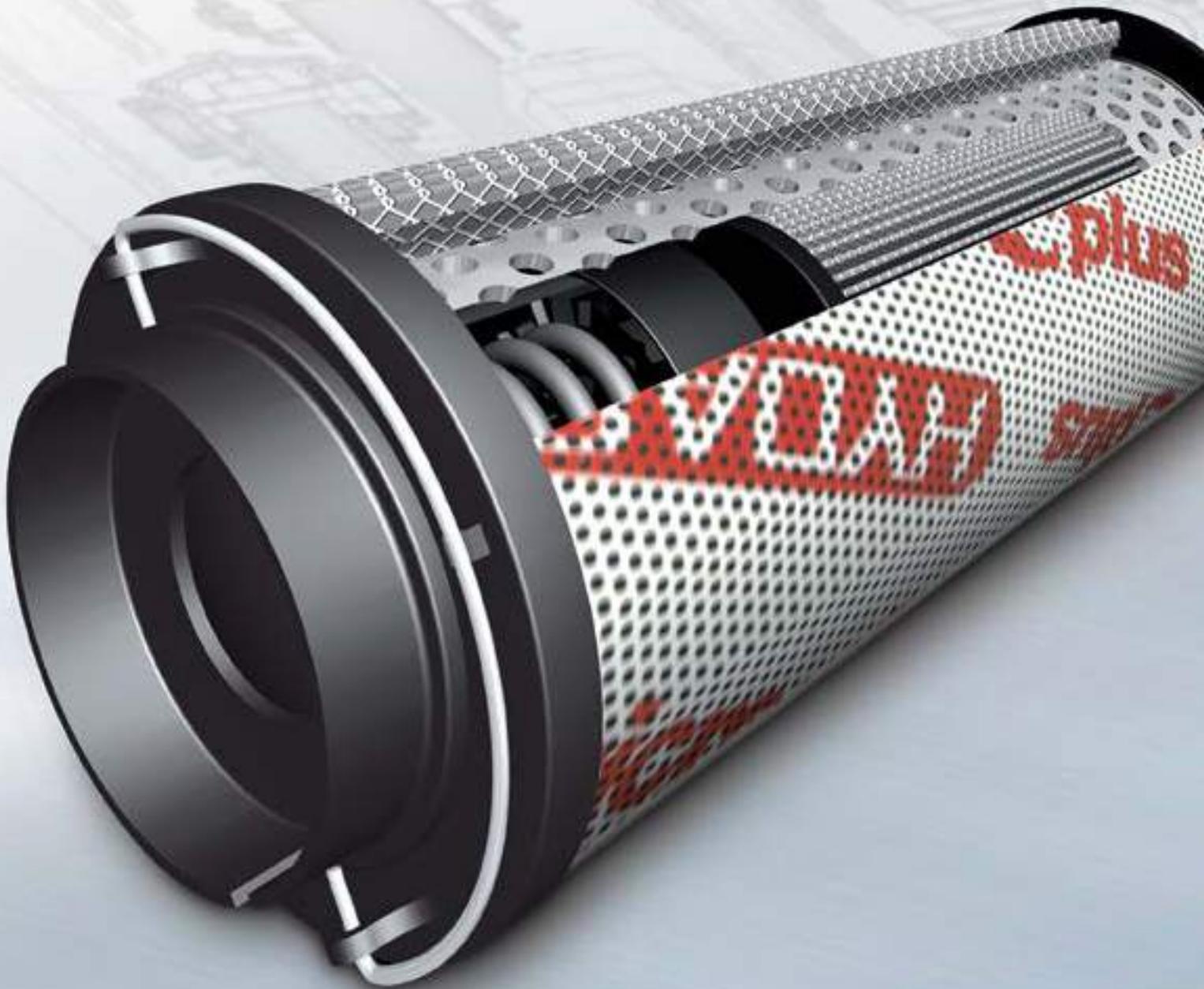


HYDAC INTERNATIONAL

Filters

Hydraulic & Lube Oil





Components, Systems and Service. All from one Company.

