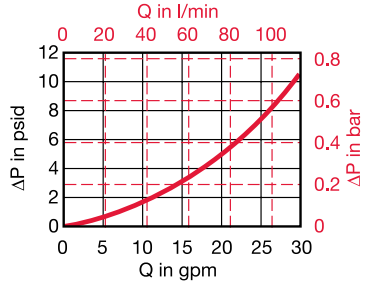
Housing Curve:

Pressure loss through housing is as follows:

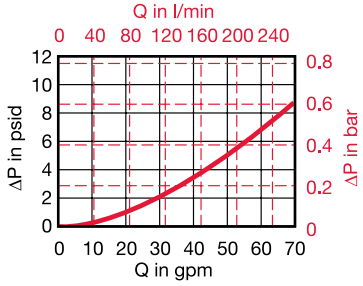
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

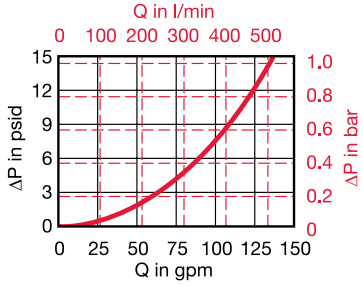
RFLD 111 Housing



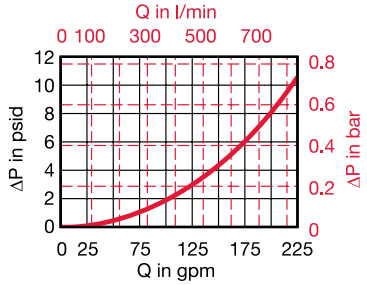
RFLD 241 Housing



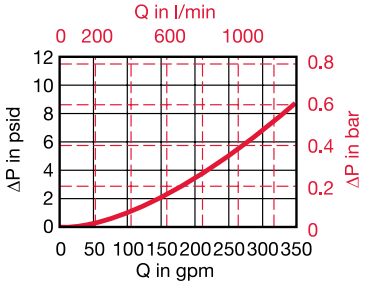
RFLD 501 Housing



RFLD 851 Housing



RFLD 1301 Housing



Required Element Per Housing

Housing Size	Element Size	Elements per Side
111	0110	2
241	0240	2
501	0500	2
851	0850	2
1301	1300	2

Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0110	0.817	0.517	0.329	0.178
0240	0.338	0.208	0.142	0.096
0500	0.162	0.104	0.069	0.044
0850	0.082	0.055	0.036	0.023
1300	0.045	0.032	0.024	0.014

Size	...R...P/HC (Paper)
	10, 20 µm
110	0.128
240	0.049
500	0.024
850	0.012
1300	0.007

Size	...R...W/HC (Wire Screen)
	25, 50, 100, 200 µm
110	0.0301
240	0.0137
500	0.0066
850	0.0038
1300	0.0027

Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
0110	–	–	0.464	0.317
0240	–	–	0.209	–
0850	0.078	0.053	0.046	0.032
1300	0.049	0.034	0.029	0.020

Size	...R...P/HC (Paper)
	10, 20 µm
0110	0.128
0240	0.049
0500	0.024
0850	0.012
1300	0.007

Size	...R...BN/AM	
	3 µm	10 µm
1300	0.088	0.033

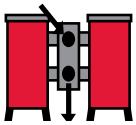
Size	...R...AM
	040A
0500	0.138
0850	0.074
1300	0.048

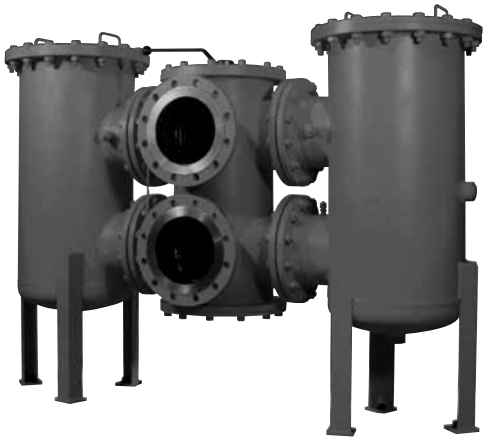
All Element K Factors in psi / gpm.

RFLD Welded Series

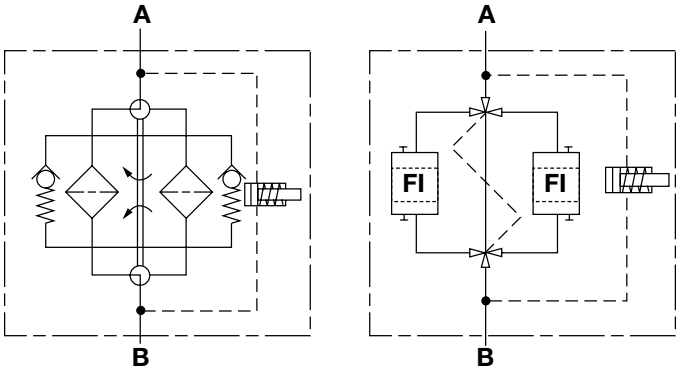
Inline Duplex Filters

230 psi • up to 3900 gpm





Hydraulic Symbol



Features

- Models 1300 to 15000 are made of rolled steel housings with bolt-on steel lids; Stainless steel models are available.
- ANSI flange connections for each filter size provide maximum connection flexibility eliminating additional adapters and intermediate flanges.
- Inlet and outlet connections are located on the same side of the transfer valve.
- Transfer valve and pressure equalization line allow easy changeover between filter housings without costly system shutdown.
- Models 5200 to 15000 use the same filter element size (1300 R) allowing maximum standardization in multiple filter element housing.
- Clogging indicators have no external dynamic seal. High reliability is acheived and magnetic actuation eliminates a leak point.

Applications

Technical Details

Mounting Method	Floor mounted legs *(Filters must not be used as pipe support)*
Port Connection	
1300/1320	4” ANSI 150# Flange
2500/2520	6” ANSI 150# Flange
4000/4020	8” ANSI 150# Flange
5200 - 15020	10” ANSI 150# Flange
Flow Direction	Inlet: Front top Outlet: Front Bottom
Construction Materials	
Head, Lid	Steel
Note: Please inquire to the factory for available stainless steel models.	
Flow Capacity	
1300/1320	350 gpm (1300 lpm)
2500/2520	650 gpm (2500 lpm)
4000/4020	1050 gpm (4000 lpm)
5200/5220	1400 gpm (5200 lpm)
6500/6520	1700 gpm (6500 lpm)
7800/7820	2050 gpm (7800 lpm)
15000/15020	3900 gpm (15000 lpm)
Housing Pressure Rating	
Max. Operating Pressure	150 psi (10 bar) standard 230 psi (16 bar) optional
Proof Pressure	345 psi (24 bar)
Fatigue Pressure	Contact HYDAC office
Burst Pressure	Contact HYDAC office
Element Collapse Pressure Rating	
BN/HC, W/HC	290 psid (20 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 29 psid (2 bar) -10% *(standard)* ΔP = 72 psid (5 bar) -10% *(standard)*	
Bypass Valve Cracking Pressure	
ΔP = 43 psid (3 bar) +10% ΔP = 87 psid (6 bar) +10%	

Model Code

RFLD BN/HC 1300 C A T 3 A 1 . 1 / S 150 V _ DH

Filter Type

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®
W/HC = Wire Screen

Size
1300, 1320, 2500, 2520, 4000, 4020, 5200, 5220, 6500, 6520, 7800, 7820, 15000, 15020

Operating Pressure
B = 150 psi (10 bar)
C = 230 psi (16 bar)

Type of Change Over Valve
A = Ball Valve – ANSI 2", 3", 4", 6" / DN 50, 80, 100, 150 *(sizes 1300 - 2520)*
B = Segment Valve – ANSI 6", 8", 9", 13" / DN 150, 200, 250, 300 *(sizes 2500 - 15020)*
C = Butterfly – ANSI *(same as Segment sizes)* / DN *(same as Segment sizes) (sizes 2500 - 15020)*

Type of Connection
2 = 2" ANSI Flange *(sizes 1300)*
4 = 3" ANSI Flange *(sizes 2500)*
5 = 4" ANSI Flange *(sizes 1320 & 2520)*
7 = 6" ANSI Flange *(sizes 2500 & 2520)*
8 = 8" ANSI Flange *(sizes 4000 & 4020)*
9 = 10" ANSI Flange *(sizes 5200 - 7820)*
10 = 12" ANSI Flange *(sizes 15000 & 15020)*
L = DN 50 *(sizes 1300 - 2520)*
S = SAE/DIN DN 80 *(sizes 1300 - 5220)*
T = SAE/DIN DN 100 *(sizes 1300 - 7820)*
V = DN 150 *(sizes 2500 - 7820)*
W = DN 200 *(sizes 4000 - 15020)*
X = DN 250 *(sizes 5200 - 15020)*
Y = DN 300 *(sizes 15000 & 15020)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N
40 = AM
3, 10 = BN/AM
25, 74, 149 =W/HC
10, 20 = P/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(latest version always supplied)*

Country of Installation
(omit) = standard *(non coded)*
S = ASME Coded with "U" Stamp

Flange
(omit) = DIN Flange Connection to DIN 2501/1
150 = 150 lbs ANSI Flange

Seals
(omit) = Buna-N
V = Fluoroelastomer (FPM)

Bypass Valve Cracking Pressure
(omit) = 43 psid (3 bar) *(return line - standard)*
B6 = 87 psid (6 bar) *(return line - extended service life)*
KB = no bypass
not available with ECO/N

Supplementary
(omit) = Cover Lifting Device *(Handle only)*
DH = Cover Lifting Device *(Davit lifting mechanism for sizes 4000 and larger, style may vary)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = Indictor with brass piston *(for water base fluids)*
SO103H = Modification of BN4HC Elements for Phosphate Ester Fluids

Replacement Element Model Code

0850 R 010 BN4HC / V

Size
0850, 1300, 1700, 2600

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
25, 74, 149 = W/HC
40 = AM
3, 10 = BN/AM
10, 20, = P/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar)
5 = 72 psid (5 bar)
(optional)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

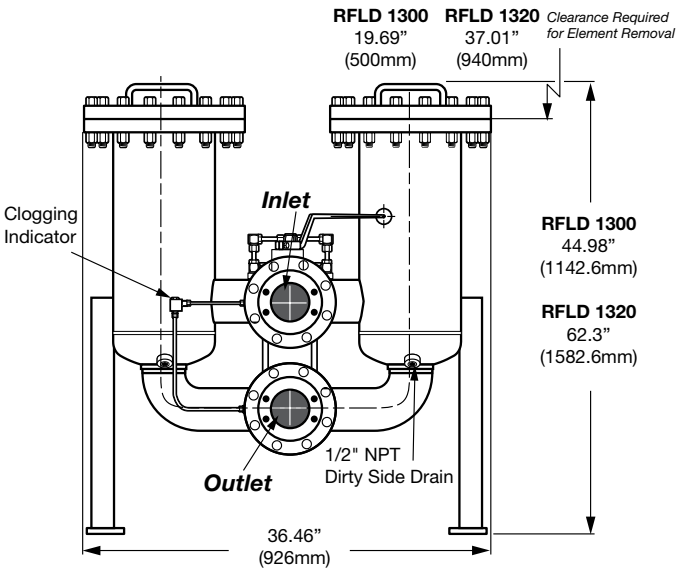
Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

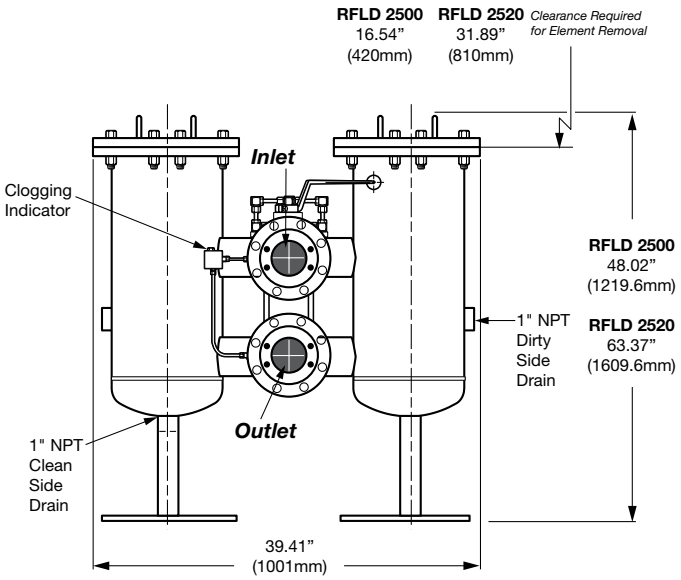
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

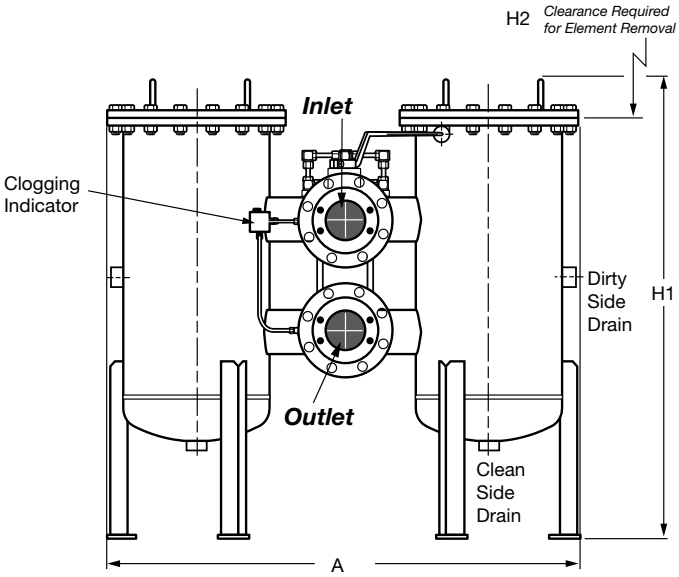
Dimensions
RFLD 1300 / 1320



RFLD 2500 / 2520



RFLD 2500 - 15020 Butterfly Change-Over (Change-Over Type C)



Size	Connection	A	H1
2500/2520	DN 150	54.25/1378	73.62/1108 58.98/1498
4000/4020	DN 150 DN 200	63.62/1616 67.87/1724	46.06/1170 61.42/1560 47.44/1205 62.80/1595
5200/5220	DN 150 DN 200 DN250	65.59/1666 70.63/1794 79.13/2010	49.57/1259 66.77/1696 49.57/1259 66.77/1696 52.20/1326 69.53/1766
6500/6520	DN 150 DN 200 DN250	75.43/1916 78.90/2004 87.01/2210	49.61/1260 66.93/1700 54.33/1380 71.65/1820 54.33/1380 71.65/1820
7800/7820	DN 150 DN 200 DN250	75.43/1916 78.90/2004 87.01/2210	49.61/1260 66.93/1700 54.33/1380 71.65/1820 54.33/1380 71.65/1820
15000/15020	DN 200 DN 250 DN 300	96.46/2450 104.17/2646 109.69/2786	56.10/1425 73.43/1865 56.10/1425 73.43/1865 59.06/1500 76.38/1940

Dimensions are in inches/millimeters.

Size	1300	1320	2500	2520	4000	4020	5200	5220	6500	6520	7800	7820	15000	15020
Weight (lbs.)	330	403	577	643	1023	1111	1962	2204	2471	2826	2490	2861	3205	3578

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

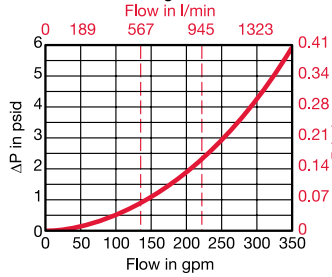
Housing Curve:

Pressure loss through housing is as follows:

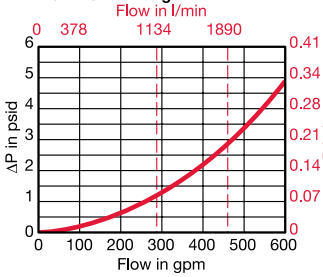
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 21)*

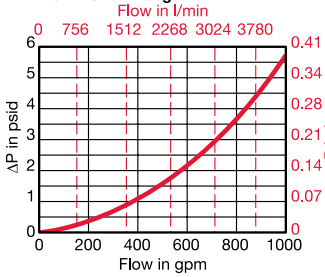
RFLD 1300/1320 Housing w/ ANSI 4" Flange



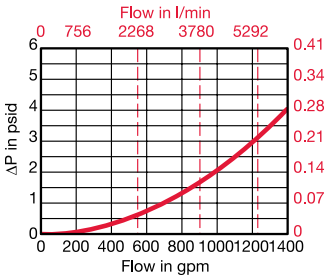
RFLD 2500/2520 Housing w/ ANSI 6" Flange



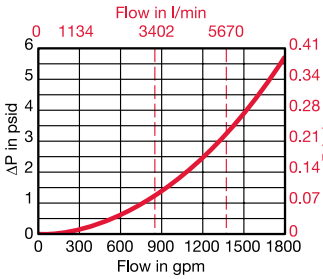
RFLD 4000/4020 Housing w/ ANSI 8" Flange



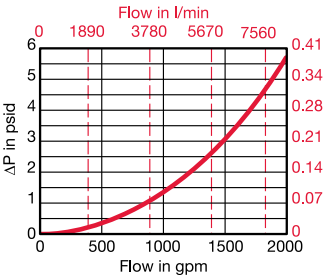
RFLD 5200/5220 Housing w/ ANSI 10" Flange



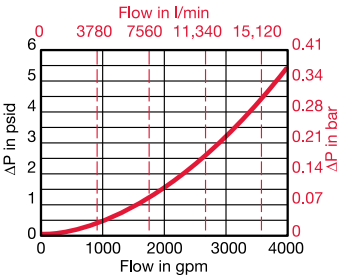
RFLD 6500/6520 Housing w/ ANSI 10" Flange



RFLD 7800/7820 Housing w/ ANSI 10" Flange



RFLD 15000/15020 Housing w/ ANSI 10" Flange



Required Element Per Housing

Housing Size	Element Size	Elements per Side
1300 / 1320	1300 / 2600	1 / 1
2500 / 2520	0850 / 1700	3 / 3
4000 / 4020	0850 / 1700	5 / 5
5200 / 5220	1300 / 2600	4 / 4
6500 / 6520	1300 / 2600	5 / 5
7800 / 7820	1300 / 2600	6 / 6
15000 / 15020	1300 / 2600	10 / 10

Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...R...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0850	0.082	0.055	0.036	0.023
1300	0.045	0.032	0.024	0.014
1700	0.040	0.029	0.018	0.011
2600	0.023	0.016	0.011	0.007

Size	...R...W/HC (Wire Screen)
	25, 50, 74, 100, 149, 200 µm
850	0.0038
1300	0.0027
1700	0.0019
2600	0.0011

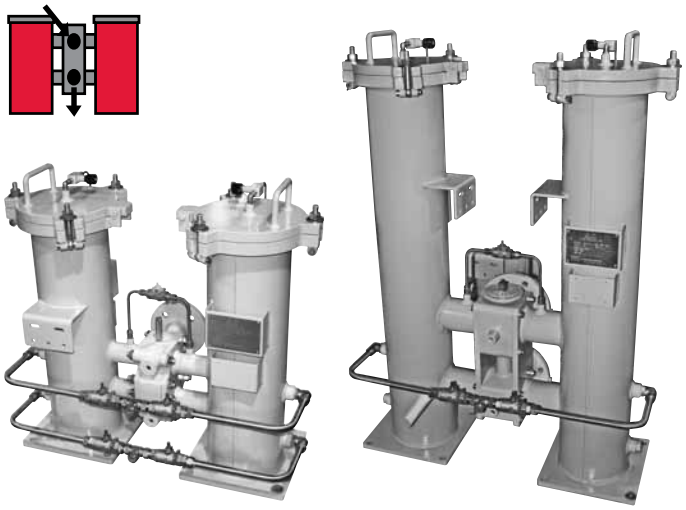
Size	...R...ECO/N			
	3 µm	5 µm	10 µm	20 µm
0850	0.078	0.053	0.046	0.032
1300	0.049	0.034	0.029	0.020
1700	0.038	0.026	0.023	–
2600	0.024	0.017	0.014	0.010

All Element K Factors in psi / gpm.

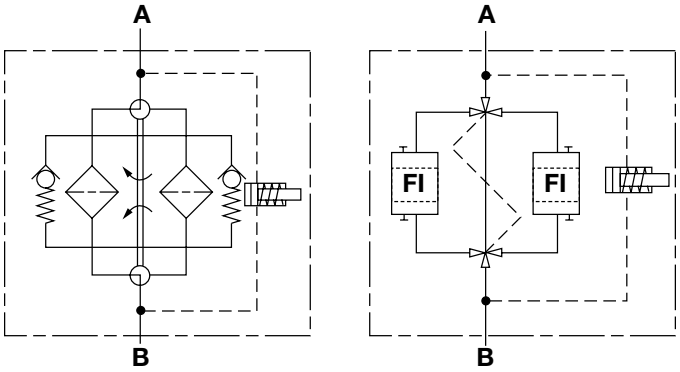
RFLDH Welded Series

Inline Duplex Filters

150 psi • up to 700 gpm



Hydraulic Symbol



Features

- Models are available in carbon and stainless steel versions. Lids are swing bolt mounted.
- ANSI flange connections.
- Inlet and outlet connections are located on the same side of the transfer valve.
- Transfer valve and pressure equalization line allow easy changeover between filter housings without costly system shutdown.
- Clogging indicators have no external dynamic seal. High reliability is acheived and magnetic actuation eliminates a leak point.
- Stainless drain piping with ball valves available.
- Air bleed line available.
- ASME coded with U-stamp available.
- API Compliant versions available

Applications

Technical Details

Mounting Method	Floor mounted legs *(Filters must not be used as pipe support)*
Port Connection	
1300/1303	2” ANSI 150# Flange
2500/2503	3” ANSI 150# Flange
1320/1323, 2520/2523	4” ANSI 150# Flange
4020/4023	6” ANSI 150# Flange
Flow Direction	Inlet: Front top Outlet: Front Bottom
Construction Materials	
1300, 1320, 2500, 2520, 4020 - Carbon Steel 1303, 1323, 2503, 2523, 4023 - Stainless Steel	
Flow Capacity	
1300/1303	167 gpm (650 lpm)
1320/1323	304 gpm (1150 lpm)
2500/2503	270 gpm (1050 lpm)
2520/2523	525 gpm (2000 lpm)
4020/4023	700 gpm (2650 lpm)
Housing Pressure Rating	
Max. Operating Pressure	150 psi (10 bar) standard
Proof Pressure	345 psi (24 bar)
Fatigue Pressure	Contact HYDAC office
Burst Pressure	Contact HYDAC office
Element Collapse Pressure Rating	
BN/HC, W/HC	290 psid (20 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 29 psid (2 bar) -10% ΔP = 72 psid (5 bar) -10%	
Bypass Valve Cracking Pressure	
ΔP = 43 psid (3 bar) +10% ΔP = 87 psid (6 bar) +10%	

Model Code

RFLDH BN/HC 1300 C A T 3 A 1 . X / S 150 V DH

Filter Type

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron®/Aquamicron®
W/HC = Wire Screen

Size
1300 / 1303 / 1320 / 1323 / 2500 / 2503 / 2520 / 2523 / 4020 / 4023

Operating Pressure
B = 150 psi (10 bar)

Type of Change Over Valve
A = Ball Valve *(other ratings available, consult factory)*

Type of Connection
3 = 2" ANSI Flange *(sizes 1300/1303)*
4 = 3" ANSI Flange *(sizes 2500/2503)*
5 = 4" ANSI Flange *(sizes 1320/1323 & 2520/2523)*
7 = 6" ANSI Flange *(sizes 4020/4023)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N
40 = AM
3, 10 = BN/AM
25, 74, 149 =W/HC
10, 20 = P/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(latest version always supplied)*

Country of Installation
(omit) = (non coded)
S = ASME Coded with "U" Stamp

Flange
150 = 150 lbs ANSI Flange

Seals
(omit) = Buna-N
V = Fluoroelastomer (FPM)

Bypass Valve Cracking Pressure
(omit) = 43 psid (3 bar) *(return line - standard)*
B6 = 87 psid (6 bar) *(return line - extended service life)*] not available with ECO/N
KB = no bypass

Supplementary
(omit) = Cover Lifting Device *(Handle only)*
DH = Cover Lifting Device *(Davit lifting mechanism for sizes 4020 and larger, style may vary)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = Indictor with brass piston *(for water base fluids)*
SO103H = Modification of BN4HC Elements for Phosphate Ester Fluids
SB = Equalization lines *(standard)*
VKD = Drain piping
EM = Air bleed valves

Replacement Element Model Code

0850 R 010 BN4HC / V

Size
0850, 1300, 1700, 2600

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
25, 74, 149 = W/HC
40 = AM
3, 10 = BN/AM
10, 20, = P/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar)] *(optional)*
5 = 72 psid (5 bar)]

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

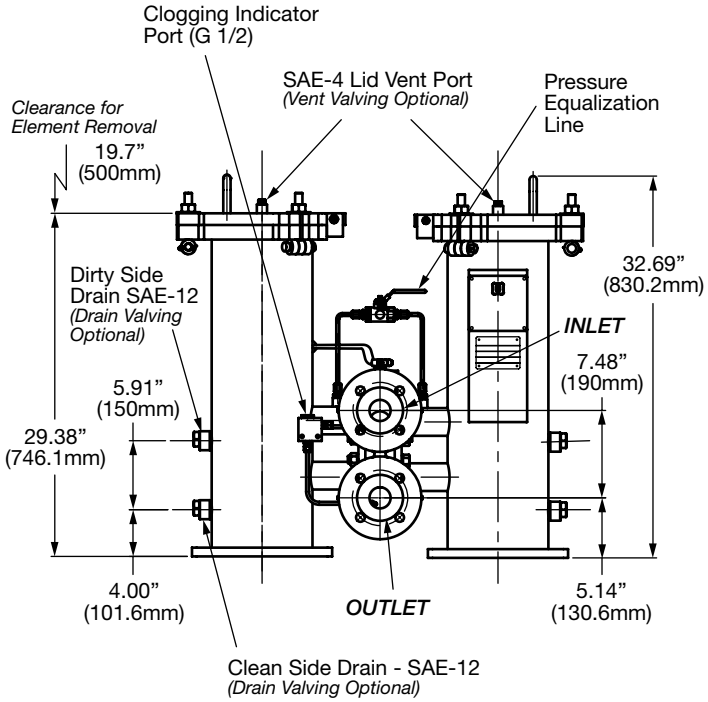
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

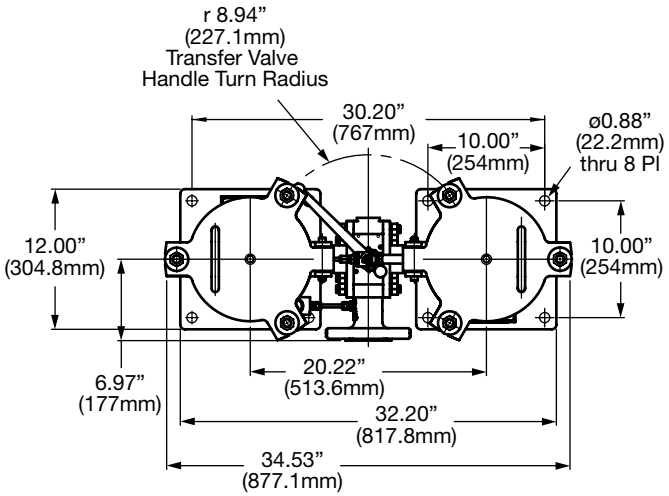
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

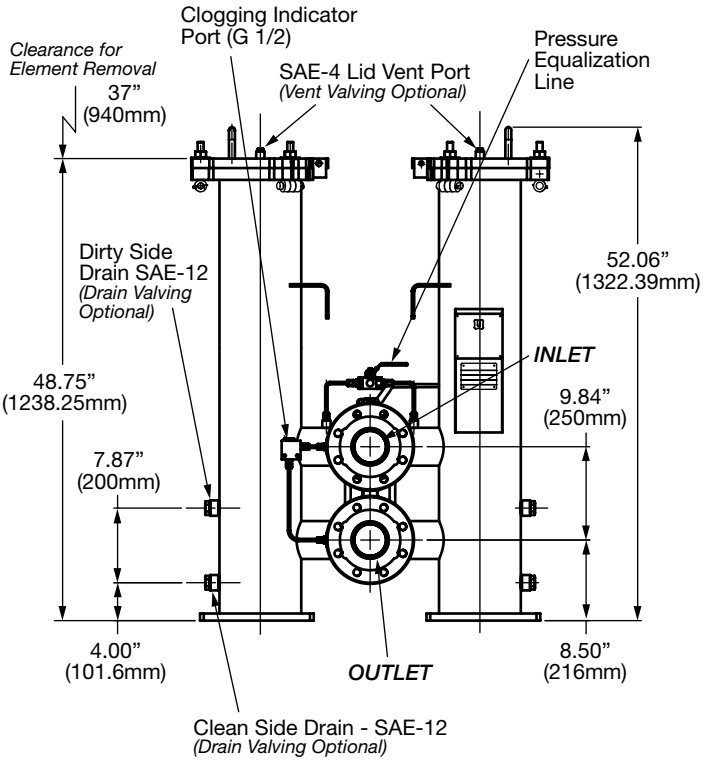
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

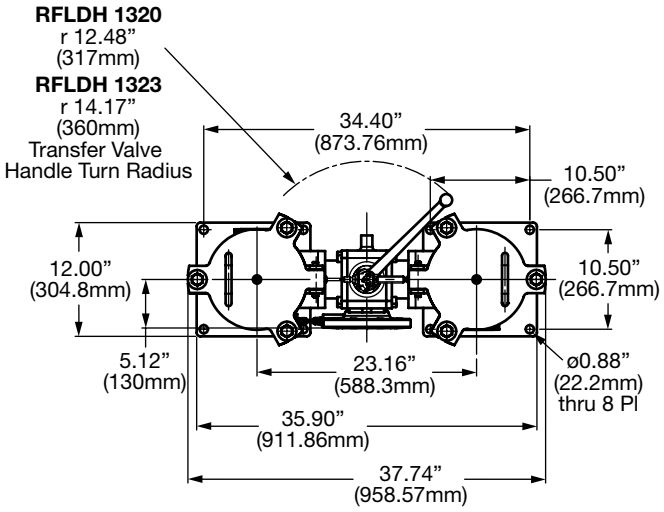
Dimensions
RFLDH 1300 / 1303



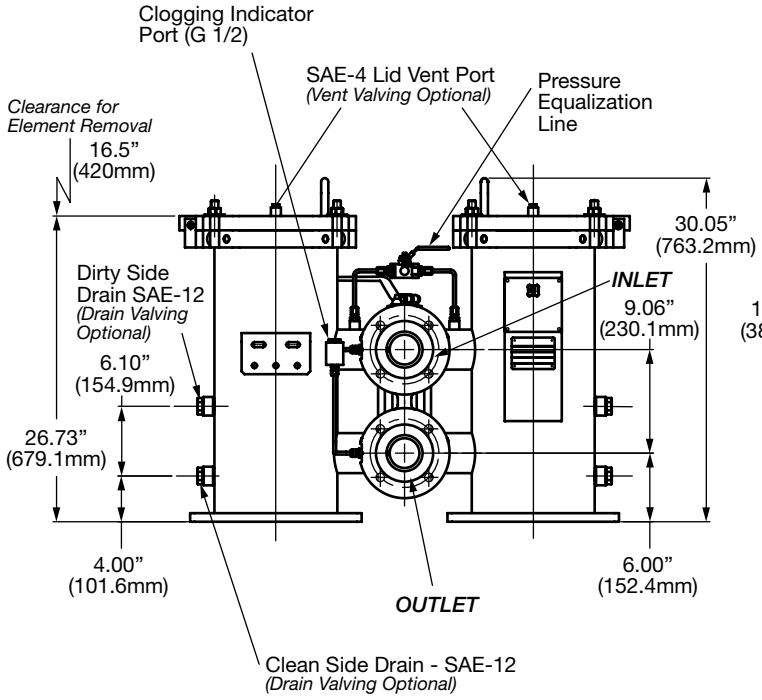


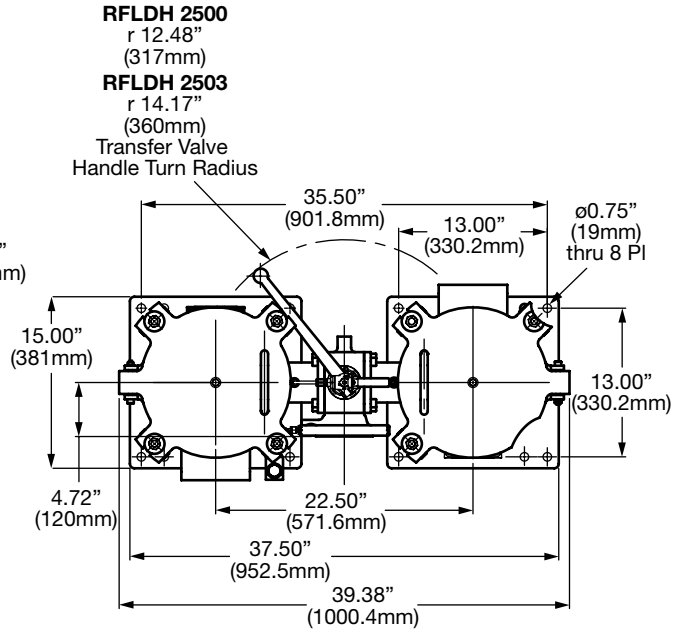
RFLDH 1320 / 1323



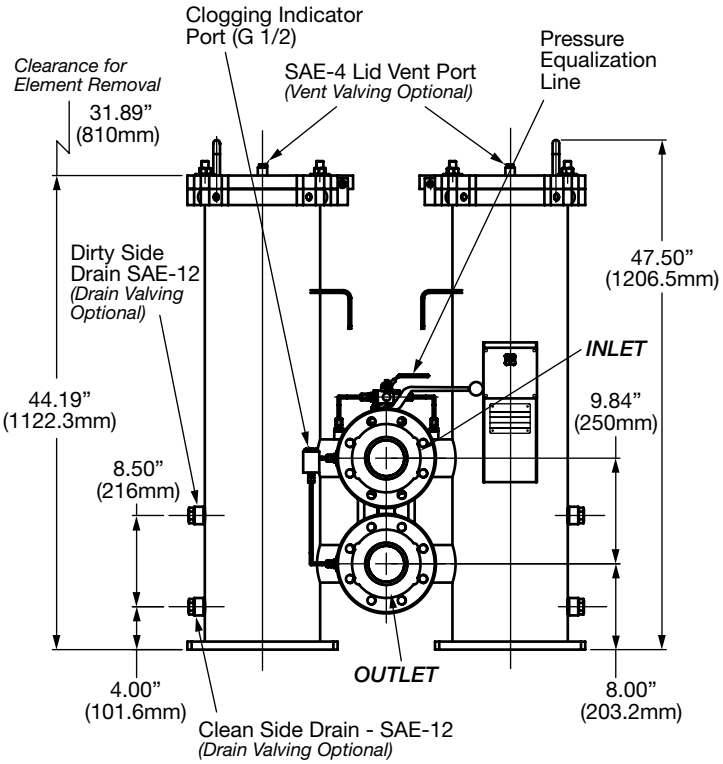


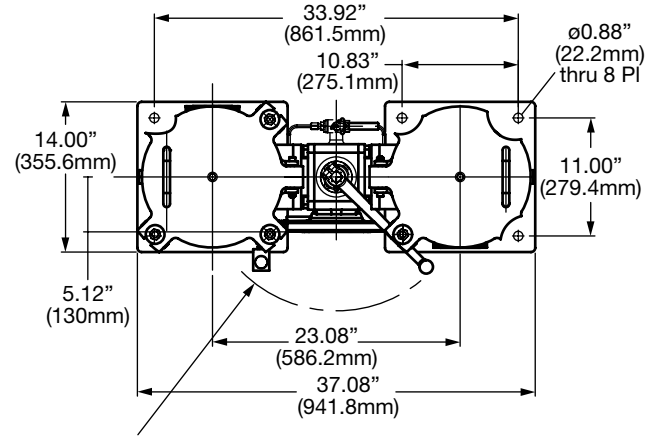
Dimensions
RFLDH 2500 / 2503





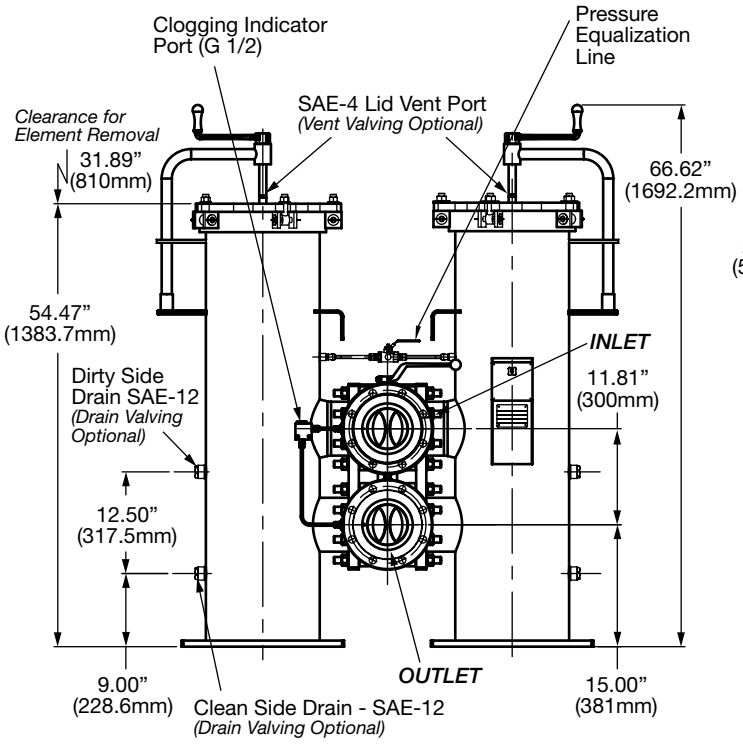
RFLDH 2520 / 2523

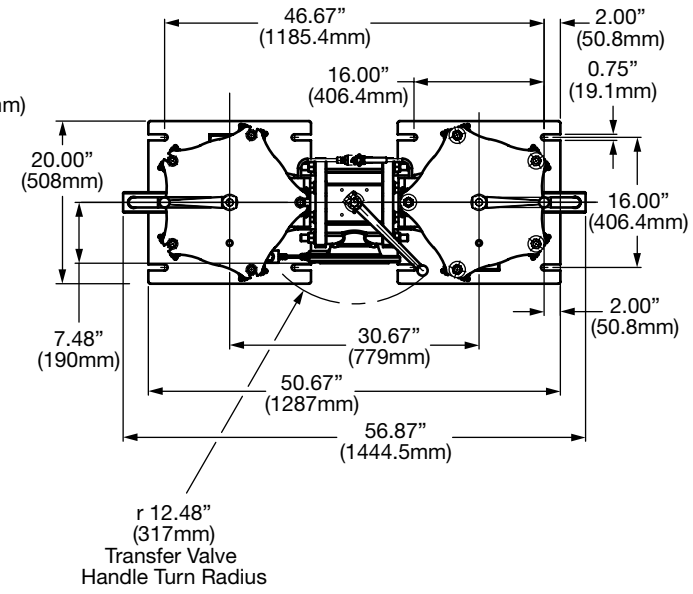




RFLDH 2520
r 12.48"
(317mm)
RFLDH 2523
r 14.17"
(360mm)
Transfer Valve
Handle Turn Radius

Dimensions
RFLDH 4020





Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

Required Element Per Housing

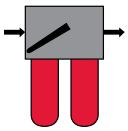
Housing Size	Element Size	Elements per Side
1300 / 1303	1300	1
1320 / 1323	2600	1
2500 / 2503	0850	3
2520 / 2523	1700	3
4020 / 4023	1700	5

Notes:

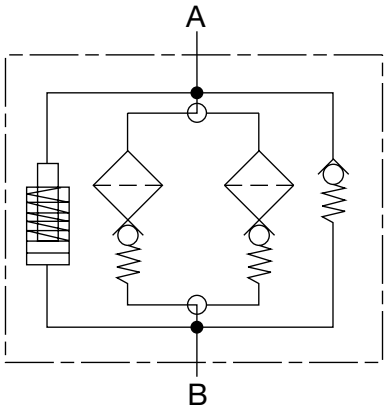
FLND Series

Inline Duplex Filters

360 psi • up to 100 gpm



Hydraulic Symbol



Features

- Lightweight duplex filter constructed of aluminum.
- Aluminum alloy is water tolerant - anodization is not required for high water based fluids (HWBF).
- The filter housings are designed to withstand pressure surges as well as high static pressure loads.
- The screw-in bowl allows the filter element to be easily removed for replacement or cleaning.
- A visual (pop-up), electrical, electrical/visual (lamp), or electronic differential type clogging indicator
- The standard model is supplied with vent and drain plugs, and also a connection for differential clogging indicator.
- The pressure is equalized between chambers by raising the change-over lever prior to switching it to the relevant filter side. Thus, the filter contains an integrated equalization valve.

Technical Details

Mounting Method	4 mounting holes - filter head	
Port Connection	SAE-24 (1-7/8-12UN)	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head, Bowl	Aluminum	
Flow Capacity		
160	42 gpm (160 lpm)	
250	66 gpm (250 lpm)	
400	105 gpm (400 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	360 psi (25 bar)	
Proof Pressure	540 psi (38 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	Contact HYDAC office	
Element Collapse Pressure Rating		
BN/HC, W/HC	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% ΔP = 72 psid (5 bar) -10% ΔP = 116 psid (8 bar) -10%		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% ΔP = 102 psid (7 bar) +10%		

Applications


Automotive


Gearboxes


Industrial


Power Generation


Pulp & Paper


Shipbuilding


Steel / Heavy Industry

Model Code

FLND BN/HC 250 D D F 10 A 1 . X / 12 - V - B7

Filter Type
FLND = Inline duplex filter

Element Media
BN/HC = Betamicron® *(Low Collapse)* W/HC = Wire Mesh

Size
160, 250, 400

Operating Pressure
D = 360 psi (25 bar)

Type of Change-Over
D = segment valve

Port Type / Size
F = SAE-24 (1 1/2")
K = SAE DN 38 Flange

Filtration Rating *(micron)*
3, 6, 10, 25 = BN/HC 25, 50, 100, 200 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(latest version is always supplied)*

Port Configuration
(omit) = SAE DN Flange
12 = SAE straight thread inlet/outlet connections

Seals
V = Fluoroelastomer (FPM) *(standard)*

Bypass Valve
(omit) = no bypass *(optional - consult factory)*
B3 = 43 psid (3 bar) *(optional)*
B7 = 101.5 psid (7 bar) *(standard)*

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = suitable for oil-water emulsions (HFA, HFC), NBR seals *(refers exclusively to the type of clogging indicator)*
EV = knurled air bleed valve *(replaces standard socket head plug)*

Replacement Element Model Code

0160 DN 010 BN4HC /

Size
0160, 0250, 0400

Type
DN

Filtration Rating *(micron)*
3, 6, 10, 25 = BN4HC
25, 50, 100, 200 = W/HC

Element Media
BN4HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

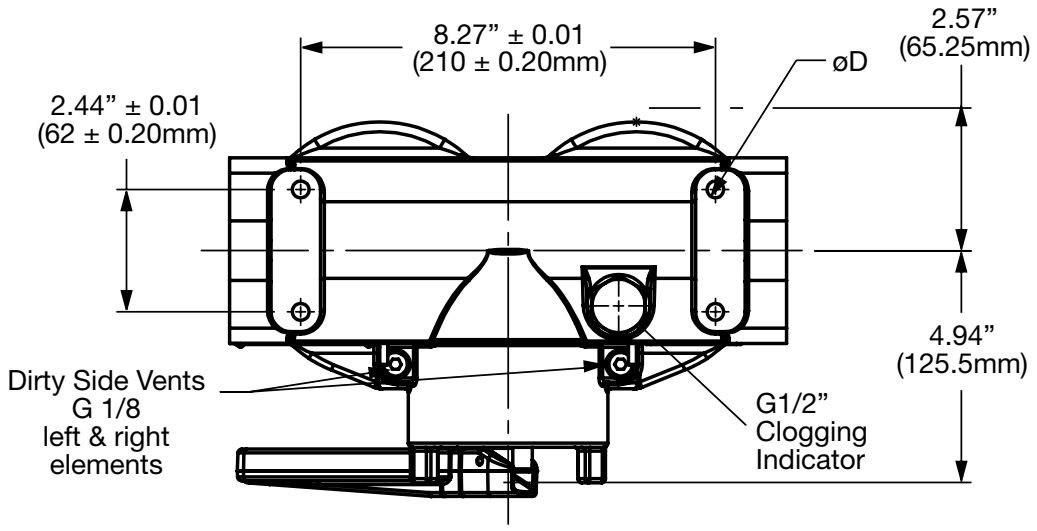
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

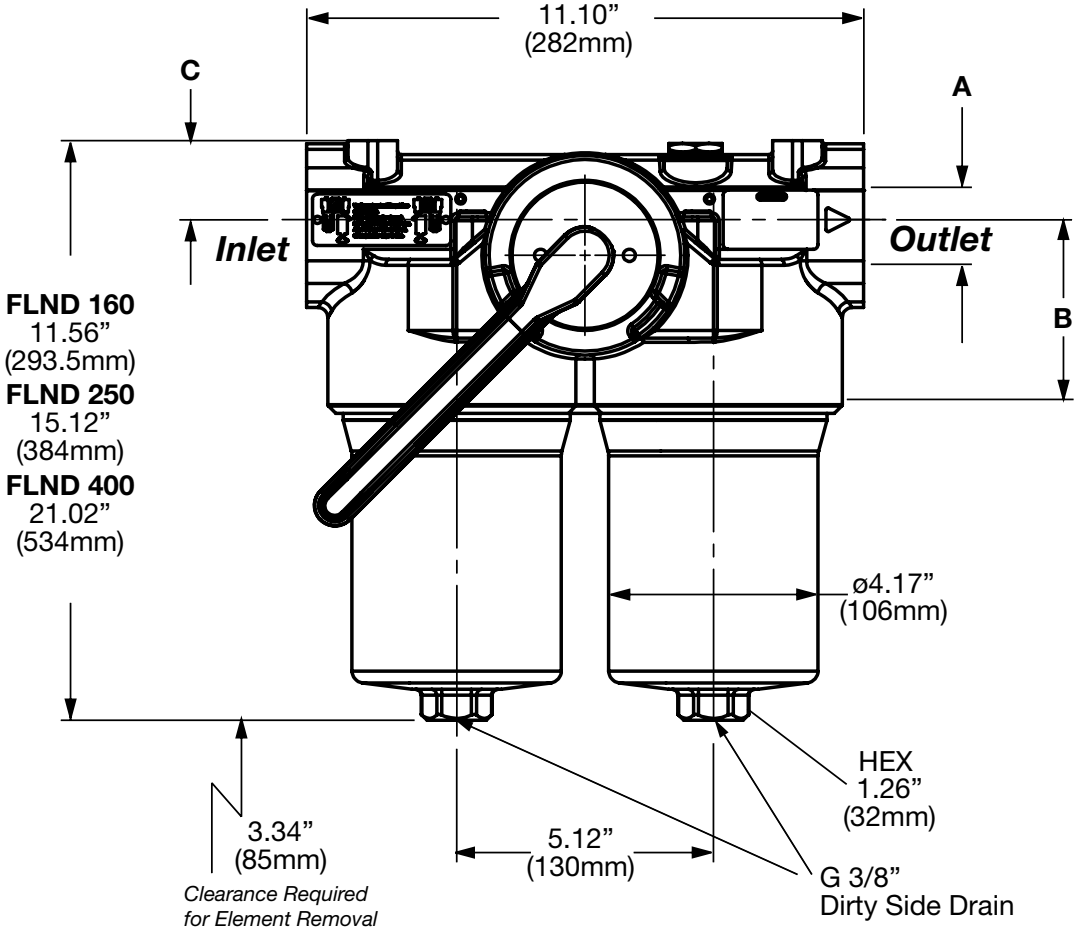
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



A	B	C
SAE-24	3.622” (92)	1.575” (40)
DN 38	3.504” (89)	1.693” (43)



Size	160	250	400
Weight (lbs.)	22.7	25.6	28.7

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

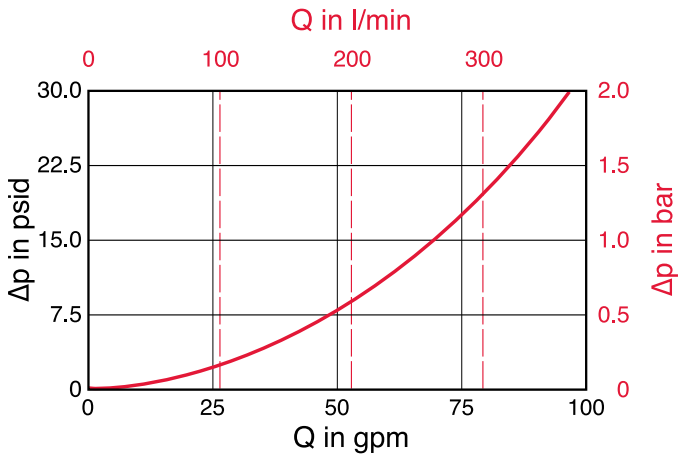
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



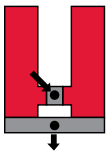
Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

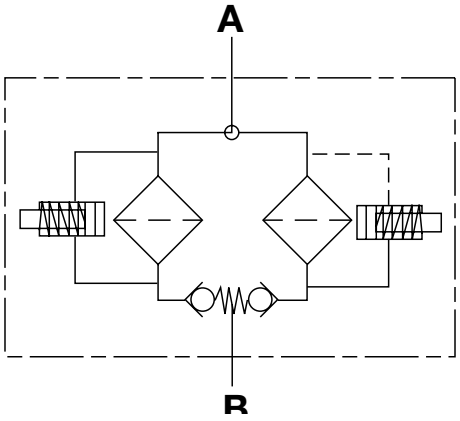
Size	...DN...BN4HC (Betamicron® Low Collapse)			
	3 µm	6 µm	10 µm	25 µm
0160	0.439	0.280	0.190	0.143
0250	0.280	0.177	0.117	0.093
0400	0.178	0.111	0.071	0.055

All Element K Factors in psi / gpm.

NFHD Series
Modular Inline Duplex Filters
360 psi • up to 450 gpm



Hydraulic Symbol



Features

- Top access for easy element changeout.
- All models have an air bleed valve (vent) installed in the lid.
- Single large element with no leak points for highest efficiency and dirt capacity
- Lid with swing bolts for fast servicing without tools
- Drain port (Far side) SAE 12 (3/4")
- Clogging Indicator for local and remote signals
- Easily banked in parallel (manifolded) for high viscosity applications.
- Available with Betafit elements - consult HYDAC.