Our fluid engineering solutions are defined by the scope and complexity of our customers' requirements.

Our products range from individually designed components in the fields of fluid engineering, hydraulics and electronics right up to complete systems for specific functions.

All components and systems are conceived and designed in-house. Experienced industrial and product specialists develop innovative products and efficient solutions for high-quality, cost-effective production. Throughout the globe, our production facilities share one common goal: quality. We take great pride in both our products and solutions.

Industries and Applications



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*For specific details on each filter assembly, please refer to the “Quick Reference Guide” - Section A.

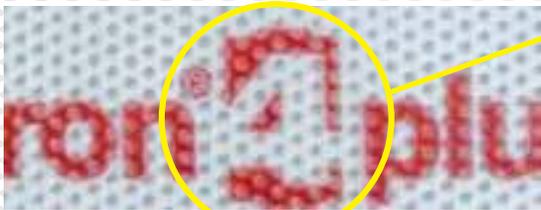


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NOTE

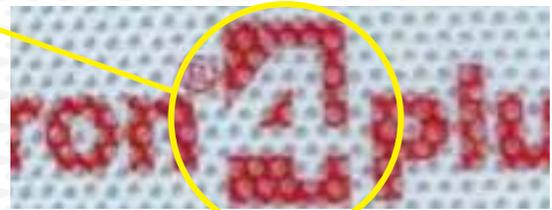
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Can You Spot The Difference?



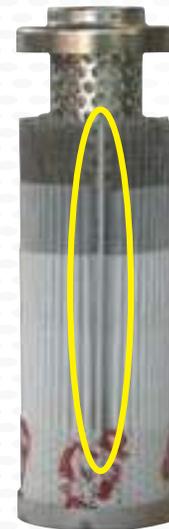
HYDAC element

The frame of the “4” in the replica element is rectangular, whereas in the wrap which is used by HYDAC, the frame of the “4” is designed in the form of a filter element.



Replica element

Buy Only Genuine



HYDAC multi-layer mesh-pack design with ultrasonic welded seam.

How to Spot the Difference

Here, notice the difference in the outer wrap: the perforation pattern and the red border around the “4”. Not visible, the pirated element had less filtration layers of lower quality and a glued seam (a HYDAC seam is typically welded). In addition, the end cap identification was inkjet printed (a genuine HYDAC element is laser etched) and the dates on the end cap and its packaging did not match. Last, subtle misspellings were noticed (Beta**r**nicron instead of Beta**m**icron and design**e**d instead of design**i**ng).

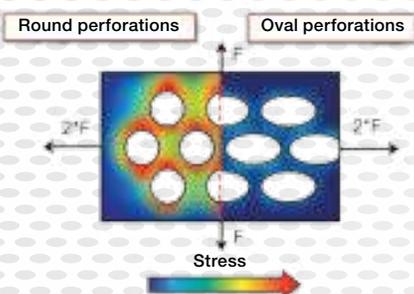
It seems that everyone is in the replacement element business, but “Buyer Beware!”. There are suppliers—pirates—who have no concern for quality. Their mission is simply to capitalize on a brand’s reputation for quality engineering. Pirates will offer rock bottom prices, but remember: design differences result in performance differences. Keep in mind that “you get what you pay for”. Don’t end up paying the ultimate price – component failure, production down time and costly repair - by using a cheap, imitation, low-performing element.

The housing pictured right shows evidence of competitor element failure—bypass springs and pieces of the end cap in the outlet side. Application—gearbox. Using Genuine HYDAC products is imperative for optimal performance.



Winning the War

HYDAC has introduced a new outer wrap design to further differentiate our elements. This exclusive outer wrap both improves performance and provides you quality protection. It features a unique oval-shaped perforation that improves diffusion flow. This is a one-of-a-kind design, so if your element includes this feature, you are assured it is a HYDAC quality original and not an imitation. It is standard on all HYDAC elements.