Technical Details

Mounting Method	Floor mounting brackets
Port Connection	SAE-64 Flange Code 61
Flow Direction	Inlet: Side Outlet: Side
Construction Materials	
Head, Lid, Elbows, Manifolds	Ductile Iron
Housing	Steel
Flow Capacity	
1300	343 gpm (1300 lpm)
2600, 5200, 7800, 10400	450 gpm (1700 lpm)
Housing Pressure Rating	
Max. Operating Pressure	360 psi (25 bar)
Proof Pressure	540 psi (37 bar)
Fatigue Pressure	360 psi (25 bar)
Burst Pressure	> 1440 psi (100 bar)
Element Collapse Pressure Rating	
BN/HC, W/HC	290 psid (20 bar)
ECO/N, BN/AM, P/HC, AM	145 psid (10 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 29 psid (2 bar) -10% *(standard)*	
ΔP = 72 psid (5 bar) -10% *(optional)*	
Bypass Valve Cracking Pressure	
ΔP = 43 psid (3 bar) +10%	
ΔP = 87 psid (6 bar) +10%	

Applications


Automotive


Gearboxes


Industrial


Power Generation


Pulp & Paper


Shipbuilding


Steel / Heavy Industry

Model Code

NFHD BN/HC 1300 D A P 3 A 1 . 0 / 16 A

Filter Type
NFHD = In-line Duplex Return Line Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*
AM = Aquamicron®
P/HC = Polyester
ECO/N = ECOmicron® *(Low Collapse)*
BN/AM = Betamicron® Aquamicron®
W/HC = Wire Screen

Size
1300, 2600, 5200, 7800, 10400

Operating Pressure
D = 360 psi (25 bar)

Type of Change Over
A = Ball valve

Type of Connection
P = SAE DN 100 (4") flange

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC, ECO/N
10, 20 = P/HC
3, 10 = BN/AM
25, 74, 149 = W/HC
40 = AM

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1

Modification Number *(latest version always supplied)*

Port Configuration
16 = SAE-64, (4") Code 61 Flange

Flow Path *(Facing Indicator)*
A = Front Inlet and Front Outlet *(standard)*
B = Front Inlet and Back Outlet
C = Back Inlet and Back Outlet
D = Back Inlet and Front Outlet

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = 43 psid Bypass *(standard)*
B1 = 15 psid Bypass
B6 = 87 psid Bypass
KB = No Bypass
not available with ECO/N

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C & D indicators only)*
S0103H = Modification of BN4HC and P/HC Elements for Phosphate Esters

Replacement Element Model Code

1300 R 010 BN4HC / V

Size
1300 - for housings: 1300
2600 - for housings: 2600, 5200, 7800, 10400

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC, ECO/N
40 = AM
25, 74, 149 = W/HC
3, 10 = BN/AM
10, 20 = P/HC

Element Media
BN4HC, ECO/N, BN/AM, AM, P/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals*y*

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

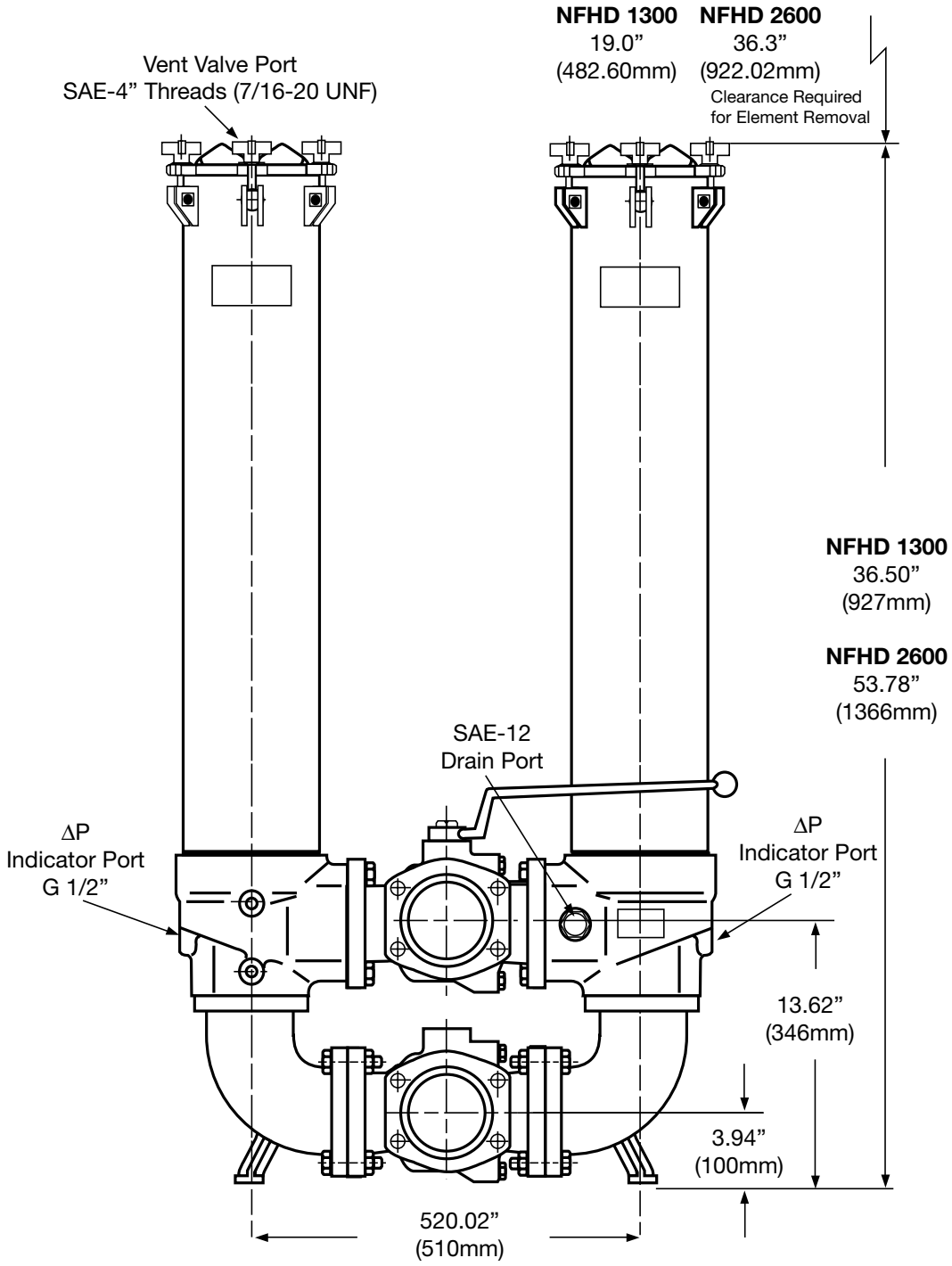
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

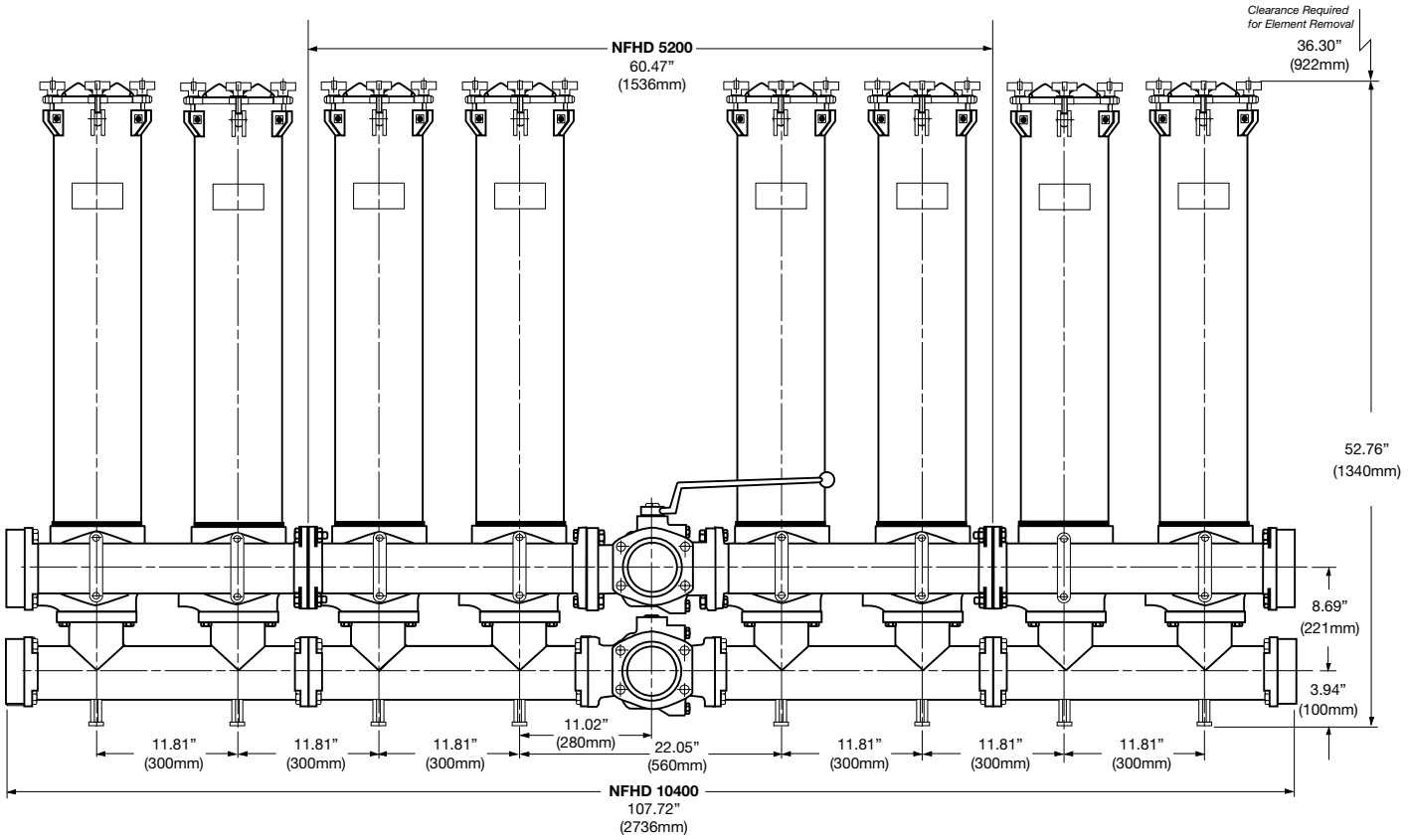
Dimensions
NFHD 1300 / 2600



Size	1300	2600
Weight (lbs.)	294	344

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

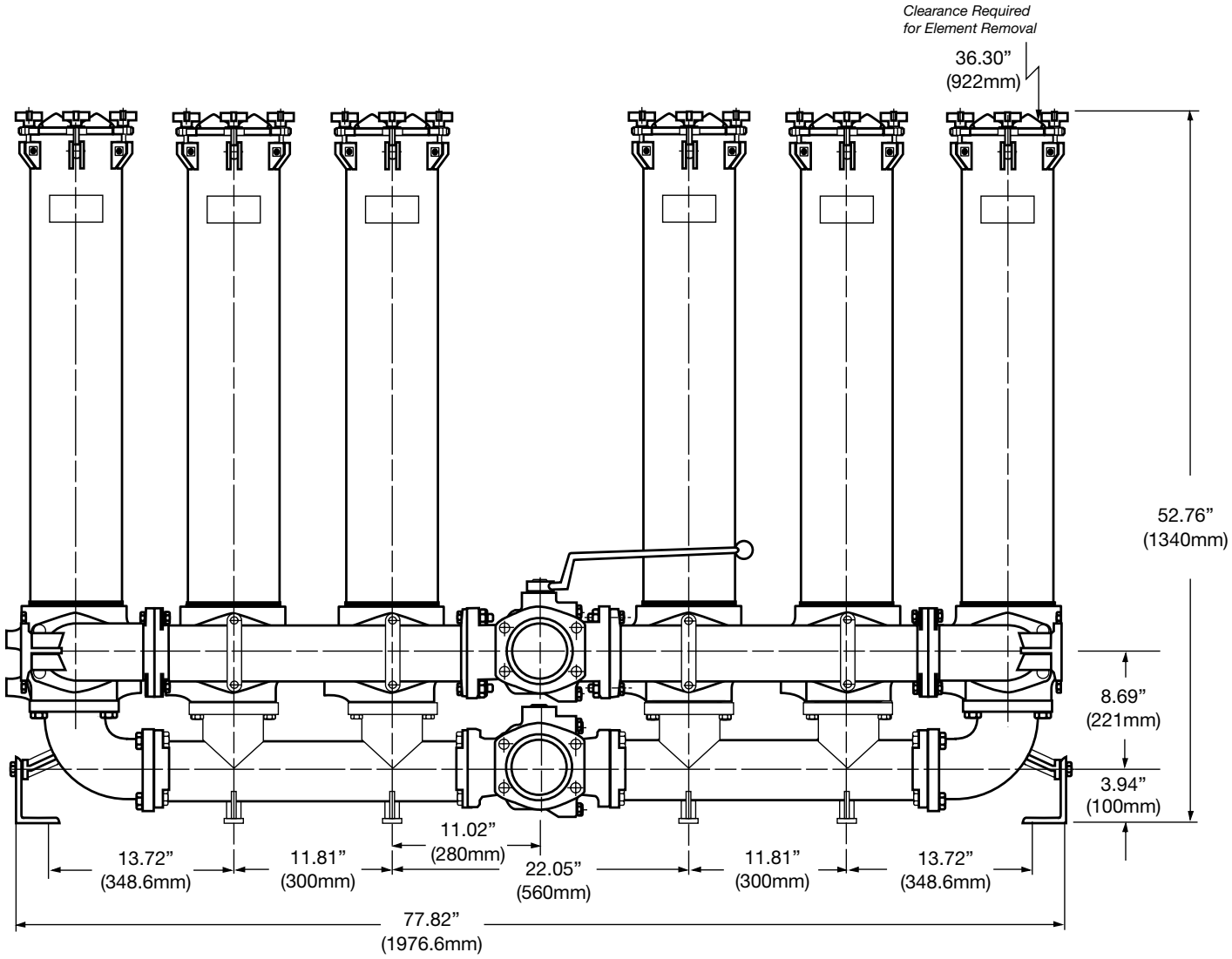
NFHD 5200 / 10400



Size	5200	10400
Weight (lbs.)	777	1407

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

NFHD 7800



Size	7800
Weight (lbs.)	1008

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

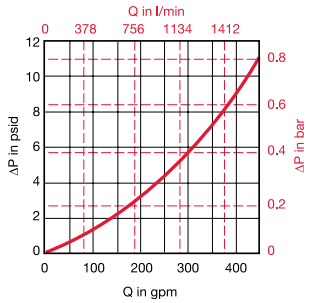
Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

The curve below shows the clean ΔP through the Housing for a single filter. To determine Clean ΔP for manifolds with multiple housings, multiply the Clean ΔP curve value by the percentage values in the table.

ΔP Housing

NFHD 1300 & NFHD 2600



NFHD System	Multiplier
5200	93%
7800	83%
10400	74%

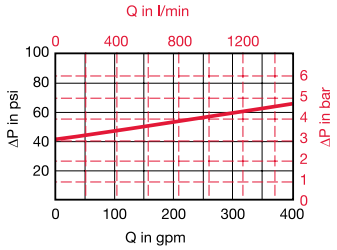
Example

Conditions	
400 gpm flow	
NFHD 5200 manifold specified	
ΔP Curve	= 9 psid
ΔP 5200	= 9 psid X 0.73
	= 8.4 psid $_{\text{Piping \& Housing}}$
ΔP Total System = 8.4 psid + ΔP Element	

Bypass Valve Curve:

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 ΔP Calculations:

Sizing (K) Flow Factors below show the pressure drops across clean elements *(excluding housings and piping)*. (K) Factors are calculated from mineral based fluid at viscosity of 141 SUS and specific gravity of 0.86. To determine clean ΔP for NFH manifolds with more than one housing, use the adjusted (K) factors below and multiply by total flow rate.

Example

Conditions
Lube system
Viscosity of 1,000 SUS
Specific gravity 0.86
75 gpm flow
Low pressure drop essential
10 µm Betamicron® filter element
Selection
An NFHD 2600 filter gives an Adjusted Clean element ΔP as follows:
Clean ΔP = 75 gpm x 0.017 = 1.275 psid
Clean $\Delta P_{adj.}$ = 1.275 x $\frac{1000}{141}$ = 9.04 psid

Element K Factors

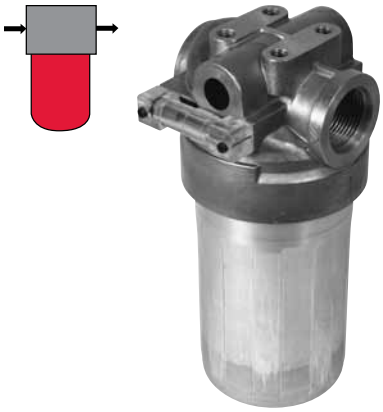
$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Housing Size	# of Elements	Size	...R...BN4HC (Betamicron® Low Collapse)				...R...ECO/N (ECOmicron®)			
			3 µm	5 µm	10 µm	20 µm	3 µm	5 µm	10 µm	20 µm
1300	2	1300	0.045	0.032	0.024	0.014	0.049	0.034	0.029	0.020
2600	2	2600	0.023	0.016	0.011	0.007	0.024	0.017	0.014	0.010
5200	4	2600	0.012	0.008	0.006	0.004	0.012	0.009	0.007	0.005
7800	6	2600	0.008	0.006	0.004	0.002	0.008	0.006	0.005	0.003
10400	8	2600	0.006	0.004	0.003	0.002	0.006	0.004	0.004	0.003

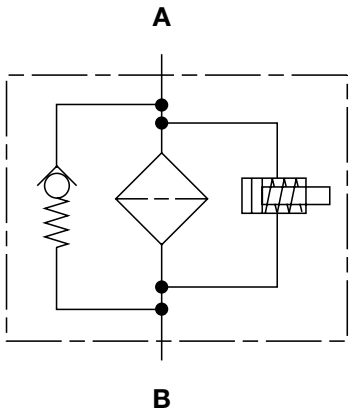
Housing Size	# of Elements	Size	...R...BN/AM		...R...P/HC (Paper)	...R...W/HC (Wire Screen)
			3 µm	10 µm	10 µm	25, 50, 100, 200 µm
1300	2	1300	0.088	0.033	0.007	0.0027
2600	2	2600	0.052	0.019	0.003	0.0011
5200	4	2600	0.026	0.010	0.002	0.0005
7800	6	2600	0.017	0.006	0.001	0.0004
10400	8	2600	0.013	0.005	0.0008	0.0003

All Element K Factors in psi / gpm.

MFX Series
Inline Filters
725 psi • up to 35 gpm



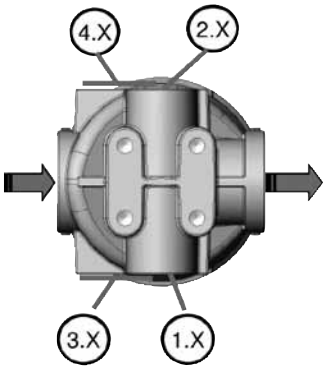
Hydraulic Symbol



Features

- Eco-friendly, cost-effective alternative to spin-on filters
- Integrated retrofit protection
- Longer service life of the filter bowl because of fatigue resistant up to 725 psi
- High level operating safety. Bowl seal and bypass valve are integrated in the filter element and therefore renewed at every element change.
- “Missing Element Protection”
- High diversity of clogging indicators
- Various connection types (SAE-12, G ¾, SAE-16, G 1, M33x2)

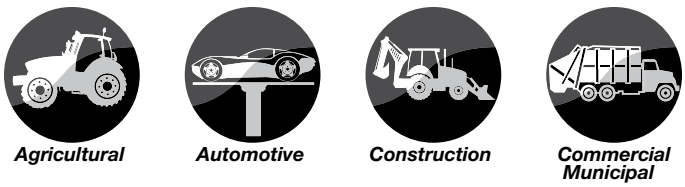
Clogging Indicator Assignment



Technical Details

Mounting Method	4 Mounting holes (3/8-16UNC)
Port Connection	SAE-12, G 3/4 SAE-16, G 1, M33x2
Flow Direction	Inlet: Side Outlet: Side (opposite each other)
Construction Materials	
Head	Die Cast Aluminum
Bowl	Extruded Aluminum
Flow Capacity	
100 200	26 gpm (100lpm) 35 gpm (130 lpm)
Housing Pressure Rating	
Max. Operating Pressure	725 psi (50 bar)
Proof Pressure	870 psi (60 bar)
Fatigue Pressure	725 psi (50 bar) @ 1 million cycles
Burst Pressure	2600 psi (183 bar)
Element Collapse Pressure Rating	
BN/HC	290 psid (20 bar)
ECO/N, MM	145 psid (10 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoro-Rubber or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 35 psi (2.4 bar) -10%	
Bypass Valve Cracking Pressure	
ΔP = 50 psid (35 bar) +10%	

Applications



Model Code

MFX BN/HC 100 G I 10 A 4 . 0 / B3.5

Filter Type
MFX = In-Line Medium Pressure Filter

Filter Media
BN/HC, ECO/N, MM

Size
100, 200

Operating Pressure
G = 725 psi (50 bar)

Type of Connection
H = G 3/4
I = 1 1/16-16UNF (SAE 12)
J = G 1
K = 1 5/16-12UNF (SAE 16)
L = M33x2

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC, ECO/N 10, 15 = MM

Type of Clogging Indicator
A, W, B/BM, C, M, D, BF

Indicator Location
1-4 = 3 + 4 BF Indicator only
1 + 2 not with BF indicato

Type Modification Number *(latest version always supplied)*

Supplementary Details
B1.7 = Cracking pressure of the bypass valve 25 psi (1.7) bar
B3.5 = Standard, cracking pressure of the bypass valve 50 psi (3.5 bar)
V = Fluoroelasromer (FPM) seals, filter suitable for fast bio-degradable fluids and phosphate esters (HFD-R)
L... = Lamp for relevant voltage (24V, 48V, 110V, 220V)
LED = 2 LEDs up to a voltage of 24 Volt

Replacement Element Model Code

0100 MX 010 BN4HC / - B3.5

Size
0100, 0200

Type
MX

Filtration Rating *(micron)*
003, 005, 010, 020 = BN4HC, ECO/N
010, 015 = MM

Filter Material
BN4HC, ECO/N, MM

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals
B1.7 = Cracking pressure of the bypass valve 25 psi (1.7) bar
B3.5 = Standard, cracking pressure of the bypass valve 50 psi (3.5 bar)

Clogging Indicator Model Code

VM 2 B . X / _ _ _ _ _

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar)

Type of Indicator
A = no indicator, plugged port
W = no indicator, without port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
M = Electric switch, single pole
D = Electric switch and light
BF = Visual analog

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

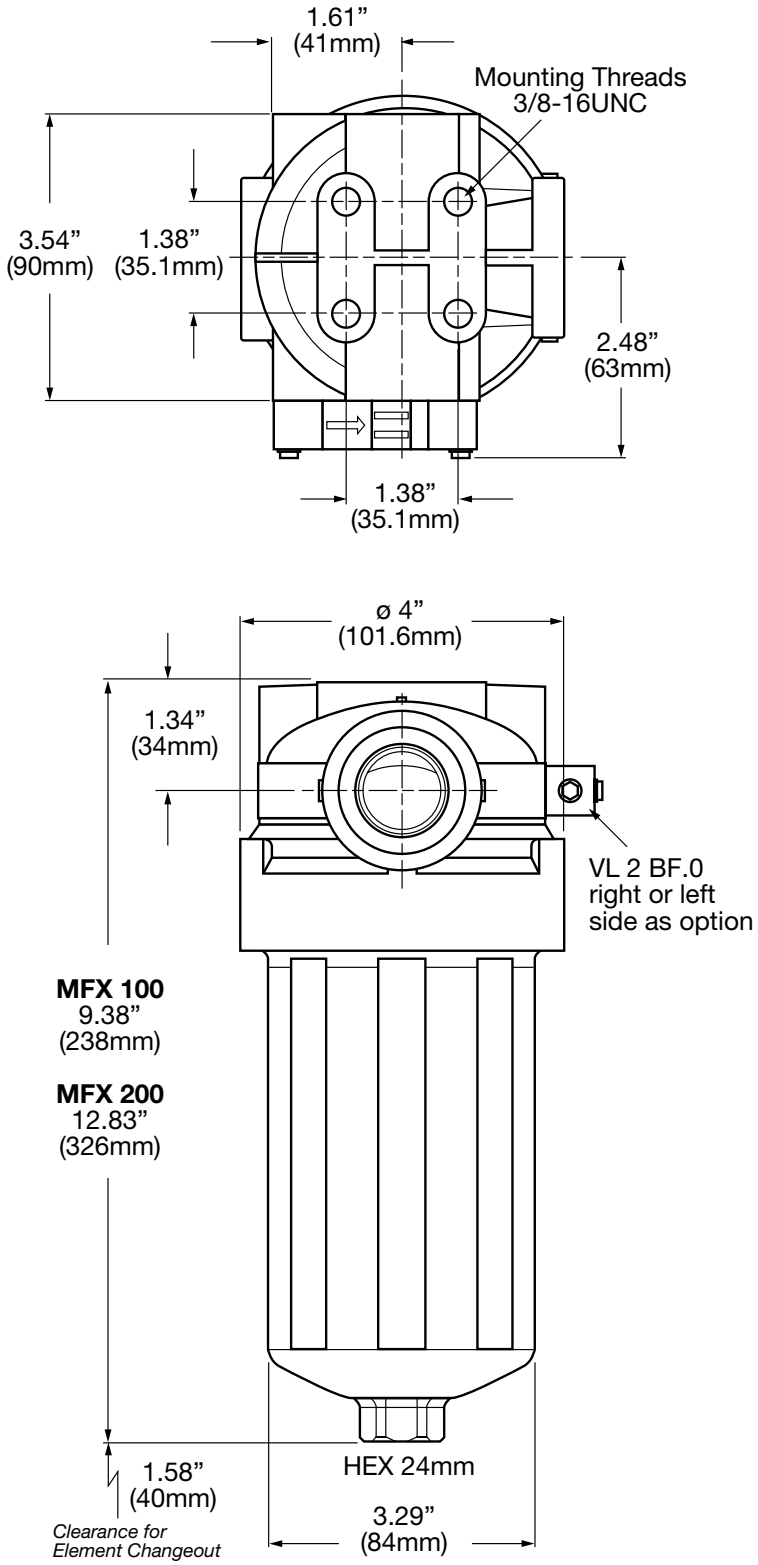
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

MFX Series

Dimensions



Size	100	200
Weight (lbs.)	3.2	3.9

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

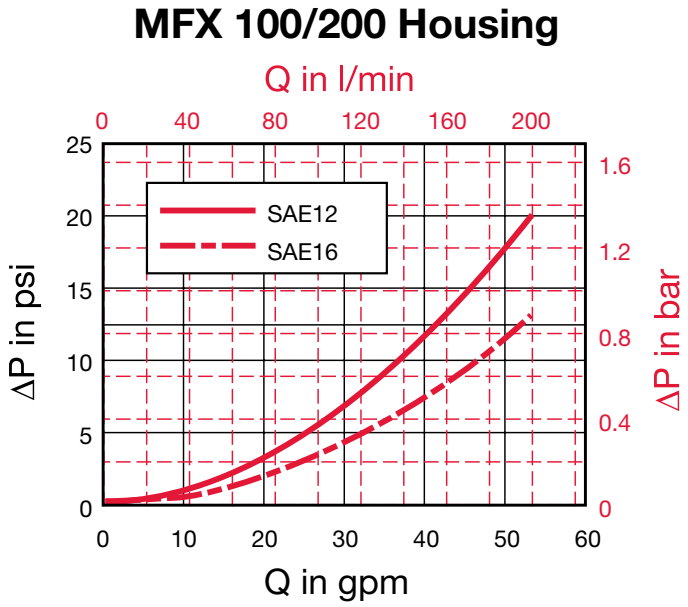
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...MX...BN4HC (Betamicron® Low Collapse)		
	5 µm	10 µm	20 µm
100	0.4941	0.2196	0.1867
200	0.3459	0.1482	0.1098

Size	...MX...ECO/N		
	5 µm	10 µm	20 µm
100	0.5490	0.3569	0.2635
200	0.3239	0.2086	0.1537

Size	...MX...MM	
	10 µm	15 µm
100	0.1482	0.1208
200	0.0878	0.0714

All Element K Factors in psi / gpm.

MF, MFD, MFDS Series

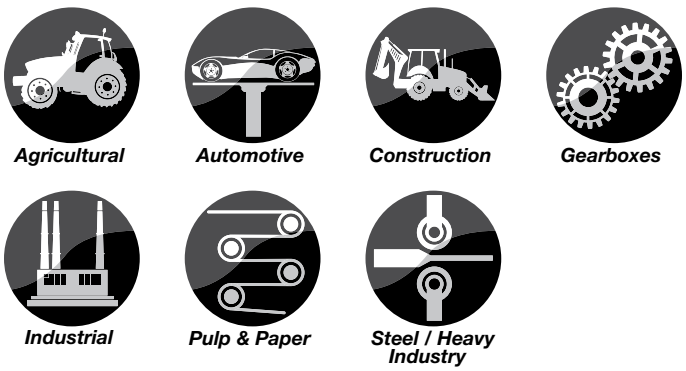
Spin-On Filters

250 PSI • up to 120 GPM

Features

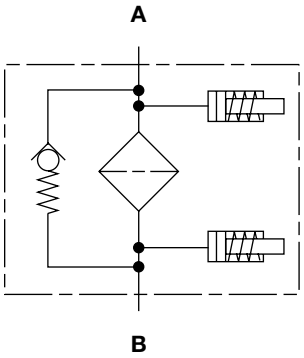
- MF Filters are manufactured with an aluminum head.
- Choice of NPT, SAE straight thread O-ring boss, BSPP, and SAE 4-bolt flange porting to allow easy installation without costly adapters.
- Quick easy element changeouts.
- MF Filters designed to be used with hydrocarbon based fluids only
- MF Filters are available in static and differential pressure sensing configurations.

Applications

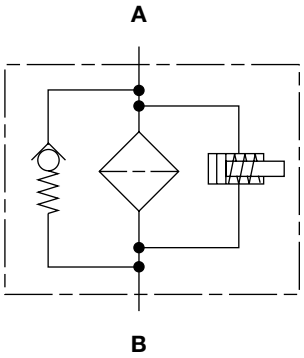


Hydraulic Symbol

MF 40/80/85/160/180



MF 90/95/190/195



Technical Details

Mounting Method		
MF40/80/85	2 mounting holes	
MF90/95	4 mounting holes	
MF160/180	2 or 4 mounting holes	
MF190/195	2 or 3 mounting holes	
MFD	2 mounting holes	
MFDS	4 mounting holes	
Port Connection		
MF40	SAE-6	
MF80/85/90/95	3/4" BSPP, 3/4" NPT, SAE-12, 1" NPT, SAE-16	
MF160/180/190/195	1 1/4" BSPP, 1 1/4" NPT, SAE-20, 1 1/2" NPT, SAE-24	
MFD160/180	1 1/2" NPT, SAE-24	
MFDS160/180*	2" SAE Flange Code 61, 1 1/2" NPT Comb. Port	
MFDS190/195*	2" SAE Flange Code 61, 1 1/2" NPT Comb. Port	
Flow Direction	Inlet: Side	Outlet: Side
Construc. Materials	Head: Aluminum	Can: Steel
Flow Capacity		
40	7 gpm (26 lpm)	
80	15 gpm (57 lpm)	
85	25 gpm (95 lpm)	
90	15 gpm (57 lpm)	
95	25 gpm (95 lpm)	
160,190	30 gpm (114 lpm) per can	
180,195	60 gpm (227 lpm) per can	
Housing Pressure Rating	MF40/80/85/160/180/190/195	MF90/95
Max. Oper. Pressure	120 psi (8 bar)	250 psi (17 bar)
Proof Pressure	180 psi (12.4 bar)	375 psi (26 bar)
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
BN, P, A	80 psid (5.5 bar)	
Fluid Temp. Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Buna-N.		
Indicator Trip Pressure		
ΔP = 20 psid (1.4 bar) -10%		
ΔP = 29 psid (2 bar) -10%		
ΔP = 44 psi (3 bar) *(B3.4 Bypass)*		
Vacuum = 2 psi (0.1 bar) *(Suction)*		
Bypass Valve Cracking Pressure		
ΔP = 3 psid (0.2 bar) +10% *(for suction applications)*		
ΔP = 25 psid (1.7 bar) +10% *(standard for nominal filters)*		
ΔP = 43 psid (3 bar) +10% *(standard for absolute BN filters)*		
ΔP = 50 psid (3.4 bar) +10% *(standard for absolute BN filters, MF 80/90/95/160/180/190/195, MFD 160/180, MFDS 160/180)*		

**Note: Maximum allowable torque for flanged ports is 26 ft-lbs (1/2" - 13 UNC bolts)*

Model Code

MF BN 80 G 5 A 1 . X / 5.2

Filter Type
- MF = Single Element
- MFD = Dual Filter Heads & Elements *(End to End) (sizes 160, 180, 190, & 195 only)*
- MFDS = Dual Filter Heads & Elements *(Side by Side) (sizes 160, 180, 190, & 195 only)*

Element Media
BN = Betamicron® *(Low Collapse)* P = Paper AM = Water Removal

Size
40*, 80*, 85§, 90, 95†, 160, 180, 190 *(uses size 160 element)*, 195 *(uses size 180 element)*

Type of Connection
- G = Threaded
- GF = Combination Threaded/Flanged *(MFDS 160/180 only)*

Filtration Rating *(micron)*
3, 5, 10, 20 = BN/HC 3, 10 25 = P 10 = AM

Type of Clogging Indicator
A, C, E, LE
(Static - sizes 80, 85, 160, 180); (Differential - sizes 90, 95, 190, 195)

Type Number

Modification Number *(latest version always supplied)*

Port Configuration

Assembly	Code	Port	Code	Port	
MF 40	12.1	SAE 6	5.1	3/8" NPT	
MF 80/85, 90/95	0.2 5.2 12.2	3/4" BSPP *(use MA elements)* 3/4" NPT SAE 12 Thread	5.1 12.1	1" NPT SAE 16 Thread	
MF 160/180, MF 190/195	0.2 5.2 12.2	1 1/4" BSPP *(use MA elements)* 1 1/4" NPT SAE 20 Thread	5.1 12.1	1 1/2" NPT SAE 24 Thread	MF 160/180 only
MFD 160/180 MFDS 160/180 MFDS 190/195	5.1 5.1 5.1	1 1/2" NPT 1 1/2" NPT / 2" SAE Flange Combo *(Code 61)* 1 1/2" NPT / 2" SAE Flange Combo *(Code 61)*	12.1	SAE 24 Thread	

Bypass Valve Cracking Pressure
- B1.7 = 25 psid/1.7 bar *(Standard on paper filters sizes 80 - 195 and size 40 BN)*
- B0.2 = 3 psid/0.2 bar *(For Suction Applications)*
- B1.3 = 18 psid/1.3 bar *(size 40 paper only)*
- B3.4 = 50 psid/3.4 bar *(Standard on BN & AM Series) (sizes MF 80/90/95/160/180/190/195 & MFD 160/180 only)*
- KB = No Bypass
- IP2 = Alternate Indicator Position 2 *(sizes MF190/195 or MFDS 190/195)*

Replacement Element Model Code

0080 MA 005 BN

Size
- 0040, 0080 - **(not available with 3 µm BN elements)*
- 0085 - §*(not available with BN, AM and 3 µm P elements)*
- 0095 - †*(not available with 20 µm BN elements)*
- 0090, 0160, 0180

Filtration Rating *(microns)*
3, 5, 10, 20 = BN 3, 10, 25 = P
10 = AM *(not available with size 0085)*

Element Media
BN, P, AM

Supplementary Details
Bypass settings for element 0040 only *(bypass valve is inside element)*
- B1.3 = 18 PSID Bypass (P)
- B1.7 = 25 PSID Bypass (BN)

(Spin-on elements available with NBR seals only)

Clogging Indicator Model Code

VMF 2 B . X /

Indicator Prefix
VMF = Mobile Filters

Trip Pressure
- 2 = 29 psid (2 bar)
- 1.7 = 25 psid (1.7 bar) *(optional)*

Type of Indicator
- A = no indicator, plugged port
- C = Electric switch
- E = Gauge
- LE = Electric pressure switch

Modification Number

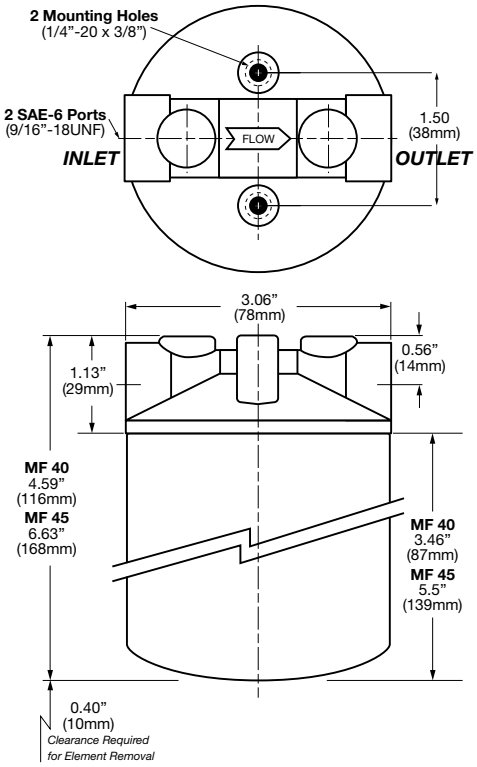
Supplementary Details
Seals
- *(omit)* = Nitrile (NBR) *(standard)*
- V = Fluoroelastomer (FPM)

(*For additional details and options, see Clogging Indicators section.*)

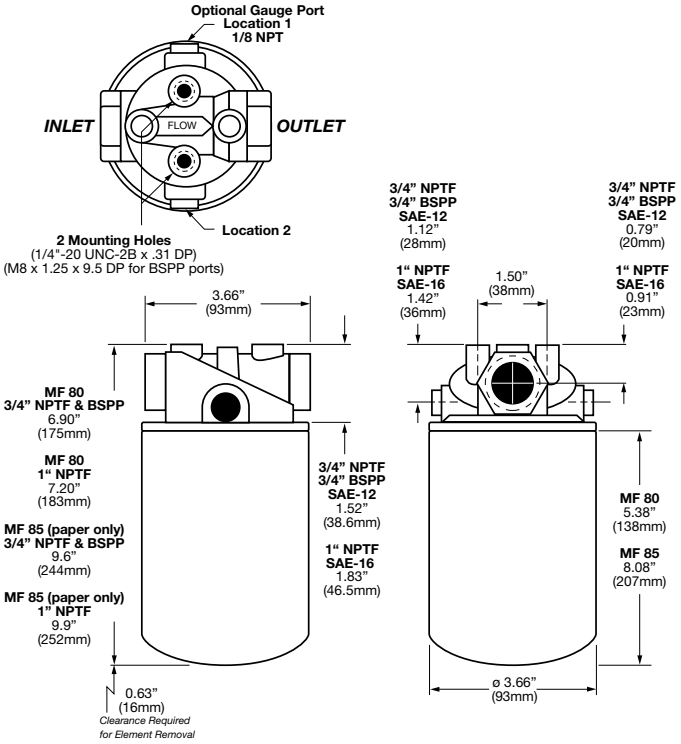
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions

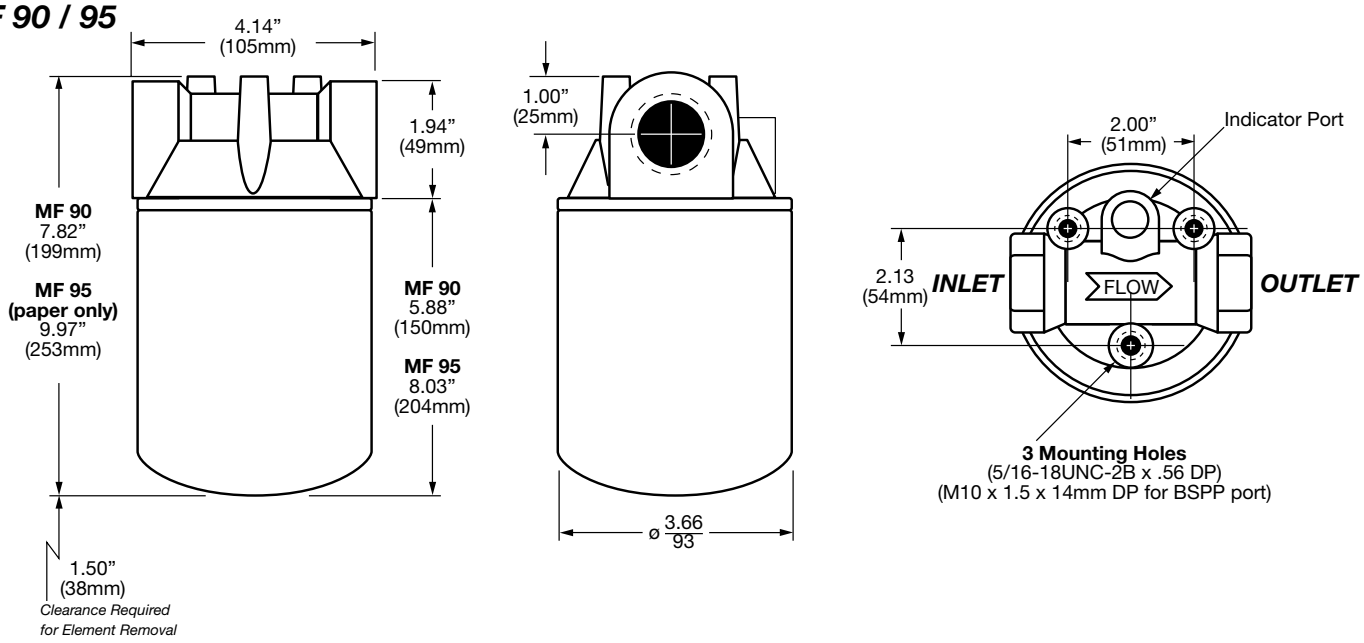
MF 40



MF 80 / 85



MF 90 / 95



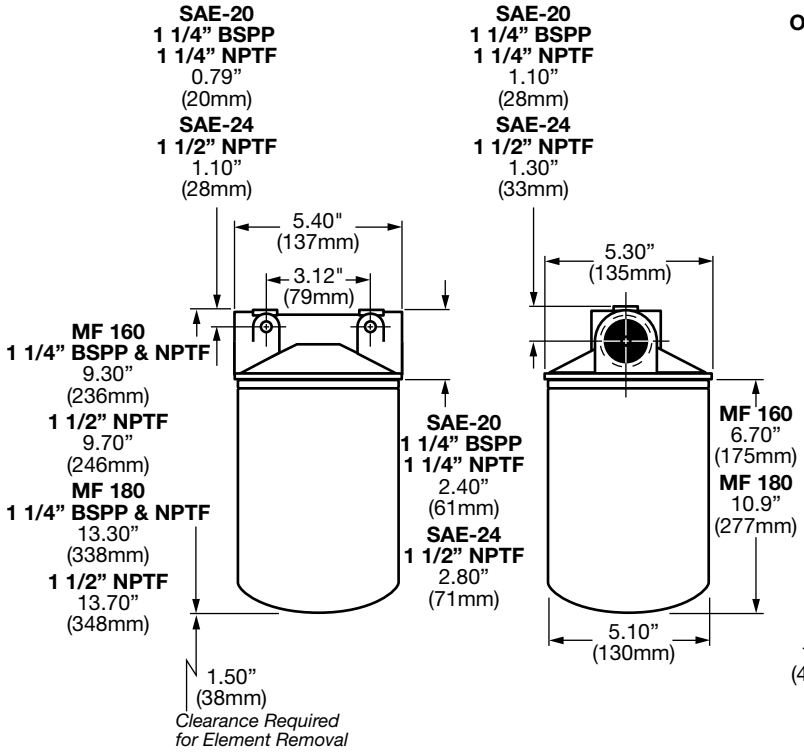
Size	40 Head	40 Can (BN)	40 Can (P)
Weight (lbs.)	0.24	0.73	0.6

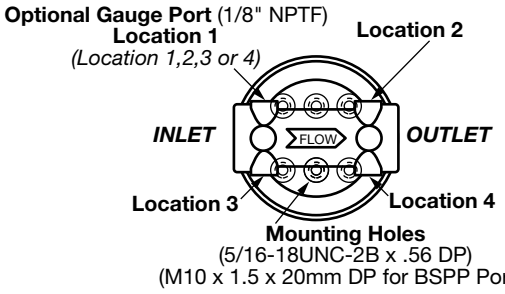
Size	80 / 85 Head	80 Can (BN)	80 Can (P)	85 Can (P)
Weight (lbs.)	0.41	1.35	1.08	1.42

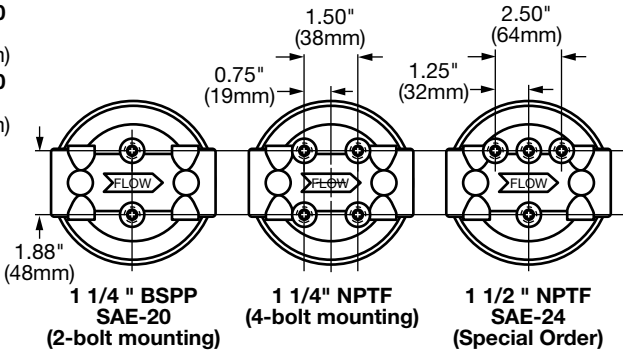
Size	90 / 95 Head	90 Can (BN)	90 Can (P)	95 Can (BN)	95 Can (P)
Weight (lbs.)	1.12	1.5	1.29	2.04	1.47

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

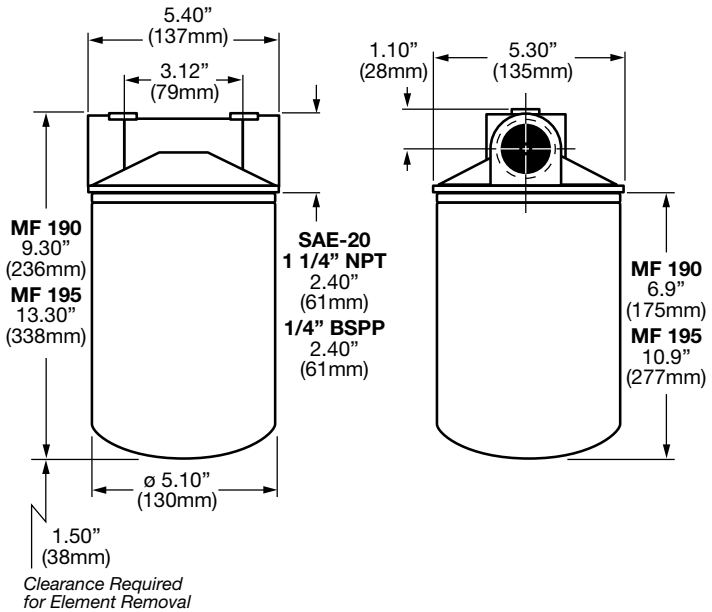
MF 160 / 180

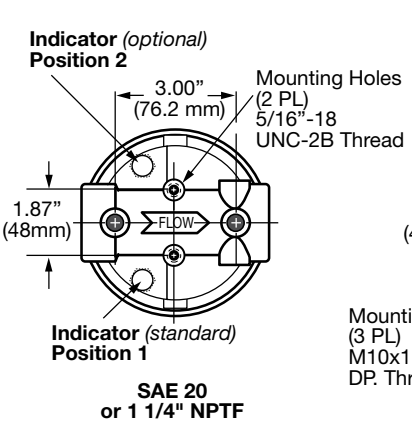


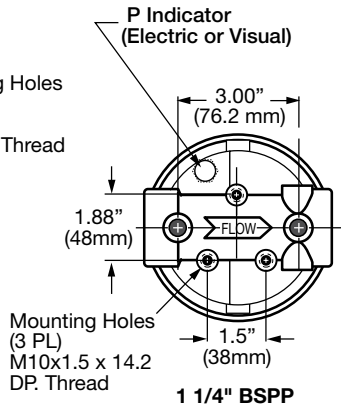




MF 190 / 195





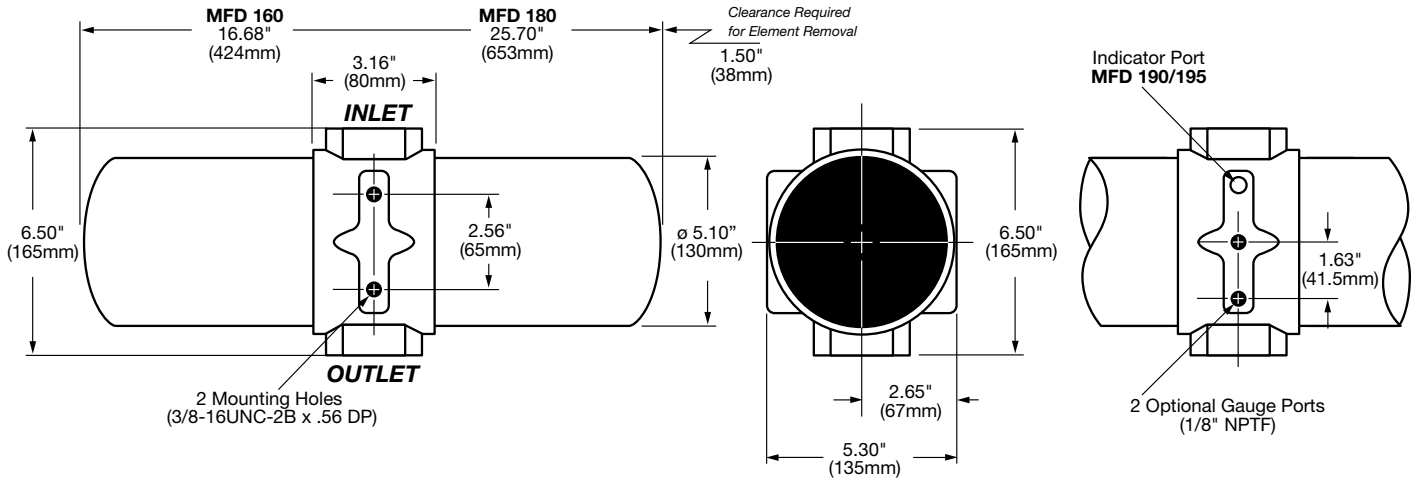


Size	160 / 180 Head	160 Can (BN)	160 Can (P)	180 Can (BN)	180 Can (P)
Weight (lbs.)	1.31	2.56	2.15	3.69	2.68

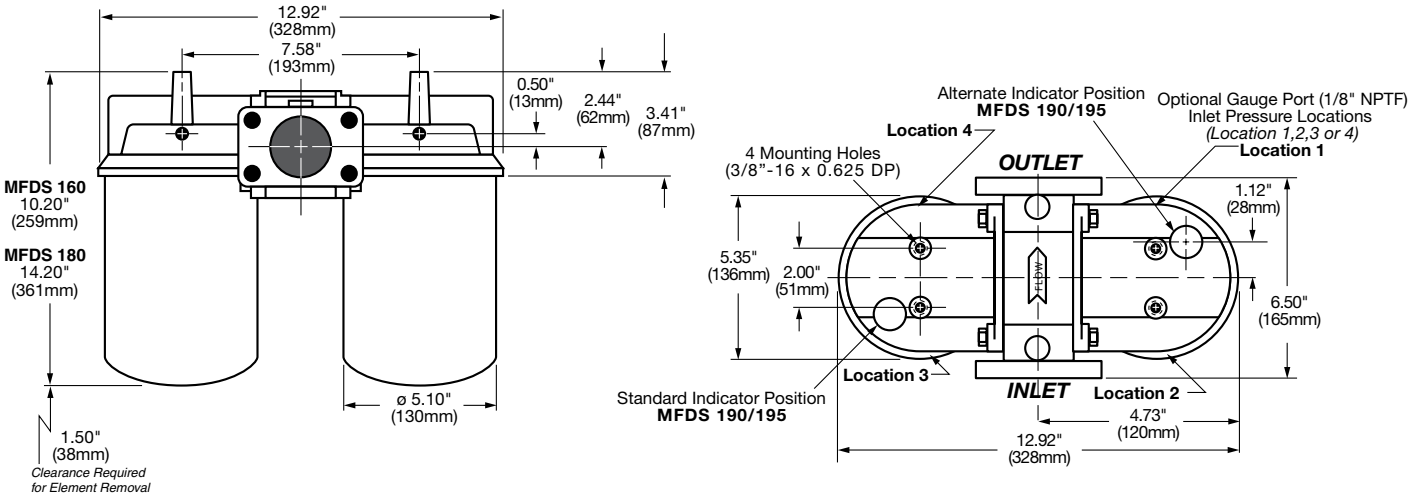
Size	190 / 195 Head	190 Can (BN)	190 Can (P)	195 Can (BN)	195 Can (P)
Weight (lbs.)	1.68	2.56	2.15	3.69	2.68

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

MFD 160 /180



MFDS 160 / 180 / 190 / 195



Size - MFD	160 / 180 Head	160 Can (BN)	160 Can (P)	180 Can (BN)	180 Can (P)
Weight (lbs.)	3.66	2.56	2.15	3.69	2.68

Size - MFDS	160 / 180 Head	160 Can (BN)	160 Can (P)	180 Can (BN)	180 Can (P)
Weight (lbs.)	6.4	2.56	2.15	3.69	2.68

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

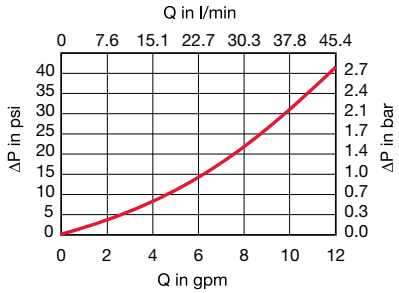
Housing Curve:

Pressure loss through housing is as follows:

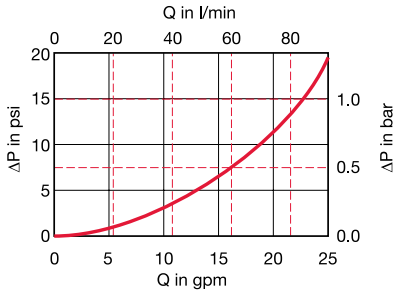
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

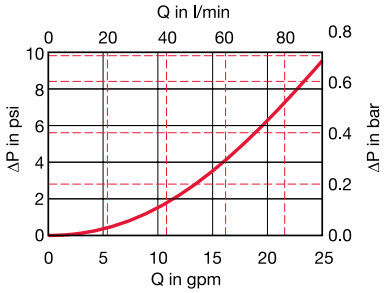
MF 40



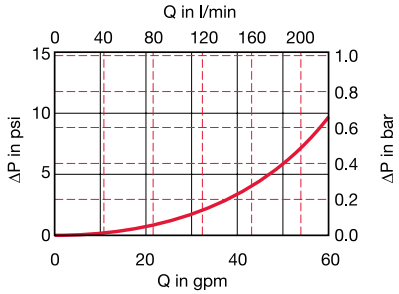
MF 80 / 85



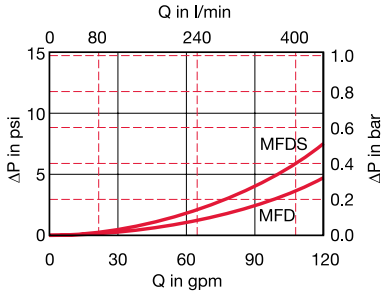
MF 90 / 95



MF 160 / 180 / 190 / 195



MFD / MFDS 160 / 180 / 190 / 195



Aquamicron Water Removal Element Capacity vs. Flow

Spin-On Element	Optimum Flow Rate		Maximum Flow Rate	
	Flow (gpm)	Capacity (quarts)	Flow (gpm)	Capacity (quarts)
0080MA010AM	2	0.12	6	0.08
0090MA010AM	2	0.12	6	0.08
0095MA010AM	4	0.17	8	0.11
0160MA010AM	4	0.23	8	0.16
0180MA010AM	6	0.45	15	0.32

Spin-on Connection Chart

Size	Can Connection Thread		
	MA	MG	MU
0040	3/4" - 16 UN - 2B	—	—
0080	—	3/4" BSPP	—
0080/0085	1" - 12 UN -2B	—	—
0090/0095	1-1/2" - 16 UN - 2B	—	—
0160	—	1-1/4" BSPP	—
0160/0180	1-1/2" - 16 UN - 2B	—	—

MA = UN Tap Plate Thread (standard); MG = BSPP Tap Plate Thread (special); MU = Metric Tap Plate Thread (special - consult HYDAC)

Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

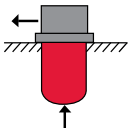
Size	...MA...BN			
	3 µm	5 µm	10 µm	20 µm
0040	1.3914	1.1799	0.6289	0.3613
0080	0.5216	0.4423	0.2357	0.1354
0090	0.4841	0.3702	0.3451	0.1911
0095	0.2762	0.2112	0.1969	0.1090
0160	0.2372	0.1983	0.1113	0.0625
0180	0.1231	0.1029	0.0577	0.0325

Size	...MA...P		
	3 µm	10 µm	25 µm
0040	7.763	2.348	1.516
0080	1.606	0.486	0.314
0085	—	0.351	0.227
0090	1.594	0.482	0.311
0095	0.894	0.270	0.174
0160	0.839	0.192	0.145
0180	0.443	0.134	0.087

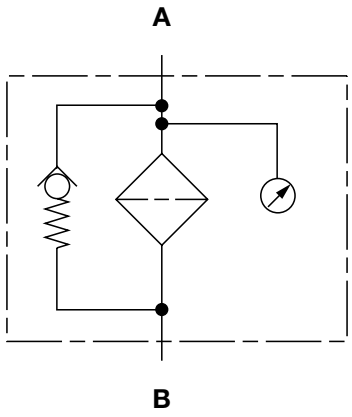
Size	...MA...AM
	010 µm
0080	0.513
0085	0.367
0090	0.507
0095	0.284
0160	0.233
0180	0.136

All Element K Factors in psi / gpm.