Identifying Genuine **HYDAC** could mean the difference between Success and Failure!



Quick Reference Guide

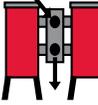
Quick Reference is an easy one-stop general selection guide. Broken down by operating pressure (low, medium, high), filter type (inside-tank, in-tank, inline, duplex, manifold-mount, etc.), maximum flow rate, port size, and flow path; Quick Reference narrows down the selection into one or more filter series suitable for the application. Catalog page numbers are also provided so that the desired filter series data sheet can be found with ease.

QUICK REFERENCE

Low Pressure Filters

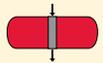
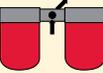
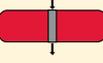
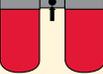
Filter Type	Maximum Pressure psi (bar)	Maximum Flow gpm (l/min)	Port Size Range (in)	Flow Path	Indicator D = Diff. S = Static	Filter Model Page	Features
Inside Tank	145 (10)	43 (165)	2 (outlet)		S	RFM...S page D88	Unique design places entire filter inside of the reservoir tank. Consult Factory.
	145 (10)	132 (500)	1.26 (outlet)		S	RFM...Set page D88	Unique design places entire filter inside of the reservoir tank plenum. Consult Factory. Ideal for low tank top clearances and multiple inlets to reservoir.
In-Tank	360 (25)	343 (1300)	1/2 - 4		S D-size 660 & up with DE option	RF page D2	HYDAC standard in-tank/in-line filters. Threaded or flanged outlets and one piece casting enable in-line use. Robust design.
	360 (25)	450 (1700)	4		S (in-tank; 1.x) D (in-line; 2.x)	NF page D12	Configurable for in-tank or in-line applications. Low weight, water tolerant aluminum alloy-high flow capability.
	145 (10)	300 (1100)	3/4 - 2 1/2		S	RFM page D50	In-tank low cost high performance mobile filters – Sizes 75, 90, 150, 165, & 185 have a built-in breather option. All sizes allow oil filling through element.
	100 (7)	26 (100)	1" hose barb			RFMP page D66	In-tank return filter made of polyamide-housing and plastic lid-low cost.
	100 (7)	100 (378)	1 1/2		S	HF4R page D70	Meets HF4 automotive specs and uses industry standard-size HF4 spec elements. Threaded outlet permits in-line use.
	145 (10)	211 (800)	3/4 - 2 1/2		S & Vac.	RKM page D74	Single filter functions as return line and charge pump filter in single housing. (up to two charge pumps)
In-Tank Duplex	360 (25)	343 (1300)	3/4 - 4		S	RFD page D26	For return lines in continuously operating systems; tank mounting or in-line due to one piece casting.
	360 (25)	450 (1700)	4		S (1.x) D (2.x)	NFD page D34	For return lines in continuously operating systems; tank mounting (1.x) and in-line (2.x).
In-Line	360 (25)	350 (1325)	3, 4		D	RFL Cast page D94	Back Mount single filter with metric threads.
	145 / 232 (10 / 16)	3963 (15000)	2 - 12		D	RFL Welded page D98	Floor mounted. Holds up to ten 2600 high capacity elements. ASME and CRN versions available. For High flow applications.
	360 (25)	105 (400)	1 1/4		D	FLN (DIN) page D108	HYDAC standard DIN low pressure filter. Low weight, water-tolerant aluminum alloy.
	500 (34.5)	450 (1700)	4		D	NFH (modular) page D112	Filters can be manifolded for high viscosity applications. Housings designed for high flow up to 450 gpm, and/or high viscosity fluid (e.g. in lube systems).
In-Line Staged	360 (25)	300 (1136)	2 - 4		D	NF...UHE page D120	Ultra-high efficiency staged filter combinations to increase separation efficiencies far above levels achieved by single elements, for cleaning fluids and transferring.
	360 (25)	300 (1136)	4		D	NFD...UHE page D42	Ultra-high efficiency staged filter combinations to increase separation efficiencies far above levels achieved by single elements, for cleaning fluids and transferring.
In-Line Modular Manifold-Parallel	360 (25)	1350 (5110)	4		D	NF MMP page D180	In-line manifolded modular parallel filter assemblies for high flow and high viscosity applications particularly in primary metals and pulp and paper applications. Fully isolatable in maintenance mode-element changeout.