SF Series
In-tank Suction Filters
360 psi • up to 300 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Inlet/Outlet port options include NPT port or SAE 4-bolt flange to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, or Ethylene Propylene) provides compatibility with oil/water emulsions, high water base fluids, and synthetic fluids.
- Bolt-on lid requires minimal clearance for removal.
- A mechanically actuated, electrical, electrical / visual (lamp), or vacuum gauge bypass indicator can be installed.
- Bypass valve with low cracking pressure prevents pump cavitation.

Technical Details

Mounting Method	4 mounting holes - filter head	
Port Connection	Inlet	Outlet
110	SAE-12	SAE-12
240	SAE-20	SAE-20
330	SAE-20 2” NPT 2” NPT	2” NPT 2” NPT 2” SAE Flange, Code 61
950	3 1/2” SAE Flange, Code 61	3 1/2” SAE Flange, Code 61
1300	4” SAE Flange, Code 61	4” SAE Flange, Code 61
Flow Direction	Inlet: Bottom	Outlet: Side
Construc. Materials	Housing	Lid
SF 110-330 SF 950-1300	Aluminum Ductile Iron	Aluminum Ductile iron
Flow Capacity		
110 240 330 950 1300	5 gpm (20 lpm) 20 gpm (80 lpm) 40 gpm (150 lpm) 200 gpm (757 lpm) 300 gpm (1135 lpm)	
Housing Pressure Rating		
Max. Oper. Press. Proof Pressure Fatigue Pressure	360 psi (25 bar) 540 psi (38 bar) 360 psi (25 bar) @ 700,000 cycles	
Burst Pressure	110 240 330 950-1300	1080 psi (75 bar) 1230 psi (85 bar) 1440 psi (100 bar) >1440 psi (100 bar)
Element Collapse Pressure Rating		
W/HC P/HC	290 psid (20 bar) 145 psid (10 bar)	
Fluid Temp. Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 3 psi (0.2 bar) -10% *(standard)*		
Bypass Valve Cracking Pressure		
ΔP = 3 psi (0.2 bar) +10% *(standard)*		

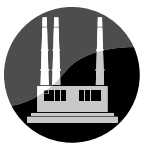
Applications


Agricultural


Automotive


Construction


Gearboxes


Industrial


Steel / Heavy Industry

Model Code

SF W/HC 330 W G 25 UE 1 . 1 / 3 __ B0.2

Filter Type
SF = In-Tank Inlet Suction Filter

Element Media
W/HC = Wire Screen

Size
110, 240, 330, 950, 1300

Operating Pressure
W = suction operation

Type of Connection
C = SAE 12 *(sizes 110)*
E = SAE 20 *(sizes 240 - 330)*
G = 2" NPT *(size 330)*
NPT available w/Adapter
L = 2" NPT Inlet / SAE 32 Flange Outlet *(size 330)*
O = SAE 56 Flange *(size 950)*
P = SAE 64 Flange *(size 1300)*

Filtration Rating *(micron)*
25, 74, 149 = W/HC

Type of Clogging Indicator *(static)*
A, UE, UF

Type Number

Modification Number *(latest version always supplied)*

Outlet Port Configuration
3 = NPT *(size 330)*
12 = SAE Straight Thread Inlet/Outlet Connection *(sizes 110 & 240 only)*
16 = SAE Code 61 Flange *(sizes 330-1300)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPR)

Cracking Pressure of Bypass Valve
B0.2 = 3 psid (0.2 bar) *(standard)*

Replacement Element Model Code

0330 RS 25 W/HC / V

Size
0330, 0660, 0950, 1300

Filtration Rating *(micron)*
25, 74, 149 = W/HC

Element Media
W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VR 2 UE . X /

Indicator Prefix
VR = Return Filters

Trip Pressure
0.2 = 3 psid (0.2 bar)

Type of Indicator
A = no indicator, plugged port
UE = Vacuum gauge
UF = Vacuum switch

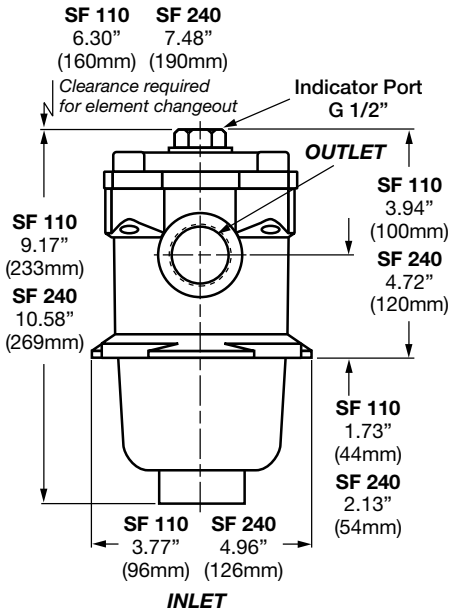
Modification Number

Supplementary Details
Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

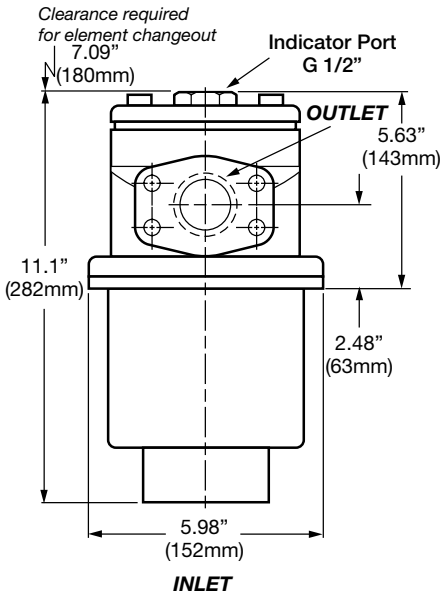
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

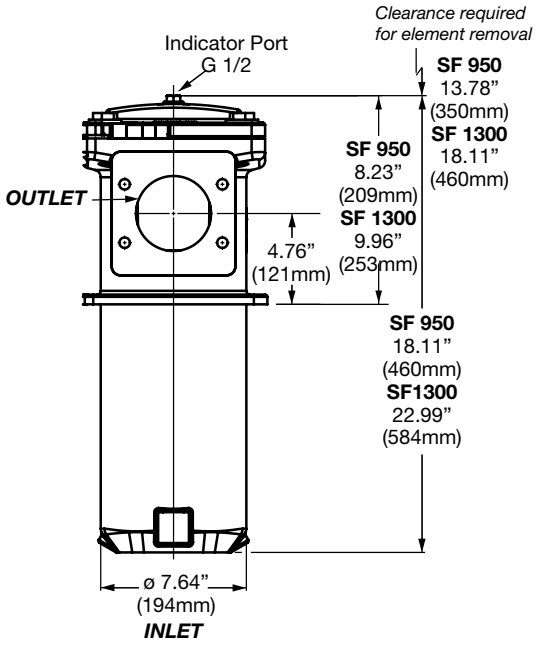
Dimensions
SF 110 / 240



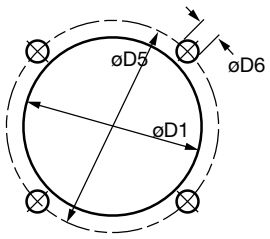
SF 330



SF 950 / 1300



Mounting Pattern



Size	øD1	øD5	øD6
110	3.15" (80mm)	3.94" (100mm)	0.26" (6.5mm)
240	4.17" (106mm)	5.32" (135mm)	0.30" (7.5mm)
330	5.31" (135mm)	6.9" (170mm)	0.35" (9mm)
950/1300	8.19" (208mm)	11.42" (290mm)	0.71" (18mm)

Size	SF 110	SF 240	SF 330	SF 950	SF 1300
Weight (lbs.)	2.0	3.7	7.5	86	94.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

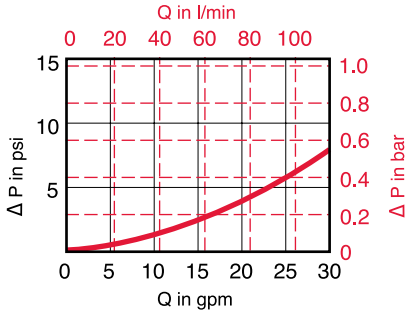
Housing Curve:

Pressure loss through housing is as follows:

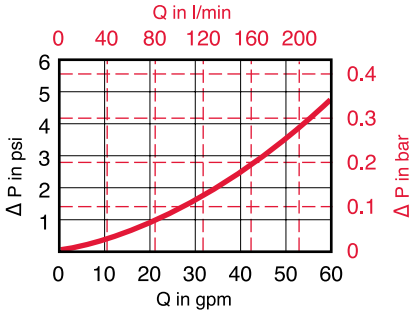
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

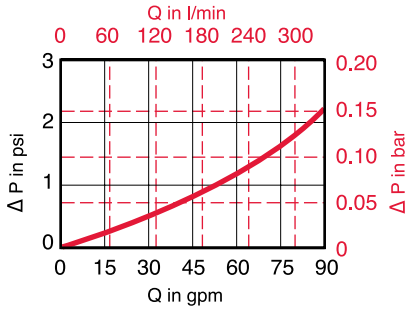
SF 110 HOUSING



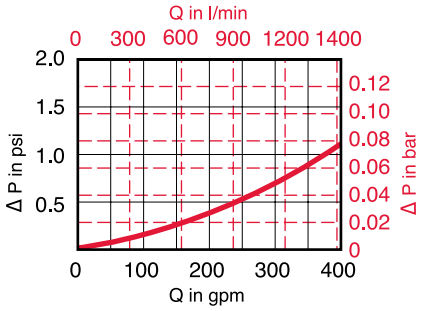
SF 240 HOUSING



SF 330 HOUSING



SF 950/1300 HOUSING



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	**W/HC** (Wire Screen) **25, 74, 149 µm**
0110	0.0285
0240	0.0137
0330	0.0099
0950	0.0033
1300	0.0027

All Element K Factors in psi / gpm.

LPF Series
Inline Filters
1000 psi • up to 140 gpm

Features

- LPF filters are manufactured with cast aluminum head and aluminum cold formed bowls.
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF) - except LPF 660.
- LPF filters are a desirable substitute for spin-on filters when dynamic fluid conditions call for the superior durability and leak-proof quality of a well-constructed cartridge filter.
- Quick-response, bypass valves protect against high differential pressures caused by cold start-ups, flow surges and pressure spikes. Filters can also be supplied without bypasses.
- The simple inline design minimizes pressure drop and provides the significant benefit of compactness. The use of lightweight materials, makes these filters ideal for mobile equipment applications.

NEW!

- Sizes 160/240/280
- 2-piece design
- Easier servicability
- Upgraded operating pressure; now 725 psi (50 bar)

Applications


Agricultural

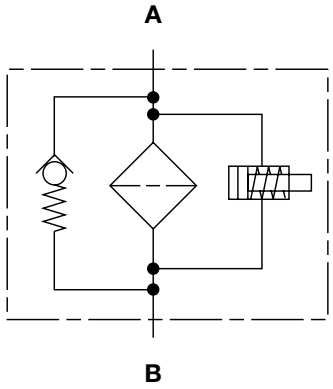

Automotive


Construction


Industrial


Steel / Heavy Industry

Hydraulic Symbol



Technical Details

Mounting Method	35 - 55: 3 mounting holes 160 - 280: 2 mounting holes 660: 4 mounting holes	
Port Connection		
35 - 55	SAE-8, 1/2" BSPP	
160 - 280	SAE-20, 1 1/4" BSPP	
660	SAE-24	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Cast Aluminum	
Bowl	Aluminum Extrusion	
Flow Capacity		
35	9 gpm (35 lpm)	
55	15 gpm (55 lpm)	
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
280	74 gpm (280 lpm)	
660	174 gpm (660 lpm)	
Housing Pressure Rating		
Max. Oper. Pressure	35 - 55	580 psi (40 bar)
	160 - 280	725 psi (50 bar)
	660	1000 psi (69 bar)
Proof Pressure	35 - 55	870 psi (60 bar)
	160 - 280	1088 psi (75 bar)
	660	1500 psi (100 bar)
Fatigue Pressure	35 - 55	Contact HYDAC
	160 - 280	725 psi (50 bar)
	660	1000 psi (69 bar)
Burst Pressure	35 - 55	Contact HYDAC
	160 - 280	> 3625 psi (200 bar)
	660	4000 psi (276 bar)
Element Collapse Pressure Rating		
BH/HC, V		3045 psid (210 bar)
BN/HC, W/HC		290 psid (20 bar)
Fluid Temp. Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)*		
ΔP = 72 psid (5 bar) -10% *(standard)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)*		
ΔP = 87 psid (6 bar) +10% *(standard sizes 160 - 660)*		
ΔP = 100 psid (7 bar) +10% *(standard sizes 35 / 55)*		

Model Code

LPF BN/HC 280 G E 3 A 1 . 2 / 12 _ B6 _

Filter Type
LPF Inline filter

Element Media
BH/HC = Betamicron® *(High Collapse)* BN/HC = Betamicron® *(Low Collapse)*
W/HC = Wire Screen

Size
35, 55, 160, 240, 280, 660

Operating Pressure
(omit) = 1000 psi *(size 660)*
G = 725 psi *(sizes 160, 240, 280)*
E = 580 psi *(size 35 & 55)*

Type of Connection
E = SAE 20 J = 3/4 - 16 UNF *(size 35 & 55)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BH/HC, BN/HC 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, BF, C, D *(size 660 only includes an SAE ported indicator, consult HYDAC for details)*

Type Number
1
2 *(sizes 160, 240, 280 only)*

Modification Number *(latest version always supplied)*

Port Configuration
0 = BSPP Ports (160 - 280 = G 1 1/4")
12 = SAE Thread
Not required for sizes 35 and 55

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(BH4HC elements recommended)*
B3 = 43 psid bypass *(optional)*
B6 = 87 psid bypass *(standard) (sizes 160 - 660 only)*
B7 = 102 psid bypass *(standard) (sizes 35 - 55 only)*

Supplementary
SO103H = Modification of BN4HC *(Betamicron® Low Collapse)* Element For Phosphate Ester Fluids
SO155H = Modification of BH4HC *(Betamicron® High Collapse)* Element For Phosphate Ester Fluids
SO150H = Anodized filter head for water based fluids *(size 660 only)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Thermal Lockout on indicator at 100˚F *(contact HYDAC for B or BM type indicators)*

Replacement Element Model Code

0035 D 010 BN4HC / V

Size
0035, 0055, 0160, 0240, 0280, 0660

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN4HC
25, 74, 149 = W/HC

Element Media
BH4HC, BN4HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi *(sizes 35-280)*
Note: for size 660, consult HYDAC

Trip Pressure
2 = 29 psid (2 bar)
5 = 72 psid (5 bar)
(optional)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
BF = Visual analog
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

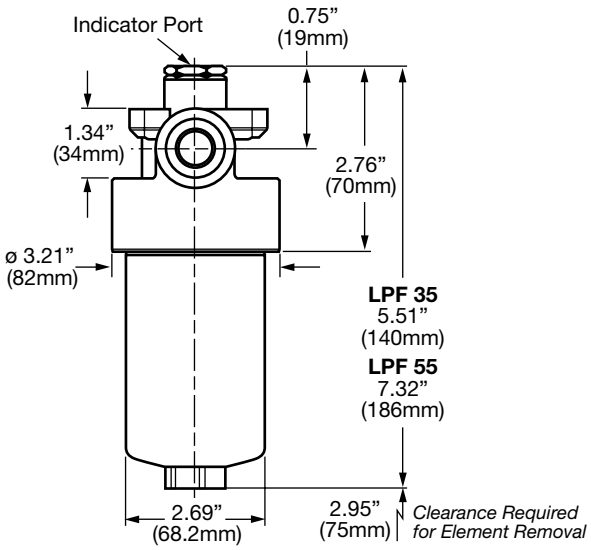
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

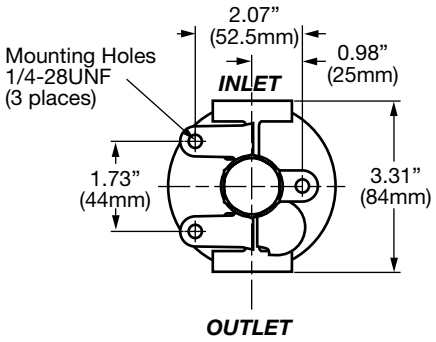
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

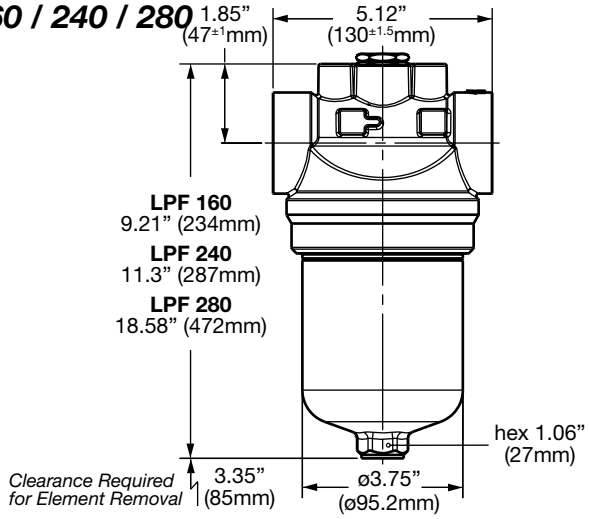
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

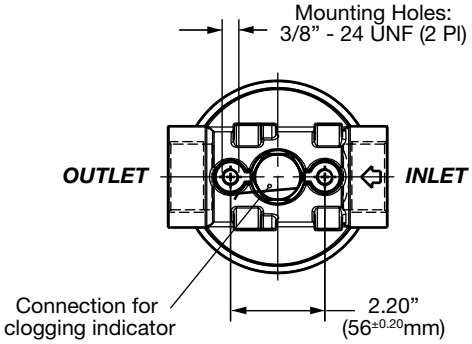
Dimensions LPF 35 / 55



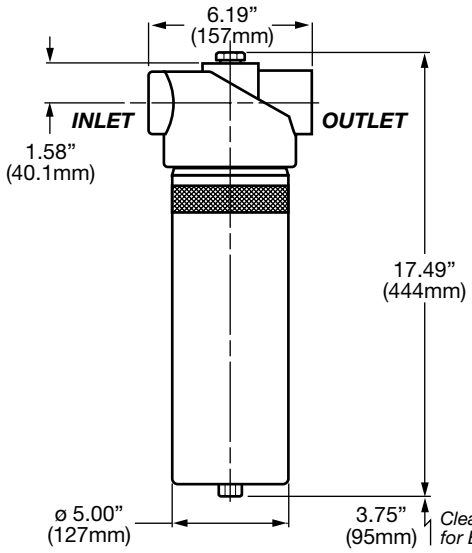


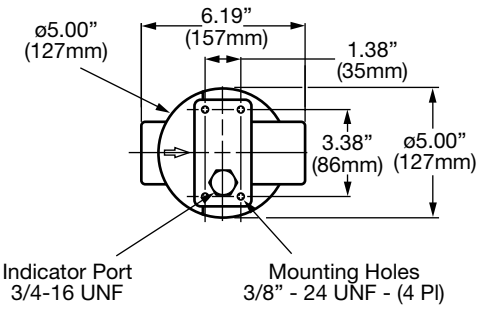
LPF 160 / 240 / 280





LPF 660





Size	35	55	160	240	280	660
Weight (lbs.)	2.2	2.4	5.1	5.5	7.5	11.7

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

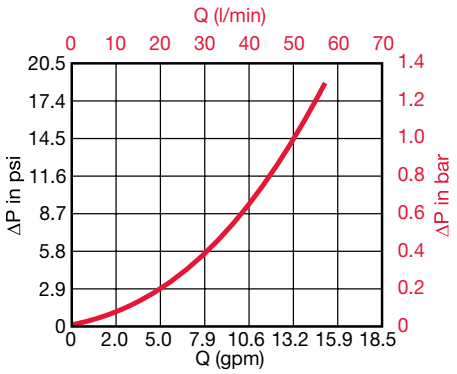
Housing Curve:

Pressure loss through housing is as follows:

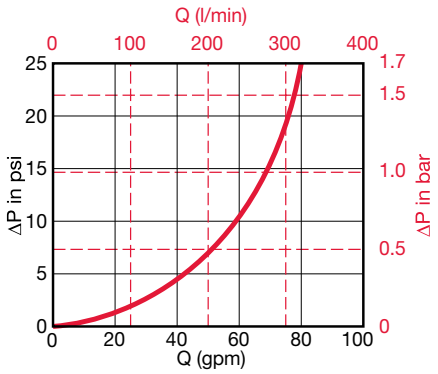
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

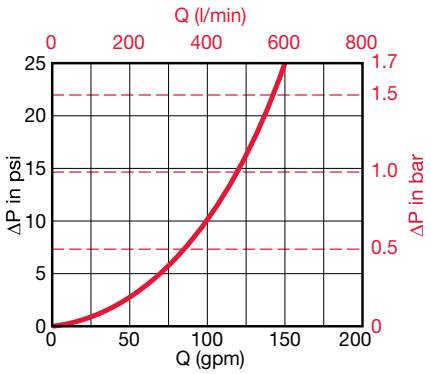
LPF 35 / 55 Housing



LPF 160 / 240 / 280 Housing



LPF 660 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

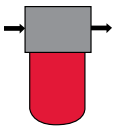
Size	**...D...BN4HC** (Betamicron® Low Collapse)			
	3 µm	**5 µm**	**10 µm**	**20 µm**
0035	1.294	1.041	0.811	0.510
0055	0.751	0.603	0.444	0.263
0160	0.718	0.480	0.252	0.193
0240	0.450	0.333	0.196	0.128
0280	0.220	0.171	0.092	0.071
0660	0.136	0.099	0.061	0.044

Size	**...D...BH4HC** (Betamicron® High Collapse)			
	3 µm	**5 µm**	**10 µm**	**20 µm**
0035	–	–	–	–
0055	–	–	–	–
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0660	0.179	0.106	0.055	0.049

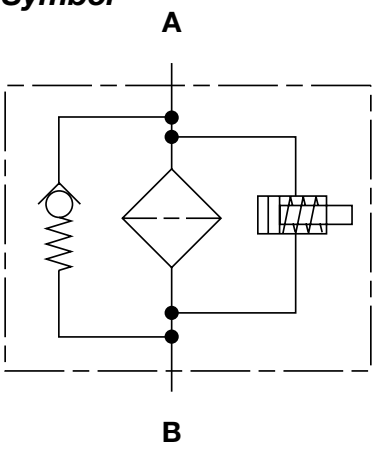
Size	**...D...W/HC** (Wire Screen)
	25, 50, 100,200 µm
0035	–
0055	–
0160	0.016
0240	0.010
0280	0.009
0660	0.004

All Element K Factors in psi / gpm.

LF Series
Inline Filters
1500 psi • up to 180 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF).
- Inlet & outlet port options include NPT and SAE straight thread O-ring boss to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, EPDM) 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, and contaminated fluid cannot be washed downstream when element is serviced.
- Differential Pressure Indicators. HYDAC indicators have no external dynamic seal. This results in a high system reliability due to magnetic actuation, thus eliminating a potential leak point.
- A poppet-type bypass valve (optional) is separate from the main flow path (except LF 60 / 110) to provide positive sealing during normal operation and fast opening during cold starts and flow surges.
- For special finishes and coatings – consult HYDAC for minimum quantities, availability and pricing.

Applications


Agricultural


Automotive


Construction


Industrial


Railways


Steel / Heavy Industry

Technical Details

Mounting Method	4 mounting holes	
Port Connection		
30	SAE-8, 1/2” NPT, 1/2” BSPP	
60/110	SAE-12, 3/4” NPT, 3/4” BSPP	
160/240/280	SAE-20, 1 1/4” NPT, 1 1/4” BSPP	
330/660	SAE-24, 1 1/2” NPT, 1 1/2” BSPP	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Cast Aluminum	
Bowl	Aluminum Extrusion (sizes 30 - 330)	
	Steel (sizes 280 & 660)	
Flow Capacity		
30	8 gpm (30 lpm)	
60	16 gpm (60 lpm)	
110	29 gpm (110 lpm)	
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
280	74 gpm (280 lpm)	
330	84 gpm (330 lpm)	
660	174 gpm (660 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	1500 psi (100 bar)	
Proof Pressure	2250 psi (150 bar)	
Fatigue Pressure	1500 psi (100 bar)	
Burst Pressure	size 30 5510 psi (380bar)	
	sizes 60 - 660 > 6090 psi (420 bar)	
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
BN/HC, W/HC	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)*		
ΔP = 72 psid (5 bar) -10% *(standard)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)*		
ΔP = 87 psid (6 bar) +10% *(standard)*		

Model Code

LF BH/HC 30 I B 3 A 1 . 0 / 3

Filter Type
LF = Inline filter

Element Media
BH/HC = Betamicron® *(High Collapse)*
V = Metal Fiber
BN/HC = Betamicron® *(Low Collapse)*
W/HC = Wire Screen

Size
30, 60, 110, 160, 240, 280, 330, 660

Operating Pressure
I = 1500 PSI (100 bar)

Type of Connection
B = SAE-8 *(size 30 only)*
C = SAE-12 *(sizes 60 & 110 only)*
E = SAE-20 *(sizes 160, 240, & 280 only)*
F = SAE-24 *(sizes 330 & 660 only)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BH/HC, BN/HC
3, 5, 10, 20 = V
25, 74, 149 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1 = Sizes 30 to 660

Modification Number *(latest version always supplied)*

Port Configuration
0 = BSPP
3 = NPT Ports *(with adapters)*
12 = SAE Straight Thread O-Ring Boss Ports

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(BH4HC or V elements recommended)*
B3 = 43PSID Bypass *(optional)*
B6 = 87PSID Bypass *(standard)*

Supplementary Details
SO103H = Modification of BN4HC *(Low Collapse)* Element For Phosphate Esters
SO150H = Head & Bowl Anodized for High Water Based Fluids (HWBF) *(sizes 60 & 110 only)*
SO155H = Modification of BH4HC *(High Collapse)* Element For Phosphate Esters
SO184 = G-1/2 Drain in Bowl Option For Sizes 60 - 280 *(comes standard for sizes 330, 660, & 1320)*
W = Indicator with brass piston *(for use with water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0030 D 010 BN4HC / V

Size
0030, 0060, 0110, 0160,
0240, 0280, 0330, 0660

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN4HC
3, 5, 10, 20 = V
25, 74, 149 = W/HC

Element Media
BH4HC, BN4HC, V, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

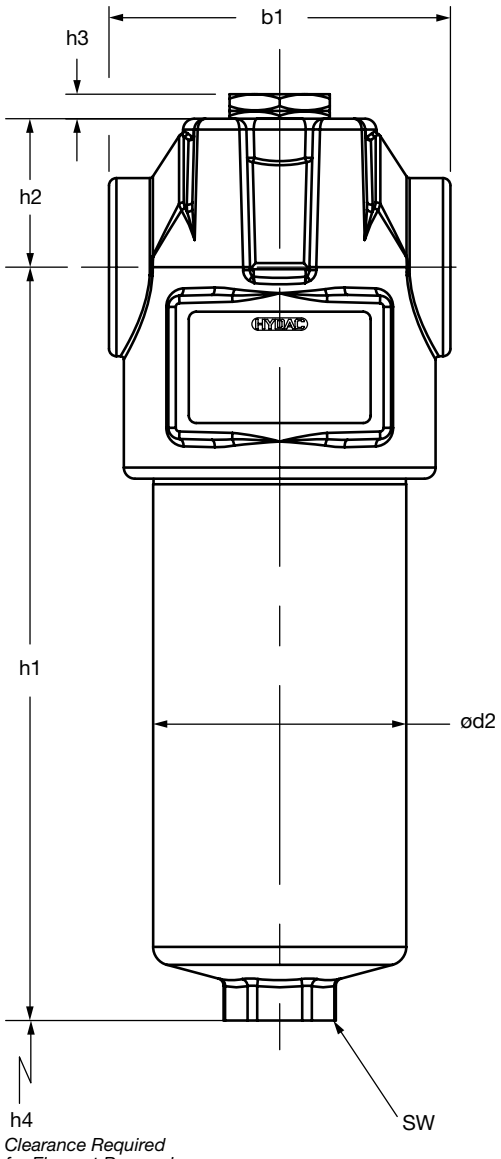
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

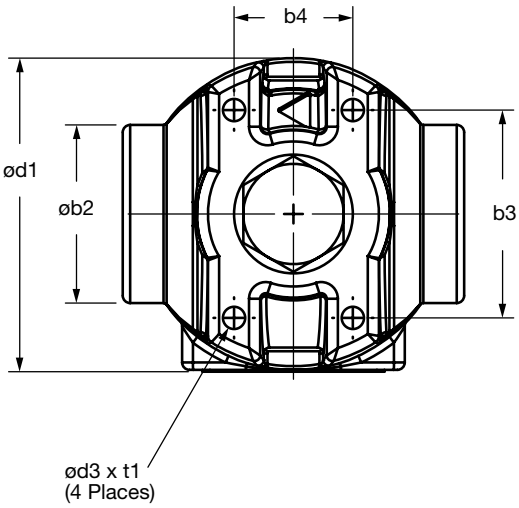
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions LF 30 - 660





Size	b1	b2	b3	b4	d1	d2	d3	h1	h2	h3	h4	SW	t1
30	2.72" 69mm	1.42" 36mm	1.77" 45mm	1.18" 30mm	2.64" 67mm	2.05" 52mm	10-32UNF-2B	4.94" 125.5mm	1.22" 31mm	0.27" 7.0mm	2.95" 75mm	0.94" 24mm	0.24" 6.0mm
60	3.54" 90mm	1.89" 48mm	2.20" 56mm	1.26" 32mm	3.31" 84mm	2.68" 68mm	1/4-28UNF-2B	5.41" 137.5mm	1.53" 39mm	0.24" 6.0mm	2.95" 75mm	1.06" 27mm	0.35" 9.0mm
110	3.54" 90mm	1.89" 48mm	2.20" 56mm	1.26" 32mm	3.31" 84mm	2.68" 68mm	1/4-28UNF-2B	8.15" 207mm	1.53" 39mm	0.24" 6.0mm	2.95" 75mm	1.06" 27mm	0.35" 9.0mm
160	4.92" 125mm	2.56" 65mm	3.35" 85mm	1.38" 35mm	4.57" 116mm	3.74" 95mm	3/8-24UNF-2B	7.50" 190.5mm	1.81" 46mm	0.24" 6.0mm	3.74" 95mm	1.26" 32mm	0.55" 14mm
240	4.92" 125mm	2.56" 65mm	3.35" 85mm	1.38" 35mm	4.57" 116mm	3.74" 95mm	3/8-24UNF-2B	9.86" 250.5mm	1.81" 46mm	0.24" 6.0mm	3.74" 95mm	1.26" 32mm	0.55" 14mm
280	4.92" 125mm	2.56" 65mm	3.35" 85mm	1.38" 35mm	4.57" 116mm	3.74" 95mm	3/8-24UNF-2B	9.86" 250.5mm	1.81" 46mm	0.24" 6.0mm	3.74" 95mm	1.26" 32mm	0.55" 14mm
330	6.26" 159mm	3.35" 85mm	4.53" 115mm	2.36" 60mm	6.30" 160mm	5.12" 130mm	1/2-20UNF-2B	9.94" 252.5mm	1.97" 50mm	0.24" 6.0mm	4.13" 105mm	1.42" 36mm	0.47" 12mm
660	6.26" 159mm	3.35" 85mm	4.53" 115mm	2.36" 60mm	6.30" 160mm	5.12" 130mm	1/2-20UNF-2B	16.44" 417.5mm	1.97" 50mm	0.24" 6.0mm	4.13" 105mm	1.42" 36mm	0.47" 12mm

Size	30	60	110	160	240	280	330	660
Weight (lbs.)	1.76	3.3	3.96	8.15	9.5	25.6	17.6	38.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

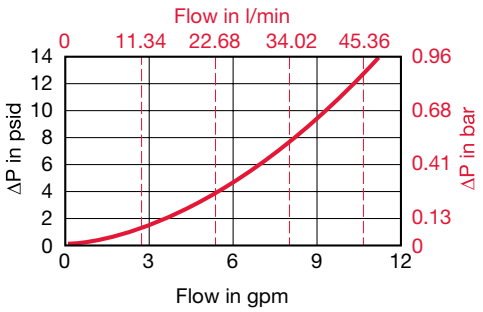
Housing Curve:

Pressure loss through housing is as follows:

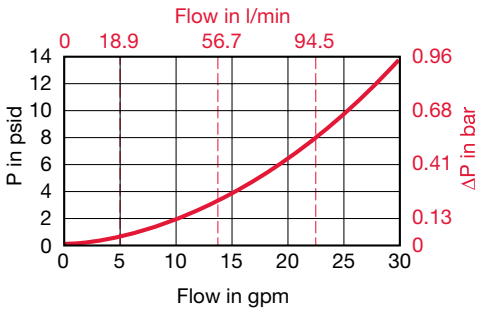
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

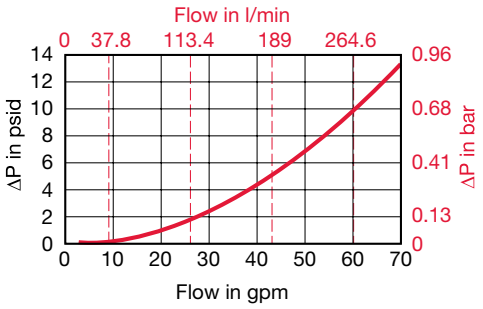
LF 30 Housing



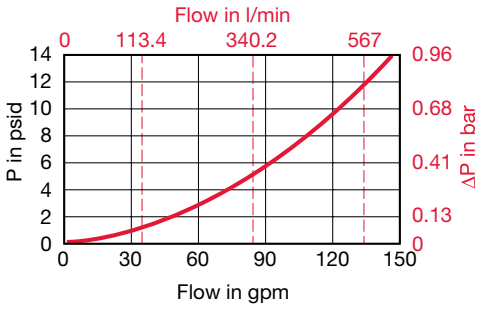
LF 60 / 110 Housing



LF 160 / 240 / 280 Housing



LF 330 / 660 Housing



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	3.504	2.374	1.251	0.618
0060	1.582	1.116	0.723	0.433
0110	0.819	0.585	0.361	0.205
0160	0.718	0.480	0.252	0.193
0240	0.450	0.333	0.196	0.128
0280	0.220	0.171	0.092	0.071
0330	0.294	0.215	0.163	0.095
0660	0.136	0.099	0.061	0.044

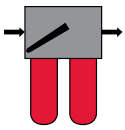
Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	5.000	2.780	1.989	1.042
0060	3.210	1.785	0.993	0.669
0110	1.394	0.819	0.488	0.307
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0330	0.422	0.244	0.154	0.108
0660	0.179	0.106	0.055	0.049

Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0030	1.011	0.740	0.411	0.200
0060	0.877	0.511	0.296	0.183
0110	0.452	0.304	0.182	0.118
0160	0.251	0.177	0.123	0.079
0240	0.169	0.137	0.093	0.062
0280	0.126	0.093	0.064	0.041
0330	0.121	0.097	0.065	0.043
0660	0.063	0.050	0.034	0.021

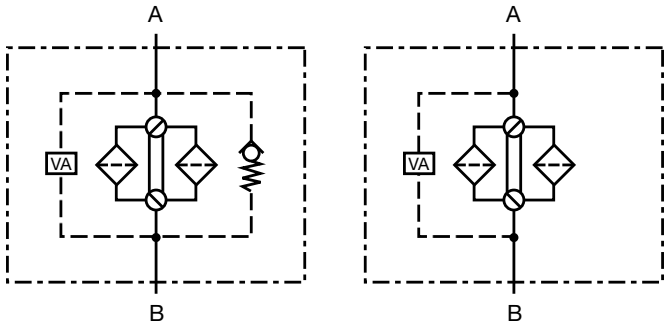
Size	...D...W/HC Elements
	25, 50, 74, 100, 149, 200 µm
0030	0.166
0060	0.042
0110	0.023
0160	0.016
0240	0.010
0280	0.009
0330	0.008
0660	0.004

All Element K Factors in psi / gpm.

FMND Series
Inline Duplex Filters
3000 psi • up to 100 gpm



Hydraulic Symbol



Features

- The FMND filter consists of a ductile iron filter head with built-in change-over valve and three different lengths of screw-in filter bowls.
- The FMND filter can be supplied with or without bypass valve, but includes vent and drain screws, and also a connection for a differential pressure clogging indicator.
- Pressure equalization requirement is achieved by raising the change-over lever prior to switching it to the relevant filter side.
- Fatigue pressure rating = maximum allowable working pressure rating.

Technical Details

Mounting Method	4 mounting holes
Port Connection	SAE-24
Flow Direction	Inlet: Side Outlet: Side
Construction Materials	
Head	Ductile iron
Bowl	Steel
Flow Capacity	
160	42 gpm (160 lpm)
250	66 gpm (250 lpm)
400	100 gpm (400 lpm)
Housing Pressure Rating	
Max. Operating Pressure	3000 psi (207 bar)
Proof Pressure	4500 psi (315 bar)
Fatigue Pressure	3000 psi (210 bar) @ 1 million cycles
Burst Pressure	10,650 psi (735 bar)
Element Collapse Pressure Rating	
BH/HC	3045 psid (210 bar)
BN/HC, W/HC	290 psid (20 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 29 psid (2 bar) -10% *(optional)*	
ΔP = 72 psid (5 bar) -10% *(standard)*	
Bypass Valve Cracking Pressure	
ΔP = 102 psid (7 bar) +10%	

Applications

Model Code

FMND BH/HC 250 L D F 10 A 1 . X / 12 - V -

Filter Type
FMND = Inline Duplex Filter

Element Media
BH/HC = Betamicron® *(High Collapse)* BN/HC = Betamicron® *(Low Collapse)*
W/HC = Wire Screen

Size
160, 250, 400

Operating Pressure
L = 3000 psi (210 bar)

Type of Changeover
D = segment valve

Type and Size of Port
F = SAE-24 (1 1/2")
K = SAE DN 38 Flange

Filtration Rating *(micron)*
3, 6, 10, 25 = BH/HC, BN/HC 25, 50, 100, 200 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(the latest version is always supplied)*

Port Configuration
(omit) = SAE DN Flange
12 = SAE straight thread inlet/outlet connections

Seals
V = Fluoroelastomer (FPM) *(standard)*

Bypass Valve
(omit) = no bypass *(optional)*
B7 = 102 psid *(standard)*

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = Indicators with brass piston *(for use with high water based fluids HWBF)*

Replacement Element Model Code

0160 DN 010 BN/HC /

Size
0160, 0250, 0400

Type
DN

Filtration Rating *(micron)*
3, 6, 10, 25 = BH/HC, BN/HC
25, 50, 100, 200 = W/HC

Element Media
BH/HC, BN/HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix
VM = G 1/2 3000 psi

Trip Pressure
2 = 29 psid (2 bar) *(optional)*
5 = 72 psid (5 bar) *(optional)*

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

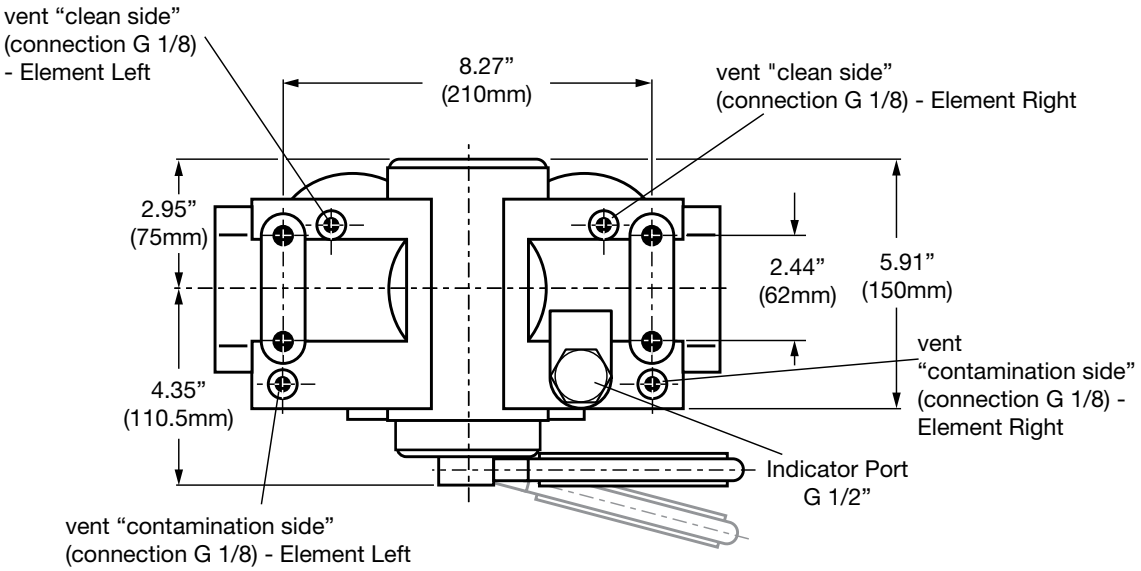
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

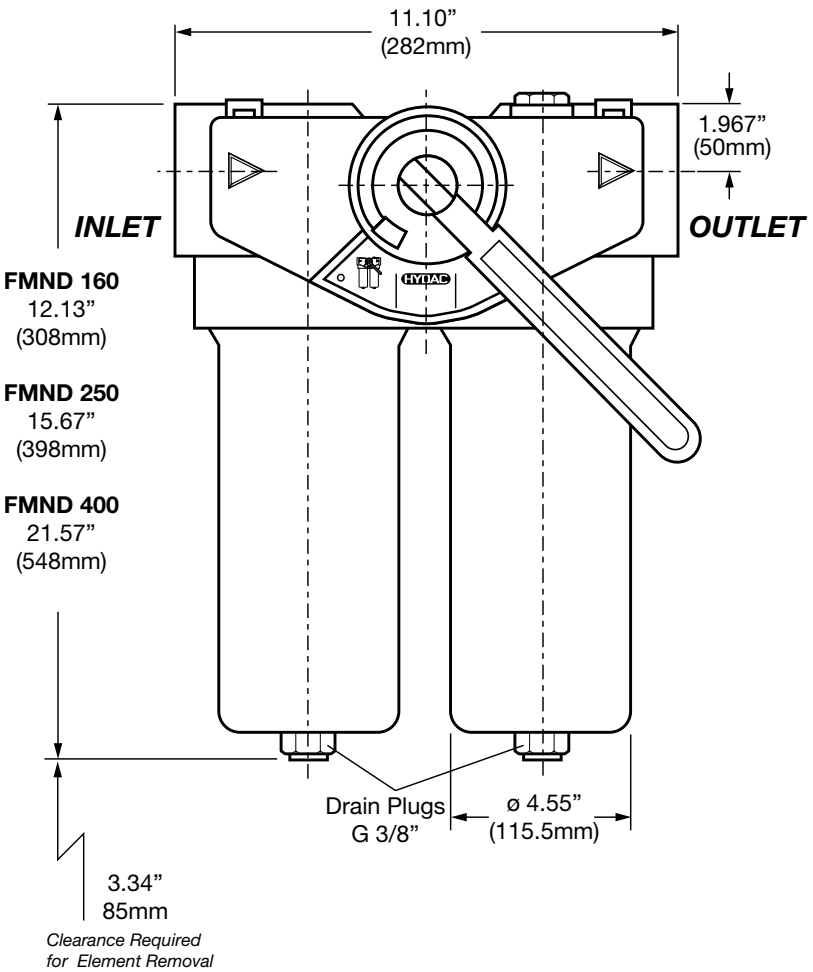
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions





Size	160	250	400
Weight (lbs.)	94.6	97.4	100.5

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

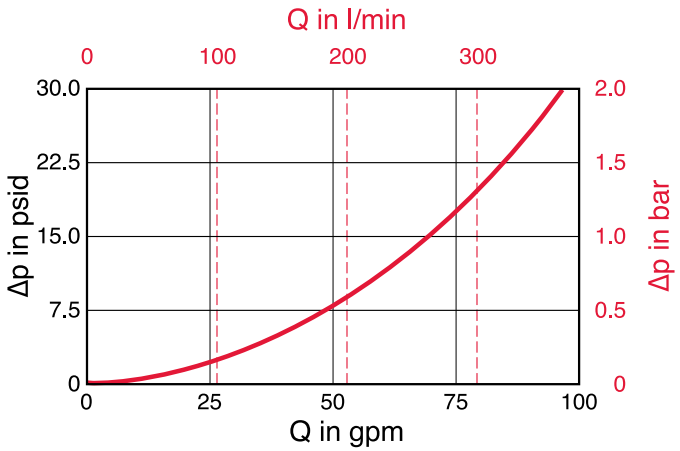
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

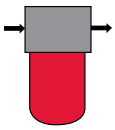
$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...DN...BN/HC			
	3 µm	6 µm	10 µm	25 µm
0160	0.439	0.306	0.202	0.143
0250	0.275	0.178	0.111	0.091
0400	0.178	0.110	0.073	0.055

Size	...DN...BH/HC			
	3 µm	6 µm	10 µm	25 µm
0160	0.439	0.274	0.219	0.143
0250	0.292	0.183	0.151	0.107
0400	0.256	0.162	0.146	0.092

All Element K Factors in psi / gpm.

DF Series
Inline Filters
6000 psi • up to 180 gpm

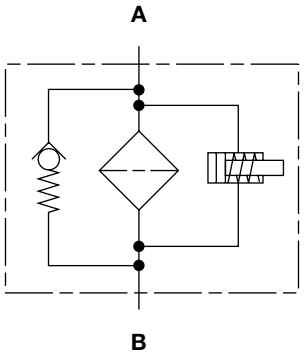


Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Choice of NPT, SAE straight thread O-ring boss, and SAE 4-bolt flange porting (sizes 60 - 1320) to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, EPDM) 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, and contaminated fluid cannot be washed downstream when element is serviced.
- Differential Pressure Indicators. HYDAC indicators have no external dynamic seal. This results in a high system reliability due to magnetic actuation, thus eliminating a potential leak point.
- A poppet-type bypass valve (optional) provides positive sealing during normal operation and fast opening during cold starts and flow surges.
- For special finishes and coatings – consult HYDAC for minimum quantities, availability and pricing.
- Fatigue pressure ratings equals maximum allowable working pressure rating.