Low Pressure (cont.) and 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 / 580) (25 / 40)	343 (1300)	1 - 4		D	RFLD Cast page D128	Back mounted duplex filter with metric threads. Ball valve changeover.
	145 / 232 (10 / 16)	3900 (14,763)	2 - 8		D	RFLD Welded page D134	Floor mounted. Holds up to ten 2600 high capacity elements per side. ASME and CRN versions available. For high flow applications. Large ball valve changeovers available.
	145 (10)	793 (3000)	2 - 6		D	RFLDH Welded page D148	Floor mounted. Holds up to 5 high cap. elements/side. ASME standard; Ball valve changeover. Carbon & stainless steel.
	232 (16)	634 (2400)	1 - 6		D	AFLD (API) page D158	In-line duplex filter series which are API 614 compliant. These filters are available with CRN, AS1210 and GOST certifications. Material certificate is standard.
	360 (25)	105 (400)	1 1/4 - 1 1/2		D	FLND (DIN) page D168	Integrated equalization valve with transfer valve. Light weight. CRN available. Water tolerant aluminum alloy.
	500 (34.5)	450 (1700)	4		D	NFHD (modular) page D172	Filters can be manifolded for high flow/viscosity applications in continuously operating systems.
In-Tank Suction	360 (25)	200 (757)	3/4 - 4		Mechanical Bypass In Element	SF page D202	Mounts in-tank. Modified vacuum gauge indicators are available.
	145 (10)	80 (303)	2 1/2 Flange Plus 2 x 1 1/2 SAE Threaded		Vacuum Gauge / Switch	SFW60412 page D208	Mounts in-tank; side or bottom tank mounting possible. Consult Factory.
Spin-On Single Element <i>(available in BSPP ports)</i>	120 (8.3)	7 (26.5)	3/8		N/A	MF 40 page D192	Standard length element. Not available with 3 µm Betamicron elements.
	120 (8.3)	15 (57)	3/4 - 1		S	MF 80 page D192	Standard length element. Not available with 3 µm Betamicron elements.
	120 (8.3)	25 (95)	3/4 - 1		S	MF 85 page D192	Extended length element. Same head as size 80. 10 µm paper elements only. 25 psid bypass standard.
	120 (8.3)	30 (113)	1 1/4 - 1 1/2		S	MF 160 page D192	Standard length element.
	120 (8.3)	60 (227)	1 1/4 - 1 1/2		S	MF 180 page D192	Extended length element. Same head as size 160.
	120 (8.3)	30 (113)	1 1/4 - 1 1/2		D	MF 190 page D192	Standard length element. ΔP Sensing Indicators for applications where tank not vented to atmosphere.
	120 (8.3)	60 (227)	1 1/4 - 1 1/2		D	MF 195 page D192	Extended length element. Same head as size 190. ΔP Sensing Indicators for applications where tank not vented to atmosphere.
	250 (17)	15 (57)	3/4 - 1		D	MF 90 page D192	Standard length element. 250 psi rating minimizes leakage in case of flow surges. ΔP sensing indicators. Not available in 3 µm or 25 µm paper elements.
	250 (17)	25 (95)	3/4 - 1		D	MF 95 page D192	Extended length element. 250 psi rating minimizes leakage in case of flow surges. Same head as size 90. ΔP sensing indicators. 20 µm Betamicron or 25 µm paper elements not available.