Applications

Hydraulic Symbol



Technical Details

Mounting Method	4 mounting holes	
Port Connection		
30	SAE-8, 1/2" NPT, 1/2" BSPP	
60/110	SAE-12, 3/4" NPT, 3/4" BSPP 3/4" SAE, Code 62	
160/240/280	SAE-20, 1 1/4" NPT, 1 1/4" BSPP 1 1/4" SAE, Code 62	
330/660/1320	SAE-24, 1 1/2" NPT, 1 1/2" BSPP 2" SAE Flange Code 62	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Housing (1320)	Steel	
Cap (660 & 1320 ver. 2)	Ductile iron	
Flow Capacity		
30	8 gpm (30 lpm)	
60	16 gpm (60 lpm)	
110	29 gpm (110 lpm)	
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
280	74 gpm (280 lpm)	
330	87 gpm (330 lpm)	
660	174 gpm (660 lpm)	
1320	190 gpm (720 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	6000 psi (420 bar)	
Proof Pressure	9000 psi (610 bar)	
Fatigue Pressure	6000 psi (420 bar) @ 1 million cycles	
Burst Pressure	30	15950 psi (1100 bar)
	60/110	17400 psi (1200 bar)
	160/240/280	17110 psi (1180 bar)
	330/660/1320	15080 psi (1040 bar
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
BN/HC, W/HC	290 psid (20 bar)	
Fluid Temp. Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)*		
ΔP = 72 psid (5 bar) -10% *(standard)*		
ΔP = 116 psid (8 bar) -10% *(optional non bypass)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)*		
ΔP = 87 psid (6 bar) +10% *(standard)*		
Non Bypass Available		

Model Code

DF BN/HC 30 T B 3 A 1 . X / 12 - V B6

Filter Type
DF = Inline filter

Element Media
BH/HC = Betamicron® *(High Collapse)* BN/HC = Betamicron® *(Low Collapse)*
V = Metal Fiber W/HC = Wire Screen

Size
30, 60, 110, 160, 240, 280, 330, 660, 1320

Pressure Range
T = 420 bar

Size and Nominal Connection
B = 1/2 Threaded *(size 30 only)* I = SAE 3/4" Code 62 Flange *(sizes 60-140 only)*
C = 3/4 Threaded *(sizes 60-140 only)* J = SAE 1 1/4" Code 62 Flange *(sizes 160-280 only)*
E = 1 1/4 Threaded *(sizes 160-280 only)* L = SAE 2" Code 62 Flange *(sizes 330-1320 only)*
F = 1 1/2 Threaded *(sizes 330-1320 only)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BH/HC, BN/HC 3, 5, 10, 20 = V 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1 = One piece bowl *(sizes 30-660 only)* 2 = Two piece bowl *(sizes 660-1320 only)*

Modification Number *(latest version always supplied)*

Port Configuration
(omit) = BSPP
3 = NPT ports – NPT ported filters will be SAE with adaptors in each port
12 = SAE straight thread o-ring boss ports
16 = SAE flange ports *(sizes 60-1320 only)*

Seals
(omit) = Nitrile (NBR) standard
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM) Seals *(subject to minimum quantities)*

Bypass Valve
(omit) = Non-bypass B3 = Bypass *(3 bar)* B6 = Bypass *(6 bar)*

Supplementary Details
SO103H = Modification of BN4HC *(Low Collapse)* Element For Phosphate Esters
SO155H = Modification of BH4HC *(High Collapse)* Element For Phosphate Esters
SO184 = G-1/2 Drain in Bowl Option For Sizes 60 - 280 *(comes standard for sizes 330, 660, & 1320)*
W = Indicator with brass piston *(for use with water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0030 D 010 BN4HC / V

Size
0030, 0060, 0110, 0160,
0240, 0280, 0330, 0660, 1320

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN4HC
3, 5, 10, 20 = V
25, 74, 149 = W/HC

Element Media
BH4HC, BN4HC, V, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

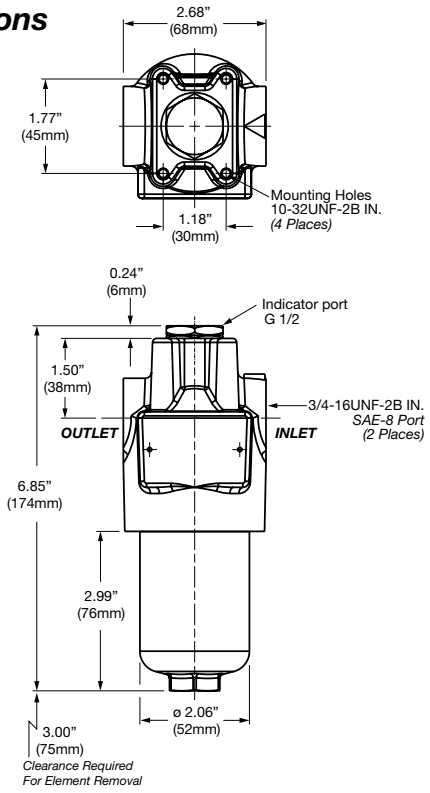
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

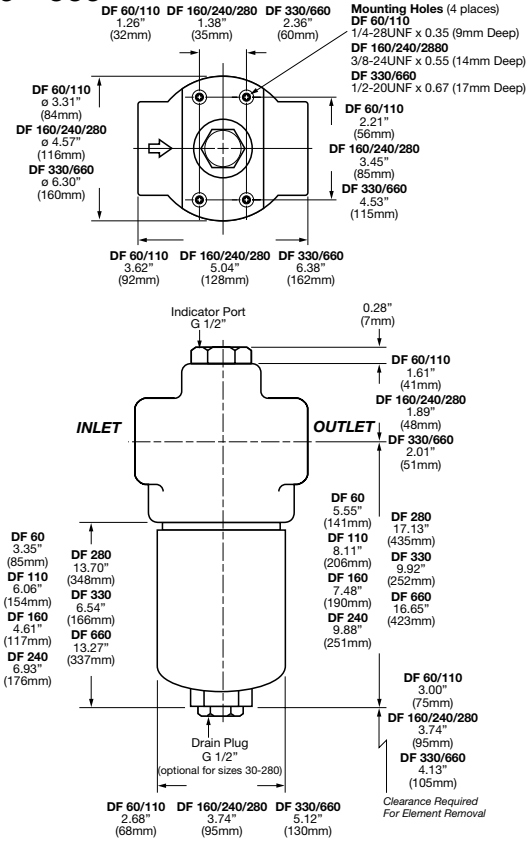
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

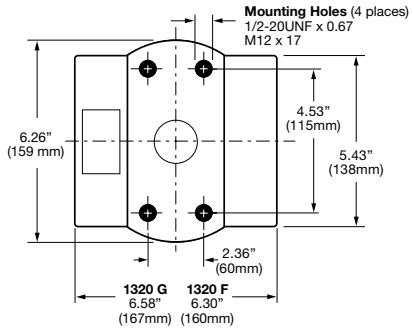
Dimensions DF 30

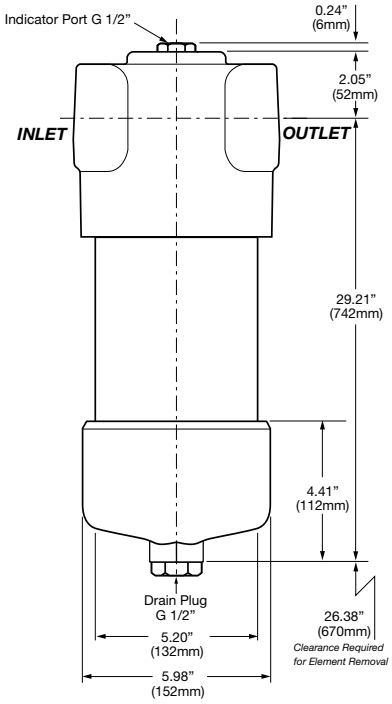


DF 60 - 660

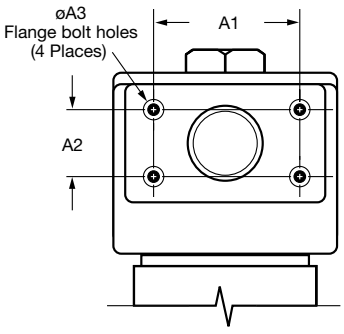


DF 1320





SAE - Code 62



Size	A1	A2	A3
60/110/140	50.8±0.3	23.8±0.3	3/8"-16UNC-2B x 24 DP
160/240/280	66.7±0.3	31.8±0.3	1/2"-UNC-2B x 25 DP
330/660/990/1320	96.8±0.3	44.5±0.3	3/4"-10UNC-2B x 38 DP

Size	30	60	110	160	240	280	330	660	1320
Weight (lbs.)	4.0	8.6	10.5	20.0	23.4	32.0	47.2	62.4	105.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

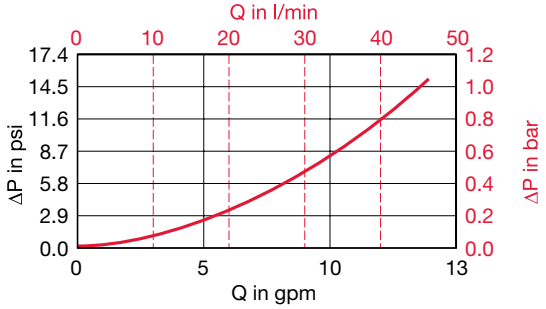
Housing Curve:

Pressure loss through housing is as follows:

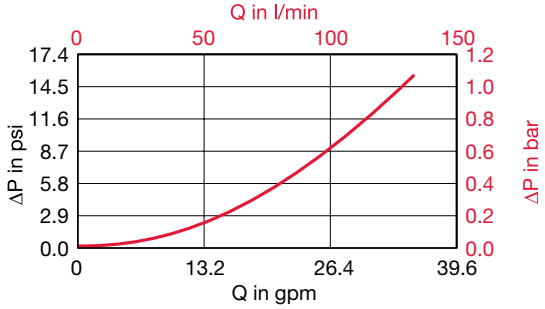
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

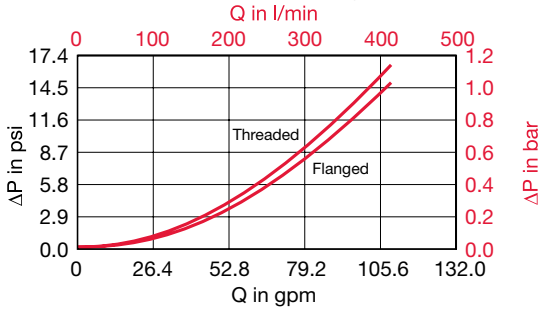
DF 30 Housing



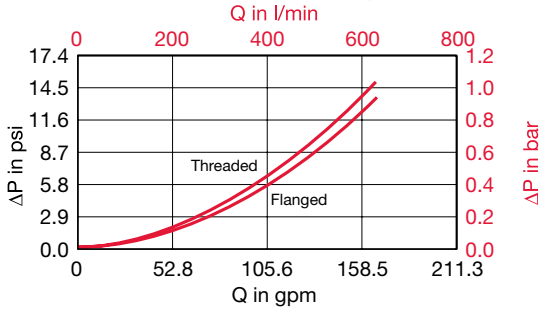
DF 60 / 110 Housing



DF 160 / 240 / 280 Housing



DF 330 / 660 / 1320 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...**BN4HC** (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	3.504	2.374	1.251	0.618
0060	1.582	1.116	0.723	0.433
0110	0.819	0.585	0.361	0.205
0160	0.718	0.480	0.252	0.193
0240	0.450	0.333	0.196	0.128
0280	0.220	0.171	0.092	0.071
0330	0.294	0.215	0.163	0.095
0660	0.136	0.099	0.061	0.044
1320	0.068	0.048	0.030	0.021

Size	...D...**BH4HC** (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	5.000	2.780	1.989	1.042
0060	3.210	1.785	0.993	0.669
0110	1.394	0.819	0.488	0.307
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0330	0.422	0.244	0.154	0.108
0660	0.179	0.106	0.055	0.049
1320	0.089	0.054	0.031	0.024

Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0030	1.011	0.740	0.411	0.200
0060	0.877	0.511	0.296	0.183
0110	0.452	0.304	0.182	0.118
0160	0.251	0.177	0.123	0.079
0240	0.169	0.137	0.093	0.062
0280	0.126	0.093	0.064	0.041
0330	0.121	0.097	0.065	0.043
0660	0.063	0.050	0.034	0.021
1320	0.032	0.026	0.018	0.012

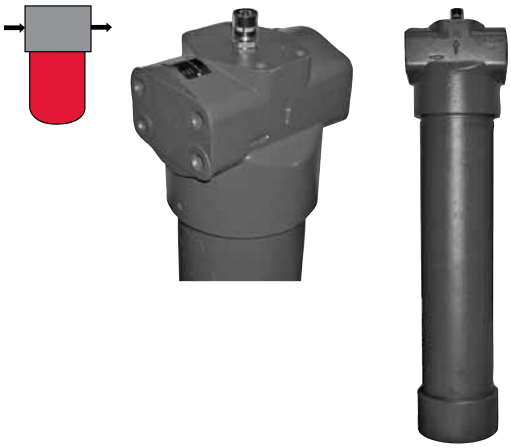
Size	...D...W/HC Elements
	25, 50, 74, 100, 149, 200 µm
0030	0.166
0060	0.042
0110	0.023
0160	0.016
0240	0.010
0280	0.009
0330	0.008
0660	0.004
1320	0.002

All Element K Factors in psi / gpm.

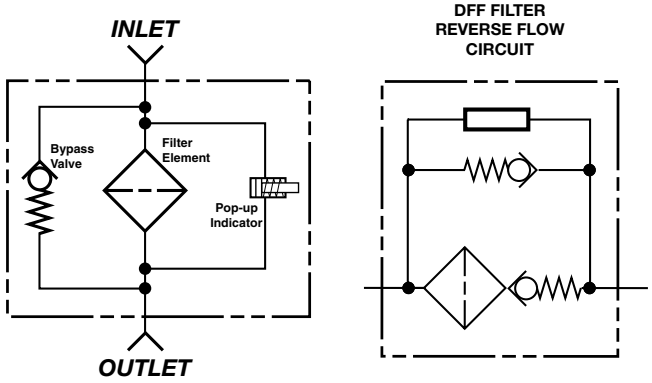
DF/DFF 1500 Series

Inline Filters

6090 psi • up to 250 gpm



Hydraulic Symbol



Features

- Available in T ported or L ported configurations
- Handles high flows to 250 GPM *(pricing competitive)*
- Available in bi-directional flow and single flow configurations
- Two part bowl for ease of operation and element change-out
- Filter head made of ductile iron
- Filter bowl made of steel
- Can mount head on top with bottom access or head on bottom with top access
- Available in 26" & 39" 9400/9901 element configurations - consult factory.

Applications

Technical Details

Mounting Method	4 Mounting holes in the filter head - M-12 Threads
Port Connection	SAE-32 four bolt code 62 Flange (DIN 50) with metric bolt threads M-20 to 30mm deep / 2" SAE 32 straight thread O-Ring Boss / 2" BSPP thread
Flow Direction	Side inlet and outlet - Indicator on top Side inlet and top outlet - Indicator on side
Construction Materials	Head: Ductile Iron (GGG40) Bowl: Steel
Flow Capacity	250 gpm (950 lpm)
Housing Pressure Rating	
Max. Operating Pressure	6090 psi (420 bar)
Proof Pressure	9135 psi (630 bar)
Fatigue Pressure	6090 psi (420 bar) @ 300,000 cycles
Burst Pressure	Contact HYDAC
Element Collapse Pressure Rating	
BN/HC, W/HC	435 psid (30 bar)
BH/HC	3045 psid (210 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.
Indicator Trip Pressure	ΔP = 29 psid (2 bar) -10% ΔP = 72 psid (5 bar) -10% ΔP = 116 psid (8 bar) -10% *(non-bypass)*
Bypass Valve Cracking Pressure	ΔP = 43 psid (3 bar) +10% ΔP = 87 psid (6 bar) +10% Non Bypass Available

Model Code

DF BH/HC 1500 T G 3 A 2 . X / 12

Filter Type
DF = Inline filter
DFF = Inline filter - Reverse flow

Element Media
BN/HC = Betamicron® *(Low Collapse)* W/HC = Wire Screen
BH/HC = Betamicron® *(High Collapse) (required on DFF)*

Size and Nominal Connection
1500 = 2" BSPP / SAE 32 Straight Thread / 2" SAE Flange Code 62

Pressure
T = 6090 psi / 420 bar

Type of Head
(omit) = T Port L = L Port

Type of Connection
G = 2" Threaded L = 2" Flanged SAE Code 62 (SAE DIN 50)

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC 3, 5, 10, 20 = BH/HC 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
2 = Standard Mounting - Bottom Accessible *(two-piece bowl)*
3 = Upside Down Mounting w/o Drain Port in Head *(two-piece bowl) - (cust. to supply low point drain external to filter)*

Modification Number *(latest version always supplied)*

Port Configuration
(omit) = SAE Flange Ports Code 62 *(metric bolt threads M-20)* 0 = BSPP 12 = SAE Straight Thread O-Ring Boss Ports

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM)

Bypass Valve
(omit) = Without Bypass *(BH4HC elements recommended)*
B3 = 43PSID Bypass *(optional)*
B6 = 87PSID Bypass *(standard)*
No bypass on DFF 1500

Supplementary Details
SO103H= Modification of BN4HC *(Low Collapse)* Element For Phosphate Esters
SO155H= Modification of BH4HC *(High Collapse)* Element For Phosphate Esters
W = Indicator with brass piston *(for use with water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*
P26 = with 26" Betafit Element (9400/9901)
P39 = with 39" Betafit Element (9400/9901)

Replacement Element Model Code

1500 D 010 BN4HC / V

Size
1500

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC
3, 5, 10, 20 = BH4HC
25, 74, 149 = W/HC

Element Media
BN4HC, BH4HC, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

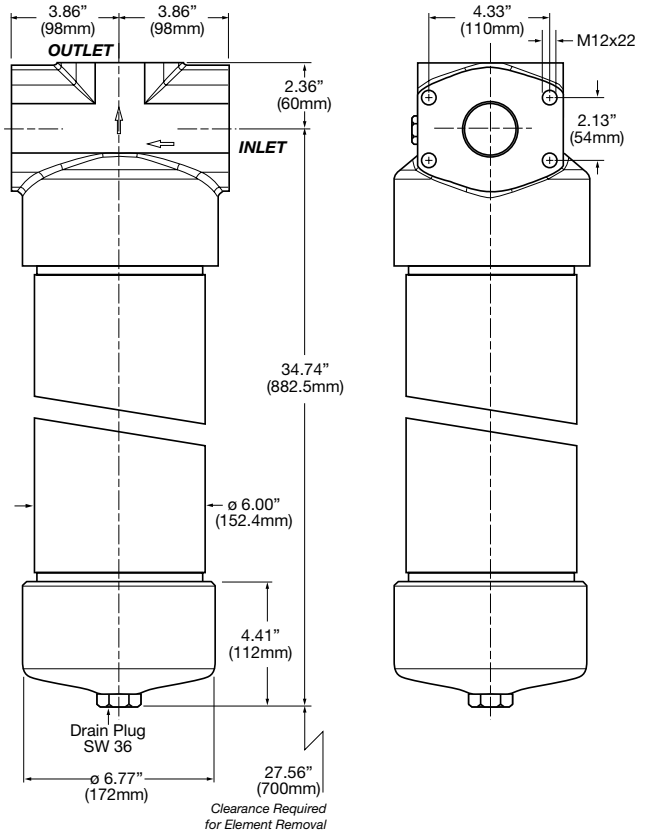
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

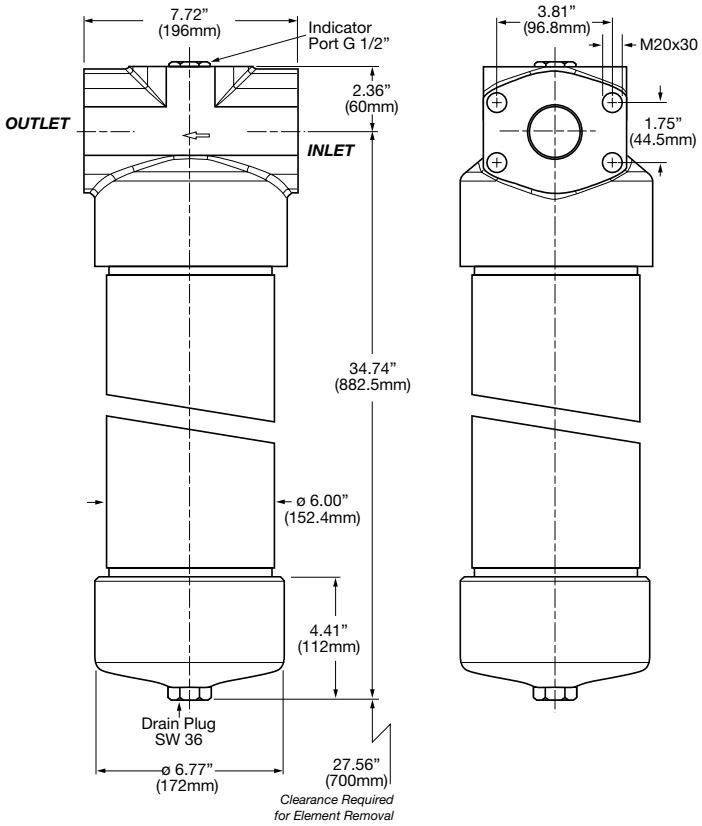
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

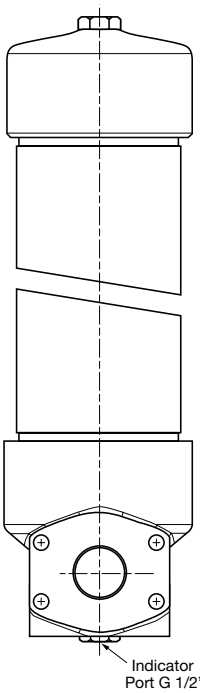
Dimensions 2.0 Version "L" Configuration



"T" Configuration

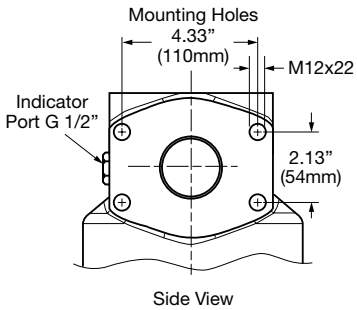


3.0 Version Element Access on Top Can be "L" or "T" Configuration

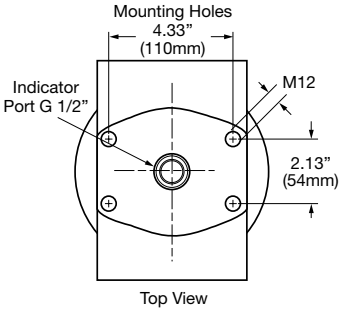


Note: No Drain Port provided – Customer to place Drain Port filter-side of isolation valving in piping.

Mounting Bolt Pattern "L" Configuration



"T" Configuration



Size	1500
Weight (lbs.)	170

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

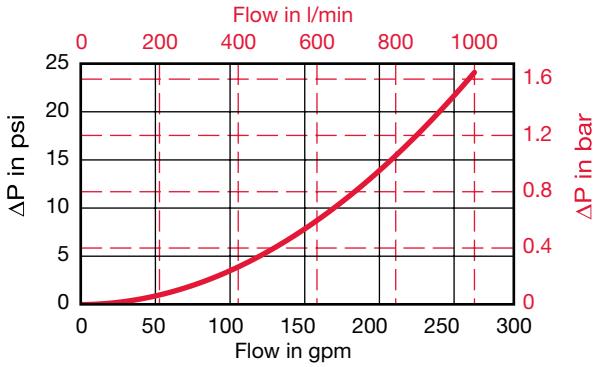
Housing Curve:

Pressure loss through housing is as follows:

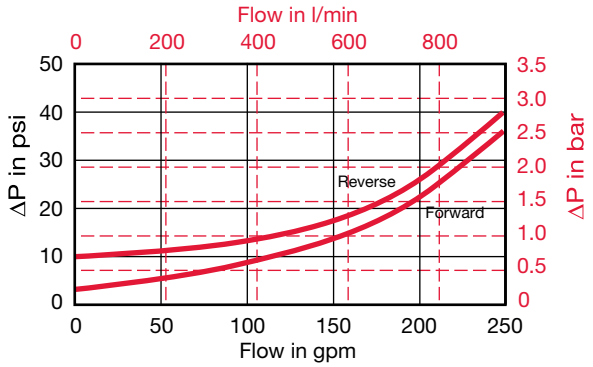
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

DF 1500



DFF 1500



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
1500	0.060	0.044	0.033	0.022

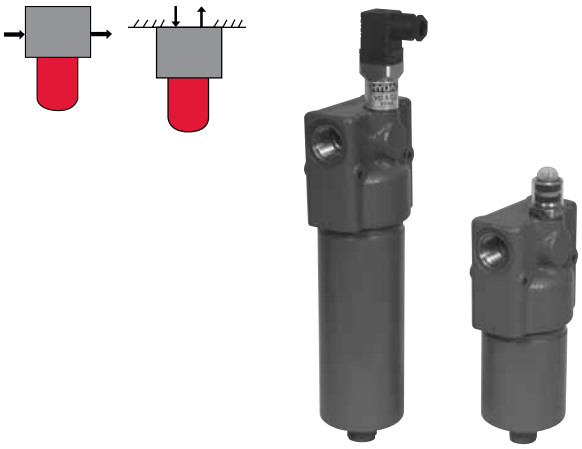
Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
1500	0.077	0.044	0.033	0.027

All Element K Factors in psi / gpm.

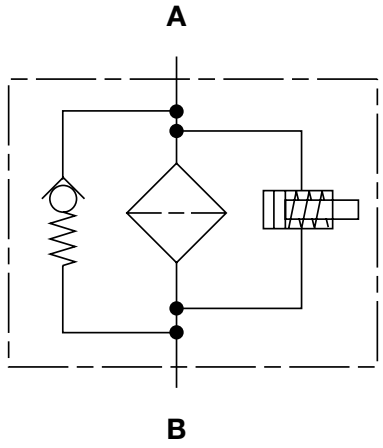
HF2P Series

Inline Filters

4000 psi • up to 25 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Inlet/Outlet port options include SAE straight thread O-ring boss, BSPP and subplate mounting to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, 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, and contaminated fluid cannot be washed downstream when element is serviced.
- Clogging indicators are actuated by differential pressure and have no external dynamic seal. High reliability is achieved and magnetic indicator actuation eliminates a potential leak point.
- A poppet type bypass valve is typically mounted out of the flow path between the inlet and outlet port to provide positive sealing during normal operation and fast response during cold starts and flow surges.
- Fatigue pressure rating equals maximum allowable working pressure rating.

Applications


Agricultural


Automotive


Construction


Industrial


Railways

Technical Details

Mounting Method	2 mounting holes	
Port Connection	SAE-12, 3/4" BSPP, Manifold Mount	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Flow Capacity		
4"	16 gpm (60 lpm)	
8"	25 gpm (94 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	4000 psi (275 bar)	
Proof Pressure	6000 psi (420 bar)	
Fatigue Pressure	4000 psi (275 bar) @ 1 million cycles	
Burst Pressure	14,680 psi (1012 bar)	
Element Collapse Pressure Rating		
BH/HC	3045 psid (210 bar)	
BN	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)*		
ΔP = 72 psid (5 bar) -10% *(standard)*		
ΔP = 116 psid (8 bar) -10% *(optional on bypass)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)*		
ΔP = 87 psid (6 bar) +10% *(standard)*		
Non Bypass Available		

Model Code

HF2P BN 04 G 3 C 1 . 2 / 12 V - B6 - T100

Filter Type
HF2P = Inline pressure filter

Element Media
BN = Betamicron® *(Low Collapse)* BH = Betamicron® *(High Collapse)*

Element Length
04 = 4 inches 08 = 8 inches

Type of Connection
G = Threaded In-Line P = Manifold Mount

Filtration Rating *(microns)*
3, 6, 12, 25 = BN 3, 6, 10, 17 = BH

Type of Clogging Indicator
A, B/BM, C, D, J, J4

Type Code
1

Modification Number *(the latest version is always supplied)*

Port Configuration
(omit) = Manifold Filter
12 = SAE 12" straight thread O-ring boss
0 = BSPP straight thread G 3/4" *(contact factory for minimum quantity & availability)*

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(when used with BH element)*
B3 = 3 bar/43 psid
B6 = 6 bar/87 psid *(standard)*

Supplementary
SO103H= Modification of BN elements for phosphate esters
SO155H= Modification of BH4HC Element for Phosphate Ester Fluids
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Thermal lockout on indicator at 100°F *(C, D, J, and J4 indicators only)*
(Consult HYDAC for B/BM indicators for thermal lockout Non-Standard)

Replacement Element Model Code

1 . 07 . 08 D 03 BN / V

Length *(nominal inches)*
04, 08

Filtration Rating *(micron)*
3, 6, 12, 25 = BN
3, 6, 10, 17 = BH

Element Media
BN, BH

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
J = Electric switch *(Brad Harrison 5-pin mini connector)*
J4 = Electric switch - M12 *(Brad Harrison 4-pin micro connector)*

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

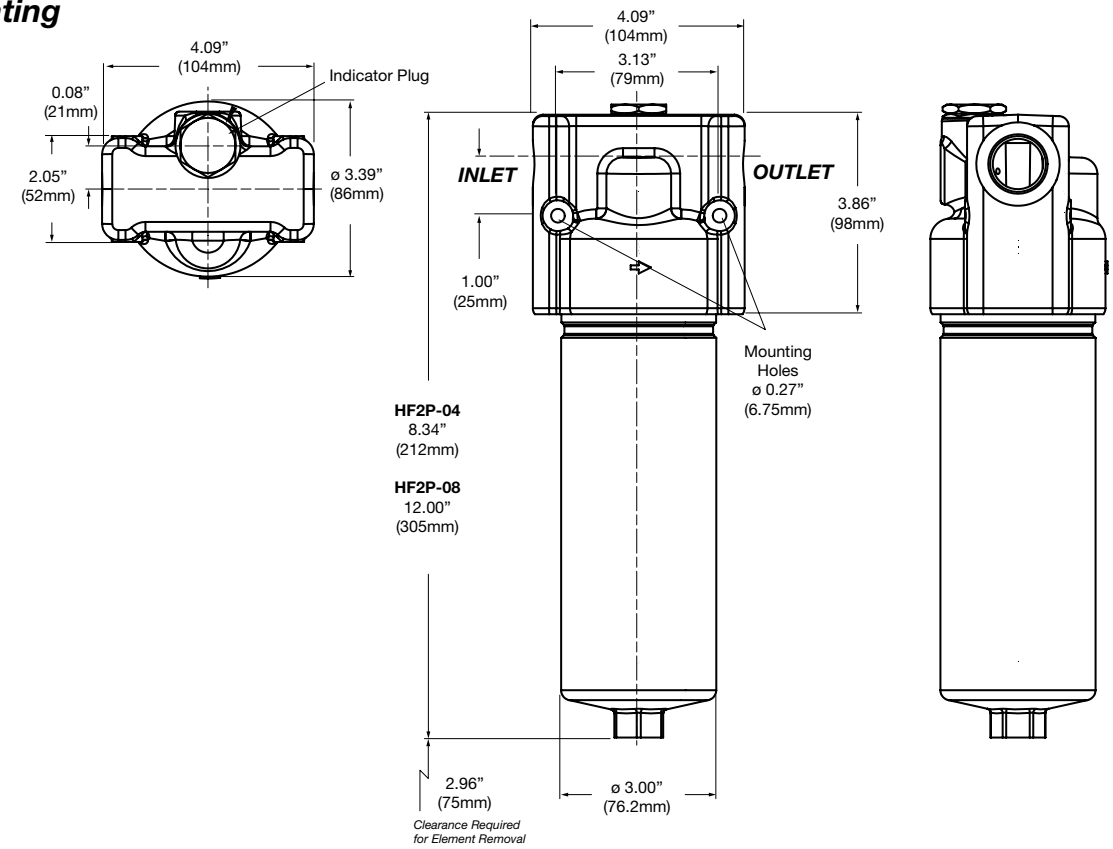
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

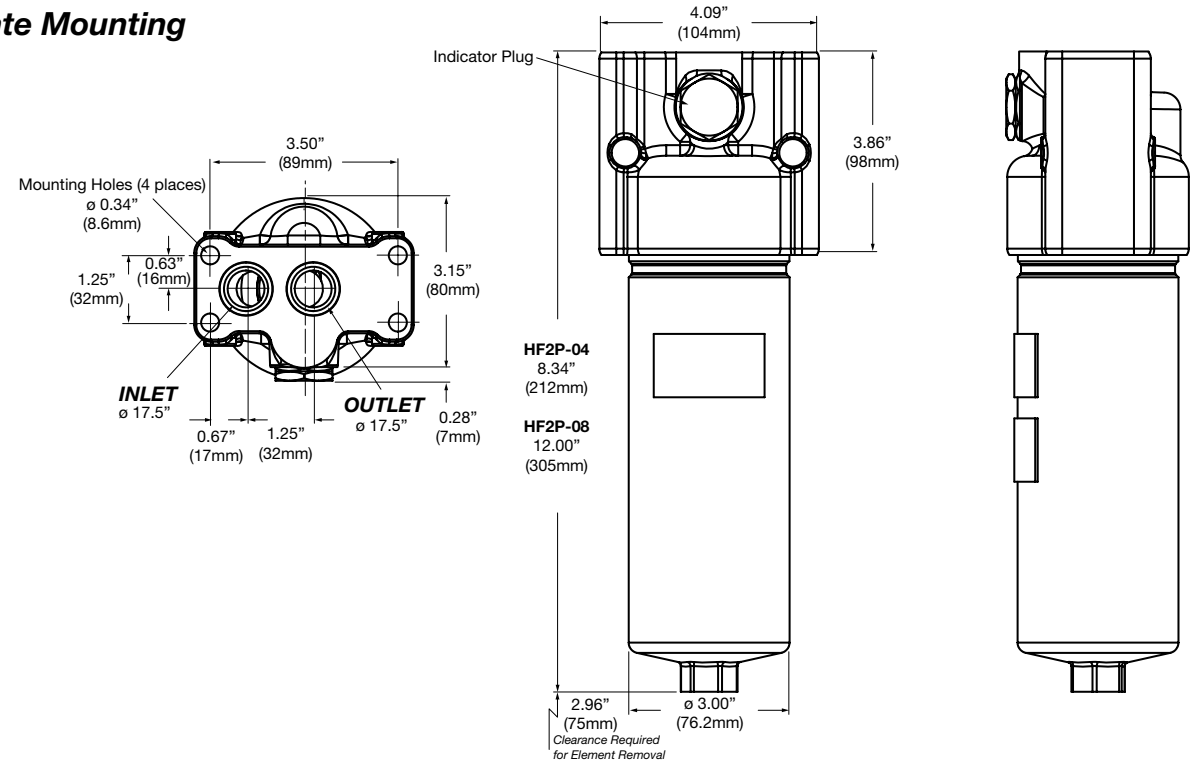
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions
Inline Mounting



Subplate Mounting



Size	04	08
Weight (lbs.)	10.1	13.4

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

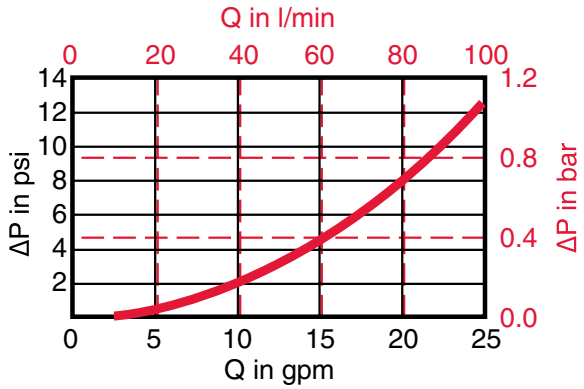
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	1.07.XXD...BN			
	3 µm	6 µm	12 µm	25 µm
04	2.0461	1.7350	0.9248	0.5313
08	0.9751	0.8152	0.4574	0.2571

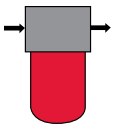
Size	1.07.XXD...BH			
	3 µm	6 µm	10 µm	17 µm
04	2.3965	1.6883	1.0266	0.5384
08	1.1652	0.8208	0.4991	0.2618

All Element K Factors in psi / gpm.

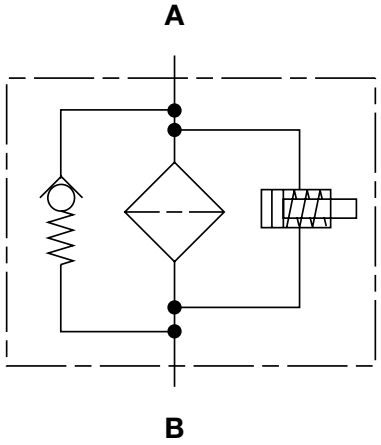
HF3P Series

Inline Filters

6000 psi • up to 120 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Inlet/Outlet port options include SAE straight thread O-ring boss, BSPP and subplate mounting to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, 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, and contaminated fluid cannot be washed downstream when element is serviced.
- Clogging indicators are actuated by differential pressure and have no external dynamic seal. High reliability is achieved and magnetic indicator actuation eliminates a potential leak point.
- A poppet type bypass valve is typically mounted out of the flow path between the inlet and outlet port to provide positive sealing during normal operation and fast response during cold starts and flow surges.
- Fatigue pressure rating equals maximum allowable working pressure rating.

Applications

Automotive

Construction

Industrial

Railways

Steel / Heavy Industry

Technical Details

Mounting Method	4 mounting holes	
Port Connection	SAE-16, SAE-24, 1” BSPP, 1 1/2” BSPP, 1 1/2” SAE Flange Code 61, 2” SAE Flange Code 62	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Housing (size 16)	Steel	
Cap (size 16)	Ductile iron	
Flow Capacity		
4”	28 gpm (106 lpm)	
8”	55 gpm (208 lpm)	
13”	91 gpm (344 lpm)	
16”	120 gpm (454 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	6000 psi (420 bar)	
Proof Pressure	9000 psi (610 bar)	
Fatigue Pressure	6000 psi (420 bar) @ 1 million cycles	
Burst Pressure	15,080 psi (1040 bar)	
Element Collapse Pressure Rating		
BH	3045 psid (210 bar)	
BN	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)*		
ΔP = 72 psid (5 bar) -10% *(standard)*		
ΔP = 116 psid (8 bar) -10% *(optional on bypass)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)*		
ΔP = 87 psid (6 bar) +10% *(standard*		
Non Bypass Available		

Model Code

HF3P BN 08 G 3 A 1.1 / 12 V B6

Filter Type
HF3P = In-Line pressure filter

Element Media
BN = Betamicron® *(Low Collapse)* BH = Betamicron® *(High Collapse)*

Element Length
04 = 4 inches *(non-standard)* 13 = 13 inches
08 = 8 inches 16 = 16 inches *(non-standard)*

Type of Connection
G = Threaded Inline F = Flanged Inline

Filtration Ratings *(microns)*
3, 6, 12, 25 = BN 3, 6, 10, 17 = BH

Type of ΔP Clogging Indicator
A, B/BM, C, D, J, J4

Type Modification Number
1.1 = 2" Flange code 62 or SAE 24" or G 1 1/2
2.1 = 1 1/2" Flange code 61
3.1 = 1" SAE 16 or G 1" Threaded *(reduced port)*

Port Configuration
0 = BSPP Threaded Ports G 1 1/2" or G 1"
12 = SAE straight thread O-ring boss SAE 24" or SAE 16"
16 = SAE flange ports - SAE 2", code 62 (6000 psi) or 1 1/2" code 61

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = without bypass *(BH elements recommended)*
B3 = 3 bar/43 psid
B6 = 6 bar/87 psid *(standard)*

Supplementary
SO103H = Modification of BN elements for phosphate ester fluids
SO155H = Modification of BH elements for phosphate ester fluids
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Thermal lockout on indicator at 100°F *(C, D, J, and J4 indicators only)*

Replacement Element Model Code

1 . 11 . 08 D 03 BN / V

Length *(nominal inches)*
04, 08, 13, 16

Filtration Rating *(micron)*
3, 6, 12, 25 = BN
3, 6, 10, 17 = BH

Element Media
BN, BH

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
J = Electric switch *(Brad Harrison 5-pin mini connector)*
J4 = Electric switch - M12 *(Brad Harrison 4-pin micro connector)*

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

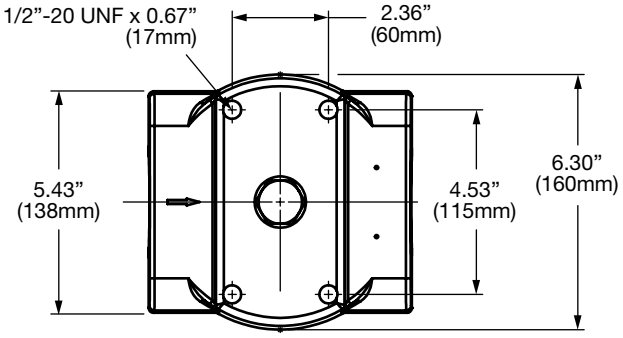
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

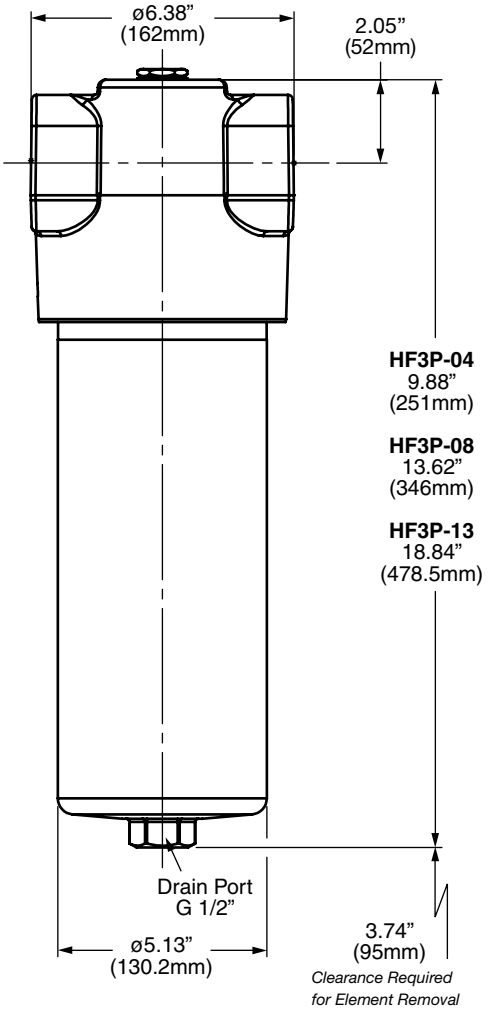
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

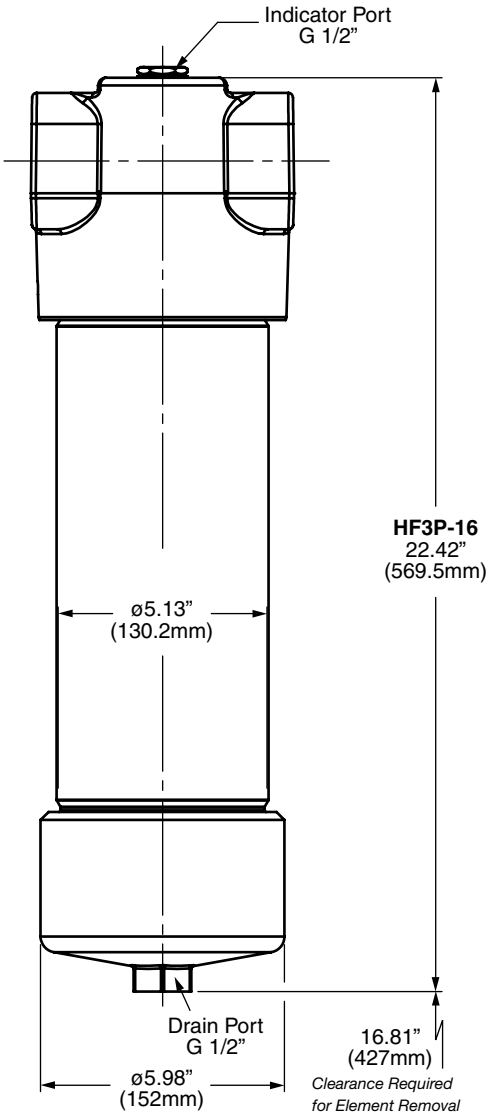
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions







Size	04	08	13	16
Weight (lbs.)	44.8	49.5	62.9	95.7

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

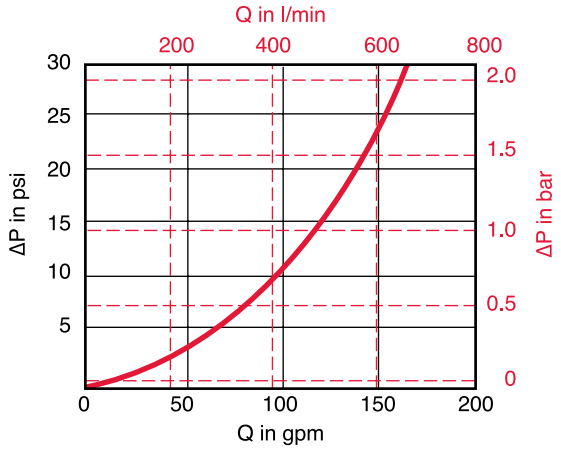
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	1.11.XXD...BN			
	3 µm	6 µm	12 µm	25 µm
04	0.5895	0.4999	0.2664	0.1531
08	0.2886	0.2413	0.1354	0.0761
13	0.1751	0.1464	0.0821	0.0462
16	0.1322	0.1105	0.0620	0.0348

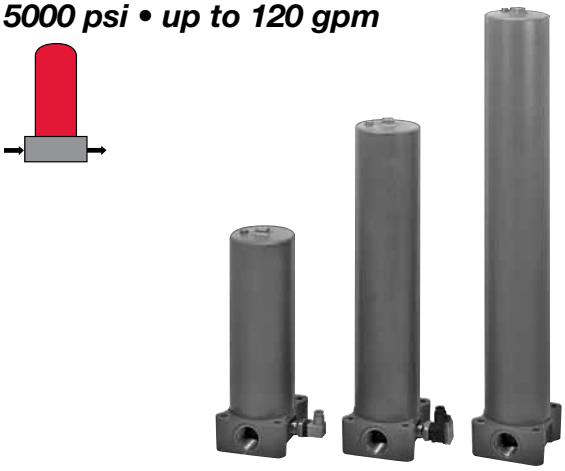
Size	1.11.XXD...BH			
	3 µm	6 µm	10 µm	17 µm
04	0.9366	0.6598	0.4012	0.2104
08	0.4553	0.3208	0.1951	0.1023
13	0.2738	0.1929	0.1173	0.0615
16	0.2060	0.1452	0.0883	0.0463

All Element K Factors in psi / gpm.

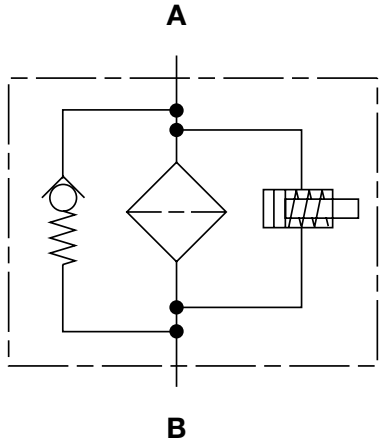
HF4P Series

Inline Filters

5000 psi • up to 120 gpm



Hydraulic Symbol



Features

- Meets HF4 automotive standard
- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Inlet/Outlet port options include SAE straight thread O-ring boss, BSPP and subplate mounting to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, 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, and contaminated fluid cannot be washed downstream when element is serviced.
- Clogging indicators are actuated by differential pressure and have no external dynamic seal. High reliability is achieved and magnetic indicator actuation eliminates a potential leak point.
- A poppet type bypass valve is typically mounted out of the flow path between the inlet and outlet port to provide positive sealing during normal operation and fast response during cold starts and flow surges.
- Fatigue pressure rating equals maximum allowable working pressure rating.

Applications

Technical Details

Mounting Method	4 mounting holes
Port Connection	SAE-24, 1 1/2" BSPP, 1 1/2" SAE Flange Code 61, 1 1/2" SAE Flange Code 62, Manifold Mount
Flow Direction	Inlet: Side Outlet: Side *(opposite each other)*
Construction Materials	
Head, Cap	Ductile iron
Housing	Steel
Flow Capacity	
9"	50 gpm (189 lpm)
18"	100 gpm (378 lpm)
27"	120 gpm (454 lpm)
Housing Pressure Rating	
Max. Operating Pressure	5000 psi (345 bar)
Proof Pressure	7500 psi (517 bar)
Fatigue Pressure	5000 psi (345 bar) @ 1 million cycles
Burst Pressure	15,000 psi (1040 bar)
Element Collapse Pressure Rating	
BH	3045 psid (210 bar)
BN	150 psid (10 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.
Indicator Trip Pressure	ΔP = 29 psid (2 bar) -10% *(optional)* ΔP = 72 psid (5 bar) -10% *(standard)* ΔP = 116 psid (8 bar) -10% *(optional on bypass)*
Bypass Valve Cracking Pressure	ΔP = 43 psid (3 bar) +10% *(optional)* ΔP = 87 psid (6 bar) +10% *(standard)* Non Bypass Available

Model Code

HF4P BN 09 G 20 D 1 . 1 / 12 V B6 L115

Filter Type
HF4P = Inline pressure filter

Element Media
BN = Betamicron® *(Low Collapse)* BH = Betamicon® *(High Collapse)* W = Wire Screen

Element Length
09 = 9 inches 18 = 18 inches 27 = 27 inches

Type of Connection
P = Manifold Mount G = Threaded In-Line F = Flanged

Filtration Rating *(microns)*
3, 5, 10, 20 = BH, BN 25, 74, 149 = W

Type of Clogging Indicator
A, B/BM, C, D, J, J4

Type Code
1

Modification Number *(the latest version is always supplied)*

Port Configuration
(omit) = Manifold mount *(use when "P" connection type is selected)*
0 = 1 1/2" BSPP Straight Threads
12 = SAE-24 straight thread O-ring boss
16 = 1 1/2" SAE 4 bolt flange code 61 or 62

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(BH elements only)*
B3 = 3 bar/43 psid
B6 = 6 bar/87 psid *(standard)*

Supplementary
SO103H= Modification of BN & W elements for phosphate ester fluids.
SO155H= Modification of BH elements for phosphate ester fluids
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Thermal lockout on indicator at 100° F *(C, D, J, and J4 indicators only)*
Code 61= 4 Bolt Code 61

Replacement Element Model Code

5 . 03 . 09 D 03 BN / V

Length *(nominal inches)*
09, 18, 27

Filtration Rating *(micron)*
3, 5, 10, 20 = BN, BH
25, 74, 149, = W

Element Media
BN, BH, W

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light
J = Electric switch *(Brad Harrison 5-pin mini connector)*
J4 = Electric switch - M12 *(Brad Harrison 4-pin micro connector)*

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

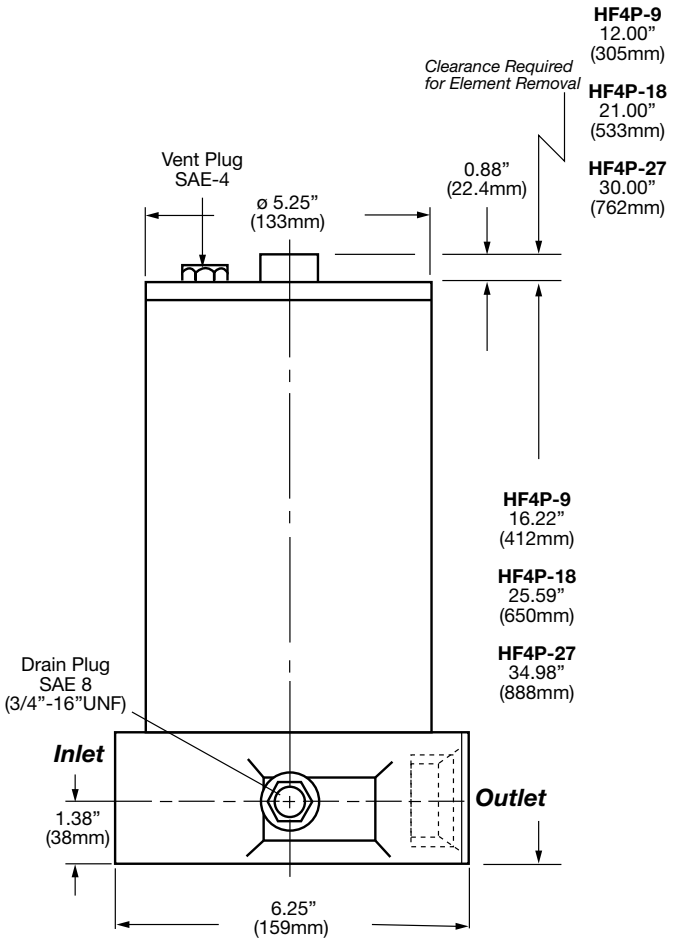
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

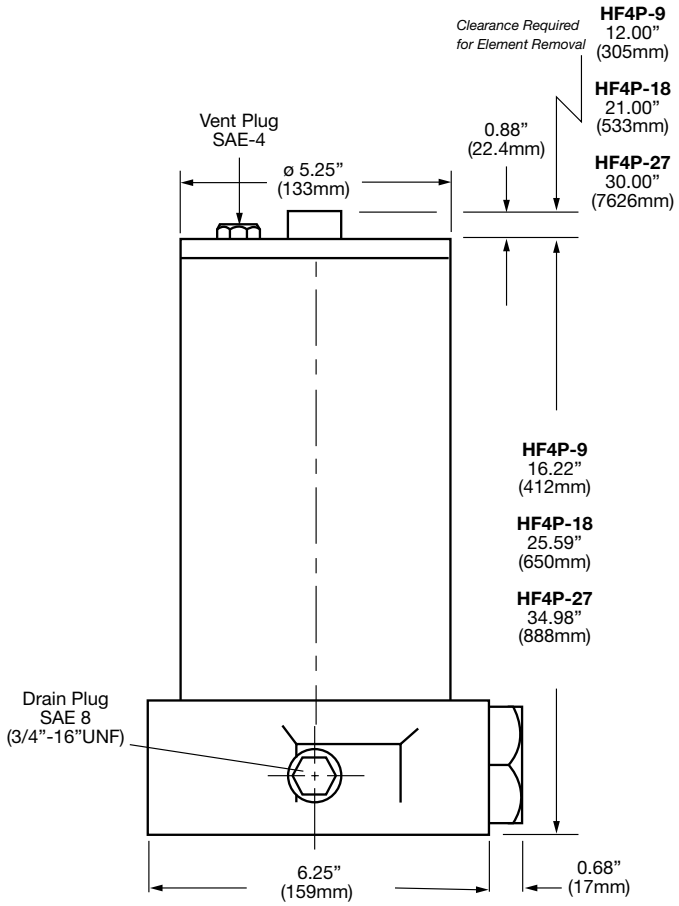
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

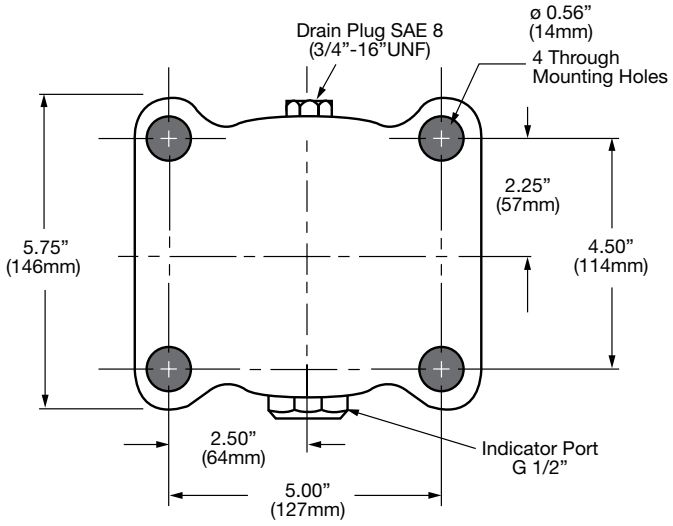
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

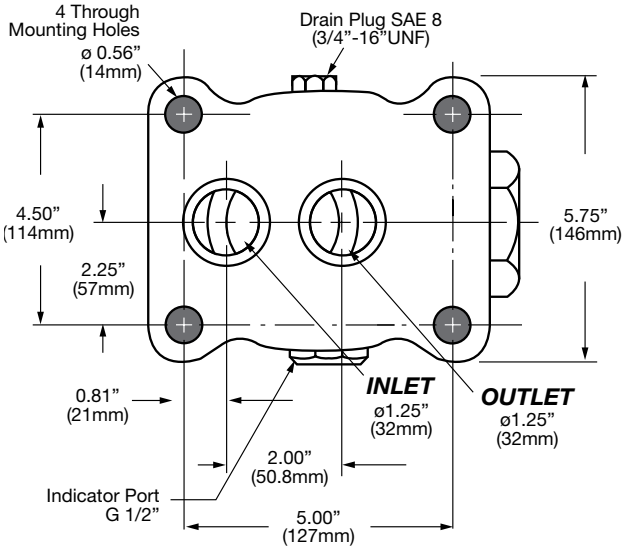
Dimensions
HF4P Inline



HF4P Manifold







Size	Inline	09	18	27	Manifold	09	18	27
Weight (lbs.)		59.4	79.3	105.6		61.2	81.1	107.4

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

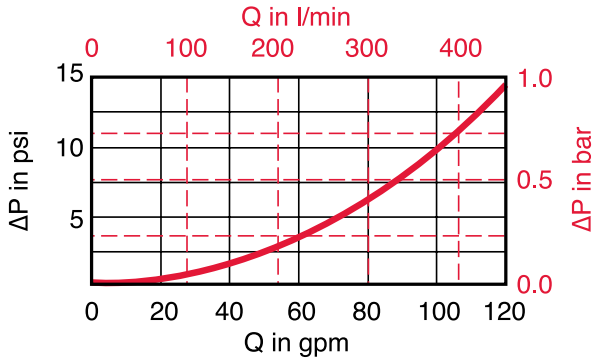
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

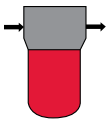
Size	5.03.XXD...BN			
	3 µm	5 µm	10 µm	20 µm
09	0.1680	0.1405	0.0788	0.0443
18	0.0800	0.0669	0.0375	0.0211
27	0.0517	0.0432	0.0242	0.0136

Size	5.03.XXD...BH			
	3 µm	5 µm	10 µm	20 µm
09	0.2068	0.1457	0.0886	0.0465
18	0.0967	0.0681	0.0414	0.0217
27	0.0630	0.0444	0.0270	0.0142

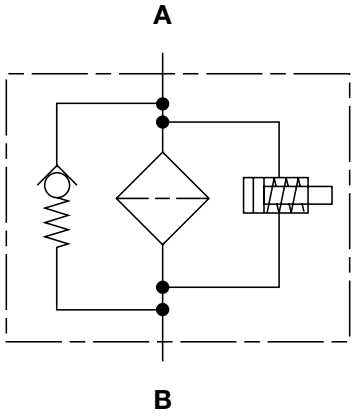
Size	5.03.XXD...W		
	25 µm	74 µm	149 µm
09	0.0073	0.0073	0.0073
18	0.0035	0.0035	0.0035
27	0.0023	0.0023	0.0023

All Element K Factors in psi / gpm.

MFM Series
Inline Filters
4000 PSI • up to 30 GPM



Hydraulic Symbol



Features

- Because of their efficient design and construction, MFM filters are considered a cost effective solution for new equipment, or as a replacement for filters already specified on existing equipment.
- The MFM filter is available in 4 sizes comprised of four different bowl and element lengths. The models 35, 55, 75, and 95, provide maximum flow rates of 10, 18, 25, and 30 GPM respectively.
- A quick-response by-pass valve protects against high differential pressures caused by cold start-ups, flow surges and pressure spikes.
- The high bypass pressure setting (100 psid) minimizes the possibility of contamination due to premature bypassing.
- Filters may be specified with or without a clogging indicator. Both Visual and electrical indicators are available. Standard indicators actuate at 72 psid.
- Filter materials are compatible with all mineral, lubricating oils, and commonly used fire retardant fluids per ISO 2943.
- Fatigue pressure rating equals maximum allowable working pressure rating.

Technical Details

Mounting Method	4 mounting holes - filter head	
Port Connection	SAE-12, 3/4" BSPP	
Flow Direction	Inlet: Side *(opposite each other)*	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Flow Capacity		
35	10 gpm (35 lpm)	
55	18 gpm (68 lpm)	
75	25 gpm (95 lpm)	
95	30 gpm (113 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	4000 psi (280 bar)	
Proof Pressure	6000 psi (400 bar)	
Fatigue Pressure	4000 psi (280 bar) @ 1 million cycles 4600 psi (320 bar) @ 100,000 cycles	
Burst Pressure	13,920 psi (960 bar)	
Element Collapse Pressure Rating		
BN/HC	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 72 psid (5 bar) -10%		
Bypass Valve Cracking Pressure		
ΔP = 100 psid (7 bar) +10% *(standard)*		

Applications


Agricultural


Automotive


Construction


Gearboxes


Industrial


Commercial Municipal

Model Code

MFM BN/HC 75 O I 10 A 4 . 0 / B7

Filter Type
MFM = In-Line High Pressure Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*

Size
35 = 10 gpm
55 = 18 gpm
75 = 25 gpm
95 = 30 gpm

Operating Pressure
O = 4000 psi (280 bar)

Type of Connection
I = 1 1/16-12UNF (SAE 12)
H = G 3/4
(Other connections available on request)

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC

Type of Clogging Indicator
A, B/BM, C, D

Type Number
4 = 4 mounting holes

Type Modification Number *(latest version always supplied)*

Supplementary Details
SO103H = Modification of BN elements for phosphate ester fluids
W = Indicator with brass piston *(for water based fluids)*
B7 = Standard, cracking pressure of the bypass valve 7 bar
V = Fluoroelastomer (FPM) seals, filter suitable for fast bio-degradable fluids and phosphate esters (HFD-R)
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
LED = 2 LEDs up to a voltage of 24 Volt
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0035 D 010 BN4HC / V

Size
0035, 0055, 0075, 0095

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC

Element Media
BN4HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

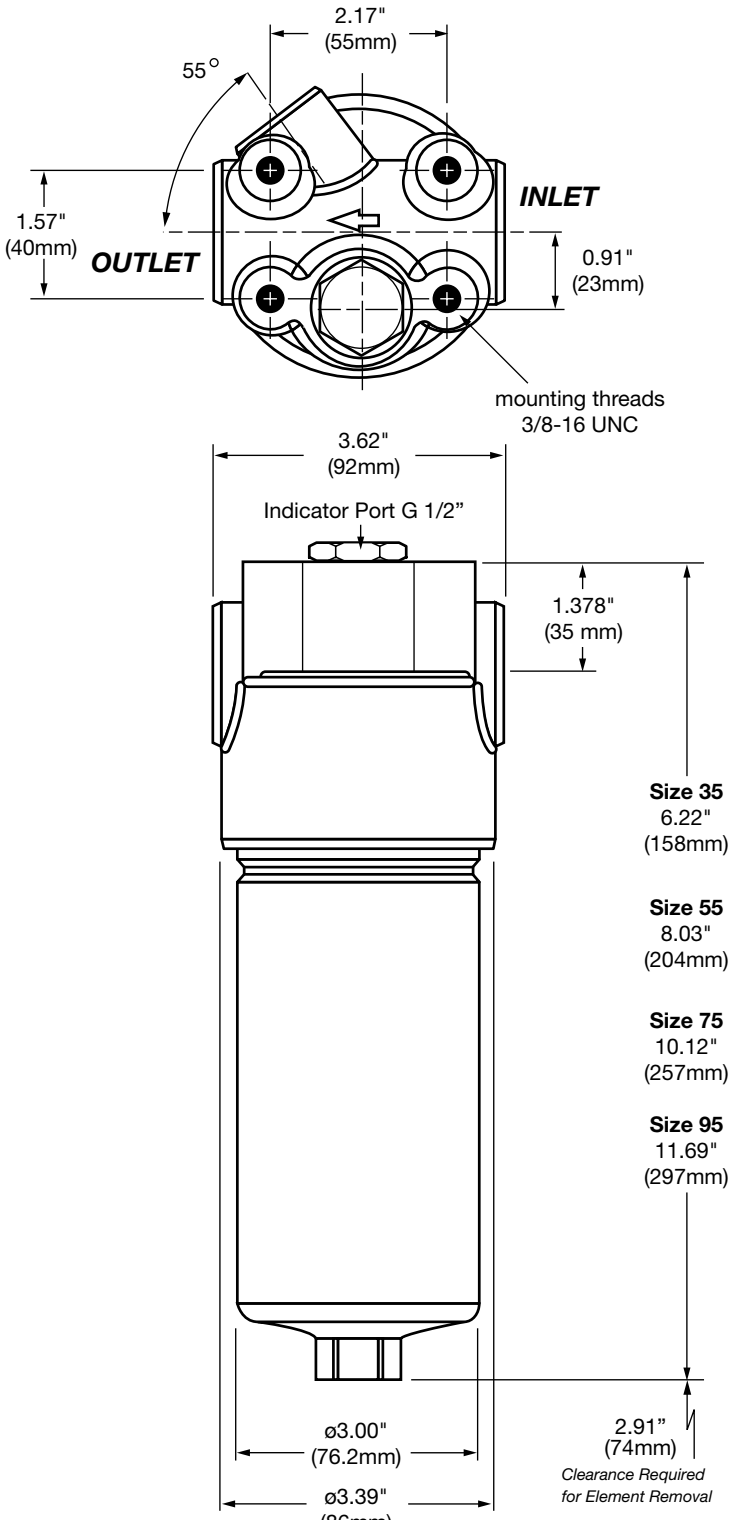
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



Size	35	55	75	95
Weight (lbs.)	6.39	8.29	9.90	10.60

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

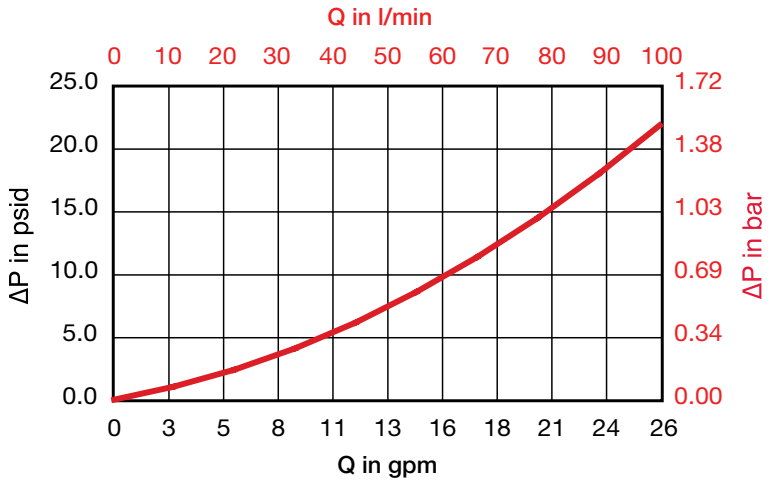
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

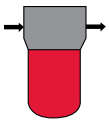
Size	...D...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0035	1.294	1.041	0.811	0.510
0055	0.751	0.603	0.444	0.263
0075	0.510	0.411	0.290	0.170
0095	0.411	0.329	0.225	0.132

All Element K Factors in psi / gpm.

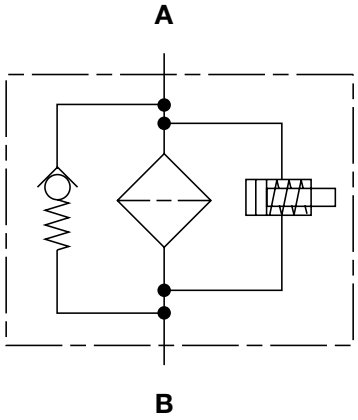
HFM Series

Inline Filters

5800 psi • up to 37 gpm



Hydraulic Symbol



Features

- The HFM filter is available in 2 sizes comprised of 2 different bowl and element lengths. The models 75 and 95, provide maximum flow rates of 29 and 37 GPM respectively.
- A quick-response by-pass valve protects against high differential pressures caused by cold start-ups, flow surges and pressure spikes.
- The high bypass pressure setting (100 psid) minimizes the possibility of contamination due to premature bypassing.
- Filters may be specified with or without a clogging indicator. Both Visual and electrical indicators are available. Standard indicators actuate at 72 psid.
- Filter materials are compatible with all mineral, lubricating oils, and commonly used fire retardant fluids per ISO 2943.
- Fatigue pressure rating equals maximum allowable working pressure rating.

Technical Details

Mounting Method	3 or 4 mounting holes - filter head
Port Connection	SAE 16, 1" BSPP
Flow Direction	Inlet: Side Outlet: Side *(opposite each other)*
Construction Materials	
Head	Ductile iron
Bowl	Steel
Flow Capacity	
75	29 gpm (110 lpm)
95	37 gpm (140 lpm)
Housing Pressure Rating	
Max. Operating Pressure	5800 psi (400 bar)
Proof Pressure	8700 psi (600 bar)
Fatigue Pressure	Contact HYDAC office
Burst Pressure	13,920 psi (960 bar)
Element Collapse Pressure Rating	
BN/HC	290 psid (20 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 72 psid (5 bar) -10%	
Bypass Valve Cracking Pressure	
ΔP = 100 psid (7 bar) +10%	

Applications


Agricultural


Automotive


Construction


Gearboxes


Industrial


Commercial Municipal


Power Generation

Model Code

HFM BN/HC 95 S K 10 A 1 . 0 / B7

Filter Type
HFM = In-Line High Pressure Filter

Element Media
BN/HC = Betamicron® *(Low Collapse)*

Size
75 = 29 gpm
95 = 37 gpm

Operating Pressure
S = 5800 psi (400 bar)

Type of Connection
J = 1" BSPP *(optional)*
K = 1 5/16-12UN (SAE 16)

Filtration Rating *(microns)*
3, 5, 10, 20 = BN/HC

Type of Clogging Indicator
A, B/BM, C, D

Type Number
1

Type Modification Number *(latest version always supplied)*

Supplementary Details
SO103H = Modification of BN elements for phosphate ester fluids
W = Indicator with brass piston *(for water based fluids)*
B7 = Standard, cracking pressure of the bypass valve 7 bar
V = Fluoroelastomer (FPM) seals, filter suitable for fast bio-degradable fluids and phosphate esters (HFD-R)
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
LED = 2 LEDs up to a voltage of 24 Volt
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0075 D 010 BN4HC / V

Size
0075, 0095

Filtration Rating *(micron)*
3, 5, 10, 20 = BN4HC

Element Media
BN4HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

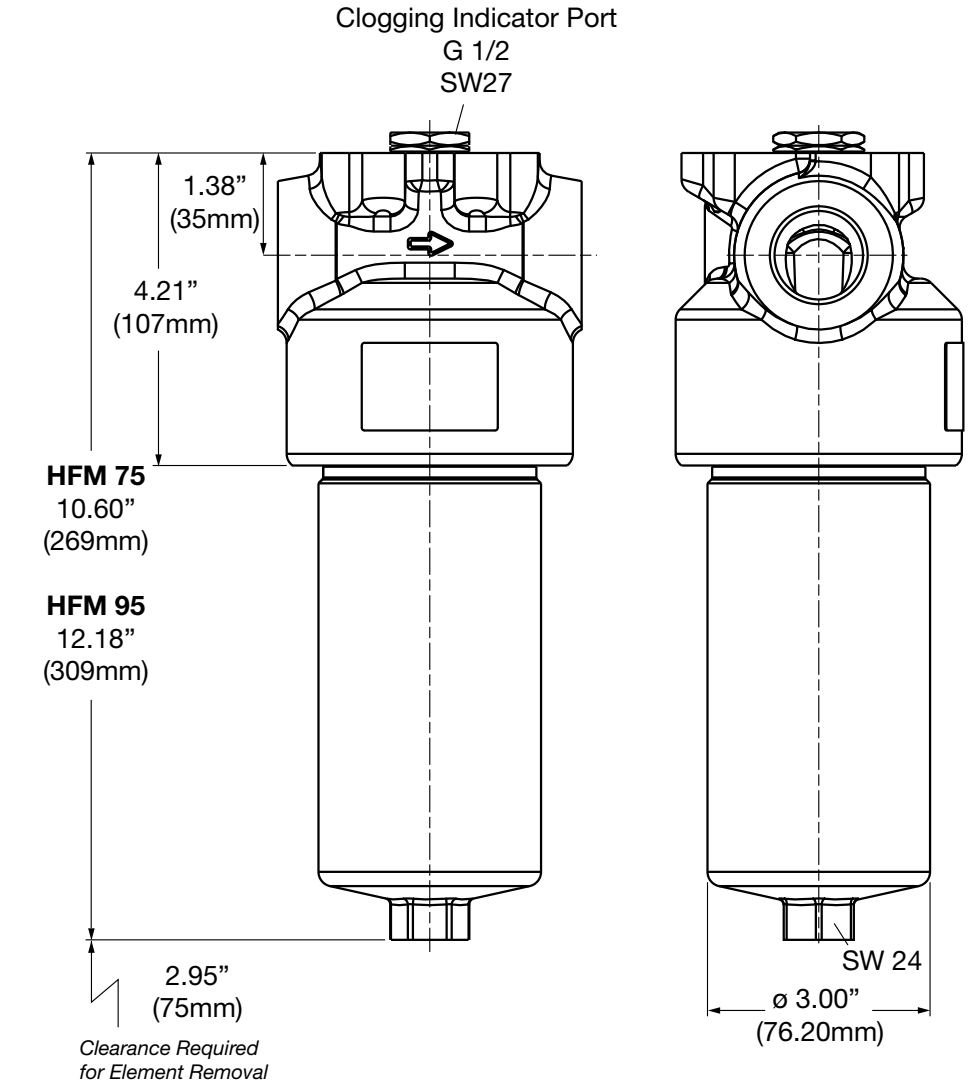
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

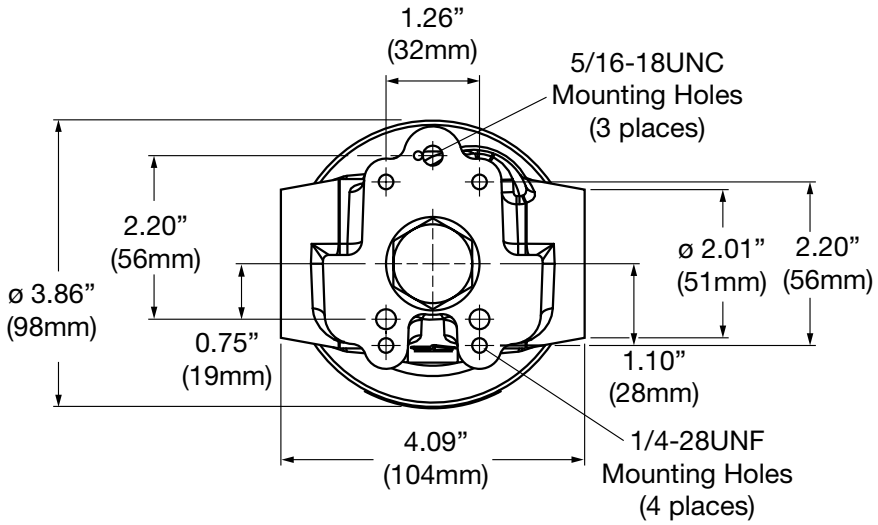
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions





Size	95
Weight (lbs.)	12.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

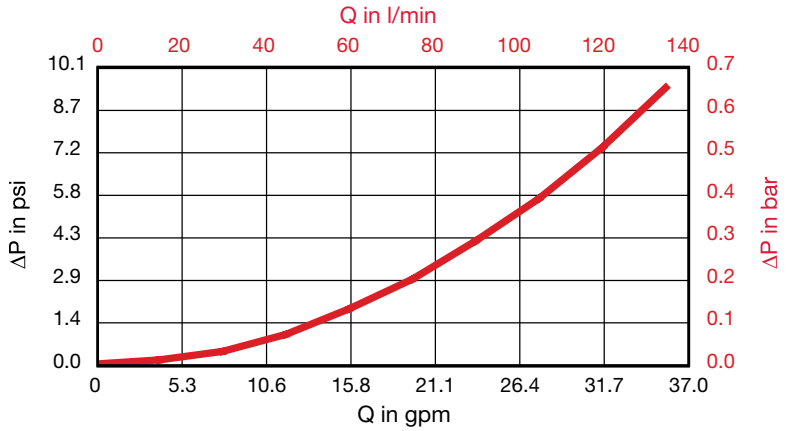
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

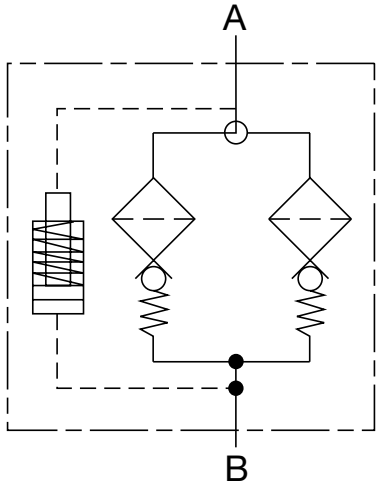
$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...**BN4HC** (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0075	0.510	0.411	0.290	0.170
0095	0.411	0.329	0.225	0.132

All Element K Factors in psi / gpm.

DFDK Series
Inline Duplex Filters
4500 psi • up to 90 gpm

Hydraulic Symbol



Features

- The DFDK Filters have a filter head of ductile iron and a screw-in bowl of cold-formed steel.
- The filter housings are designed to withstand pressure surges as well as high static pressure loads.
- The screw-in bowl allows the filter element to be easily removed for replacement or cleaning.
- A visual *(pop-up)*, electrical, electrical/visual (lamp), or other electronic differential types of clogging indicators are available to suit each application.
- DFDK filters are available only with high collapse pressure elements since no bypass is provided.

Technical Details

Mounting Method	4 mounting holes	
Port Connection		
60/110	SAE-12	
160/240/280	SAE-24	
330/660/1320	2” SAE-32 Flange Code 62	
Flow Direction	60 - 280	330 - 1320
Inlet	Top	Top
Outlet	Side	Back
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Housing (1320)	Steel	
Cap (1320)	Ductile iron	
Flow Capacity		
60/110	13 gpm (50 lpm)	
160/240/280	35 gpm (132 lpm)	
330/660/1320	90 gpm (340 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	4500 psi (315 bar)	
Proof Pressure	6800 psi (475 bar)	
Fatigue Pressure	Contact HYDAC Office	
Burst Pressure	> 18,270 psi (1260 bar)	
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 116 psid (8 bar) -10% (standard)		

Applications


Automotive


Industrial


Power Generation


Pulp & Paper


Railways


Steel / Heavy Industry

Model Code

DFDK BH/HC 60 Q A C 3 A 1 . 0 -

Filter Type
DFDK = Duplex Pressure Filter with Ball Valve Selector

Element Media
BH/HC = Betamicron® *(High Collapse)* V = Metal Fiber

Size
60, 110, 160, 240, 280, 330, 660, 1320 *(larger sizes available - contact HYDAC)*

Pressure Range
K = 2320 psi (160 bar) *(sizes 1320 - 3960 with type code 3 only)*
Q = 4568 psi (315 bar) *(sizes 30 - 1320 with type code 1 or 2 only)*

Valve
A = Ball Valve

Connection
B = SAE 8 *(size 30 only)*
C = SAE 12 *(sizes 60/110 only)*
F = SAE 24 *(sizes 160 - 280 only)*
L = 2" SAE Code 62 *(sizes 330 - 1320 only)*
M = 2 1/2" SAE Code 62 *(sizes 1320 only)*

Filtration Rating *(micron)*
3, 5, 10, 20 = BH/HC 3, 5, 10, 20 = V

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1 = One Piece Bowl *(sizes 60 - 660 only)*
2 = Two Piece Bowl *(size 280, 330, 660, 1320 only)*
3 = Upside down mounting - Element top access *(size 1320 only)*

Modification Number *(latest version always supplied)*

Port Configuration
12 = SAE Straight thread O-ring Boss Ports *(sizes 60-280 only)*
16 = SAE Flange Ports *(sizes 330-1320 only)*

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Supplementary Details
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
W = Indicators with brass piston *(for use with water based fluids)*
SO155H = Modification of BH4HC Elements for Phosphate Esters.
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0030 D 010 BH4HC / V

Size
0060, 0110, 0160, 0240,
0280, 0330, 0660, 1320

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC
3, 5, 10, 20 = V

Element Media
BH4HC, V

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
8 = 116 psid (8 bar)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

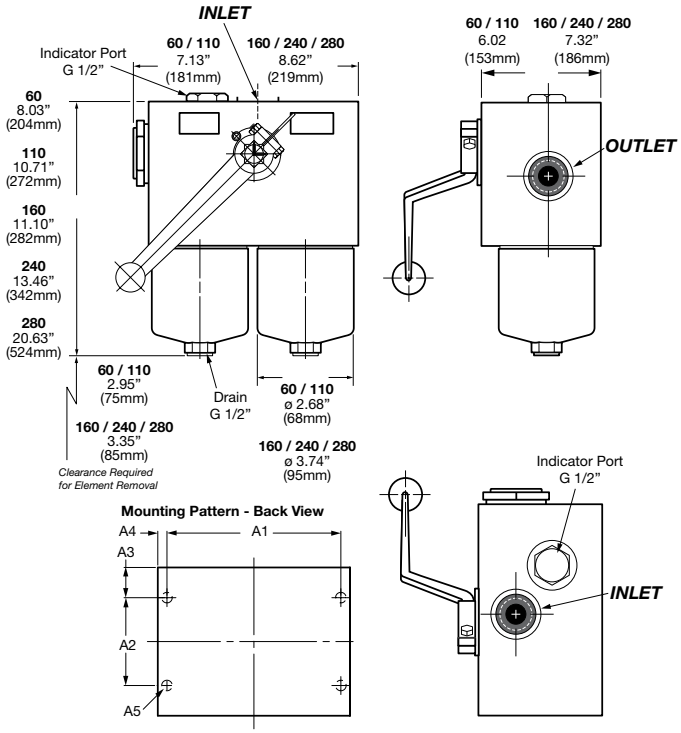
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

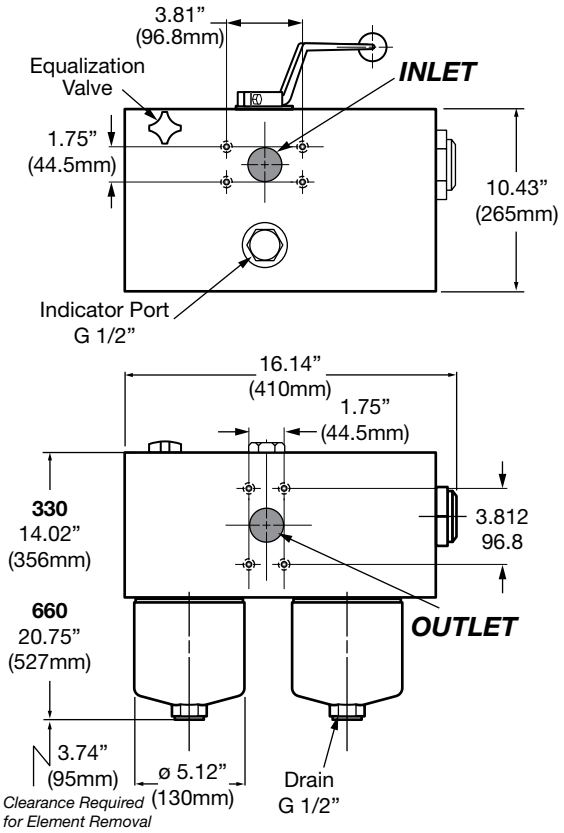
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions
DFDK 60 / 110 / 160 / 240 / 280

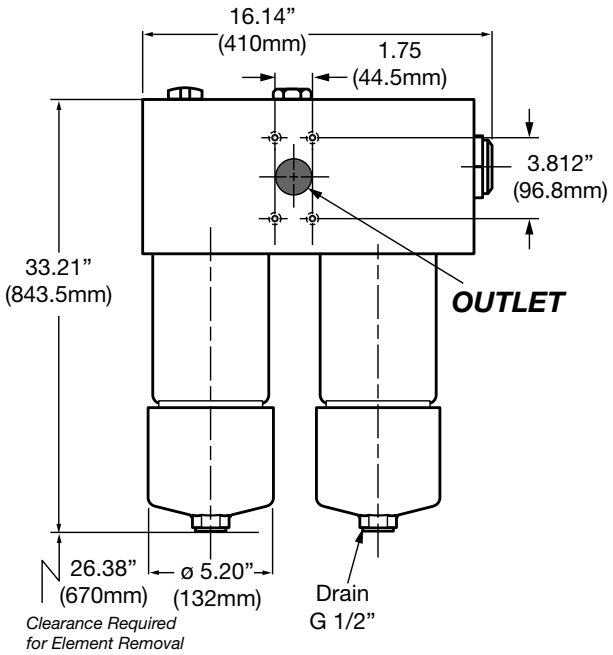


Size	A1	A2	A3	A4	A5
60/110	138 ± 0.2	78 ± 0.2	19	16	1/4"-28UNF-2Bx10DP
160/240/280	190 ± 0.2	96 ± 0.2	33	10	3/8"-24UNFx11/16DP

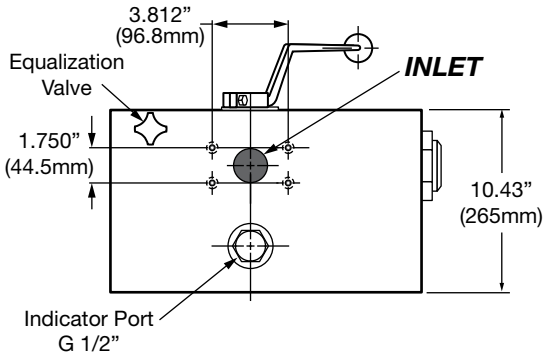
DFDK 330 / 660



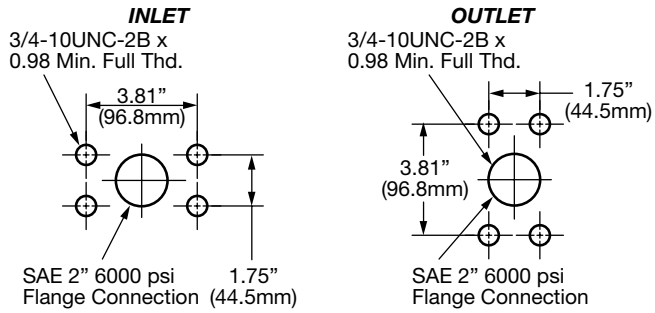
DFDK 1320 – Back View



DFDK 1320 – Top View



Flange Detail 330 / 660 / 1320



Size	60	110	160	240	280	330	660	1320
Weight (lbs.)	16.0	36.2	70.6	76.3	93.5	335.0	366.0	427.7

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

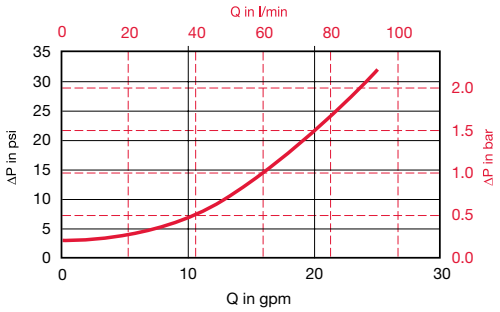
Housing Curve:

Pressure loss through housing is as follows:

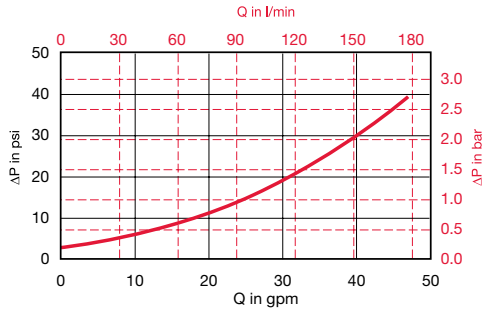
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

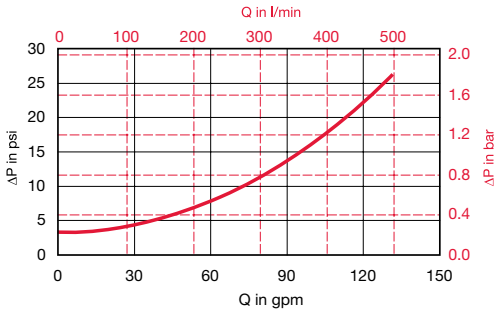
DFDK 60 / 110 Housing



DFDK 160 / 240 / 280 Housing



DFDK 330 / 660 / 1320 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0060	3.210	1.785	0.993	0.669
0110	1.394	0.819	0.488	0.307
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0330	0.422	0.244	0.154	0.108
0660	0.179	0.106	0.055	0.049
1320	0.089	0.054	0.031	0.024

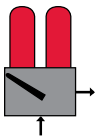
Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0060	0.877	0.511	0.296	0.183
0110	0.452	0.304	0.182	0.118
0160	0.251	0.177	0.123	0.079
0240	0.169	0.137	0.093	0.062
0280	0.126	0.093	0.064	0.041
0330	0.121	0.097	0.065	0.043
0660	0.063	0.050	0.034	0.021
1320	0.032	0.026	0.018	0.012

All Element K Factors in psi / gpm.

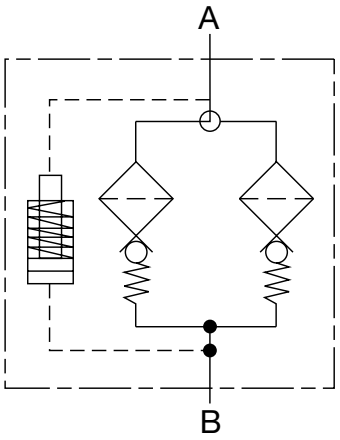
HFDK4P Series

Inline Duplex Filters

4500 psi • up to 90 gpm



Hydraulic Symbol



Features

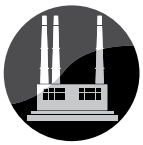
- The HFDK4P pressure duplex filter meets HF4 automotive specification element requiremnets.
- The HFDK4P filters have a filter head and lid of ductile iron and a cold formed steel housing to meet high fatigue pressure requirements.
- The filter housings are designed to withstand pressure surges as well as high static pressure loads.
- The screw-in lids allow top access for the filter element to be easily removed for replacement.
- Visual (pop-up), electrical, electrical/visual (lamp), or electronic differential type clogging indicators are available.
- HFDK4P filters are available only with high collapse pressure elements with no bypass provided.

Technical Details

Mounting Method	4 mounting holes
Port Connection	2” SAE Flange Code 62
Flow Direction	Inlet: Bottom Outlet: Back
Construction Materials	
Head, Lid	Ductile iron
Housing	Steel
Flow Capacity	
9”	50 gpm (189 lpm)
18”	75 gpm (284 lpm)
27”	90 gpm (340 lpm)
Housing Pressure Rating	
Max. Operating Pressure	4500 psi (315 bar)
Proof Pressure	6800 psi (475 bar)
Fatigue Pressure	4500 psi (315 bar)
Burst Pressure	Contact HYDAC Office
Element Collapse Pressure Rating	
BH	3045 psid (210 bar)
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)
Fluid Compatability	
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	
ΔP = 116 psid (8 bar) -10% *(standard)*	
ΔP = 72 psid (5 bar) -10% *(optional)*	

Applications

Automotive



Industrial

Power Generation

Pulp & Paper

Shipbuilding

Steel / Heavy Industry

Model Code

HFDK4P BH 27 F 5 C 1 . 0 / 16 V BO

Filter Type
HFDK4P = Inline duplex pressure filter

Element Media
BH = Betamicron® *(High Collapse)*

Element Length
09 = 9 inches
18 = 18 inches
27 = 27 inches

Type of Connection
F = Flanged

Filtration Rating *(micron)*
3, 5, 10, 20 = BH

Type of Clogging Indicator
A, B/BM, C, D

Type Code
1

Modification Number *(the latest version is always supplied)*

Port Configuration
16 = 2" SAE 4 bolt flange (code 62)

Indicator Trip Pressure
(omit) = 116 psid (8 Bar) *(standard)*
A5 = 72 psid (5 Bar)

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM)

Supplementary
SO155H = Modification of BH elements for phosphate ester fluids
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
BO = M-12x1 Connection *(LZ Indicator)*
T100 = Thermal lockout on indicator at 100°F *(C and D indicators only)*

Replacement Element Model Code

5 . 03 . 09 D 03 BH /-V

Length *(nominal inches)*
09, 18, 27

Filtration Rating *(micron)*
3, 5, 10, 20 = BH

Element Media
BH

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
5 = 72 psid (5 bar) *(standard)*
8 = 116 psid (8 bar) *(option)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

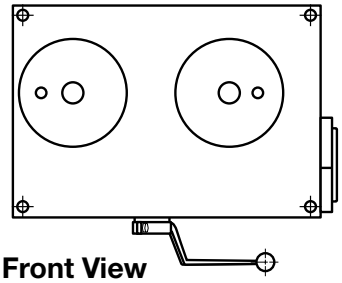
Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

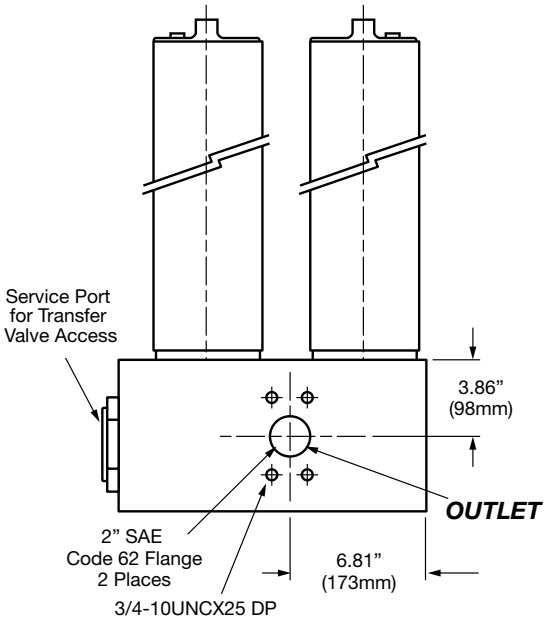
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions

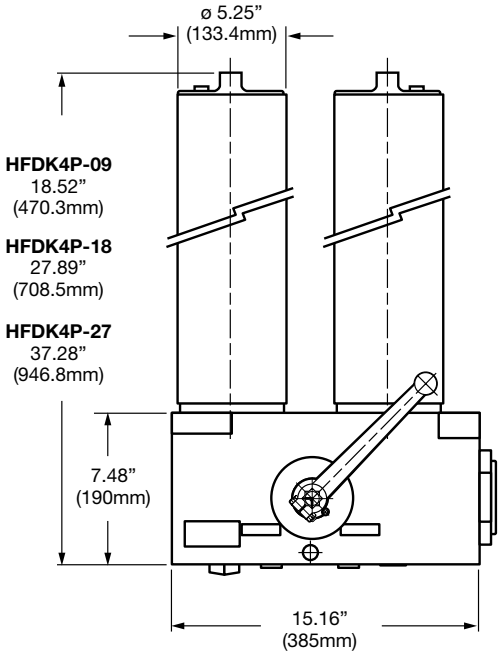
Top View



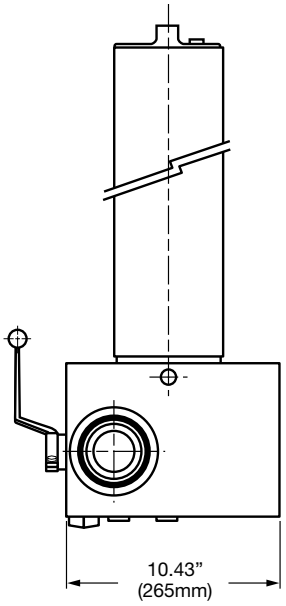
Back View



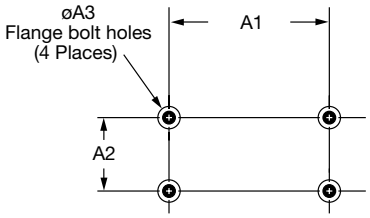
Front View



Side View

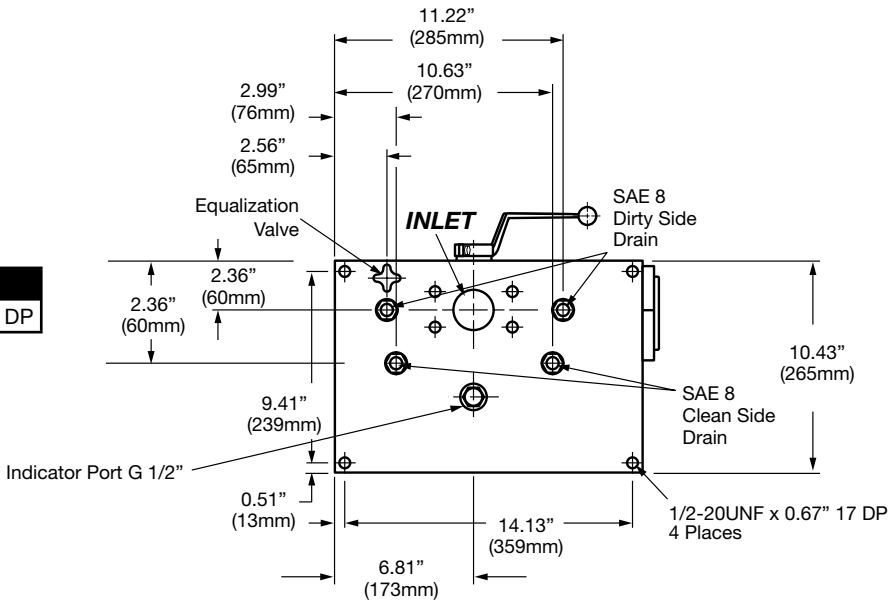


Flange Detail



A1	A2	A3
96.8±0.3	44.5±0.3	3/4"-10UNC-2B x 38 DP

Bottom View



Size	09	18	27
Weight (lbs.)	345	385.4	425.4

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

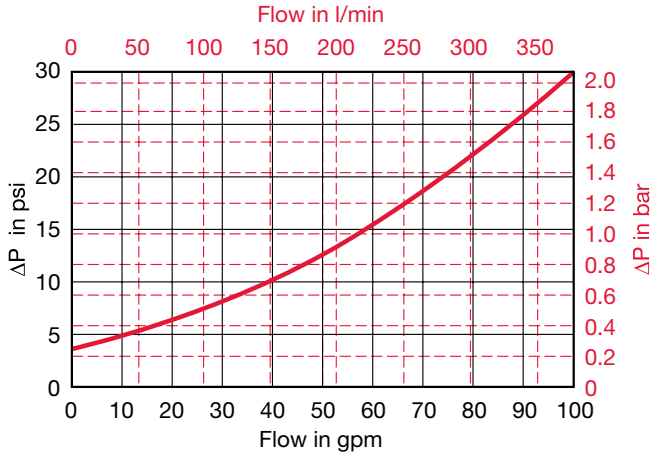
Assembly ΔP = Housing ΔP + Element ΔP

Housing Curve:

Pressure loss through housing is as follows:

$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*



Element K Factors

$$\text{P Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141\ \text{SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

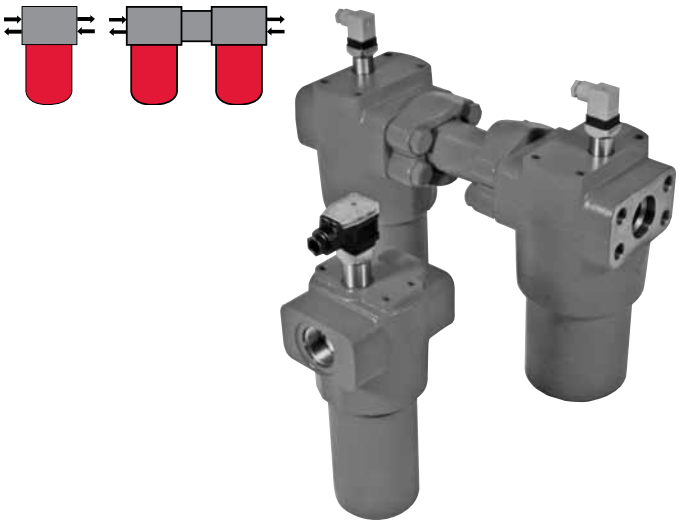
Size	5.03.XXDBH			
	3 µm	5 µm	10 µm	20 µm
09	0.2068	0.1457	0.0886	0.0465
18	0.0967	0.0681	0.0414	0.0217
27	0.0630	0.0444	0.0270	0.0142

All Element K Factors in psi / gpm.

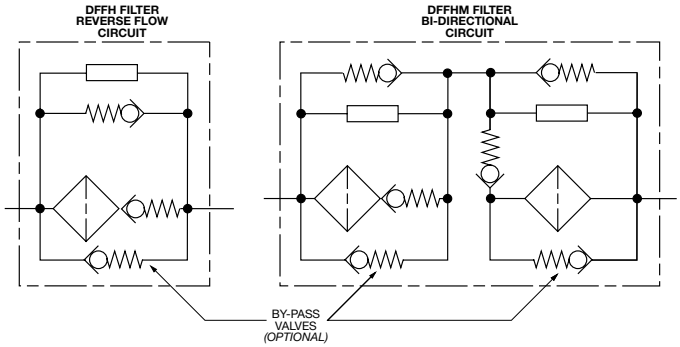
DFFH & DFFHM Series

Reverse Flow & Bi-directional Filters

6000 psi • up to 100 gpm



Hydraulic Symbol



Features

- DFFH Reverse Flow models filter fluid in the forward direction and bypass the filter element when the flow direction is reversed.
- DFFHM Bi-Directional model allows 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 adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (Nitrile, Fluoroelastomer, and EPR) provide 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.

Applications


Agricultural


Automotive


Construction


Industrial


Railways

Technical Details

Mounting Method	DFFH: 4 mounting holes DFFHM: 8 mounting holes	
Port Connection		
DFFH 160/240/280	SAE-20, 1 1/4" SAE Flange Code 62	
DFFH 330/660/1320	SAE-24, 2" SAE Flange Code 62	
DFFHM 160/240/280	1 1/4" SAE Flange Code 62	
DFFHM 330/660/1320	1 1/2" SAE Port or 2" SAE Flange Code 62	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Flow Capacity		
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
280	74 gpm (280 lpm)	
330	87 gpm (330 lpm)	
660/1320	100 gpm (380 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	6000 psi (420 bar)	
Proof Pressure	9000 psi (610 bar)	
Fatigue Pressure	6000 psi (420 bar)	
Burst Pressure	Contact HYDAC Office	
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
BN/HC, W/HC	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)* ΔP = 72 psid (5 bar) -10% *(standard)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)* ΔP = 87 psid (6 bar) +10% *(standard)*		

Model Code

DFFH BH/HC 160 G 3 A 1 . 0 / 12 _ _ _ _

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

Element Media
BH/HC = Betamicron® *(High Collapse)* BN/HC = Betamicron® *(Low Collapse)* V = Metal Fiber

Size and Nominal Connection

DFFH			DFFHM		
160	=	1 1/4" SAE Port or Flange	160	=	1 1/4" Flange *(only)*
240	=	1 1/4" SAE Port or Flange	240	=	1 1/4" Flange *(only)*
280	=	1 1/4" SAE Port or Flange	280	=	1 1/4" Flange *(only)*
330	=	1 1/2" SAE Port or 2" Flange	330	=	2" Flange *(only)*
660	=	1 1/2" SAE Port or 2" Flange	660	=	2" Flange *(only)*
1320	=	1 1/2" SAE Port or 2" Flange	1320	=	2" Flange *(only)*

Type of Connection
G = Threaded *(not available for DFFHM)* F = Flange

Filtration Rating *(micron)*
3, 5, 10, 20 = BH/HC, BN/HC 3, 5, 10, 20 = V

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1
2 = 2 Piece Bowl *(size 1320 only)*

Modification Number *(latest version is always supplied)*

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

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(BH4HC or V elements required)*
B6 = 87 psid Bypass *(standard)*

Supplementary Details
SO103H = Modification of BN4HC *(Low Collapse)* & W/HC Element For Phosphate Ester
SO155H = Modification of BH4HC Element for Phosphate Ester Fluids
SO184 = G-1/2" Drain in Bowl Option For Sizes 160 - 280 *(standard for sizes 330 & 660)*
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0160 D 010 BH4HC / V

Size
0160, 0240, 0280,
0330, 0660, 1320

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN4HC
3, 5, 10, 20 = V

Element Media
BH4HC, BN4HC, V

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X / _ _ _ _

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

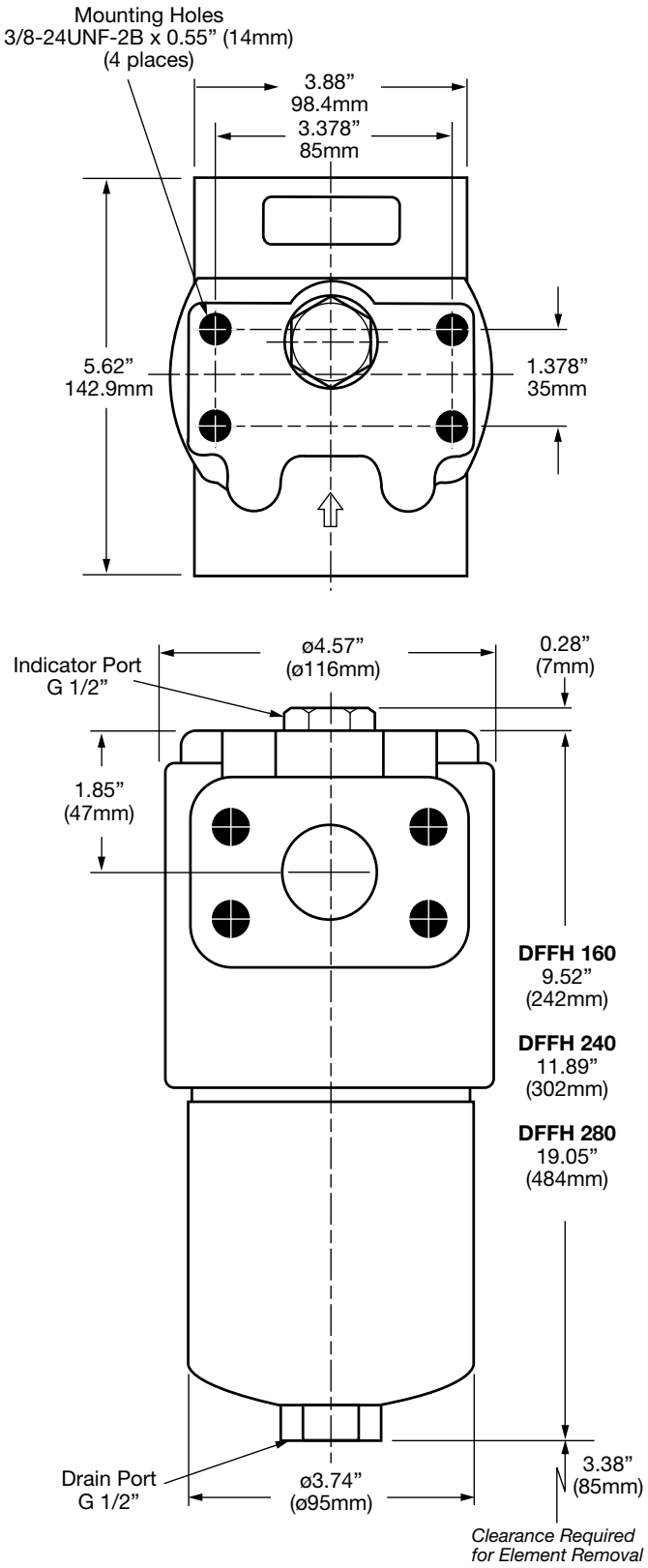
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

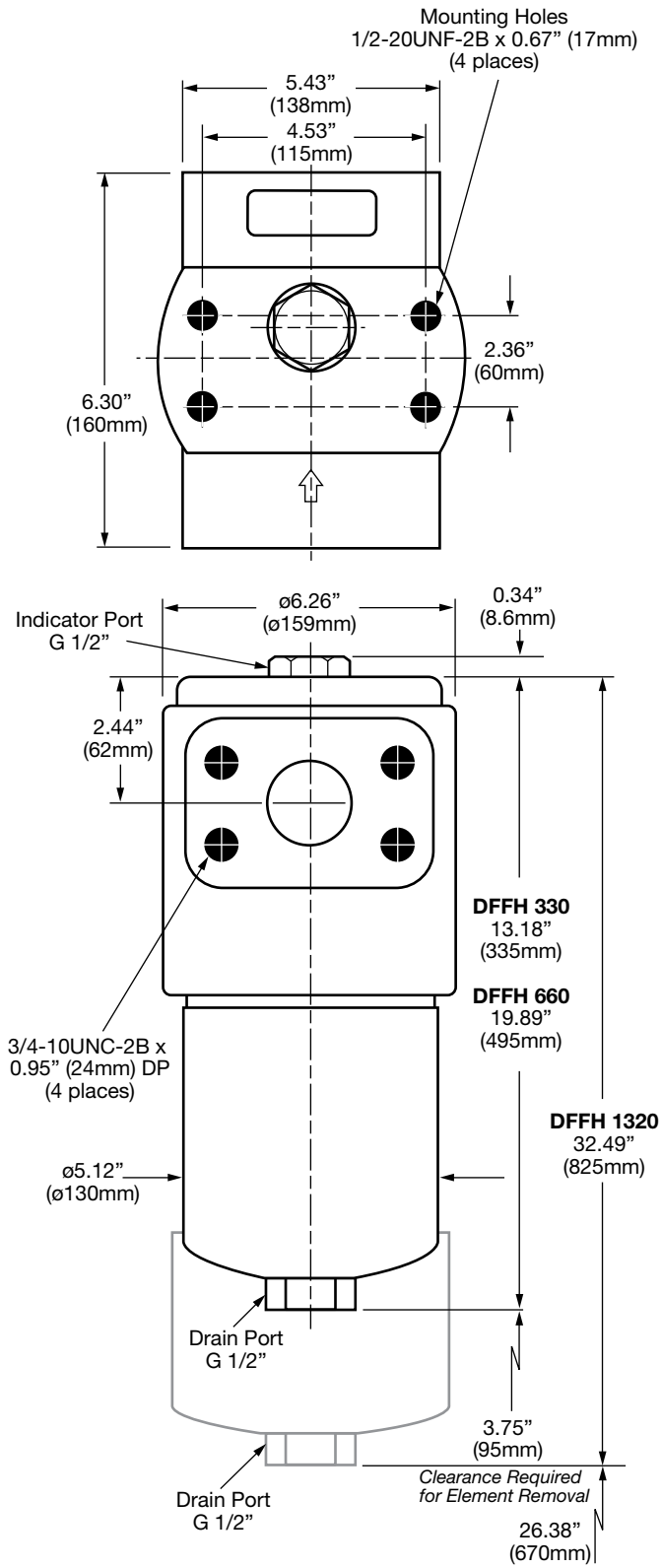
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions DFFH 160 / 240 / 280