QUICK REFERENCE

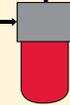
Spin-on Filters *(cont.)*

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
Spin-On Dual Elements	120 (8.3)	60 (227)	1 1/2		S	MFD 160 page D192	Parallel flow through two standard length elements mounted end to end.
	120 (8.3)	60 (227)	1 1/2 - 2		S	MFDS 160 page D192	Parallel flow through two standard length elements mounted side by side.
	120 (8.3)	120 (454)	1 1/2		S	MFD 180 page D192	Parallel flow through two extended length elements mounted end to end. Same head as MFD 160.
	120 (8.3)	120 (454)	1 1/2 - 2		S	MFDS 180 page D192	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	750 (52)	90 (341)	1 1/2		D	HF4RL page E2	In-line top loaded simplex filter which meets HF4 automotive, specification requirements and performance.
	725 (50)	74 (280)	1/2 - 1 1/4		D	LPF page E6	Multiple uses: pressure lines, returns, off-line loops, and lube lines. Aluminum for low weight and water tolerance.
	1450 (100)	174 (660)	1/2 - 1 1/2		D	LF page E12	HYDAC standard filter. Aluminum for low weight and water tolerance.
	725 (50)	35 (130)	3/4 - 1		D	MFX page E16	ECO-friendly, cost effective high performance alternative to spin-on filters.

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	6090 (420)	200 (757)	1/2 - 2		D	DF page F2	HYDAC standard high pressure filter. Wide choice of models and elements, and optional features.
	6090* / 4060 (420/ 280)	250 (946)	2		D	DF/DFE 1500 page F10	HYDAC high pressure filter, available in bi-directional and single-flow configurations.
	6090 (420)	160 (606)	2		D	DFFX page F18	In-line high flow ΔP optimized forward and reverse flow high pressure filter. High Flow and low differential pressure are prominent features.
	4060 (280)	100 (378.5)	1 - 1 1/2		D	HDF page F26	In-line forward and reverse flow capable "L" ported, high pressure filter which utilizes competitive "9600" geometry filter elements. Available with and without bypass valves. Low and high collapse elements available.
	4000 (276)	25 (95)	3/4		D	HF2P page F30	Meets HF2 automotive specifications and uses industry standard-size elements. In-line configuration.
	6090 (420)	120 (454)	1 - 2		D	HF3P page F36	Meets HF3 automotive specifications and uses industry standard-size elements. In-line configuration.
	5000 (345)	120 (454)	1 1/2		D	HF4P page F40	Meets HF4 automotive specifications and uses industry standard-size elements. Top loading in-line configuration.

*Good to 300,000 cycles

High Pressure *(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
In-Line	4060 (280)	25 (95)	3/4		D	MFM page F46	Low cost in-line high pressure filter (<i>efficient design and construction</i>).
	5800 (400)	37 (140)	1		D	HFM page F52	In-line high pressure filter.
Manifold Mount	4568 (315)	110 (416.4)	0.551 - 1.181		D	DF...QE page F80	Side mount to manifold; upper inlet, lower outlet. Size (30-280). Lower inlet, upper outlet sizes ≥ 330.
	4568 (315)	125 (473)	0.689 - 1.181		D	DFP page F86	HYDAC standard manifold filter. Ports at top.
	4000 (276)	25 (95)	0.689		D	HF2-P page F30	Meets HF2 automotive specifications and uses industry standard-size elements. Manifold configuration.
	5000 (345)	120 (454)	1.25		D	HF4-P page F40	Meets HF4 automotive specifications and uses industry standard-size elements. Manifold configuration.
Manifold Cartridge	3000 (207)	25 (95)	(1) SAE-16, (1 1/4) SAE-20		NA	CF page F98	Disposable, high pressure manifold cartridge filter. Low weight, water-tolerant aluminum alloy.
	3000 (207)	12 (45)	(1) SAE-16		NA	CP-C16 page F102	Circuit protector, high pressure manifold cartridge filter. Back-up protection for upstream pressure filters. Fits into standard C16-2 manifold port.
	6090 (420)	30 (113)	(5/8) SAE-10, (1) SAE-16, (1 1/2) SAE-24		NA	CP-SAE page F106	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	4568 (315)	10 (38)	D03/D05 Patterns (0.25 / 0.44)		D	DFZ page F92	Cartridge valve sandwich mount. Bowl on right side (standard) or left (optional).
Duplex	3045 (210)	106 (400)	1 1/4 - 1 1/2		D	FMND page F56	HYDAC standard DIN duplex high pressure filter. Right to left flow option available.
	4568 (315)	90 (340)	3/4 - 2		D	DFDK page F60	HYDAC standard industrial duplex for continuously operating systems.
	4568 (315)	90 (340)	2		D	HFDK4P page F68	Meets automotive specifications and uses HF4 standard-size elements. Top loading duplex configuration.
In-line Reverse Flow	6090 (420)	100 (378.5)	1 1/4 - 2		D	DFFH page F72	Filters in one direction; bypasses in reverse. Common use: hydrostatic circuit.
In-line Bi-Directional Flow	6090 (420)	100 (378.5)	1 1/4 - 2 Flange Only		D	DFFHM page 72	Filters in both directions (bi-directional filtration and flow). Common use: hydrostatic circuit. See DFFH/DFFHM filter brochure.

Betterfit® 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 "Betterfit Element Selector" at www.hydac-na.com .	<ul style="list-style-type: none"> • High efficiency depth filtration, pressure and return • Surface filtration (wire mesh or paper) nominal, low pressure • Tank air-breather filters • Suction Strainers

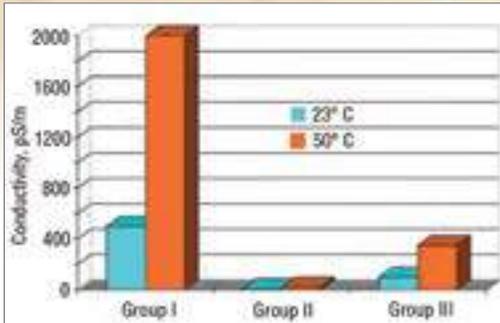


Stat-Free® Elements

New Problems, New Solutions

Today's environmentally friendly, low-conductive (**Group II & III**) hydraulic fluids can cause serious problems that did not occur with fluids containing heavy metal additives (**Group I fluids**). Electrostatic discharges and a host of other detrimental effects can occur, but a solution exists to alleviate these problems. HYDAC's Stat-Free element (code SFREE)!

Conductivities of Category Fluids



The obsolete Group 1 fluids contain zinc and other heavy metals, which gives them much higher electrical conductivity than Group II and III fluids, which are environmentally acceptable.

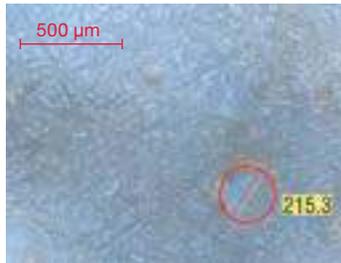
The Dangers of Static Discharge

When hydraulic and lube oils travel at a high velocity, the fluid and the mesh pack can interact, developing electrostatic charges in both. The absence of metals and impurities in today's environmentally compatible hydraulic fluids tends to promote the generation of electrostatic charges that build in the filter assembly and in the fluid which passes downstream in hydraulic and lubrication systems. Since the system is unable to neutralize this charge, it builds and eventually sparks. At the point of discharge temperatures can be high, which results in the breakdown of the lubrication fluid and whatever additives may be present. Within the filter element, these charges degrade element efficiency and rapidly age the hydraulic oil, which leads to the formation of sludge and varnish, eventually breaking down both the fluid and whatever additives may be present. Additional risks:

- Burn holes in the filter media result in loss of efficiency
- Failure of cooler units at the point of discharge
- Electronics failure from arcing of electromagnetic waves in the system
- System performance decline due to aging by-products
- Risk of fire in the reservoir due to air/oil mixture and ignition source

What Generates Static?