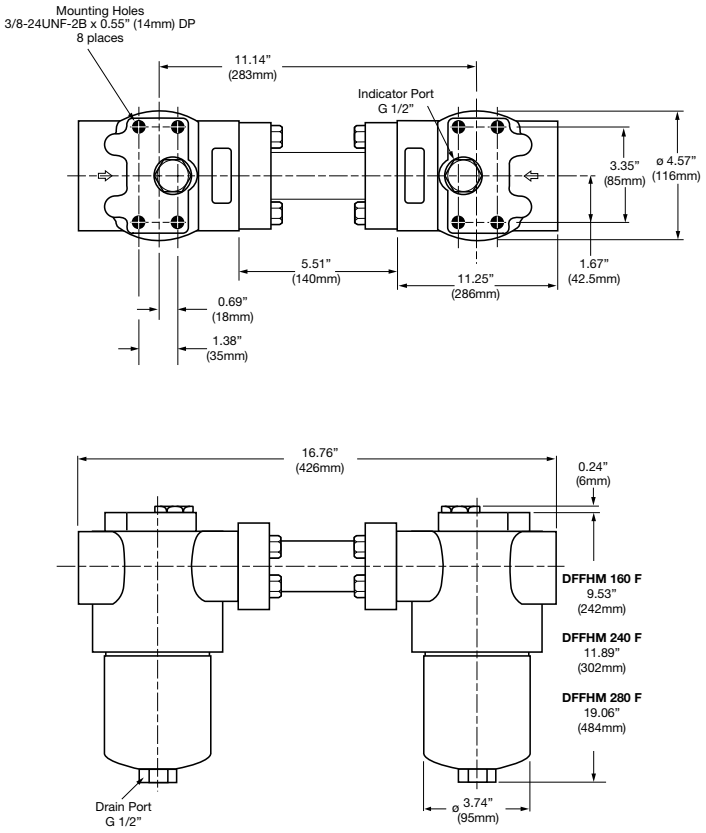
DFFH 330 / 660 / 1320



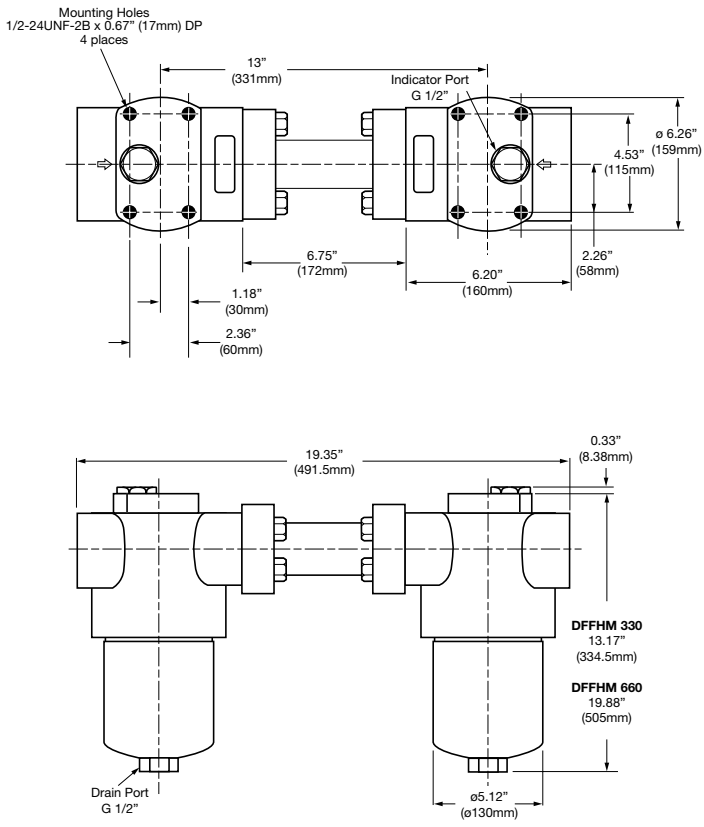
Size - DFFH	160	240	280	330	660	1320
Weight (lbs.)	24.6	27.4	36.6	58.6	73.9	117.3

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

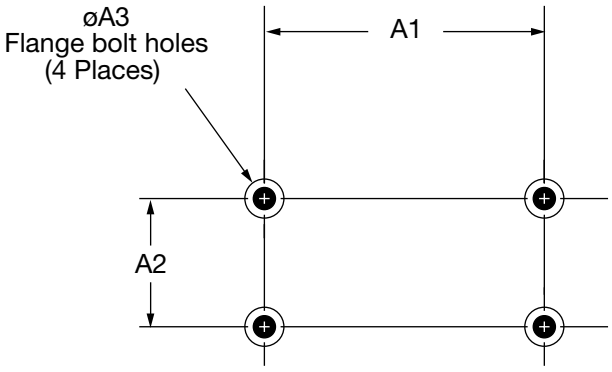
DFFHM 160 / 240 / 280



DFFHM 330 / 660



Inlet / Outlet Flange Details

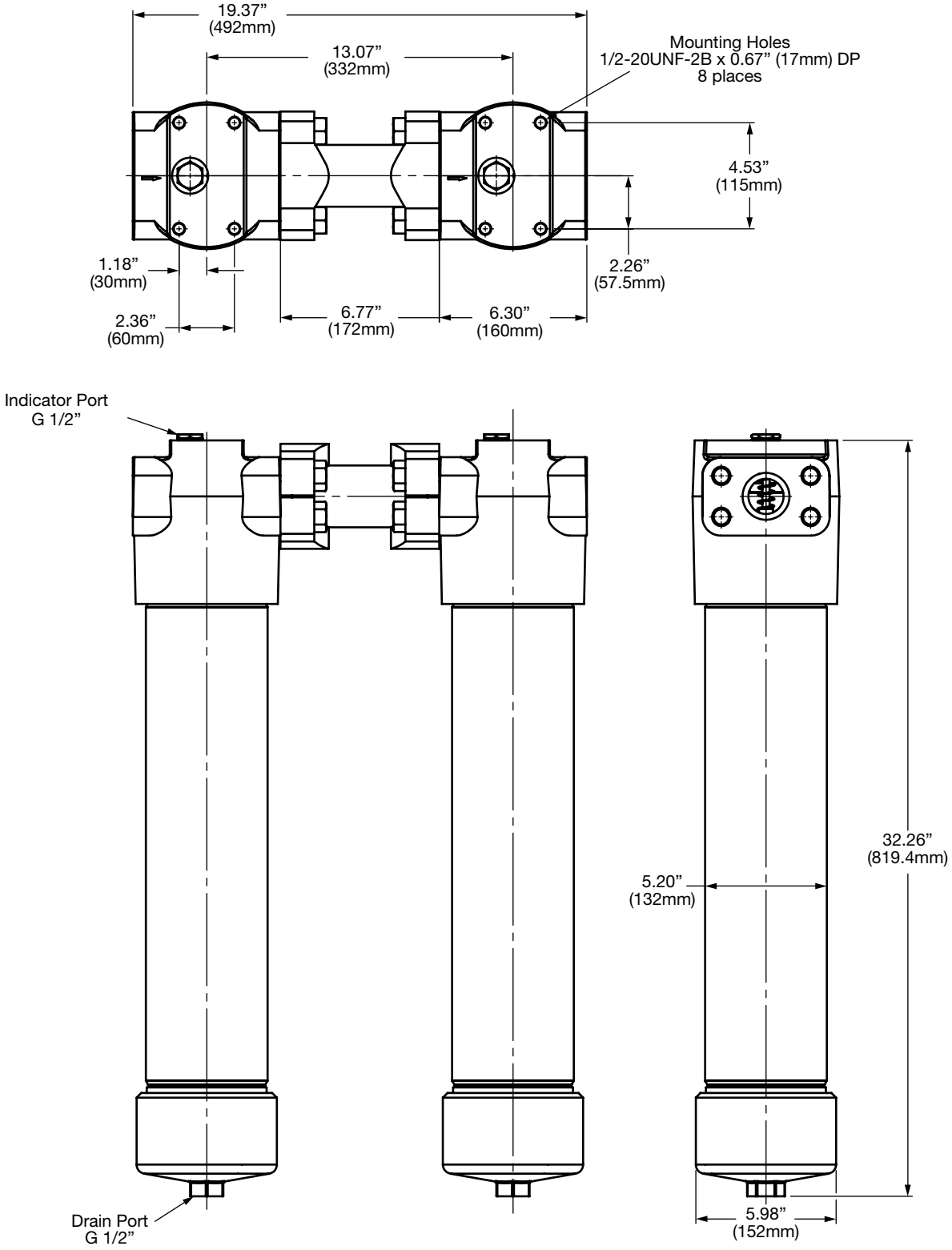


Size	A1	A2	A3
DFFH/M 160/240/280	66.7±0.3	31.8±0.3	1/2-UNC-2B x 25.4 DP
DFFH/M 330/660/1320	96.8±0.3	44.5±0.3	3/4-10UNC-2B x 24 DP

Size - DFFHM	160	240	280	330	660
Weight (lbs.)	57.1	62.7	71.1	134.2	165.0

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions DFFHM 1320



Size - DFFHM	1320
Weight (lbs.)	251.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

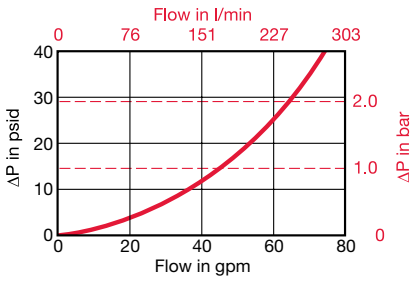
Housing Curve:

Pressure loss through housing is as follows:

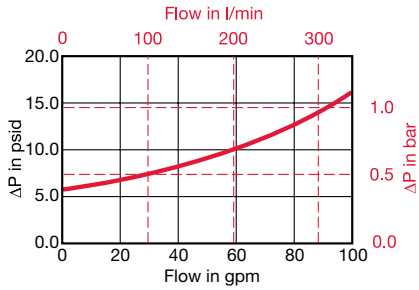
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

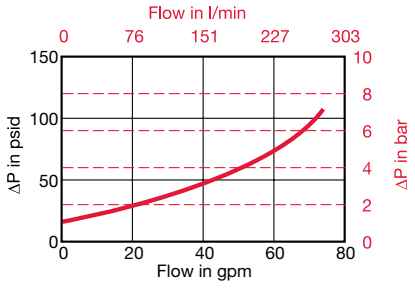
DFFH 160/240/280 Forward Flow



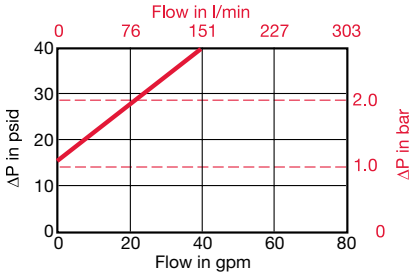
DFFH 330/660/1320 Forward Flow



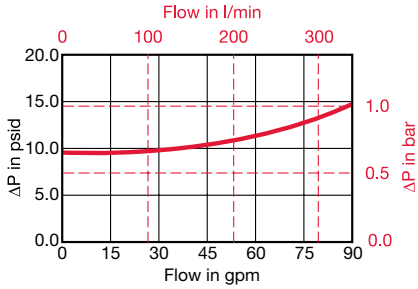
DFFHM 160/240/280 Forward & Reverse Flow



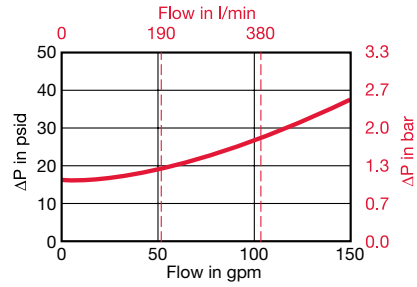
DFFH 160/240/280 Reverse Flow



DFFH 330/660/1320 Reverse Flow



DFFHM 330/660/1320 Forward & Reverse Flow



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

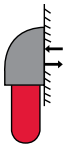
Size	...D...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0160	0.718	0.480	0.252	0.193
0240	0.450	0.333	0.196	0.128
0280	0.220	0.171	0.092	0.071
0330	0.294	0.215	0.163	0.095
0660	0.136	0.099	0.061	0.044
1320	0.068	0.048	0.030	0.021

Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0330	0.422	0.244	0.154	0.108
0660	0.179	0.106	0.055	0.049
1320	0.089	0.054	0.031	0.024

Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0160	0.251	0.177	0.123	0.079
0240	0.169	0.137	0.093	0.062
0280	0.126	0.093	0.064	0.041
0330	0.121	0.097	0.065	0.043
0660	0.063	0.050	0.034	0.021
1320	0.032	0.026	0.018	0.012

All Element K Factors in psi / gpm.

DF...QE Series
Manifold Mount Filters
4500 psi • up to 180 gpm



Features

- The DF...QE Filters have a filter head of ductile iron and a screw-in bowl of cold-formed steel for high fatigue strength.
- The filter housings are designed to withstand pressure surges as well as high static pressure loads.
- The screw-in bowl allows the filter element to be easily removed for replacement or cleaning.
- Visual (pop-up), electrical, electrical/visual (lamp), or electronic differential type clogging indicators can be installed.
- DF...QE filters are available with or without a bypass valve so either high or low collapse pressure elements may be used.
- Fatigue pressure rating equals maximum allowable working pressure rating.

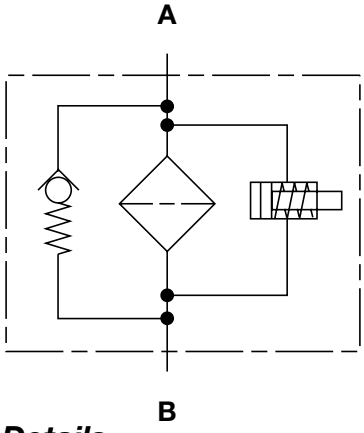
Applications

Industrial

Railways

Steel / Heavy Industry

Hydraulic Symbol



Technical Details

Mounting Method	4 mounting holes *(manifold mount)*	
Port Connection	Diameters	
30	0.551” (14mm)	
60/110	0.787” (20mm)	
160/240/280	1.260” (32mm)	
330/660/1320	1.181” (30mm)	
Flow Direction	Inlet: SIde	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Housing (1320)	Steel	
Cap (1320)	Ductile iron	
Flow Capacity		
30	8 gpm (30 lpm)	
60	16 gpm (60 lpm)	
110	29 gpm (110 lpm)	
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
280	74 gpm (280 lpm)	
330	87 gpm (330 lpm)	
660	174 gpm (660 lpm)	
1320	180 gpm (1320 lpm)	
Housing Pressure Rating	QE	MHE
Max. Operating Pressure	4500 psi (315 bar)	3625 psi (250 bar)
Proof Pressure	6750 psi (472 bar)	5438 psi (375 bar)
Fatigue Pressure	4500 psi (315 bar) @ 1 mil. cycles	3625 psi (250 bar) @ 100 mil. cycles
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
BN/HC, W/HC	290 psid (20 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10% *(optional)*		
ΔP = 72 psid (5 bar) -10% *(standard)*		
Bypass Valve Cracking Pressure		
ΔP = 43 psid (3 bar) +10% *(optional)*		
ΔP = 87 psid (6 bar) +10% *(standard)*		

Model Code

DF BH/HC 30 Q E 3 A 1 . X /

Filter Type
DF

Element Media
BH/HC = Betamicron® *(High Collapse)* BN/HC = Betamicron® *(Low Collapse)*
V = Metal Fiber W/HC = Wire Screen

Size
30, 60, 110, 160, 240, 280, 330, 660, 1320

Operating Pressure
Q = 4500 psi (300 bar)
MH = 3625 psi (250 bar) *(high dynamic @ 100 million cycles)*

Type of Connection
E = Manifold Block Mounting - Side of Filter Head - 4 mounting holes

Filtration Rating *(microns)*
3, 5, 10, 20 = BH/HC, BN/HC 3, 5, 10, 20 = V 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1

Modification Number *(the latest version is always supplied)*

Seals
(omit = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(BH4HC or V elements recommended)*
B3 = 43 psid Bypass *(optional)*
B6 = 87 psid Bypass *(standard)*

Supplementary Details
SO103H= Modification of BN4HC *(Low Collapse)* & W/HC Element For Phosphate Ester Fluids
SO155H= Modification of BH4HC *(High Collapse)* Element For Phosphate Ester Fluids
SO184 = G-1/2 Drain in Bowl Option For Sizes 30 - 280 *(standard for sizes 330 - 1320)*
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0030 D 010 BN4HC / V

Size
0030, 0060, 0110, 0160, 0240,
0280, 0330, 0660, 1320

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN4HC
3, 5, 10, 20 = V
25, 74, 149 = W/HC

Element Media
BH4HC, BN4HC, V, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

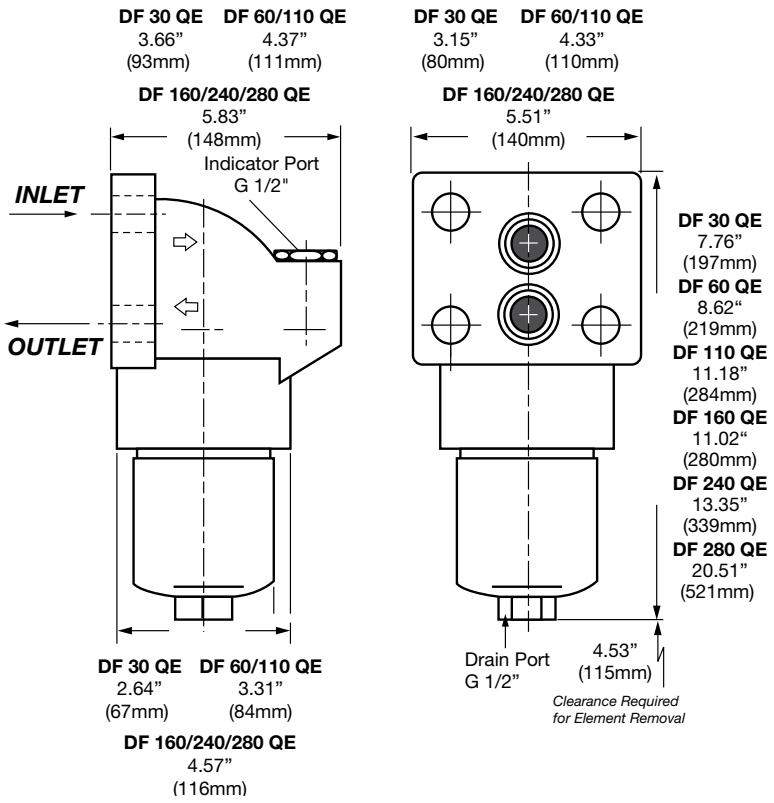
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

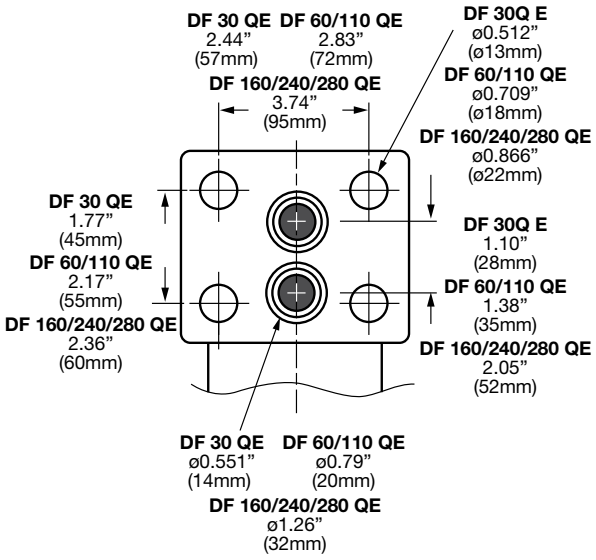
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

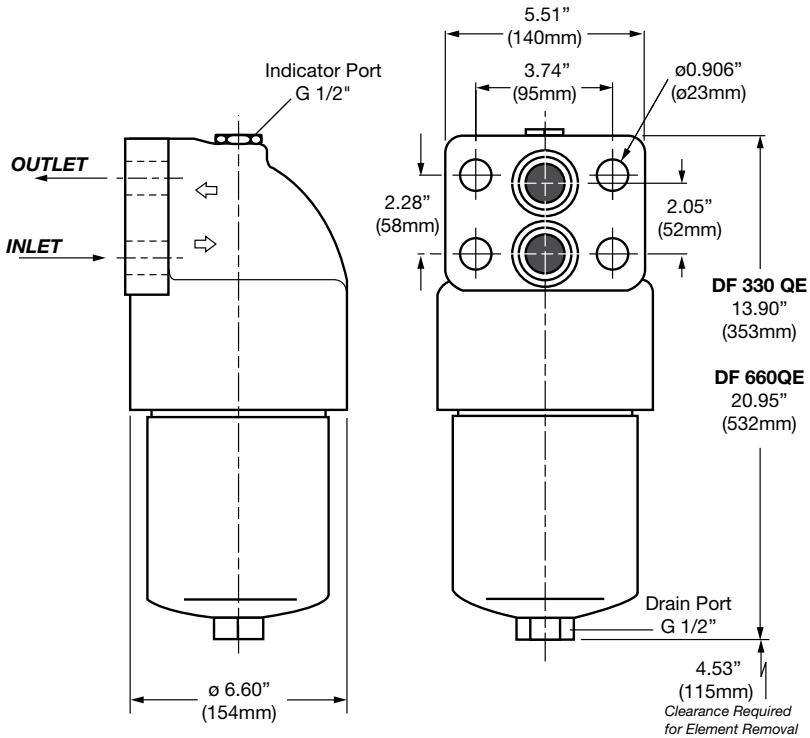
Dimensions
DF 30 – 280 QE



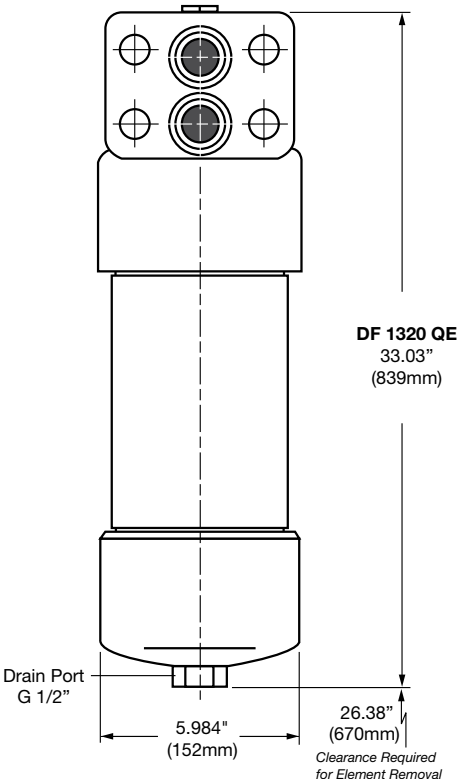
Mounting Pattern



DF 330 – 660 QE



DF 1320 QE



Size	30	60	110	160	240	280	330	660	1320
Weight (lbs.)	6.0	10.8	12.8	20.0	22.7	31.9	47.8	63.2	105.8

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

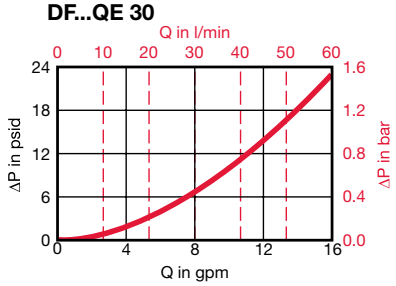
Housing Curve:

Pressure loss through housing is as follows:

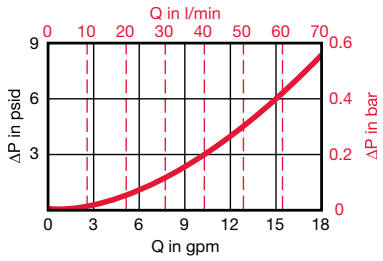
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

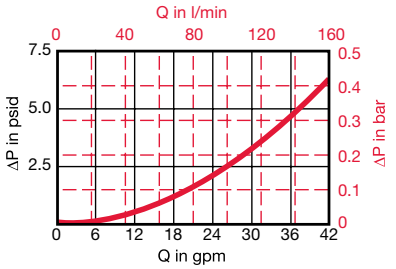
DF...QE 30



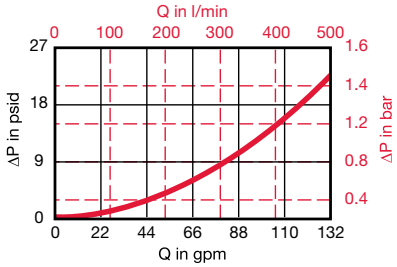
DF...QE 60/110



DF...QE 160/240/280



DF...QE 330/660/1320



Element K Factors

$$\Delta P \text{ Elements} = \text{Elements (K) Flow Factor (From Tables Below)} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	3.504	2.374	1.251	0.618
0060	1.582	1.116	0.723	0.433
0110	0.819	0.585	0.361	0.205
0140	0.701	0.450	0.261	0.157
0160	0.718	0.480	0.252	0.193
0240	0.450	0.333	0.196	0.128
0280	0.220	0.171	0.092	0.071
0330	0.294	0.215	0.163	0.095
0660	0.136	0.099	0.061	0.044
1320	0.068	0.048	0.030	0.021

Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	5.000	2.780	1.989	1.042
0060	3.210	1.785	0.993	0.669
0110	1.394	0.819	0.488	0.307
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0330	0.422	0.244	0.154	0.108
0660	0.179	0.106	0.055	0.049
1320	0.089	0.054	0.031	0.024

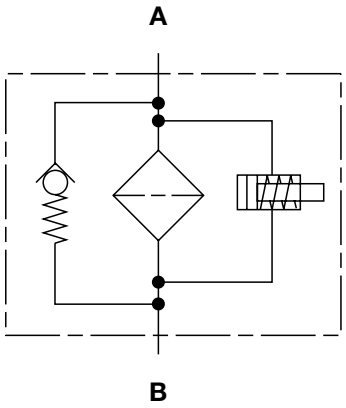
Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0030	1.011	0.740	0.411	0.200
0060	0.877	0.511	0.296	0.183
0110	0.452	0.304	0.182	0.118
0160	0.251	0.177	0.123	0.079
0240	0.169	0.137	0.093	0.062
0280	0.126	0.093	0.064	0.041
0330	0.121	0.097	0.065	0.043
0660	0.063	0.050	0.034	0.021
1320	0.032	0.026	0.018	0.012

Size	...D...W/HC Elements
	25, 50, 74, 100, 149, 200 µm
0030	0.185
0060	0.092
0110	0.050
0160	0.035
0240	0.023
0280	0.020
0330	0.020
0660	0.008
0990	0.006

All Element K Factors in psi / gpm.

DFP Series
Manifold Mount Filters
4500 psi • up to 180 gpm

Hydraulic Symbol



Features

- The filter housings are designed to withstand pressure surges as well as high static pressure loads.
- The screw-in bowl allows the filter element to be easily removed for replacement or cleaning.
- A visual (pop-up), electrical, electrical/visual (lamp), or electronic differential type clogging indicator can be installed.
- DFP filters are available with or without a bypass valve so either high or low collapse pressure elements may be used.
- Multiple indicator port locations (DFP330/660/1320 only) also allow two different types of indicators to be installed into the filter. Indicators of the same type, but with different trip pressures can also be installed.
- Fatigue pressure rating equals maximum allowable working pressure rating.

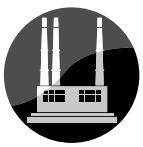
Technical Details

Mounting Method	*(manifold mount)*	
60 - 280	4 mounting holes	
330 - 1320	6 mounting holes	
Port Connection	Diameter	
60/110	0.689" (17.5mm)	
160/240/280	0.843" (21.4mm)	
330/660/1320	1.181" (30mm)	
Flow Direction	Inlet: Top	Outlet: Top
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Housing (1320)	Steel	
Cap (1320)	Ductile iron	
Flow Capacity		
60	16 gpm (60 lpm)	
110	29 gpm (110 lpm)	
160	42 gpm (160 lpm)	
240	63 gpm (240 lpm)	
280	74 gpm (280 lpm)	
330	87 gpm (330 lpm)	
660	174 gpm (660 lpm)	
1320	180 gpm (1320 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	4500 psi (315 bar)	
Proof Pressure	6750 psi (472 bar)	
Fatigue Pressure	4500 psi (315 bar) @ 1 milllion cycles	
Burst Pressure	60/110	15,805 psi (1090 bar)
	160/240/280	>18,000 psi (1240 bar)
	330/660/1320	15,660 psi (1080 bar)
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
BN/HC, W/HC	290 psid (17 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability	Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.	
Indicator Trip Pressure	ΔP = 29 psid (2 bar) -10% *(optional)* ΔP = 72 psid (5 bar) -10% *(standard)*	
Bypass Valve Cracking Pressure	ΔP = 43 psid (3 bar) +10% *(optional)*) ΔP = 87 psid (6 bar) +10% *(standard)*	

Applications


Agricultural


Construction


Industrial


Power Generation


Railways


Steel / Heavy Industry

Model Code

DFP BH/HC 60 Q B 3 A 1 . X /

Filter Type
DFP = Manifold mount filter

Element Media
BH/HC = Betamicron® *(High Collapse)* BN/HC = Betamicron® *(Low Collapse)*
V = Metal Fiber W/HC = Wire Screen

Size and Nominal Port Size
60 = 3/4" 280 = 1"
110 = 3/4" 330 = 1 1/4"
160 = 1" 660 = 1 1/4"
240 = 1" 1320 = 1 1/4"

Operating Pressure
Q = 4500 psi (315 bar)

Port Size
B = 0.69 *(sizes 60 - 110)*
C = 0.84 *(sizes 160 - 280)*
D = 1.61 *(sizes 330 - 1320)*

Filtration Rating *(microns)*
3, 5, 10, 20 = BH/HC, BN/HC 3, 5, 10, 20 = V 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1 = Single piece bowl *(sizes 60 - 660)*
2 = Two piece bowl *(size 330, 660 & 1320 only)*

Modification Number *(the latest version is always supplied)*

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bypass Valve
(omit) = Without Bypass *(BH4HC or V elements recommended)*
B3 = 43 psid Bypass *(optional)*
B6 = 87 psid Bypass *(standard)*

Supplementary Details
SO103H= Modification of BNHC *(Low Collapse)* & W/HC Element For Phosphate Ester Fluids
SO155H= Modification of BHHC *(High Collapse)* Element For Phosphate Ester Fluids
SO184 = G-1/2 Drain in Bowl Option For Sizes 60 - 280 *(standard for sizes 330, 660, & 1320)*
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
T100 = Indicator Thermal Lockout, 100°F *(C and D indicators only)*

Replacement Element Model Code

0060 D 010 BN4HC / V

Size
0060, 0110, 0160, 0240,
0280, 0330, 0660, 1320

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC, BN4HC
3, 5, 10, 20 = V
25, 74, 149 = W/HC

Element Media
BH4HC, BN4HC, V, W/HC

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X /

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
2 = 29 psid (2 bar) *(option)*
5 = 72 psid (5 bar) *(standard)*
Optional 15 psid (1 bar) & 116 psid (8 bar) available upon request

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

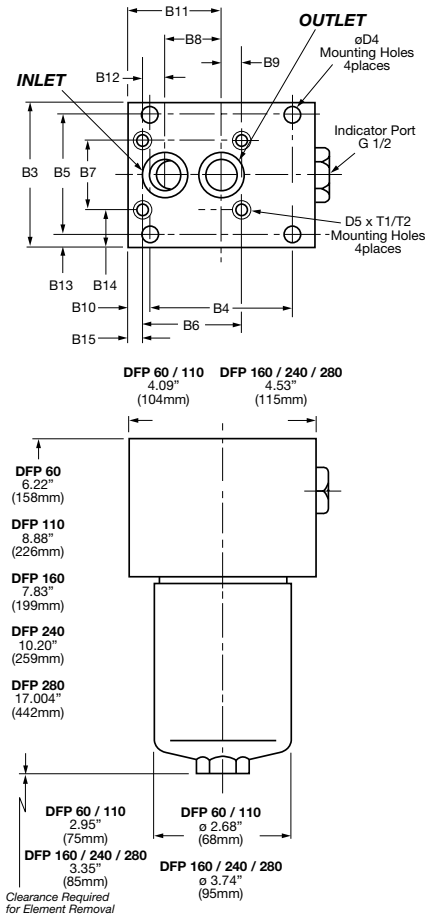
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

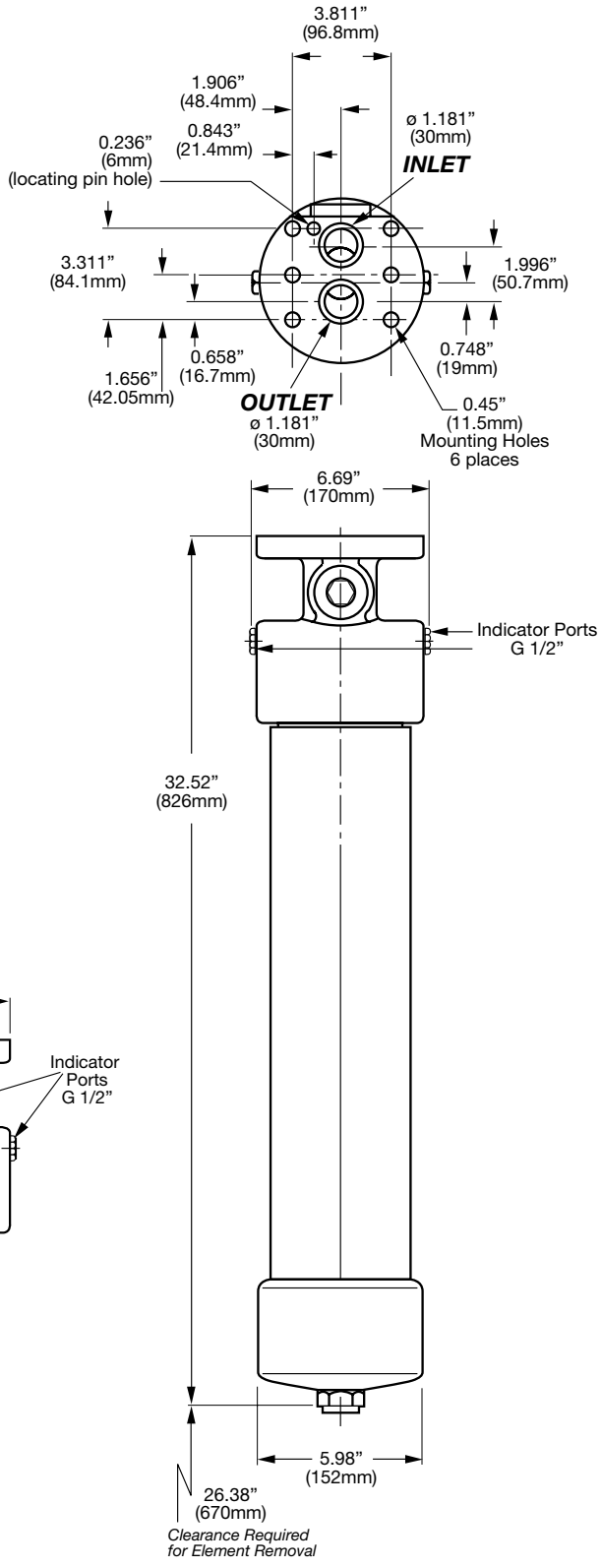
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions
DFP 60 – 280

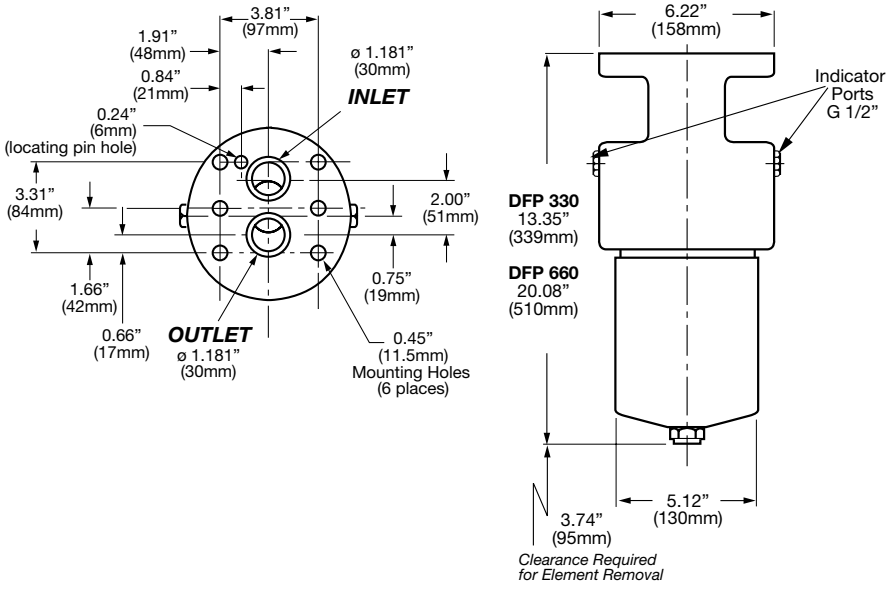


	60 / 110	160 / 240 / 280
B3	3.15" (80mm)	4.33" (110mm)
B4	3.50" (89mm)	3.54" (90mm)
B5	1.24" (31.6mm)	3.39" (86mm)
B6	–	2.40" (61mm)
B7	–	2.24" (57mm)
B8	1.24" (31.6mm)	1.50" (38mm)
B9	–	0.55" (14mm)
B10	0.30" (7.5mm)	0.49" (12.5mm)
B11	2.20" (56mm)	2.30" (58mm)
B12	–	0.35" (9mm)
B13	0.95" (24mm)	0.47" (12mm)
B14	–	1.04" (26.5mm)
B15	–	0.41" (10.5mm)
ø D4	0.33" (8.5mm)	0.35" (9mm)
Inlet	0.639" (17.5mm)	0.843" (21.4mm)
Outlet	0.639" (17.5mm)	0.843" (21.4mm)

DFP 1320



DFP 330 / 660



Size	60	110	160	240	280	330	660	1320
Weight (lbs.)	10.6	12.3	18.1	21.2	31.0	48.1	63.4	106.5

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

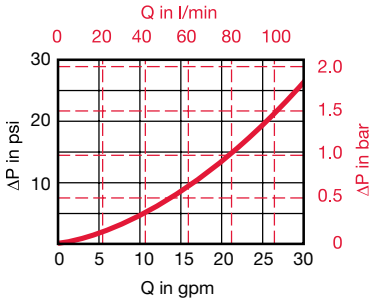
Housing Curve:

Pressure loss through housing is as follows:

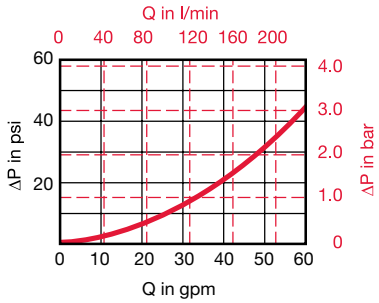
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

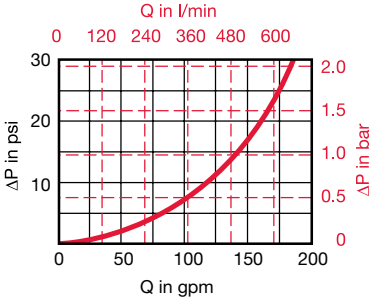
DFP 60/110 Housing



DFP 160/240/280 Housing



DFP 330/660 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...BN4HC (Betamicron® Low Collapse)			
	3 µm	5 µm	10 µm	20 µm
0060	1.582	1.116	0.723	0.433
0110	0.819	0.585	0.361	0.205
0160	0.718	0.480	0.252	0.193
0240	0.450	0.333	0.196	0.128
0280	0.220	0.171	0.092	0.071
0330	0.294	0.215	0.163	0.095
0660	0.136	0.099	0.061	0.044
1320	0.068	0.048	0.030	0.021

Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0060	3.210	1.785	0.993	0.669
0110	1.394	0.819	0.488	0.307
0160	0.919	0.569	0.322	0.240
0240	0.578	0.374	0.214	0.158
0280	0.313	0.184	0.097	0.090
0330	0.422	0.244	0.154	0.108
0660	0.179	0.106	0.055	0.049
1320	0.089	0.054	0.031	0.024

Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0060	0.877	0.511	0.296	0.183
0110	0.452	0.304	0.182	0.118
0160	0.251	0.177	0.123	0.079
0240	0.169	0.137	0.093	0.062
0280	0.126	0.093	0.064	0.041
0330	0.121	0.097	0.065	0.043
0660	0.063	0.050	0.034	0.021
1320	0.032	0.026	0.018	0.012

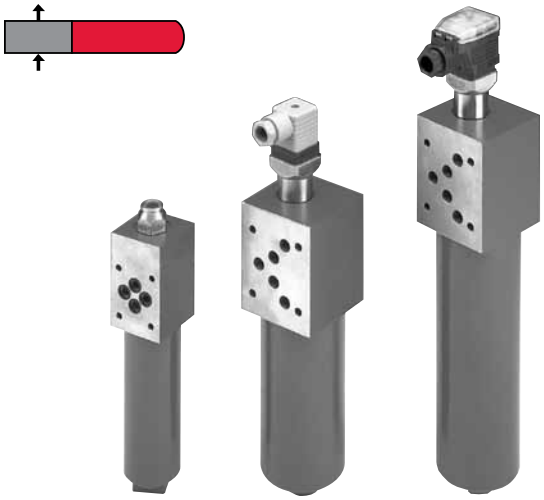
Size	...D...W/HC Elements
	25, 50, 74, 100, 149, 200 µm
0060	0.092
0110	0.050
0160	0.035
0240	0.023
0280	0.020
0330	0.020
0660	0.008
0990	0.006

All Element K Factors in psi / gpm.

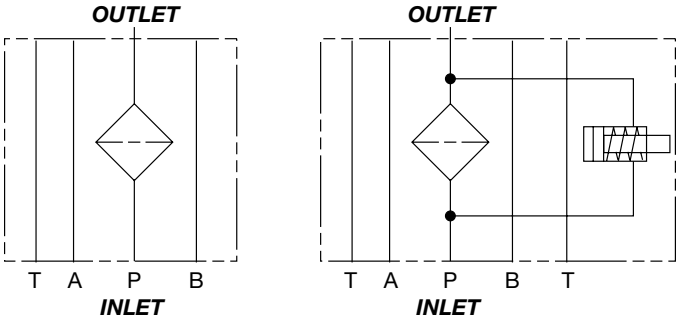
DFZ Series

Modular Stacking Filters

4500 psi • up to 10 gpm



Hydraulic Symbol



Features

- A visual (pop-up), electrical, electrical/visual (lamp) differential type clogging indicator can be installed.
- The DFZ filter can be ordered with the bowl on the left or the right side for easy element changeout.
- The DFZ filter is available in two mounting patterns to fit different hydraulic manifolds:
  ANSI/B93.7M-D03 / Cetop R35
  (was B93.7-D01) DF 30 Z
  ANSI/B93.7M-D05 / Cetop R35
  (was V93.7-D02)* DF 60 Z or DF 110 Z

**includes fifth port for optional tank connection*

Technical Details

Mounting Method	4 mounting holes *(manifold mount)*	
Port Connection		
30	ANSI DO3/A6 DIN 24340 / Cetop R35	
60/110	ANSI DO5/A10 DIN 24340 / Cetop R35	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head, Bowl	Steel	
Flow Capacity		
30	8 gpm (30 lpm)	
60/110	16 gpm (60 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	4500 psi (315 bar)	
Proof Pressure	6750 psi (472 bar)	
Fatigue Pressure	30	4500 psi (315 bar) @ 250,000 cycles
	60/110	4500 psi (315 bar) @ 1 million cycles
Burst Pressure	> 18,270 psi (1260 bar)	
Element Collapse Pressure Rating		
BH/HC, V	3045 psid (210 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoroelastomer or Ethylene Propylene seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		
Indicator Trip Pressure		
ΔP = 116 psid (8 bar) -10% (standard)		

Applications

Model Code

DFZ BH/HC 60 Q C 10 A 1 . 0 / __ - 1 - SO155H

Filter Type
DFZ = Pressure Filter

Element Media
BH/HC = Betamicron® *(High Collapse)* V = Metal Fiber

Size & Connection
30 = D03 manifold pattern
60 = D05 manifold pattern
110 = D05 manifold pattern

Operating Pressure
Q = 4500 psi (315 bar) *(all sizes)*

Type / Port Size
B = 4 ports / A 6 DIN 24340/Cetop R 35 H (DFZ 30 only)
C = 5 ports / A 10 DIN 24340/Cetop R 35 H (DFZ 60 & 110 only)

Filtration Rating *(micron)*
3, 5, 10, 20 = BH/HC 3, 5, 10, 20 = V

Type of ΔP Clogging Indicator
A, B/BM, C, D

Type Number
1

Modification Number *(latest version is always supplied)*

Seals
(omit) = Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Bowl Location
(omit) = Right Side *(standard)*
1 = Left Side

Supplementary
SO155H = Modification of BH/HC Elements for Phosphate Esters.
W = Indicator with brass piston *(for water based fluids)*
L24, L48, L110, L220 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*

Replacement Element Model Code

0030 D 010 BH4HC / V

Size
0030, 0060, 0110

Filtration Rating *(micron)*
3, 5, 10, 20 = BH4HC
3, 5, 10, 20 = V

Element Media
BH4HC, V

Supplementary Details
(omit) = standard
V = Fluoroelastomer (FPM) seals

Clogging Indicator Model Code

VD 5 B . X / ____

Indicator Prefix
VD = G 1/2 6000 psi

Trip Pressure
8 = 116 psid (8 bar)

Type of Indicator
A = no indicator, plugged port
B/BM = Visual pop-up *(auto/manual reset)*
C = Electric switch
D = Electric switch and light

Modification Number

Supplementary Details

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

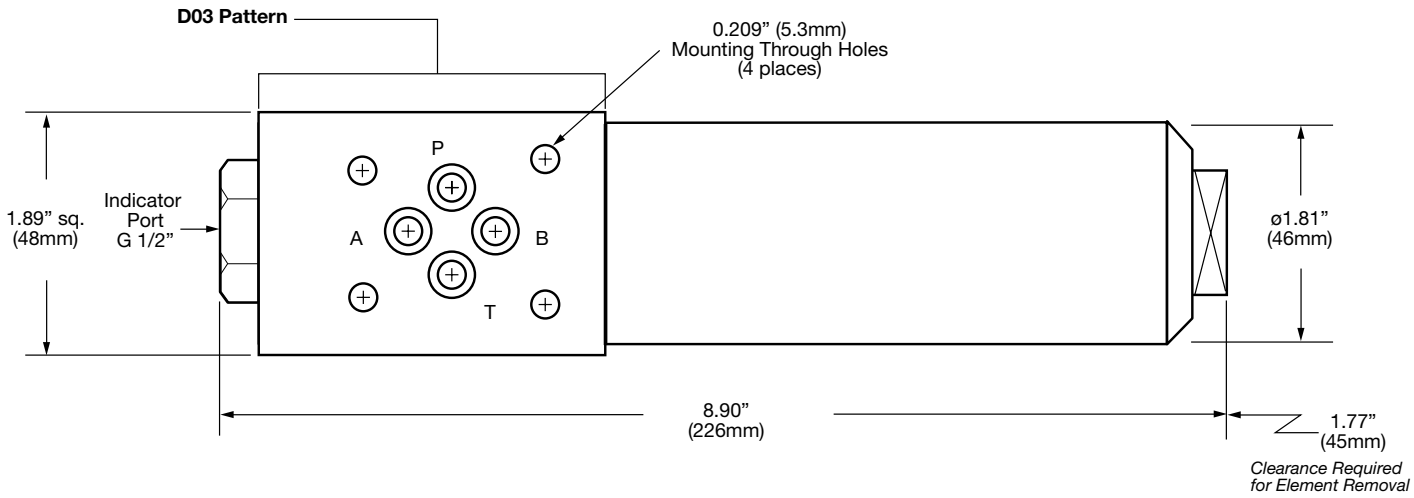
Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
T100 = Lockout below 100°F

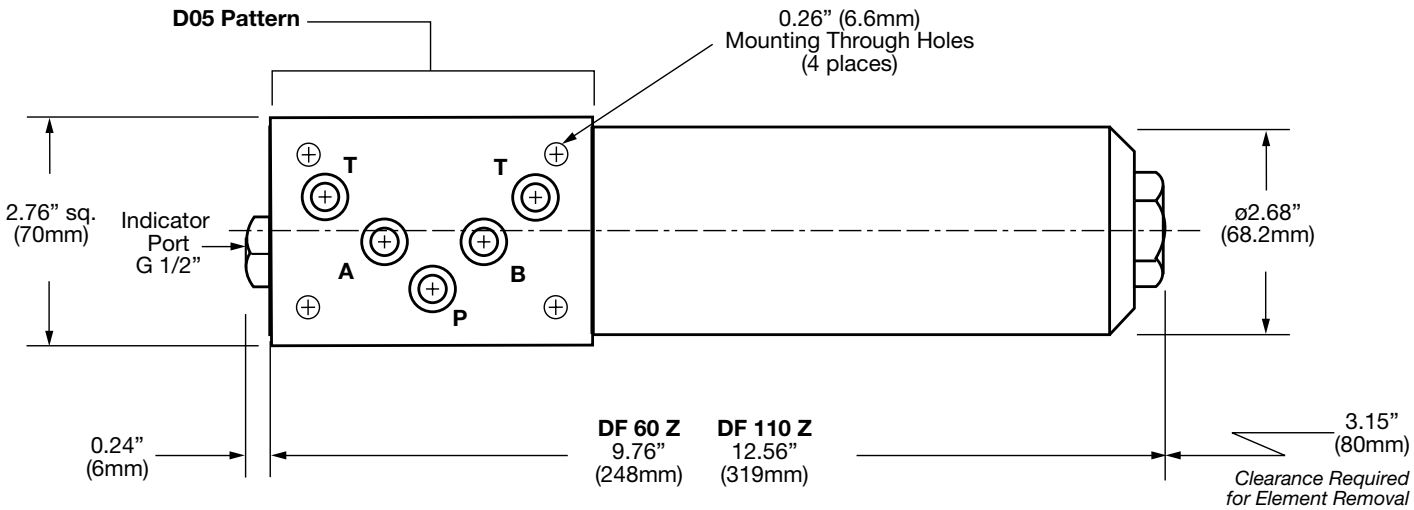
Underwrighters Approval *(VM, VD types C, D, J, and J4 only)*
CRUUS = Electrical Indicators
(*For additional details and options, see Clogging Indicators section.*)

Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions
DF 30 Z (Right Hand Version Shown) - *(standard)*



DF 60 / 110 Z (Right Hand Version Shown) - *(standard)*



Size	60	110	160	240	280	330	660	1320
Weight (lbs.)	10.6	12.3	18.1	21.2	31.0	48.1	63.4	106.5

Dimensions shown are for general information and overall envelope size only. Weights listed are without element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

Assembly ΔP = Housing ΔP + Element ΔP

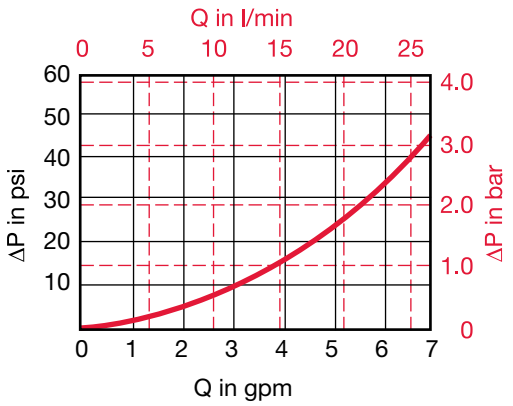
Housing Curve:

Pressure loss through housing is as follows:

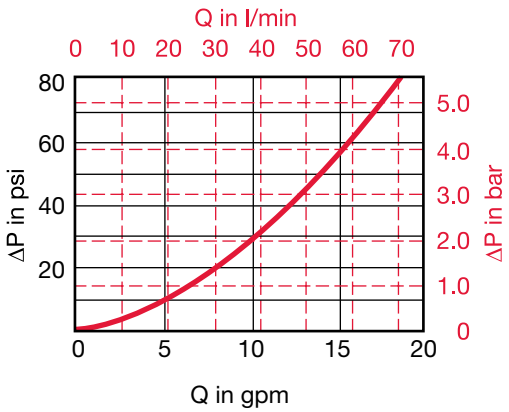
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! *(see sizing section on page 19)*

DFZ 30 Housing



DFZ 60 / 110 Housing



Element K Factors

$$\Delta P \text{ Elements} = \underset{\text{(From Tables Below)}}{\text{Elements (K) Flow Factor}} \times \text{Flow Rate (gpm)} \times \frac{\text{Actual Viscosity (SUS)}}{141 \text{ SUS}} \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Size	...D...BH4HC (Betamicron® High Collapse)			
	3 µm	5 µm	10 µm	20 µm
0030	5.000	2.780	1.989	1.042
0060	3.210	1.785	0.993	0.669
0110	1.394	0.819	0.488	0.307

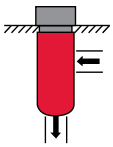
Size	...D...V Elements			
	3 µm	5 µm	10 µm	20 µm
0030	1.011	0.740	0.411	0.200
0060	0.877	0.511	0.296	0.183
0110	0.452	0.304	0.182	0.118

All Element K Factors in psi / gpm.

CF Series

Manifold Cartridge Filters

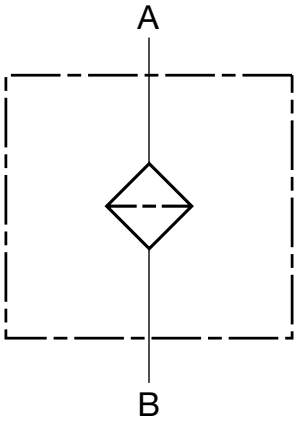
3000 psi • up to 25 gpm



CFxx20

CFxx45

Hydraulic Symbol



Features

- Made of aluminum for light weight and low cost.
- Made to throw away when fully clogged.
- Low price - market competitive

Technical Details

Port Connections	CF20 CF45	SAE-16 Modified Cavity SAE-20 Cavity (VC20-S3)
Direction of Flow		Outside to Inside flow
Materials of Construction		Aluminum
Flow Capacity		
CF20		5 GPM (15 micron - fiberglass media) 2.5 GPM recommended design flow max. - for high efficiency media
CF45		12 GPM (25, 149 micron - wire screen media) 12 GPM (15 micron - fiberglass media) 6 GPM recommended design flow max. - for high efficiency media 25 GPM (25, 149 micron - wire screen media)
Housing Pressure Rating		
Max. Operating Pressure:		3000 psi (207 bar)
Proof Pressure:		4500 psi (310 bar)
Element Performance Rating		
MM, W		290 psid (20 bar)
Fluid Temperature Range		-22° to 250°F (-30° to 121°C)
Fluid Compatability		
Compatible with all petroleum oils and synthetic fluids rated for use with Fluoro-Rubber seals. Contact HYDAC for information on special housing and element constructions available for use with water glycols, oil/water emulsions, and HWBF.		