- Fluid loading at greater than 0.017 gpm/in²
- Fluid Conductivity less than 500 picosiemens/meter
- Compact systems with high flow rates
- The use of ashless, zinc free fluids
- Low temperatures during operation



Electrostatic discharges accelerate the aging of hydraulic fluid, and burn holes in filter media. Here, a hole more than 200 μm in diameter negates the effectiveness of the 3-μm media it has compromised.



The HYDAC Solution

HYDAC utilizes metallic or carbon impregnated end caps and support tubes and has designed filtration layers with a special hybrid media. This proprietary combination minimizes the generation of charges in both the element and the fluid. The result is no chance of arcing in the filter and lower charging of the fluid preventing arcing at other locations in the system such as the coolers, hydraulic tank, valves and other close tolerance components. This line of elements is compatible with our current element line and Betterfit element interchange.

Available as an option in all HYDAC elements.

B Overview of Filters

FILTER ASSEMBLIES

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 - Contamination Control Fundamentals serves as an effective "primer" on contamination control. In the following sections, we also provide filtration information and guidance for selecting the optimal filter and element media for your application.

Section 1 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.

Section 2 details element technical data and selection criteria. Performance and element testing is described. Element selection to fit the application is addressed.

Section 3 details filter selection considerations and provides procedures for selecting and sizing filters for system applications.

Section 4 provides a detailed overview of HYDAC elements and their performance specifications.

Section 5 you'll find extensive technical data on HYDAC's comprehensive collection of high efficiency depth (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.

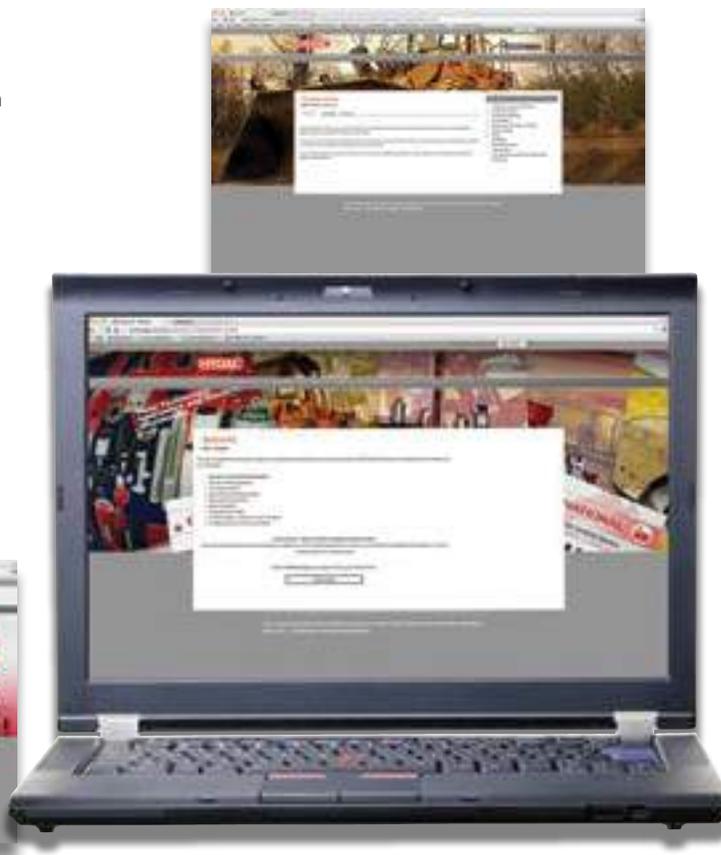
Visit Us Online...

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



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, 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 leaders in the Filtration Supply Industry.