Applications

Agricultural

Construction

Industrial

Commercial Municipal

Railways

Model Code

CF W 20 G 25 W 1 . 0 / 12

Filter Type
CF = Manifold Cartridge Filter

Element Media
MM = Mobilemicron W = Wire Mesh

Size
20, 45

Type of Connection
G = Threaded

Filtration Rating *(micron)*
15, 25, 149 = MM, W *(other medias - consult HYDAC)*

Type of Indicator
W = No Indicator Available

Type Number
1 = Standard Configuration

Modification Number *(latest version always supplied)*

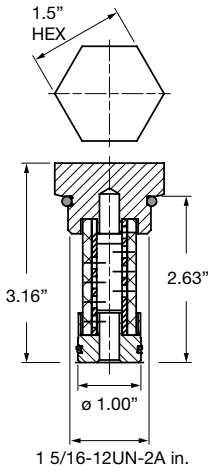
Port Configuration
12 = SAE-16 Modified Cavity *(CF 20 only)*
12 = SAE-20 Cavity (VC20-S3) *(CF 45 only)*

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

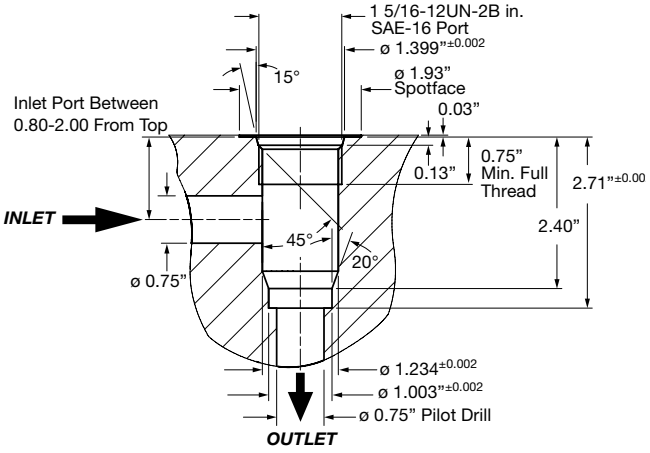
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions

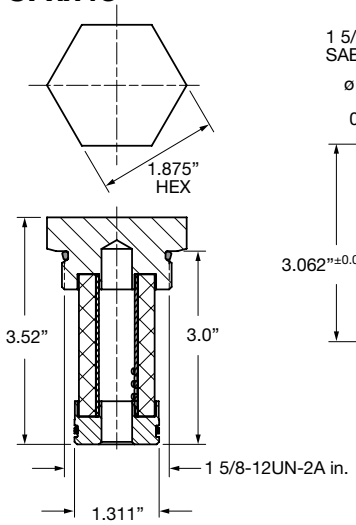
CFxx20



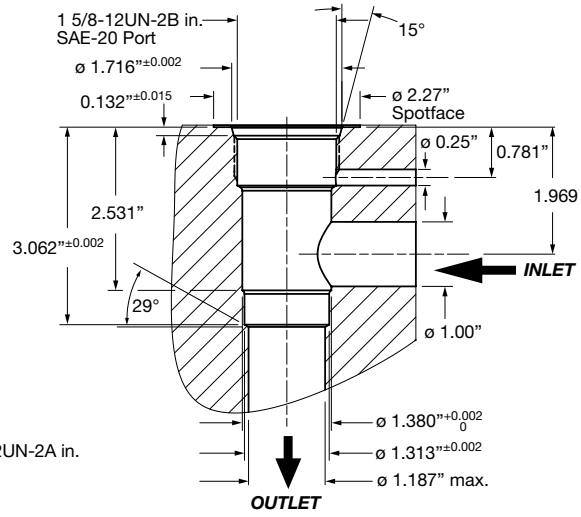
Cavity



CFxx45



Cavity



Flow Curves

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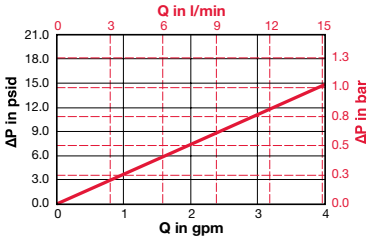

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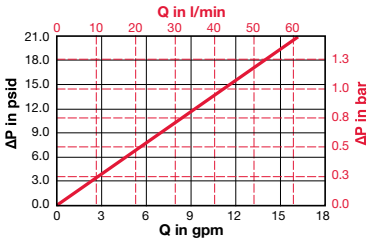

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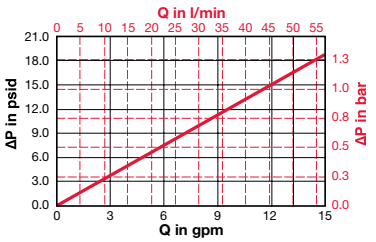

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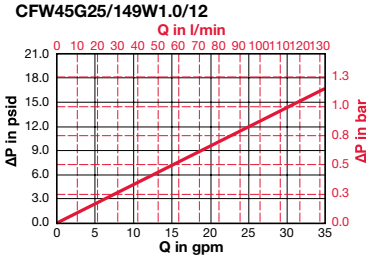
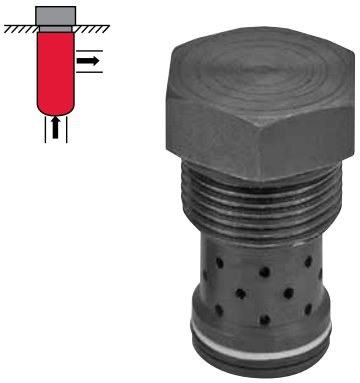


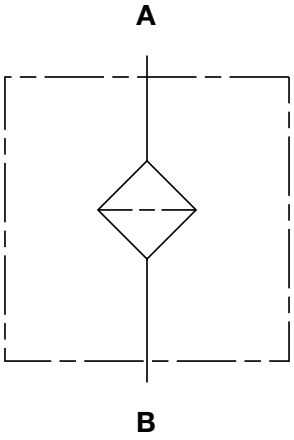
CP-C16 Series

Circuit Protector Manifold Cartridge Filters

3000 psi • up to 12 gpm



Hydraulic Symbol



Features

- Simple Cost Effective way method of component protection with minimal space requirements, eliminating design restraints.
- Fits into a standard manifold Cavity No. C16-2 Port.
- CP Circuit Protector Filters provide back-up protection when upstream pressure filters go into by-pass or if element damage occurs.
- Three (3) different element options 10, and 141 micron allow filter to be tailored to individual application needs.
- Suitable for petroleum based fluids.

Technical Details

Mounting Method	C16-2 Cavity (1 5/16-12 UN-2B Thread)	
Flow Direction	Inlet: Bottom	Outlet: Side
Construction Materials	Steel	
Flow Capacity	12 gpm (45 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	3000 psi (210 bar)	
Proof Pressure	4500 psi (210 bar)	
Fatigue Pressure	Contact HYDAC Office	
Burst Pressure	Contact HYDAC Office	
Element Collapse Pressure Rating		
W/HC	250 psid (17 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils rated for use with Nitrile seals.		

Applications


Agricultural


Automotive


Construction

Model Code

CP-C16 W 40 G 10 W 1 . 0 / 12 __

Filter Type
CP = Circuit Protector
(Common Cavity No. C16-2)

Element Media
W = Wire Mesh

Size
40

Inline Port
G = Male Thread 1 5/16-12UN-2A

Filtration Rating *(micron)*
10 = 10
141 = 141

By-pass Indicator
W = No indicator Port

Type Number
1 = Standard Configuration

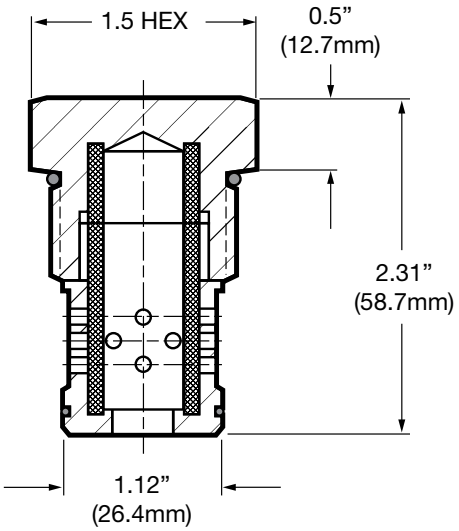
Modification Number

Port Configuration
12

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

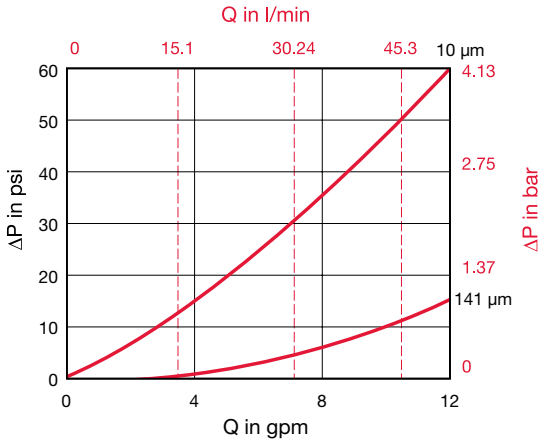
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



Flow Curves

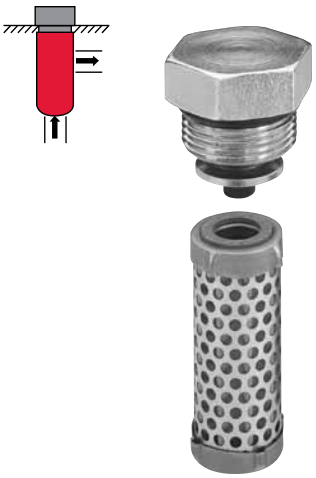
Based on testing conducted with 150 SUS fluid at 105˚F.



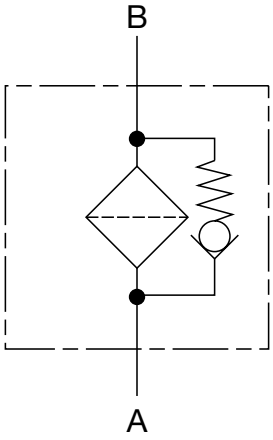
CP-SAE Series

Circuit Protector Manifold Cartridge Filters

6000 psi • up to 30 gpm



Hydraulic Symbol



Features

- Simple Cost Effective way to provide component protection with minimal space required eliminating design restraints.
- Fits into a standard manifold SAE O-ring Port.
- CP Circuit Protector Filters provide back-up protection when upstream pressure filters go into by-pass or if element damage occurs.
- CP-SAE provides operations protection through supply of a by-pass to assure flow to critical components if filter becomes clogged.
- Increased range of product use through three (3) different sizes available, 15 at 4 gpm, 40 at 12 gpm, and size 120 at 30 gpm.
- Suitable for petroleum based fluids.

Applications


Agricultural


Automotive


Construction

Technical Details

Mounting Method		
CP-SAE-15	SAE-10 Port	
CP-SAE-40	SAE-16 Port	
CP-SAE-120	SAE-24 Port	
Flow Direction	Inlet: Bottom	Outlet: Side
Construction Materials		
CP-SAE-15	Carbon steel	
CP-SAE-40	Carbon steel	
CP-SAE-120	Stainless steel	
Flow Capacity		
CP-SAE-15	4 gpm (15 lpm)	
CP-SAE-40	12 gpm (45 lpm)	
CP-SAE-120	30 gpm (113 lpm)	
Housing Pressure Rating		
Max. Operating Pressure	6000 psi (420 bar)	
Proof Pressure	9000 psi (630 bar)	
Fatigue Pressure	Contact HYDAC Office	
Burst Pressure	Contact HYDAC Office	
Element Collapse Pressure Rating		
W	100 psid (6.9 bar)	
Fluid Temperature Range	-22° to 250°F (-30° to 121°C)	
Fluid Compatability		
Compatible with all petroleum oils rated for use with Nitrile seals.		
Bypass Valve Cracking Pressure		
ΔP = 50 psid (3.4 bar) +10% (standard)		

Replacement Elements

Part Number	Description	Flow Rate
02069397	0015 D 010 W	0015 - 4 gpm
02069398	0040 D 010 W	0040 - 12 gpm
02069399	0120 D 010 W	0120 - 30 gpm

Model Code

CP-SAE W 15 G 10 W 1 . 0 / 12 B3.5 _

Filter Type
CP = Circuit Protector
(SAE O-ring Port)

Element Media
W = Wire Mesh

Size
15 = 4 gpm 40 = 12 gpm 120 = 30 gpm

Inline Port
G = Male Threaded

Filtration Rating *(micron)*
10 = 10

By-pass Indicator
W = No indicator Port

Type Number
1 = Standard Configuration

Modification Number

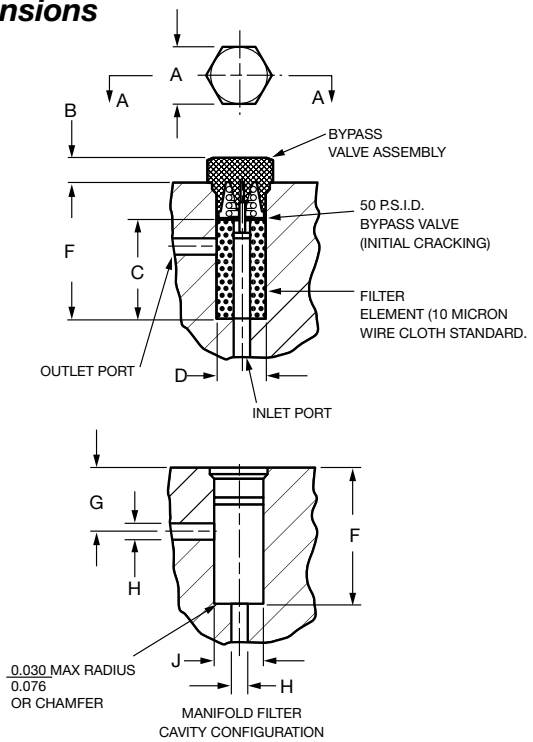
Port Configuration
12

By-pass Valve
B3.5 = 50 psi

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)

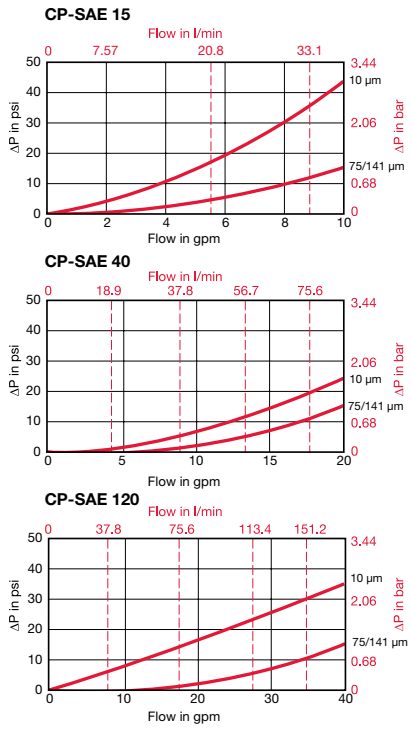
Model Codes Containing RED are non-stock items — Minimum quantities may apply – Contact HYDAC for information and availability

Dimensions



Flow Curves

Based on testing conducted with 150 SUS fluid at 105°F.



Model	A	B	C	D	E SAE O-Ring Port	F	G	H	J	Torque Alu.	Torque Steel
CP-SAE 15	1.00/25.4	0.41/10.4	1.75/44.5	0.74/18.8	-10 (7/8-14)	2.41/61.2	1.12/28.4 min 1.87/47.5 max	0.266/6.8	0.781/19.8 min 0.814/20.7 max	65 ft-lb	85 ft-lb
CP-SAE 40	1.5/38.1	0.5/12.7	2.50/63.5	1.00/25.4	-16 (1 5/16-12)	3.34/84.8	1.49/37.8 min 2.53/64.3 max	0.531/13.5	1.140/29.0 min 1.1875/30.1 max	150 ft-lb	200 ft-lb
CP-SAE 120	2.13/54.1	0.65/16.5	4.00/101.6	1.50/38.1	-24 (1 7/8-12)	5.01/127.3	1.92/48.8 min 3.81/96.8 max	0.875/22.2	1.750/44.5 min 1.803/45.8 max	230 ft-lb	305 ft-lb

Purpose of Indicators

Clogging indicators are warning devices that signal visually and/or electrically that the filter element is filled with contaminants and should be changed or cleaned. These devices activate *(trip)* when the flow of fluid causes a pressure drop across the filter element that exceeds the indicator setting. In filters that incorporate bypass valves, contaminated fluid will bypass the element if the operator does not respond to the indicator warning signal within a reasonable time. In non-bypass filters, if the indicator warning is not heeded, the pressure across the filter will build up to the point where system performance is degraded, the element fails, or the system relief valve is actuated.

The indicator is set to trip well before the element becomes fully clogged *(14 psid / 1 bar lower than bypass)*, thereby giving the operator sufficient time to take corrective action. The indicator warning may be a visual signal at the filter site *(pop-up button, light, etc.)*; or, some form of signal at a remote location *(trouble light, sound alarm, etc.)*. In some critical applications, where contamination is intolerable, the signal from the indicator may be used to shut down the system so that personnel must immediately service the unit.

Some users install filters without indicators, preferring instead to change and/or clean elements according to a fixed time schedule — or based on number of hours of operation. There is some risk in utilizing this approach. It may be difficult to establish a reliable schedule for installing new elements because the rate of dirt ingression is not known, and, in fact, may vary from time-to-time and from machine-to-machine. Use of a clogging indicator has two main benefits: first, it eliminates the need to guess when the element will clog; second, it avoids the unnecessary cost of replacing elements too soon.

Indicator Settings

In a majority of applications, a HYDAC indicator is set to trip at 15 psid (1 bar) below the bypass valve cracking pressure; or, for a non-bypass filter, at 15 psid below the element design changeout pressure. Typically, a HYDAC pressure filter bypass valve begins to crack at 87 psid (6 bar), so the indicator is set to trip at 72 psid (5 bar). A HYDAC return filter ordinarily begins to bypass at 43 psid (3 bar), so the indicator is set to trip at 29 psid (2 bar). Consequently, the operator has a period of time in which to change or clean the element before the bypass valve opens and passes contaminated fluid to sensitive components downstream of the filter.

Typically, the time from indication to bypass is 5-15% of the life of the element. For instance, if the normal service life of the element is 100 days, there is a grace period of 5-15 days before the filter begins bypassing. Nevertheless, it is advisable to change the element as soon as the indicator trips.

Non-standard indicator settings are often employed for various reasons. For instance, in lubrication systems, filters may not be allowed to have a high pressure drop, therefore, the indicator may be set to trip at less than 15 psid. When the filter is installed on the suction side of a pump, it is a common practice to limit the ΔP across the filter to 3 psid, and to set the indicator at a correspondingly low amount.

Certain HYDAC non-bypass filters, such as the DFDK duplex series and DFZ series of sandwich filters, utilize indicators that are set at 116 psid (8 bar) in order to maximize the dirt retention and service life of the elements.

In most cases, HYDAC pressure and return line filters bypass at higher pressures than other commonly used filters, meaning that indicator settings also are higher than usual. This has the advantage of extending element service life.

Types of Indicators

Filter assemblies may be ordered with or without indicators. When ordered with an indicator, the assembly model code includes a letter symbol for the indicator, such as B, C, or D. When ordered separately, an indicator has its own complete model code, as described subsequently in this brochure.

A type B or BM visual indicator is suitable when only a local warning is required. When it is necessary to signal a remote warning device, control panel, or PLC, one of the electric switches should be specified. Various kinds of switches are available to provide a range of electrical configurations, contact ratings, and connections.

The D indicator incorporates a switch and built-in light for both local and remote warning signals.

Type	Description
B	Visual Indicator with pop-up button or display that automatically resets after filter ΔP drops below trip-point
BM	Visual Indicator with pop-up button that must be manually reset after the indicator trips
C, F, G, J, J4	Electric Switch that provides a contact operation to control a warning device or indication at a remote control station. Several models offer differing electrical ratings, contact configurations, and types of connections
D	Electric Switch and Light that provides a contact operation for control or indication to a remote location and a light energizes locally at the filter to indicate 100% Clogged
E, ES	Pressure Gauges with dial faces for local clogging indication
UE	Vacuum Gauge on suction filter for local indication
UF, UG	Vacuum Switch on suction filter that provides a contact operation for control or indication to a warning device or remote control station
LE	Electrical Switch with visual pop-up button
LZ	Electrical Switch with 75% and 100% contact operations, and local visual pop-up button at 100% clogged - optional LED's
GC, GW	Electrical Analog (4 - 20 ma)/ Electrical switch with 75% and 100% warning points - optional LED's
K	Vacuum / Pressure Gauge for Filler / Breather

Key Features

Automatic vs. Manual Reset

All indicators with electric switches reset automatically to their original position when the pressure across the filter drops below trip pressure. This is true, also, for the type B visual indicator. However, on the type BM visual indicator with manual reset, the signal arm extends once the trip pressure is exceeded and remains that way until physically reset. The advantage is that the indicator signals that the element is dirty even after the system is shut down, thus, simplifying maintenance.

Thermal Lockout

When mobile and other equipment is started in the cold, the hydraulic or lube fluid is likely to be highly viscous until it approaches normal operating temperature. The high pressure drop created by a highly viscous fluid can trip the indicator and falsely signify that the element is clogged. An optional thermal lockout device, available on many HYDAC electric indicators, prevents the indicator from tripping until the fluid reaches a certain specified temperature. The device consists of a switch in series in the indicator circuit, which is caused to make or break by a bi-metal strip that alters in shape according to temperature.

The thermal lockout feature may be chosen so that the indicator is deactivated at a fluid temperature less than 100˚ F ±5˚ *(called T100)*.

Because electric indicators automatically reset once the fluid heats up, thermal lockout is necessary only when a false signal of filter condition during cold start-up poses a problem.

Single Pole, Double Throw Switches (SPDT)

HYDAC's differential pressure and most static pressure electrical indicators contain single-pole, double-throw switches. This provides the choice of normally open or normally closed contacts when the pressure differential is below trip-point.

Whether the contacts are normally open *(N/O)* or normally closed *(N/C)* is determined by the way in which the indicator is wired on site.

Magnetic Coupling

Most of HYDAC's indicators employ magnetic coupling, which separates the fluid from the actuating device. The benefit is that there is no need for a dynamic seal, therefore, far less chance of fluid leakage under high system pressure.

Interchangeability

HYDAC indicators are designed for use only with HYDAC filters, and should not be applied to other makes of filters.

Certain differential pressure indicators can be used in non-filter applications when mounted on special blocks. Detailed information regarding blocks of various kinds is presented subsequently in this brochure.

Operation

In the drawings on the following page, examples of two types of differential pressure indicators and a static pressure indicator are provided.

Application Guidelines

Differential pressure indicators react to the pressure drop across the filter that is caused by the flow of fluid through the filter housing and element. These devices measure the difference in pressure upstream and downstream of the filter element, regardless of the system pressure. They are utilized in most pressure and inline return filters.

Static pressure indicators measure only the build-up of pressure upstream of the filter element *(downstream pressure is ambient - tank vented to atmosphere)*. Consequently, if any components are located downstream of the filter, the indicator will measure the pressure drop caused by the filter and that component, thus, causing a false reading of ΔP across the filter. As a result, static indicators are recommended only on filters that discharge directly to vented tanks and have minimal back pressure.

A filter that incorporates a differential pressure indicator should be used whenever there is a significant resistance to flow in the line after the filter, even when system pressure is relatively low. For example, the filter in the feed line of a lube system requires a differential pressure indicator, although the system pressure may be low.

Differential Pressure Indicator Operation

As the differential pressure across the filter increases, the piston / magnet assembly is driven down against a spring until the attractive force between the magnet and indicator pin *(Type 1)* or a switch actuator lever *(Type 2)* is reduced sufficiently to allow the indicator to trip. In a visual indicator *(Type 1)*, tripping results in the indicator pin rising and giving visual indication that the filter must be serviced. In an electric indicator *(Type 2)*, tripping causes a switch to make or break, permitting a remote indication to warn of the need for servicing. When the ΔP drops below the trip pressure for any reason, *(installation of a clean element, heating of the oil, etc.)*, the piston/ magnet assembly returns to its original position.

With a visual indicator, the pop-up indicator pin may then respond in one of two ways: (1) With Manual Reset *(type BM)* the pin remains extended, even after the system is shut down, and must be physically pushed down to reset (2) With Automatic Reset *(type B)* the indicator pin retracts to its original position along with the piston. With all electric indicators, the circuit is automatically restored to its original normally closed or normally open position once the ΔP drops below the trip setting.

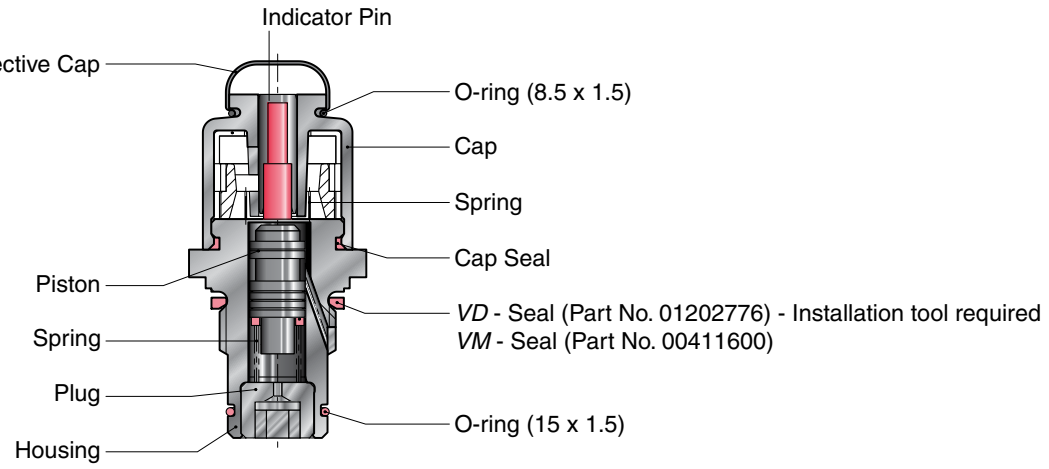
Static Pressure Indicator Operation

Increasing pressure upstream of the filter acts upon a diaphragm in the indicator *(Type 3)* and causes the indicator pin to overcome an opposing spring force until it trips at a pre-set pressure. The indicator pin automatically resets once pressure is reduced below the trip pressure. Electric static pressure indicators, which also operate mechanically, are available as well. These, too, reset automatically.

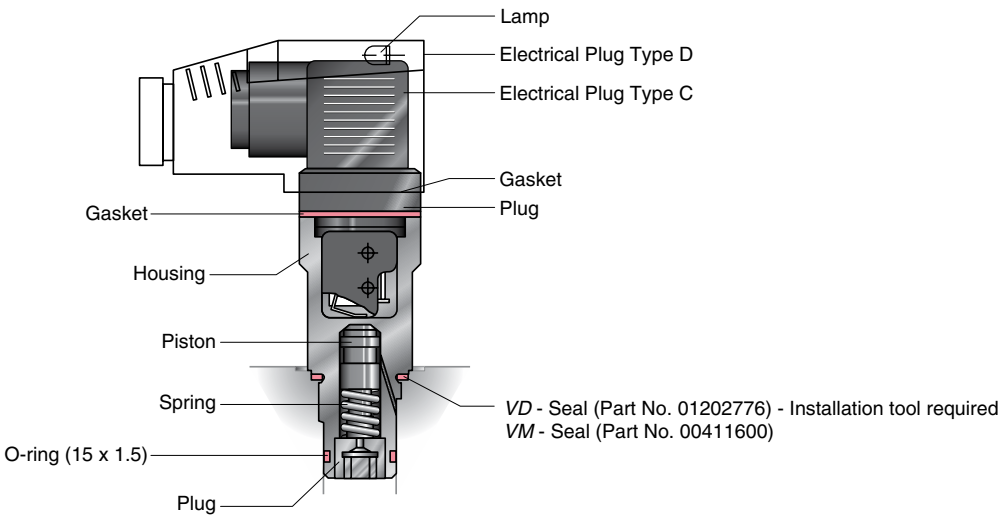
Note: certain indicators have a red/ yellow/ green display in addition to, or instead of, the pop-up indicator pin.

General Indicator Type Drawings:

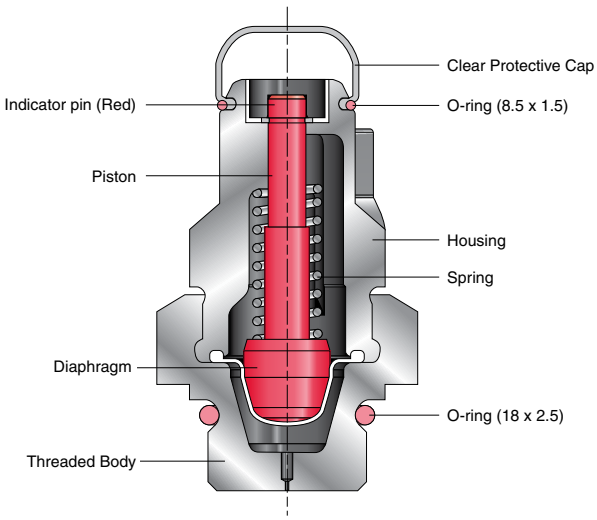
TYPE 1 Visual Indicator
Differential Pressure



TYPE 2 Electric Indicator
Differential Pressure



TYPE 3 Visual Indicator
Static Pressure



Quick Reference Guide

Filter Model	Indicator Model	Trip Pressure, psi [bar]	Indicator Type Options
Low Pressure			
RF	VR	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, FD, H, D, E, F, LE, LZ, GC
NF 1.0 *(In-Tank Version)*	VR	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, H, D, E, F, UE, GC
NF 2.0, 3.0 *(Inline Version)*	VD, VM, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, C, D, LE, LZ, GC, GW
RFD	VR	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, H, D, E, F, LE, LZ, GC
NFD *(In-Tank Version)*	VR	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, H, D, E, F
NFD *(Inline Version)*	VD, VM, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, C, D, LE, LZ, GC, GW
RFM	VR *(Sizes 30, 330-851)*, VMF *(Sizes 75-270)*	29 (2) *(standard)*, 72 (5) *(optional)*	W, A, B, BM, C, D, E, F, FD, H
HF4R(S)	VMF	1 (0.08), 10 (0.8), 20 (1.4), 29 (2)	A, C, E, G, J, J4, LE, LZ
RKM	VMF	29 (2) *(standard)*, 72 (5) *(optional)*	W, A, E, F, FD, K, UF
RFM…S/Set Series	N/A	N/A	W
RFL *(Cast Series)*	VM, VD, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, BM, C, D, LE, LZ, GC, GW
RFL *(Welded Series)*	VM, VD, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, BM, C, D, LE, LZ, GC, GW
FLN	VM, VD	29 (2), 72 (5), 116 (8)	A, B, C, D, LE, LZ
NFH	VM, VD, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, BM C, D, J, J4, GC, GW
RFLD *(Cast Series)*	VM, VD, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, BM C, D, LE, LZ, GC, GW
RFLD *(Welded Series)*	VM, VD, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, BM C, D, LE, LZ, GC, GW
FLND	VM, VD, VL	29 (2), 72 (5), 116 (8)	A, B, C, D, LE, LZ
NFHD	VM, VD, VL	29 (2) *(standard)*, 72 (5) *(optional)*	A, B, BM C, D, J, J4, GC, GW
Spin-ons - MF, MFD, MFDS	VMF	20 (1.4), 29 (2)	A, E, G, UE, UG, B, C, W
SF	VR	3 (0.2)	A, C, D, UE
MFX	VL, VM	15 (1), 36 (2.5)	W, A, B, C, CD, D, BF, M, J, J4
Medium Pressure			
HF4RL	VM, VD, VL	29 (2) *(optional)*, 72 (5) *(standard)*	A, B, BM, C, D, J, J4, LE, LZ, GC, GW
LPF	VM, VD, VL, B..HFV *(LPF 660)*	29 (2) *(optional)*, 72 (5) *(standard)*	A, B, BM, BF C, CD, D, J, J4, LE, LZ, GC, GW
LF	VM, VD, VL	29 (2) *(optional)*, 72 (5) *(standard)*	A, B, BM, C, CD, D, J, J4, LE, LZ, GC, GW
FMND	VD	29 (2) *(optional)*, 72 (5) *(standard)*	A, B, C, D, J, J4, LE, LZ, GC
High Pressure			
DF	VD	29 (2), 72 (5) *(standard)*, 116 (8)	A, B, BM, C, D, J, J4, LE, LZ, GC
DF/DFF 1500	VD	29 (2), 72 (5), 116 (8)	A, B, BM, C, D, J, J4, LE, LZ, GC
HF2P	VD	29 (2), 72 (5) *(standard)*, 116 (8)	A, B, BM, C, D, J, J4, LE, LZ, GC
HF3P	VD	29 (2), 72 (5) *(standard)*, 116 (8)	A, B, BM, C, D, J, J4, LE, LZ, GC
HF4P	VD	29 (2), 72 (5) *(standard)*, 116 (8)	A, B, BM, C, D, J, J4, LE, LZ, GC
MFM	VD	72 (5)	W, A, B, BM, C, CD, D, J, J4, LE, LZ, GC
HFM	VD	72 (5)	W, A, B, BM, C, CD, D, J, J4, LE, LZ, GC
DFDK	VD	116 (8)	A, B, BM, C, D, J, J4, LE, LZ, GC
HFDK4P	VD	72 (5), 116 (8) *(standard)*	B, BM, C, D, J, J4, LE, LZ, GC
DFFH	VD	29 (2), 72 (5) *(standard)*	A, B, BM, C, D, J, J4, LE, LZ, GC
DFFHM	VD	29 (2), 72 (5) *(standard)*	A, B, BM, C, D, J, J4, LE, LZ, GC
DF…QE	VD	29 (2), 72 (5) *(standard)*	A, B, BM, C, D, J, J4, LE, LZ, GC
DFP	VD	29 (2), 72 (5) *(standard)*	A, B, BM, C, D, J, J4, LE, LZ, GC
DFZ	VD	116 [8]	A, B, BM, C, D, J, J4, LE, LZ, GC
CF	N/A	N/A	W
CP-C16	N/A	N/A	W
CP-SAE	N/A	N/A	W

Model Code: Static Vacuum

VR 0.2 B . X /

Indicator Prefix
VR = Clogging Indicator for Return Filters

Trip Pressure / Gauge Indication Range
0.2 = 3 psi (0.2 bar) *(standard for UE vacuum gauge and UF vacuum switch for suction filters)*
2 = 29 psid (2 bar) *(standard for VR and VMF indicators on return filters except spin-ons)*
5 = 72 psid (5 bar) *(optional on VR and VMF indicators)(types B,D,F, & H only)*

Type of Indicator
B = Visual pop-up with automatic reset
BM = Visual pop-up with manual reset
D = Electric switch and light
E/ES = Horizontal gauge / Vertical gauge
F = Electric pressure switch
GC = Electronic Analog (4 - 20ma or 1 - 10V) / pressure switch 75% and 100% trips
H = Electric pressure switch
LE = Electric pressure switch / Visual pop-up button
LZ = Electric pressure switch at 75% and 100% / visual pop-up button
UE = Vacuum gauge
UF = Vacuum switch

Modification Number *(the latest version always supplied)*

Supplementary Details

Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM) (not available on VR2B or VR2BM)

"LZ" type details *(for type LZ only - omit for all other types)*
CN = electrical connection, 1 plug connector to DIN 43651 with 3 LED's *(to CNOMO standard)*
DB = electrical connection, 1 plug connector to DIN 43651 with 3 LED's *(to Daimler-Benz standard)*

"GC" type details *(for type GC only - omit for all other types)*
SP = analogue signal: voltage output 1-10V
SQ = analogue signal: voltage output 4-20mA *(current source)*
(if SP or SQ not specified "current sink" model supplied)
13 = N/O function
123 = N/C function
(pressure peak suppression up to 10 sec. cold start suppression of switching outputs *(PNP technique, positive switching)*)
LED = 3 LED's *(red, green, yellow)* in cable box
PF = floating switching outputs *(due to relay in the plug)*
30C = cold start suppression of switching outputs up to 30˚C *(other temperatures on request)*

VMF 0.2 B . X /

Indicator Prefix
VMF = Clogging Indicator for Mobile Filters
BSF = Clogging Indicator for Suction Filters

Trip Pressure / Gauge Indication Range
0.2 = 3 psi (0.2 bar) *(standard for VMF UF & UE and BSF indicators used on suction filters)*
0.6 = 9 psid (0.6 bar) *(applies to K gauge only)*
0.8 = 12 psid (.8 bar) *(applies to VMF0.8E gauge only)*
1 = 15 psid (1 bar) *(non-standard)*
1.4 = 20 psid (1.4 bar) *(standard for VMF1.4E gauges and VMF1.4G switches on nominal spin-on filters)*[1]
1.6 = 23 psid (1.6 bar) *(applies to VMF1.6E gauge only)*
1.7 = 25 psid (1.7 bar) *(standard for VMF1.7G switch for absolute spin-ons)*
2 = 29 psid (2 bar) *(standard for VR and VMF indicators on return filters except spin-ons)*
5 = 72 psid (5 bar) *(optional on VR and VMF indicators)(types B,D,F, & H only)*

Type of Indicator[2]
B = Visual pop-up with automatic reset *(VMF only)*
C = Electric switch
D = Electric switch and light
E = Horizontal gauge
ES = Vertical gauge
F,G,& H = Electric pressure switches *(VMF only)*
UE = Vacuum gauge
UF = Vacuum switch
K = Gauge *(for reservoir breathers)*[3]

Modification Number *(the latest version always supplied)*

Supplementary Details

Light Voltage *(D type indicators only)*
L24 = 24V
L110 = 110V

Seals
(omit) = Nitrile (NBR) *(standard)*
V = Fluoroelastomer (FPM)
EPR = Ethylene Propylene (EPDM)[3]

1) MFBN 80/85 absolute rated spin-ons use VMF1.4G.0 indicators
2) VMF indicators are available in all types except types C and K. BSF indicators are available only on types C and D
3) EPR seals are not available with VMF2B indicators. Model K gauges are available only with nitrile (NBR) seals

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VR2B.0 & VR2BM.0**	**VR2C.1**	**VR2D.1**
Method of Indication	**Visual:** Red pin pops up to signal clogged element. **Type B:** Automatic Reset **Type BM:** Manual Reset	**Electric:** Electric switch activates to indicate 100% clogged element.	**Visual:** LED energizes for local 100% Clogged Indication. **Electrical Contact:** N/O or N/C Contact at 100%
Port Connection	G1/2 (ISO 228)	G1/2 (ISO 228)	G1/2 (ISO 228)
Adapter	—	included, VR-1/8-S P/N 00246881	included, VR-1/8-S P/N 00246881
Housing Material	aluminum	steel	aluminum
Seals	nitrile (NBR) - standard fluoroelastomer (FPM)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)
Weight	0.18 lbs (80 grams)	0.31 lbs (140 grams)	0.84 lbs (380 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft	11 Lbf-ft
Other Characteristics	—	Trip Pressure adjustable from 15 psi to 145 psi	Trip Pressure factory adjustable from 10 psi to 130 psi
Hydraulic Data			
Operating Pressure	100 psi (7 bar)	290 psi (20 bar)	290 psi (20 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*	29 psi (2 bar) -15%	29 psi (2 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*
Thermal Lockout	not available	—	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	—	250 VAC or 24 VDC	250 VAC or 24 VDC
Maximum Induction-free Power Rating	—	5 A at 250 VAC 4 A at 24 VDC	5 A at 250 VAC 4 A at 24 VDC
Lamp / LED Supply Voltage	—	—	24 VDC 110/220 VAC
Electrical Connection	—	M20 x 1.5mm	M20 x 1.5mm
Switching Type	—	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)
Insulation	—	IP65, Terminal IP00	IP65
Other Electrical Data	—	for high voltage, low amperage *(See **Type GW** schematic on page 237)*	Optional voltages for indicator light: 24V or 110V *(See **Type D** schematic on page 237)*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VR2E.0 & VR2ES.0**	**VR2F.0**	**VR2FD.0**
Method of Indication	**Green Range:** 0-29 psi **Yellow Range:** 29-43 psi **Red Range:** 43-145 psi	**Electric:** Electric switch activates to indicate 100% clogged element.	Electric: Electric Switch activates to indicate 100% clogged element
Port Connection	G1/2 (ISO 228)	G1/2 (ISO 228)	G 1/2 (ISO 228)
Adapter	included, VR-1/8-S P/N 00246881	included, VR-MF.S.0 P/N 00319004	included, VR-1/8-S P/N 00246881
Housing Material	brass	steel	steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)
Weight	0.26 lbs (120 grams)	0.18 lbs (80 grams)	0.20 lbs (90 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft	22 Lbf-ft
Other Characteristics		Trip Pressure adjustable from 15 psi to 145 psi	
Hydraulic Data			
Operating Pressure	145 psi (10 bar)	580 psi (40 bar)	145 psi (10 bar)
Trip Pressure (or Indication Range)	0 to 145 psi (0 - 10 bar)	29 psi (2 bar) -20%	29 psi (2 bar) ± 4psi (±0.3 bar)
Thermal Lockout	—	not available	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	.-22F to 250F (-30C to 121C)
Electrical Data			
Contact Voltage max.	—	42 VAC or DC	250VAC
Maximum Induction-free Power Rating	—	2.5 A at 24 VDC	48V at 0.5A
Lamp / LED Supply Voltage	—	—	N/A
Electrical Connection	—	Screw terminal 0.156 in. (4 mm)	Deutsch DT 04-2P
Switching Type	—	Normally Open Contacts (SPST)	Normally Open Contacts
Insulation	—	IP52	IP65
Other Electrical Data	—	for low voltage, high amperage (*See **Type F** schematic on page 238)*	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VR2GC.0**	**VR2LE.0**	**VR2LZ.0**
Method of Indication	**Electric:** Electronic-analog (4-20 ma) and two electrical switches at 75% and 100% clogged.	**Electric:** Electric switch activates to indicate 100% clogged element. **Visual:** Red pin pops up to indicate 100% clogged element.	**Electric:** 2 electric switches activate to indicate 75% & 100% clogged element. **Visual:** Red pin pops up to indicate 100% clogged element.
Port Connection	G1/2 (ISO 228)	G1/2 (ISO 228)	G1/2 (ISO 228)
Adapter	—	—	
Housing Material		steel	steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)
Weight	0.75 lbs (340 grams)	0.54 lbs (245 grams)	0.67 lbs (305 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft	11 Lbf-ft
Other Characteristics		—	—
Hydraulic Data			
Operating Pressure	100 psi (7 bar)	100 psi (7 bar)	100 psi (7 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar) -20%	29 psi (2 bar) -20%	29 psi (2 bar) -15%
Thermal Lockout	optional	not available	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	20-30 VDC	115 VAC	24 VDC
Maximum Induction-free Power Rating	6 A at 220 VAC 6 A at 24 VDC	1 A at 15 VAC	1 A at 15 VAC
Lamp / LED Supply Voltage	—	—	24 VDC
Electrical Connection	7 pin plug connector to DIN 43651	M20 x 1.5mm	M20 x 1.5mm
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT) reed contacts	Normally Open (75% alarm) (SPST) Normally Closed (100% alarm) (SPST) reed contacts
Insulation	IP65	IP65	IP65
Other Electrical Data	*See **Type GC** schematic on page 227*	for low voltage, high amperage *(See **Type LE** schematic on page 228)*	for low voltage, high amperage *(See **Type LZ** schematic on page 228)*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VMF2B.0**	**VMF2D.0/L... & VMF5D.0/L...**	**VMF2F.0**
Method of Indication	**Visual:** Red pin pops up to indicate 100% clogged element. resets automatically.	**Visual/Electric:** Electric switch and light activate to indicate 100% clogged element.	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	G1/8”	G1/8”	G1/8” male
Adapter	—	—	—
Housing Material	aluminum	aluminum	steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)
Weight	0.26 lbs (120 grams)	0.77 lbs (350 grams)	0.80 lbs (365 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft	11 Lbf-ft
Other Characteristics		Trip Pressure adjustable from 10 psi to 130 psi	—
Hydraulic Data			
Operating Pressure	100 psi (7 bar)	580 psi (40 bar)	580 psi (40 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*	29 psi (2 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*	29 psi (2 bar) -20% *(contact HYDAC for special settings from 15 psi to 120 psi)*
Thermal Lockout	not available	not available	—
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	—	220 VAC or 24 VDC	42 VAC or VDC
Maximum Induction-free Power Rating	—	6 A at 220 VAC 6 A at 24 VDC	2.5 A at 24 VDC
Lamp / LED Supply Voltage	—	24 VDC 110/220 VAC	—
Electrical Connection	—	M20 x 1.5mm	Screw terminal 0.156 in. (4 mm)
Switching Type	—	Normally Open and Normally Closed Contacts (SPDT)	Normally Open Contacts (SPST)
Insulation	—	IP65	IP65, Terminal IP00
Other Electrical Data	—	Optional voltages for indicator light: 24 V or 110 V (*See **Type F** schematic on page 238)*	for high voltage, low amperage (*See **Type F** schematic on page 238)*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VMF2FD.0**	**VMF2C.1 & VMF5C.1**	**VMF0.2UF.0**
Method of Indication	**Electric:** Electric Switch activates to indicate 100% clogged element	**Electric:** Electric switch activates to indicate 100% clogged element.	**Electric:** Electric vacuum switch activates at vacuum setting to indicate 100% clogged element.
Port Connection	G1/8”	G1/8”	G1/8” male
Adapter	—	**HF4R** 1/8NPT male x M10x1 female	**RKM** G1/8 male x M10x1 female **HF4S** 1/8NPT male x M10x1 female
Housing Material	steel	steel	steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)
Weight	0.16 lbs (70 grams)	0.26 lbs (120 grams)	0.34 lbs (155 grams)
Torque Rating	22 Lbf-ft	11 Lbf-ft	11 Lbf-ft
Other Characteristics	—	Trip Pressure adjustable from 3 psi to 96 psi	Indicator mounts after element to measure vacuum before pump
Hydraulic Data			
Operating Pressure	160 psi (11 bar)	290 psi (20 bar)	300 psi (20 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar) -10%	29 psi (2 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*	-3 psi (0.2 bar) -0.2 bar *(contact HYDAC for special settings from 15 psi to 120 psi)*
Thermal Lockout	not available	not available	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	250 VAC or 24 VDC	42 VAC or VDC
Maximum Induction-free Power Rating	5 A at 250 VAC, 3A at 12, 24 VDC, 1 A at 60VDC	5 A at 250 VAC 4 A at 24 VDC	2.5 A at 24 VDC
Lamp / LED Supply Voltage	—	—	—
Electrical Connection	Deutsch DT 04-2P	M20 x 1.5mm	Screw terminal 0.156 in. (4 mm)
Switching Type	Normally Open Contacts	Normally Open and Normally Closed Contacts (SPDT)	Normally Open Contacts (SPST)
Insulation	IP65	IP65, terminals IP00	IP65, Terminal IP00
Other Electrical Data	—	—	*(See **Type UF** schematic on page 238)*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VMF2E.0**	**VMF...E.0/3**	**VMF1.4G.0/3**
Method of Indication	**Visual:** 3 color gauge **Green Range:** 0-29 psi **Yellow Range:** 29-43 psi **Red Range:** 43-145 psi	**Visual:** 3 color gauge **Green Range:** 0-12 / 0-20 psi **Yellow Range:** 12-15 / 20-25 psi **Red Range:** 15-60 / 25-60 psi	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	G1/8”	1/8 NPT male	1/8 NPT male
Adapter	—	—	—
Housing Material	brass	brass	steel
Seals	—	—	nitrile (NBR) - standard
Weight	0.23 lbs (105 grams)	0.23 lbs (105 grams)	0.195 lbs (88.5 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft	11 Lbf-ft
Other Characteristics	—	—	Trip Pressure adjustable from 10 psi to 24 psi
Hydraulic Data			
Operating Pressure	145 psi (10 bar)	60 psi (4 bar)	150 psi (10 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar)	**VMF0.8E.0:** 0 to 12 psi **VMF1.4E.0:** 0 to 20 psi	20 psi (1.3 bar)
Thermal Lockout	—	—	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	—	—	240 VAC or 24 VDC
Maximum Induction-free Power Rating	—	—	0.5 A at 240 VAC 4 A at 24 VDC 9 mA at 24 VDC
Lamp / LED Supply Voltage	—	—	—
Electrical Connection	—	—	#8 - 32 screw terminals
Switching Type	—	—	Normally Open Contacts (SPST)
Insulation	—	—	—
Other Electrical Data	—	—	*(See **Type G** schematic on page 237*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

		
General Information		
Model Code	**VMF1.7G.0/3**	**VMF0.2UE.0/3**
Method of Indication	**Electric:** Electric switch activates to indicate 100% clogged element.	**Visual:** Vacuum gauge
Port Connection	1/8 NPT Male	1/8 NPT male
Adapter	—	—
Housing Material	steel	brass
Seals	nitrile (NBR) - standard	—
Weight	0.195 lbs (88.5 grams)	0.23 lbs (105 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft
Other Characteristics	—	Trip Pressure factory adjustable from 10 psi to 130 psi
Hydraulic Data		
Operating Pressure	150 psi (10 bar)	0 psi (0 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*	-14.5 to 0 psi (-1 to 0 bar) -10%
Thermal Lockout	not available	—
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data		
Contact Voltage max.	240 VAC or 24 VDC	—
Maximum Induction-free Power Rating	0.5 A at 220 VAC 4 A at 24 VDC	—
Lamp / LED Supply Voltage	#8-32 Screw Terminals	—
Electrical Connection	Normally Open Contacts (SPST)	—
Switching Type	—	—
Insulation	—	—
Other Electrical Data	*(See **Type G** schematic on page 237)*	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

		
General Information		
Model Code	**BSF0.2C.0**	**BSF0.2D.0/L...**
Method of Indication	**Electric:** Electric switch activates to indicate that filter is in bypass	**Visual/Electric:** Electric switch and light activate to indicate that filter is in bypass
Port Connection	G1/2 (ISO 228)	G1/2 (ISO 228)
Adapter	—	—
Housing Material	aluminum	aluminum
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)
Weight	0.31 lbs (140.6 grams)	0.365lbs (165.6 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft
Other Characteristics	—	—
Hydraulic Data		
Operating Pressure	3000 psi (210 bar)	3000 psi (210 bar)
Trip Pressure (or Indication Range)	3 psi (0.2 bar)	3 psi (0.2 bar)
Thermal Lockout	not available	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data		
Contact Voltage max.	250 VAC	250 VAC
Maximum Induction-free Power Rating	5 A at 250 VAC	5 A at 250 VAC
Lamp / LED Supply Voltage	—	—
Electrical Connection	M 20 x 1.5mm	M 20 x 1.5mm
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)
Insulation	IP65	IP65
Other Electrical Data	*(See **Type C** schematic on page 237)*	Optional voltages for indicator light: 24V or 110 V *(See **Type D** schematic on page 237)*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Static Pressure Indicators for Return Filters and Vacuum Indicators for Suction Filters

			
General Information			
Model Code	**VR0.2UE.0**	**VR0.2UF.0**	**VMF0.6K.0**
Method of Indication	**Visual:** Vacuum gauge including graduated scale	**Electric:** Electric switch activates to indicate 100% clogged element	**Visual:** Gauge includes graduated scale
Port Connection	G1/2 (ISO 228)	G1/2 (ISO 228)	G1/8”
Adapter	included, G1/2 male x 1/8NPTF P/N 02067828	included, VR-1/8-S P/N 00246881	—
Housing Material	brass	brass	aluminum
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard
Weight	0.23 lbs (105 grams)	0.34 lbs (155 grams)	0.21 lbs (100 grams)
Torque Rating	11 Lbf-ft	11 Lbf-ft	11 Lbf-ft
Other Characteristics	—	—	—
Hydraulic Data			
Operating Pressure	0 psi (0 bar)	0 psi (0 bar)	8.7 psi (0.6 bar)
Trip Pressure (or Indication Range)	-14.5 to 0 psi (-1 to 0 bar) *(contact HYDAC for special settings from 15 psi to 120 psi)*	-3 psi (-0.2 bar) *(contact HYDAC for special settings from 15 psi to 120 psi)*	-15 psi to +8.7 psi (-1 bar to + 0.6 bar)
Thermal Lockout	—	—	—
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	—	42 VAC or VDC	—
Maximum Induction-free Power Rating	—	2.5 A at 42 V	—
Lamp / LED Supply Voltage	—	—	—
Electrical Connection	—	Screw Terminal 0.156 in. (4mm)	—
Switching Type	—	Normally Open Contacts (SPST)	—
Insulation	—	IP65, terminals IP00	—
Other Electrical Data	—	For low voltage, high amperage *(See **Type UF** schematic on page 238)*	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Model Code: Differential Pressure Indicators

VM 5 B . X /

Indicator Prefix
- VM = G 1/2 3000 psi
- VD = G 1/2 6000 psi
- VL = G 1/2 360 psi

Trip Pressure / Gauge Indication Range
- 1 = 15 psi (1 bar) *(optional for typically for lube applications)*
- 2 = 29 psid (2 bar) *(standard for use on return line filters)*
- 5 = 72 psid (5 bar) *(standard for use on pressure filters, except DFDK & DFZ)*
- 8 = 116 psid (8 bar) *(standard for use on DFDK filters & DFZ)*

Type of Indicator
- B = Visual pop-up with automatic reset *(VD & VM only)*
- BM = Visual pop-up with manual reset *(VD & VM only)*
- C = Electric switch *(VD, VM, VD...T, & VMH...T only)*
- D = Electric switch and light *(VD, VM, VD...T, & VMH...T only)*
- GC = Electronic Analog *(4-20ma or 1-10V)* / pressure switch 75% and 100% trips *(VD only)*
- GW = Electronic Analog *(4-20ma or 1-10V)* / pressure switch 75% and 100% trips & bypass monitoring *(VL only)*
- J = Electric switch *(Brad Harrison 5-pin mini connection) (VDH only)*
- J4 = Electric switch *(Brad Harrison 4-pin micro connection) (VDH & VMH only)*
- LE = Electric pressure switch / Visual pop-up button *(VD only)*
- LZ = Electric pressure switch at 75% and 100% / visual pop-up button *(VD only)*

Modification Number *(latest version always supplied)*

Supplementary Details

Seals
(omit)= Nitrile (NBR) *(standard)* V = Fluoroelastomer (FPM) EPR = Ethylene Propylene (EPDM)

Light Voltage *(D type indicators only)*
L24 = 24V L110 = 110V

"LZ" type details *(for type LZ only - omit for all other types)*
- CN = electrical connection, 1 plug connector to DIN 43651 with 3 LED's *(to CNOMO standard)*
- DB = electrical connection, 1 plug connector to DIN 43651 with 3 LED's *(to Daimler-Benz standard)*
- BO = (M12x1) Brad Harrison 4-pin micro connection

"GC" type details *(for type GC only - omit for all other types)*
- SP = analogue signal: voltage output 1-10V
- SQ = analogue signal: voltage output 4-20mA *(current source)*

[if SP or SQ not specified "current sink" model supplied

- 113 = N/O function
- 123 = N/C function

[pressure peak suppression up to 10 sec. cold start suppression of switching outputs *(PNP technique, positive switching)*

- LED = 3 LED's *(red, green, yellow)* in cable box
- PF = floating switching outputs *(due to relay in the plug)*
- 30C = cold start suppression of switching outputs up to 30˚C *(other temperatures on request)*

Thermal Lockout *(VM, VD types C, D, J, and J4 only)*
- T100 = Lockout below 100°F

Underwrighters Approval
- CRUUS = Electrical Indicators VMC, VMD, VMJ, VMJ4, VDC, VDD, VDJ, VDJ4

B 2 210 B HF V /

Indicator Prefix
- B = 3/4 - 16 UNF Thread *(SAE - Ported)*

Trip Pressure / Gauge Indication Range
- 1 = 15 psi (1 bar) *(optional for typically for lube applications)*
- 2 = 29 psid (2 bar) *(standard for B indicators use on return line filters)*
- 5 = 72 psid (5 bar) *(standard for B indicators use on pressure filters, except DF-ZS0104H)*
- 8 = 120 psid (8 bar) *(standard for B indicators use on DF-ZS0104H)*

Operating Pressure
- 210 = 3000 psi (210 bar) *(B & BE not available)*
- 420 = 6000 psi (420 bar)

Type of Indicator
- B = Visual pop-up with automatic reset
- BM = Visual pop-up with manual reset
- C = Electric switch
- D = Electric switch and light
- J = Electric switch *(Brad Harrison 5-pin mini connection)*
- J4 = Electric switch *(Brad Harrison 4-pin micro connection)*

Application
- HF = Hydraulic filters

Seals
- V = Fluoroelastomer (FPM) *(standard)*
- EPR = Ethylene Propylene (EPDM)

Supplementary Details

Light Voltage *(D type indicators only)*
- L24 = 24V
- L110 = 110V

Thermal Lockout *(types C, D, J, and J4 only)*
- T100 = Lockout below 100˚F

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) B2210CHFV** **2) B2210CHFV/S0126H** **3) B5210CHFV**	**1) B2210DHFV/L...** **2) B2210DHFV/L...S0126** **3) B5210DHFV/L...**	**1) B2210J4HF.1/V** **2) B2210J4HFV/S0126** **3) B5210J4HF.1/V**
Method of Indication	**Electric:** Electric switch activates to indicate 100% clogged element.	**Visual/Electric:** Electric switch and light activate to indicate 100% clogged element.	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	3/4 - 16 UNF - 2A	3/4 - 16 UNF - 2A	3/4 - 16 UNF - 2A
Adapter	—	—	—
Housing Material	aluminum	aluminum	aluminum
Seals	fluoroelastomer (FPM) - standard ethylene propylene (EPR)	fluoroelastomer (FPM) - standard ethylene propylene (EPR)	fluoroelastomer (FPM) - standard ethylene propylene (EPR)
Weight	0.080 lbs (36 grams)	0.285 lbs (129 grams)	0.205 lbs (93 grams)
Torque Rating	30 Lbf-ft	30 Lbf-ft	30 Lbf-ft
Hydraulic Data			
Operating Pressure	3000 psi (210 bar)	3000 psi (210 bar)	3000 psi (210 bar)
Trip Pressure (or Indication Range)	29 psid (2 bar) -10% *(standard for NHF/NHFD and HF4R...F)* 72 psi (5 bar) -10% *(standard for LPF 660 and HF2)*	29 psid (2 bar) -10% *(standard for NHF/NHFD and HF4R...F)* 72 psi (5 bar) -10% *(standard for LPF 660 and HF2)*	29 psid (2 bar) -10% *(standard for NHF/NHFD and HF4R...F)* 72 psi (5 bar) -10% *(standard for LPF 660 and HF2)*
Thermal Lockout	Option: Below 100°F	Option: Below 100°F	Option: Below 100°F
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	250 VAC	250 VAC
Maximum Induction-free Power Rating	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC
Electrical Connection	M 20 x 1.5mm	M 20 x 1.5mm	Brad Harrison 4-pin micro *(ø 18.6 mm x 18 threads/in.)*
Switching Type	Normally Open and Normally Closed Contacts	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)
Insulation	IP65	IP65	—
Other Electrical Data	Electrical connector can be rotated in 90° increments *(See **Type C** schematic on page 211)*	—	—
$_{c}$RU$_{us}$ Rating	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	1) Connector rotates in 90° increments 2) Optional voltage for light: 24 or 110 V *(See **Type D** schematic on page 237)*	*(See **Type J4** schematic on page 238)*

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) VL 2 GW.0** **2) VL 5 GW.0**	**1) VM2B.1** **2) VM5B.1**	**1) VM2BM.1** **2) VM5BM.1**
Method of Indication	**Electric:** Electric analog (4-20ma) and two electric switches activate to indicate 75% and 100% clogged.	**Visual:** Green or red display indicates when element is clean or 100% clogged	**Visual:** Green or red display indicates when element is clean or 100% clogged
Port Connection	G1/2	G1/2	G1/2
Adapter	—	—	—
Housing Material	aluminum	aluminum	aluminum
Seals	nitrile (NBR) - standard fluoroelastomer (FPM)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM)) ethylene propylene (EPR)
Weight	0.35 lbs (159 grams)	0.12 lbs (55 grams)	0.12 lbs (55 grams)
Torque Rating	24 Lbf-ft	24 Lbf-ft	24 Lbf-ft
Hydraulic Data			
Operating Pressure	360 psi (25 bar)	3000 psi (210 bar)	3000 psi (210 bar)
Trip Pressure (or Indication Range)	29 psi (2 bar) -10% 43 psi (3 bar) -10% 72 psi (5 bar) -10% *(contact HYDAC for special settings from 15 psi to 120 psi)*	29 psid (2 bar) -10% *(standard for RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF)*	29 psid (2 bar) -10% *(standard for RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF)*
Thermal Lockout	Optional	not available	not available
Temperature Range	-40°F to 184°F (-40°C to 85°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	20-30 VDC	—	—
Maximum Induction-free Power Rating	—	—	—
Electrical Connection	M12 x a, 8 pole male connector	—	—
Switching Type	—	—	—
Insulation	IP65	—	—
Other Electrical Data	**Current input:** 25mA + signal current 600 Ω max resistance **Current output:** <400 mA connected <1 mA disconnected	—	—
$_{c}$RU$_{us}$ Rating	—	—	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) VM2C.0 & VM2C.1/T...** **2) VM5C.0 & VM5C.1/T...**	**1) VM2CD.0/2M0** **2) VM5CD.0/2M0** **3) VM2CD.0/2M0-OE** **2) VM5CD.0/2M0-OE**	**1) VM2D0/L... & VM2D.1/L...T...** **2) VM5D0/L... & VM5D.1/L...T...**
Method of Indication	**Electric:** Electric switch activates to indicate 100% clogged element.	**Electric:** Electric Switch activates to indicate 100% clogged element	**Visual/Electric:** Electric switch and light activate to indicate 100% clogged element.
Port Connection	G 1/2	G 1/2 (ISO 228)	G 1/2
Adapter	—	—	—
Housing Material	aluminum	aluminum	aluminum
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM)) ethylene propylene (EPR)
Weight	0.33 lbs (150 grams)	0.22 lbs (100 grams)	0.33 lbs (150 grams)
Torque Rating	24 Lbf-ft	24 Lbf-ft	24 Lbf-ft
Hydraulic Data			
Operating Pressure	3000 psi (210 bar)	3000 psi (210 bar)	3000 psi (210 bar)
Trip Pressure (or Indication Range)	29 psid (2 bar) -10% *(standardfor RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF)*	29 psid (2 bar) -10% *(standardfor RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF))*	29 psid (2 bar) -10% *(standardfor RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF)*
Thermal Lockout	Option: Below 70°F or 100°F	not available	Option: Below 70°F or 100°F
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	250 VAC	250 VAC
Maximum Induction-free Power Rating	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	48 V at 0.5 A	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC
Lamp / LED Supply Voltage	—	—	24 VDC, 110/220 VAC
Electrical Connection	M 20 x 1.5mm	Deutsch DT 04-2P	M 20 x 1.5mm
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open or Normally Closed (OE) Change Over Contacts	Normally Open and Normally Closed Contacts (SPDT)
Insulation	IP65	IP65	IP65
Other Electrical Data	*(See **Type C** schematic on page 237)*	—	Optional voltages for light: 24 or 110 V *(See **Type D** schematic on page 237)*
$_{c}$RU$_{us}$ Rating	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	—	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) VM2J4.1** **2) VM5J4.1** **3) VM5J4.0 Automotive**	**1) VM2J.1** **2) VM5J.1** **3) VM5J.0 Automotive**	**1) VD5B.1** **2) VD8B.1**
Method of Indication	**Electric:** Electric switch activates to indicate 100% clogged element.	**Electric:** Electric switch activates to indicate 100% clogged element.	**Visual:** Green and red display indicates when element is clean or 100% clogged.
Port Connection	G 1/2	G1/2	G1/2
Adapter	—	—	—
Housing Material	aluminum	aluminum	stainless steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM)) ethylene propylene (EPR)
Weight	0.33 lbs (150 grams)	0.33 lbs (150 grams)	0.24 lbs (110 grams)
Torque Rating	24 Lbf-ft	24 Lbf-ft	75 Lbf-ft
Hydraulic Data			
Operating Pressure	3000 psi (210 bar)	3000 psi (210 bar)	6000 psi (420 bar)
Trip Pressure (or Indication Range)	29 psid (2 bar) -10% *(standard for RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF)*	29 psid (2 bar) -10% *(standard for RFL/RFLD & LFM)* 72 psi (5 bar) -10% *(standard for LF, LPF, DF-AFA, & MDF)*	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*
Thermal Lockout	Option: Below 70°F or 100°F	Option: Below 70°F or 100°F	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	250 VAC	—
Maximum Induction-free Power Rating	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	—
Electrical Connection	Brad Harrison 4-pin micro *(M12)*	Brad Harrison 5-pin mini *(ø 7/8" x 16 threads/in.)*	—
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)	—
Insulation	—	—	—
Other Electrical Data	*(See **Type J4** schematic on page 238)*	*(See **Type J** schematicon page 238)*	—
$_{c}$RU$_{us}$ Rating	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) VD5BM.1** **2) VD8BM.1**	**1) VD5C.0** **2) VD8C.0**	**VD5CD.0/2M0**
Method of Indication	**Visual:** Green and red display, and pop-up pin, indicate when element is 100% clogged Pin requires manual reset.	**Electric:** Electric switch activates to indicate 100% clogged element.	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	G 1/2	G1/2	G 1/2
Adapter	—	—	—
Housing Material	stainless steel	stainless steel	steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM)) ethylene propylene (EPR)
Weight	0.24 lbs (110 grams)	0.55 lbs (250 grams)	0.42 lbs (190 grams)
Torque Rating	75 Lbf-ft	75 Lbf-ft	75 Lbf-ft
Hydraulic Data			
Operating Pressure	6000 psi (420 bar)	6000 psi (420 bar)	6000 psi (420 bar)
Trip Pressure (or Indication Range)	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	72 psi (5 bar)
Thermal Lockout	not available	Optional 100°F	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	—	250 VAC	250 VAC
Maximum Induction-free Power Rating	—	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	48 V at 0.5 A
Electrical Connection	—	M 20 x 1.5mm	Deutsch DT 04-2P
Switching Type	—	Normally Open and Normally Closed Contacts (SPDT)	Normally Open Contacts
Insulation	—	IP65	IP65
Other Electrical Data	—	*(See **Type C** schematic on page 227)*	—
$_{c}RU_{us}$ Rating	—	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) VD5D.0/L...** **2) VD8D.0/L...**	**1) VD2GC.0** **2) VD5GC.0**	**1) VD2J.1** **2) VD5J.1** **3) VDH5J.0 Automotive**
Method of Indication	**Visual/Electric:** Electric switch and light activate to indicate 100% clogged element.	**Electric:** Electric-analog (4-20 ma) and two electric switches activate to indicate 75% and 100% clogged	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	G 1/2	G1/2	G1/2
Adapter	—	—	—
Housing Material	stainless steel	stainless steel	stainless steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM)) ethylene propylene (EPR)
Weight	0.55 lbs (250 grams)	0.88 lbs (400 grams)	0.55 lbs (250 grams)
Torque Rating	75 Lbf-ft	75 Lbf-ft	75 Lbf-ft
Hydraulic Data			
Operating Pressure	6000 psi (420 bar)	6000 psi (420 bar)	6000 psi (420 bar)
Trip Pressure (or Indication Range)	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	1) 30 psid (2 bar) -10% *(standard)* 2) 72 psid (5 bar) -10% *(standard)*	1) 30 psid (2 bar) -10% *(standard)* 2) 72 psid (5 bar) -10% *(standard)*
Thermal Lockout	not available	Optional	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	20-30 VDC	250 VAC
Maximum Induction-free Power Rating	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC	12 VA	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC
Lamp / LED Supply Voltage	—	24 VDC	—
Electrical Connection	M 20 x 1.5mm	7 pin plug connector to DIN 43651	Brad Harrison 5 pin mini *(ø 7/8" x 16 threads/in.)*
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)
Insulation	IP65	IP65	—
Other Electrical Data	Optional voltages for light: 24 or 110 V *(See **Type D** schematic on page 237)*	*(See **Type GC** schematic on page 237)*	*(See **Type J** schematic on page 238)*
$_{c}RU_{us}$ Rating	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	—	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) VD5J4.1** **2) VD8J4.1** **3) VDH5J4.0 Automotive**	**1) VD2LE.1** **2) VD5LE.1** **3) VD8LE.1**	**1) VD2LZ.1** **2) VD5LZ.1** **3) VD8LZ.1**
Method of Indication	**Electric:** Electric switch activates to indicate 100% clogged element.	**Visual:** Red pin and electrical switch activates to indicate 100% clogged element	**Visual:** Red pin and electrical switches activate to indicate 75% and 100% clogged conditions. LED's optional
Port Connection	G 1/2	G1/2	G1/2
Adapter	—	—	—
Housing Material	stainless steel	stainless steel	stainless steel
Seals	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM) ethylene propylene (EPR)	nitrile (NBR) - standard fluoroelastomer (FPM)) ethylene propylene (EPR)
Weight	0.42 lbs (190 grams)	0.72 lbs (325 grams)	0.72 lbs (325 grams)
Torque Rating	75 Lbf-ft	75 Lbf-ft	75 Lbf-ft
Hydraulic Data			
Operating Pressure	6000 psi (420 bar)	6000 psi (420 bar)	6000 psi (420 bar)
Trip Pressure (or Indication Range)	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	1) 30 psid (2 bar) -10% *(standard)* 2) 72 psid (5 bar) -10% *(standard)* 3) 116 psid (8 bar) -10% *(standard)*	1) 30 psid (2 bar) -10% *(standard)* 2) 72 psid (5 bar) -10% *(standard)* 3) 116 psid (8 bar) -10% *(standard)*
Thermal Lockout	not available	not available	not available
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	115 VAC	24 VDC
Maximum Induction-free Power Rating	5 A at 250 VAC 3 A at 12, 24 VDC 1 A at 60 VDC	1 A at 15 VDC 1 A at 15 VAC	1 A at 15 VDC 1 A at 15 VAC
Lamp / LED Supply Voltage	—	—	24 VDC
Electrical Connection	Brad Harrison 4 pin micro	M20 x 1.5mm	M20 x 1.5mm
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)
Insulation	—	IP65	IP65
Other Electrical Data	*(See **Type J4** schematic on page 228)*	*(See **Type LE** schematic on page 228)*	*(See **Type LZ** schematic on page 228)*
$_{c}$RU$_{us}$ Rating	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	—	—

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) B2420BHFV** **2) B5420BHFV** **3) B8420BHFV**	**1) B2420BMHFV** **2) B5420BMHFV** **3) B8420BMHFV**	**1) B5420CHFV** **2) B8420CHFV**
Method of Indication	**Visual:** Red pin pops up to indicate 100% clogged element. Pin resets automatically.	**Visual:** Red pin pops up to indicate 100% clogged element. Pin requires manual reset.	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	3/4 - 16 UNF - 2A	3/4 - 16 UNF - 2A	3/4 - 16 UNF - 2A
Adapter	—	—	—
Housing Material	stainless steel	stainless steel	stainless steel
Seals	fluoroelastomer (FPM) - standard ethylene propylene (EPR)	fluoroelastomer (FPM) - standard ethylene propylene (EPR)	fluoroelastomer (FPM) - standard ethylene propylene (EPR)
Weight	0.18 lbs (82 grams)	0.18 lbs (82 grams)	0.38 lbs (172 grams)
Torque Rating	30 Lbf-ft	30 Lbf-ft	30 Lbf-ft
Hydraulic Data			
Operating Pressure	6000 psi (420 bar)	6000 psi (420 bar)	6000 psi (420 bar)
Trip Pressure (or Indication Range)	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	1) 30 psid (2 bar) -10% *(standard)* 2) 72 psid (5 bar) -10% *(standard)*	1) 30 psid (2 bar) -10% *(standard)* 2) 72 psid (5 bar) -10% *(standard)*
Thermal Lockout	not available	not available	Option: Below 70°F or 100°F
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	—	—	250 VAC
Maximum Induction-free Power Rating	—	—	5 A at 250 VAC 3 A at 12,24 VDC 1 A at 60 VDC
Electrical Connection	—	—	M 20 x 1.5mm
Switching Type	—	—	Normally Open and Normally Closed Contacts (SPDT)
Insulation	—	—	—
Other Electrical Data	—	—	Electrical connector can rotate in 90° increments *(See **Type C** schematic on page 237)*
$_{c}$RU$_{us}$ Rating	—	—	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current

Note: Applicable Filters - see page 216, Quick Reference Guide.

Differential Pressure Indicators for Pressure Filters and Inline Return Filters

			
General Information			
Model Code	**1) B5420DHFV/L...** **2) B8420DHFV/L...**	**1) B5420JHF.1/V** **2) B8420JHF.1/V** **3) B2420JHF.1/V** **4) B2420JHF.1/V-S0126H** **5) B5420JHFV Automotive** **6) B2420JHFV Automotive**	**1) B5420J4HF.1/V** **2) B8420J4HF.1/V** **3) B5420J4HFV Automotive** **4) B2420J4HFV Automotive**
Method of Indication	**Visual/Electric:** Electric switch and light activate to indicate 100% clogged element.	**Electric:** Electric switch activates to indicate 100% clogged element.	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	3/4 - 16 UNF - 2A	3/4 - 16 UNF - 2A	3/4 - 16 UNF - 2A
Adapter	—	—	—
Housing Material	stainless steel	stainless steel	stainless steel
Seals	fluoroelastomer (FPM) - standard ethylene propylene (EPR)	fluoroelastomer (FPM) - standard ethylene propylene (EPR)	fluoroelastomer (FPM) - standard ethylene propylene (EPR)
Weight	0.45 lbs (204 grams)	0.33 lbs (150 grams)	0.33 lbs (150 grams)
Torque Rating	30 Lbf-ft	30 Lbf-ft	30 Lbf-ft
Hydraulic Data			
Operating Pressure	6000 psi (420 bar)	6000 psi (420 bar)	6000 psi (420 bar)
Trip Pressure (or Indication Range)	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*	1) 72 psid (5 bar) -10% *(standard)* 2) 116 psid (8 bar) -10% *(standard)*
Thermal Lockout	Option: Below 70°F or 100°F	Option: Below 70°F or 100°F	Option: Below 70°F or 100°F
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data			
Contact Voltage max.	250 VAC	250 VAC	250 VAC
Maximum Induction-free Power Rating	5 A at 250 VAC 3 A at 12, 24 VDC 1 A at 60 VDC	5 A at 250 VAC 3 A at 12.24 VDC 1 A at 60 VDC	5 A at 250 VAC 3 A at 12.24 VDC 1 A at 60 VDC
Lamp / LED Supply Voltage	24 VDC, 110 / 220 VAC	—	—
Electrical Connection	M 20 x 1.5mm	Brad Harrison 5 pin mini *(ø 7/8 - 16 threads/in.)*	Brad Harrison 4 pin micro
Switching Type	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)	Normally Open and Normally Closed Contacts (SPDT)
Insulation	—	—	—
Other Electrical Data	1) Connector rotates in 90˚ increments 2) Optional voltage for light: 24 or 110 V *(See **Type D** schematic on page 237)*	*(See **Type J** schematic on page 238)*	*(See **Type J4** schematic on page 238)*
$_{c}$RU$_{us}$ Rating	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current	3A, 250VAC, N.C. Contact 4A, 250VAC, N.O. Contact 4A, 250VAC, Continuous Current

Note: Applicable Filters - see page 216, Quick Reference Guide.

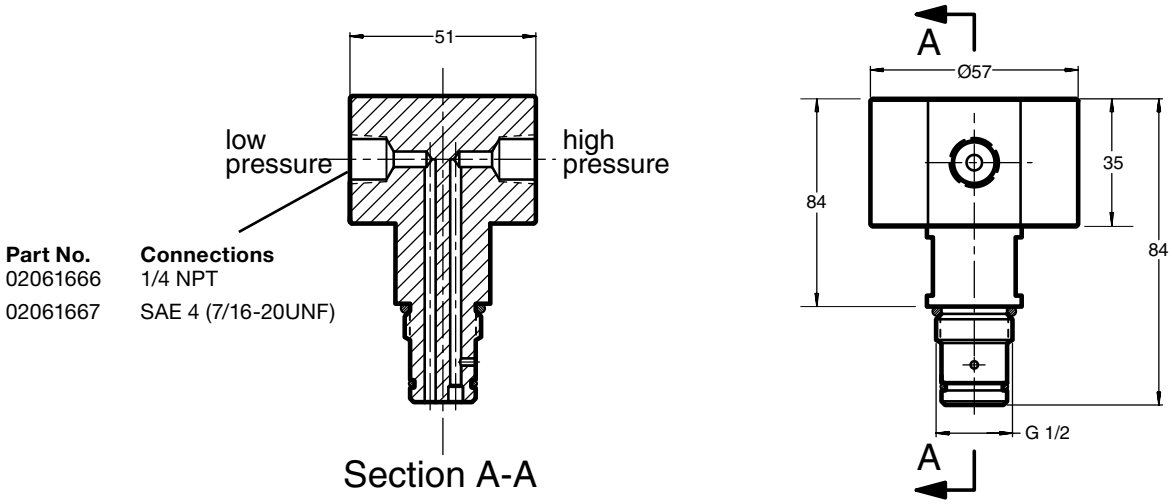
Differential Pressure Indicators for Pressure Filters and Inline Return Filters

		
General Information		
Model Code	**Type B indicator in filter head; not sold as separate item**	**Type C indicator built-in to filter head; not sold as separate item**
Method of Indication	**Visual:** Red pin pops up to indicate 100% clogged element. Pin resets automatically.	**Electric:** Electric switch activates to indicate 100% clogged element.
Port Connection	—	—
Adapter	—	—
Housing Material	plastic	steel
Seals	nitrile (NBR)	nitrile (NBR)
Weight	—	—
Torque Rating	—	—
Hydraulic Data		
Operating Pressure	250 psi (16.5 bar)	250 psi (16.5 bar)
Trip Pressure (or Indication Range)	22 psid (1.5 bar) 44 psid (3.0 bar)	22 psid (1.5 bar) 44 psid (3.0 bar)
Thermal Lockout	—	—
Temperature Range	-22°F to 250°F (-30°C to 121°C)	-22°F to 250°F (-30°C to 121°C)
Electrical Data		
Contact Voltage max.	—	36 VDC
Maximum Induction-free Power Rating	—	200 ma at 36 VDC
Electrical Connection	—	#10 Screw Terminal
Switching Type	—	Normally Open Contacts (SPST)
Insulation	—	—
Other Electrical Data	—	*(See **Type C** Spin-On schematic on page 237)*

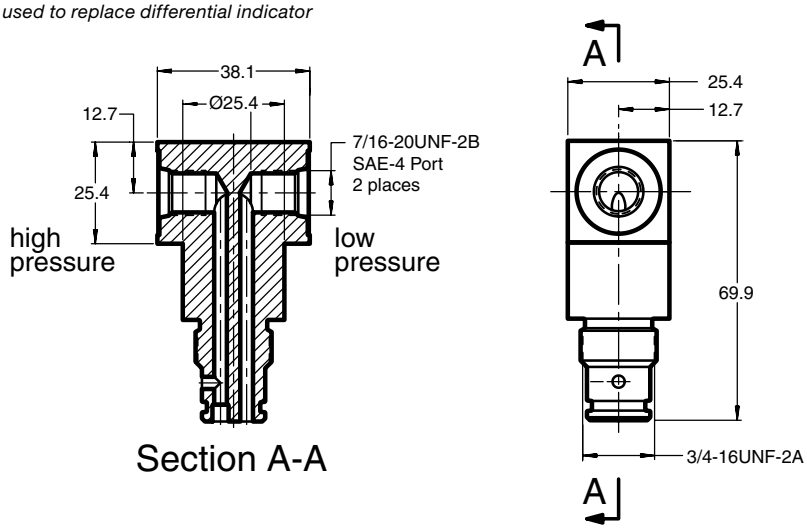
Note: Applicable Filters - see page 216, Quick Reference Guide.

Dual Indicator/Gauge Blocks

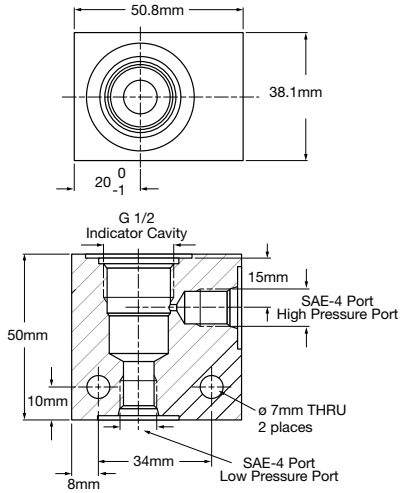
Dual Gauge Block - G 1/2 (Part No. 02061666 & 02061667) - *used to replace differential indicator*



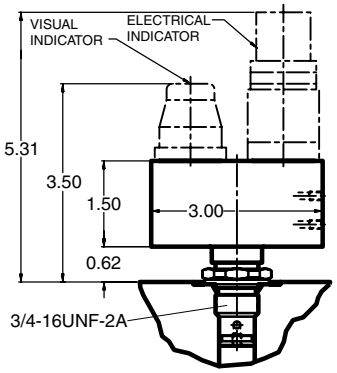
Dual Gauge Block - 3/4-16UNF (Part No. 02059931)
used to replace differential indicator



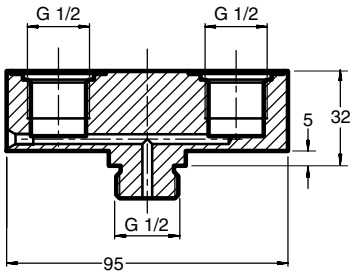
Pipe Connection Block - G1/2" Indicator SAE-4 Ports
(Part No. 02080588)



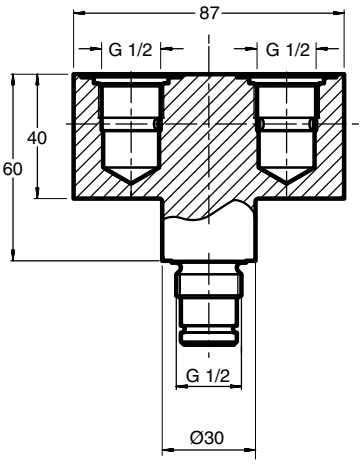
Dual Indicator Block - Differential - 3/4-16UNF
(Part No. 02063707)



Dual Indicator Block - Static - G 1/2
(Part No. 00318741)



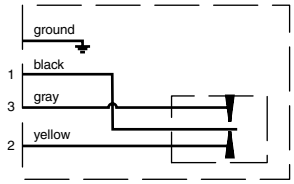
Dual Indicator Block - Differential - G 1/2
(Part No. 00318732)

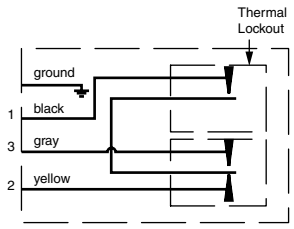


Electrical Schematics

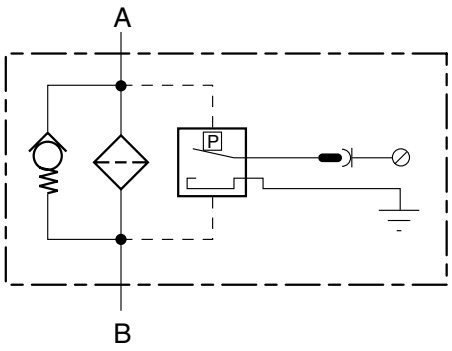
Type C

Clean Element Condition Shown
Below Trip Pressure



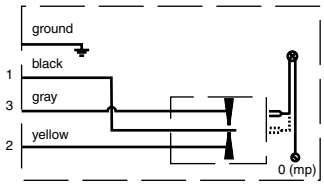


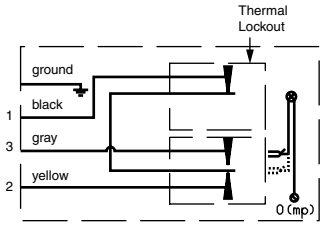
Type C Spin-On



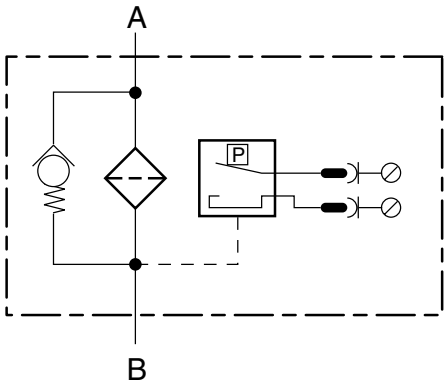
Type D

Clean Element Condition Shown
Below Trip Pressure

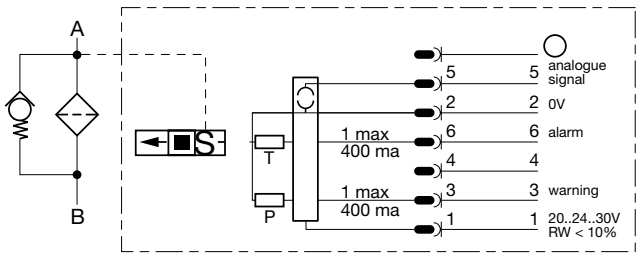




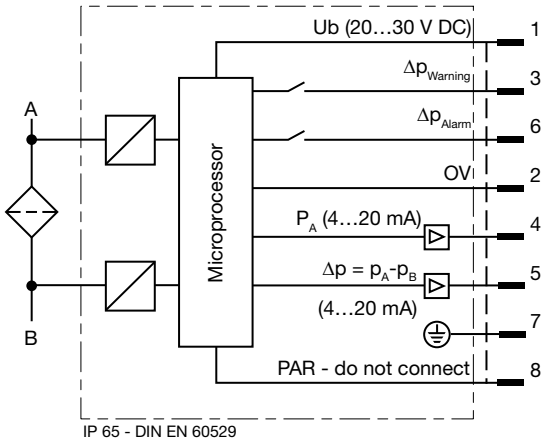
Type G



Type GC



Type GW



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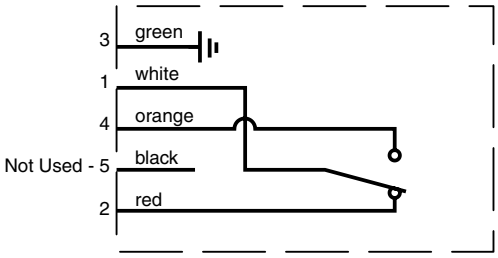
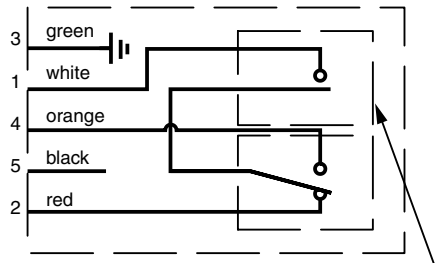
Type J

Clean Element Condition Shown Below Trip Pressure



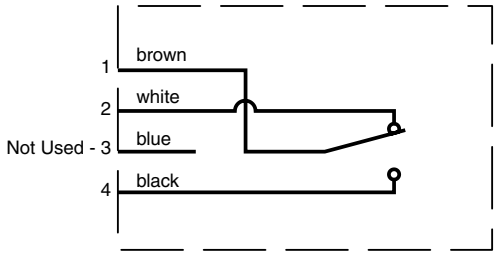


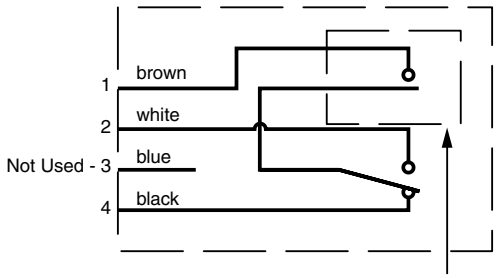
Thermal Lockout Switch will close at a predetermined temp.

Switch available for the temp. of:
70°F (21°C) standard
100°F (38°C) option

Type J4

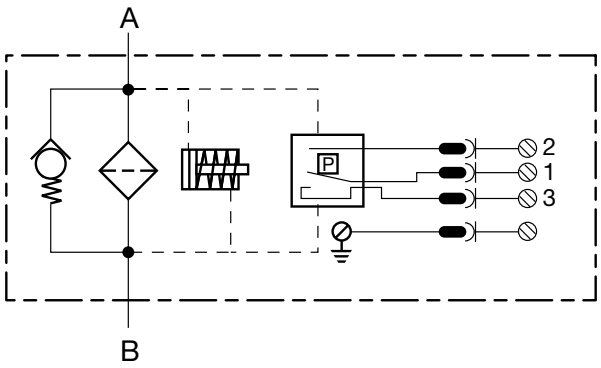
Clean Element Condition Shown Below Trip Pressure



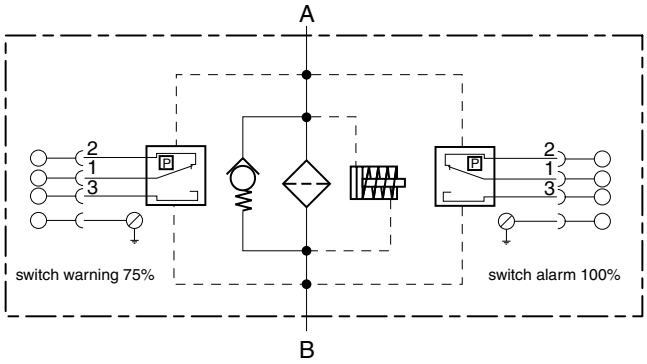


Thermal Lockout

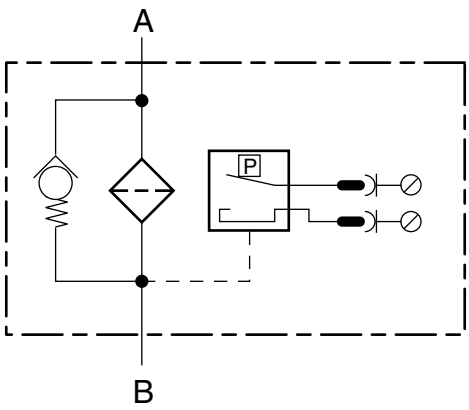
Type LE



Type LZ

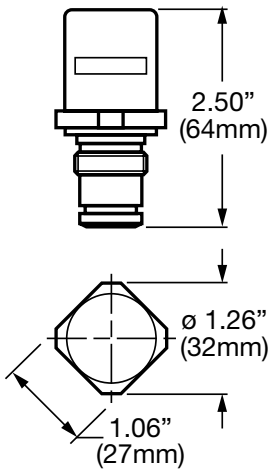


Type UF & F

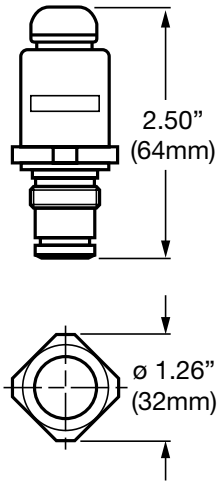


Dimensions

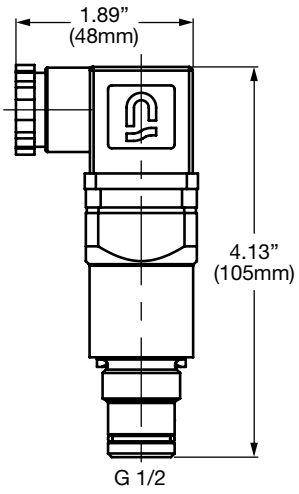
VD/VM...B



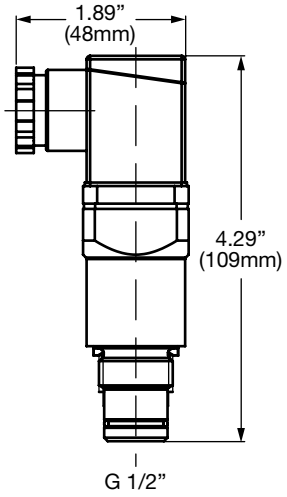
VD/VM...BM



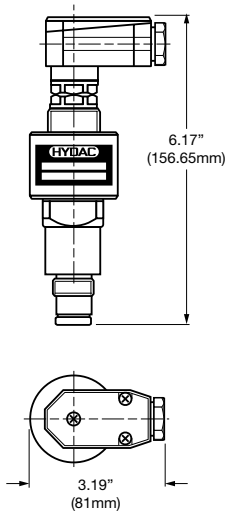
VD/VM...C



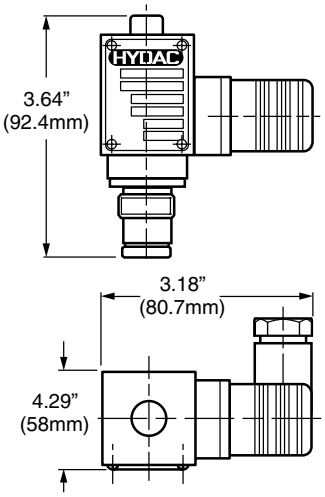
VD/VM...D



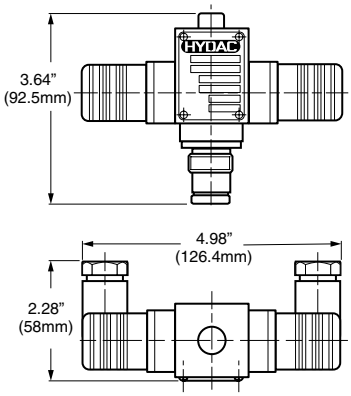
VD...GC



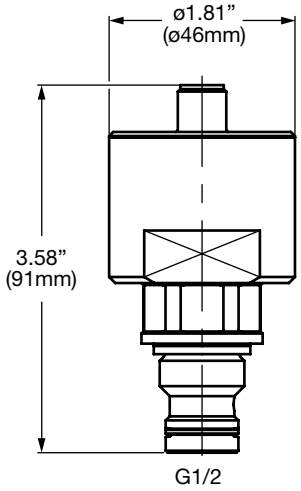
VD...LE



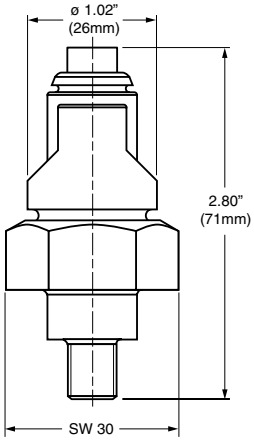
VD...LZ



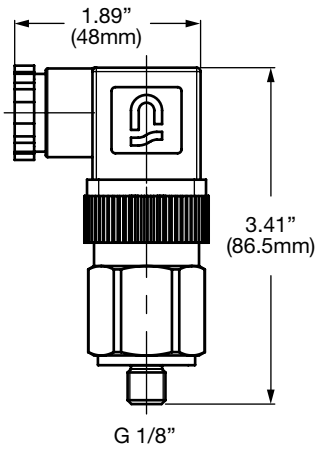
VL...GW



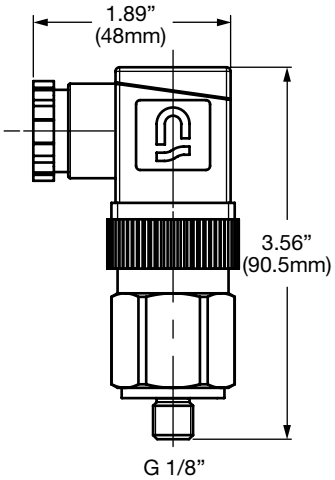
VMF2B.0



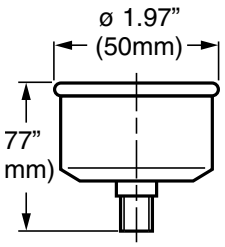
VMF...C



VMF...D



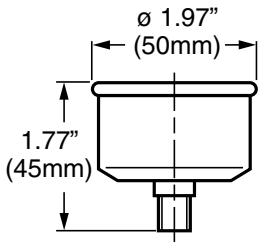
VMF.2E



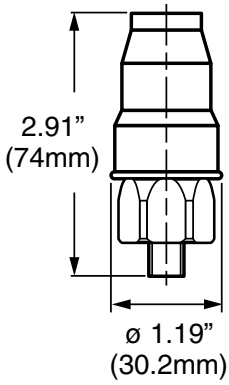
Dimensions shown are for general information and overall envelope size only. For complete dimensions please contact HYDAC to request a certified print.

Dimensions

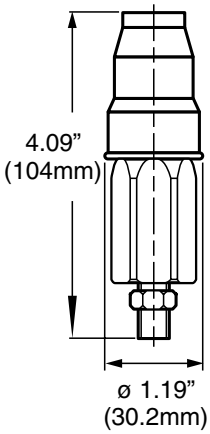
VMF0.2UE.0



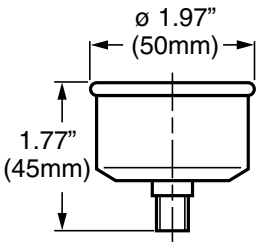
VMF2F.0



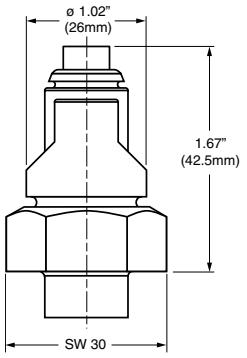
VMF0.2UF.0



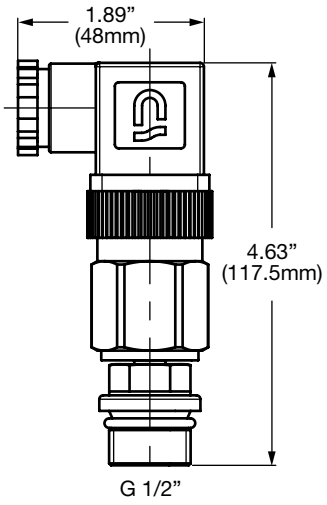
VMF0.6K.0



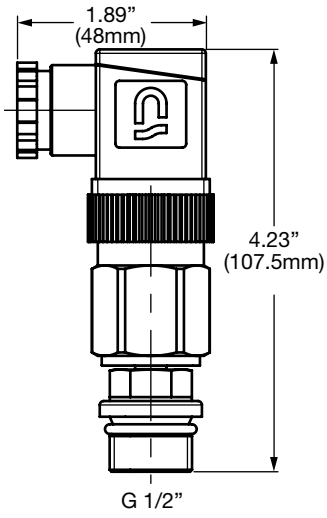
VR2B.0 & VR2BM.0



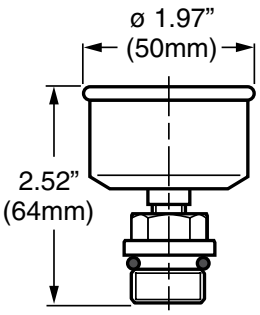
VR...C



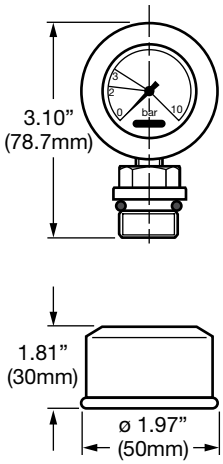
VR...D



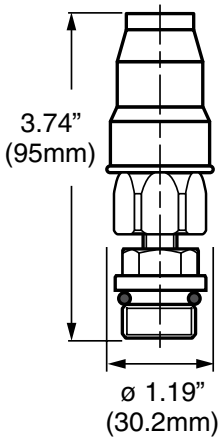
VR...E



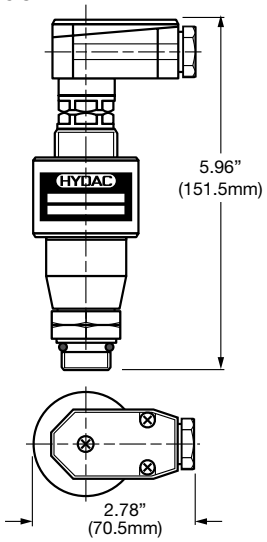
VR2ES.0



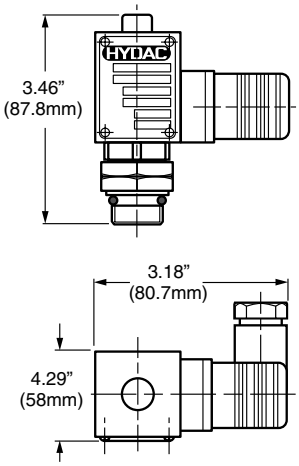
VR...F...



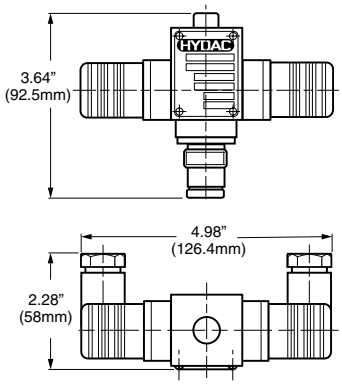
VR...GC



VR2LE.0



VR2LZ.0



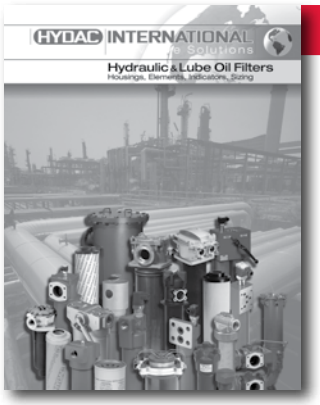
Dimensions shown are for general information and overall envelope size only. For complete dimensions please contact HYDAC to request a certified print.

Accumulators

- Bladder Accumulators
- Diaphragm Accumulators
- Piston Accumulators
- Nitrogen Bottles
- Pulsation Dampeners
- Thermal Fuse Caps
- Safety & Shut-off Blocks
- Charging & Gauging Units
- Permanent Gauging Blocks
- Mounting Components
- Sizing Information
- Spare Parts, Seal Kits & Tools

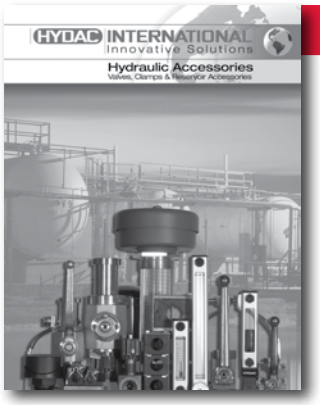
Electronics

- Pressure Transducers
- Special Environment Transducers
- Pressure Switches
- Display Units
- Temperature Transducers
- Temperature Switches
- Level Sensors
- Flow Sensors
- Diagnostic Equipment
- Adapters
- Connectors
- Mounting Kits
- Demonstration Kits



Hydraulic & Lube Oil Filters

- Inline Filters
- Inline Duplex Filters
- In-Tank Filters
- In-Tank Inline Duplex Filters
- In-Tank Return Line Filters
- In-Tank Suction Filters
- Inside Tank Filters
- Manifold Mount Filters
- Modular Stacking Filters
- Manifold Cartridge Filters
- Low, Med. & High Press. Filters
- Filter Elements
- Clogging Indicators



Hydraulic Accessories

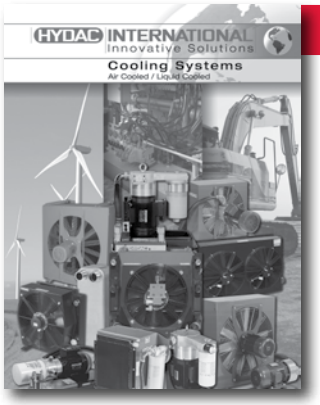
Valves
- High & Low Press. Ball Valves
- Flow Control Valves
- Hose Break Valves
- Metric Cartridge Valves

Clamps
- DIN 3015 Clamps
- Standard Clamps
- Custom Solutions

Accessories
- Breathers & Filler Breathers
- Fluid Level Indicators
- Suction Strainers
- Gauge Isolators
- TestPoints

Cartridge Valves & Manifolds

- Pressure Control Valves
- Pressure Relief Valves
- Pressure Reducing/ Relieving Valves
- Flow Control & Regulator Valves
- Check Valves
- Counterbalance Valves
- Solenoid Control Valves
- Directional Control Valves
- Proportional Valves
- Solenoid Coils
- Line Bodies & Form Tools
- Manifold Accessories
- Seal Kits & Adjustment Kits

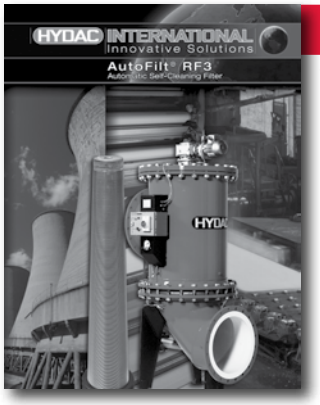


Cooling Systems

- Air Cooled Oil Coolers
- Air Cooling Systems for Water Glycol
- Air Cooled Oil Coolers for Mobile Applications
- Pump/Filter/Cooler Units
- Heat Exchangers
- Accessories
  - Adjustable Temperature Switches
  - Thermostatic Bypasses
  - Integrated Bypasses
  - Compatible Filters
  - Compatible Clogging Indicators

Mobile Hydraulics

- Sectional & Monoblock Configurations
- Manual, Hydraulic Pilot, Electro Hydraulic, Pneumatic Actuators
- Nominal flow - 14 to 42 gpm
- Maximum Pressure 5000 psi
- Special configurations to help you control fixed or variable displacement pumps
- Custom solutions in a single all-inclusive package
- Special adapted spool configurations according to your needs



Process Filtration

The AutoFilt® RF3 is an automatic self-cleaning filtration system designed for continuous maintenance free filtration of water.

- 20 - 31,000 gpm flow rates
- 2" - 36" ANSI flange sizes
- 25 - 3000 micron ratings
- 25 to 150 psi operating pressures
- ASME Code certification
- Electric, Pneumatic, or
- Electro-pneumatic power source

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Highest Performance From Optimum Element System Design Results In:

- **Reduction in Component Wear**
- **Increased Machinery Uptime**
- **Increased Element Lifetime**
- **Lower Operating Costs**
- **Lower Disposal Costs**
- **Reduction in Total Cost of Ownership**

What can you expect from HYDAC?

Commitment to always:

- Provide the very best filtration performance
- Help our customers lower their costs of ownership
- Serve and support our customers in applying filtration products

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