We are committed to providing the best available filter products to meet system and component mandatory cleanliness levels at a competitive price. As a cost-effective quality producer, we can work with your applicable department to supply contamination control technology or develop long-range supply and 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:



Agricultural



Automotive



Construction



Gearboxes



Industrial



Offshore



Commercial Municipal



Power Generation



Pulp & Paper



Railways



Shipbuilding



Steel / Heavy Industry

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

All HYDAC element manufacturing facilities have newly upgraded multi-pass test facilities capable of dynamic element performance testing to better simulate actual application cyclic flow variations.



Section 1: Contamination Control Fundamentals

Why Filter?

Seventy to ninety percent 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 degrades its optimum 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 / Management

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 3 μm Betamicon® filter media is rated at $\beta_3 \geq 1000$ (also equivalent to the filter media average pore size), meaning that it can remove particles of 3 μm and greater at 99.9% efficiency.

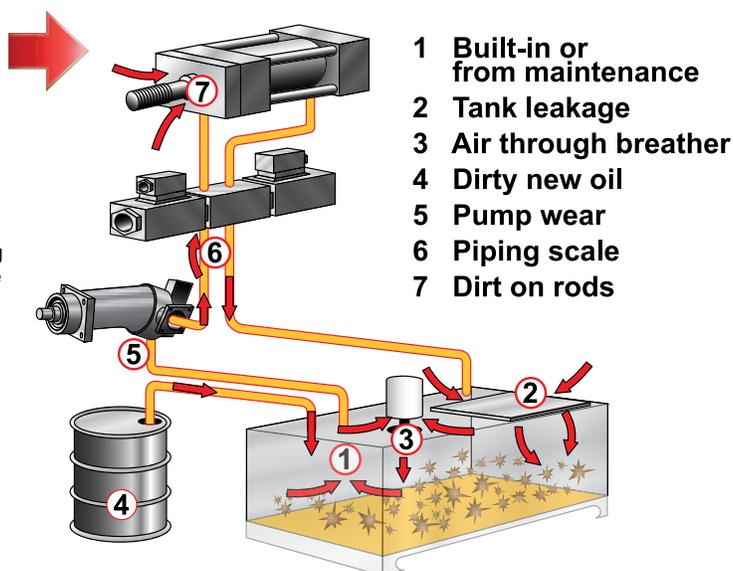
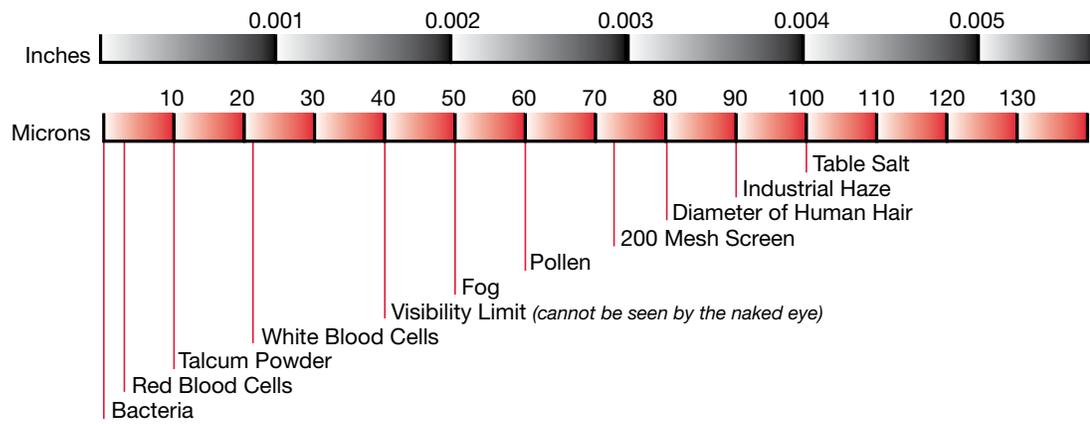


Figure 1. Typical Examples of Wear Due to Contamination



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.

In 1999, the International Standards Organization (ISO) introduced a series of new fluid cleanliness standards that reflect changes in measuring and defining the cleanliness of fluid systems and the way the size and amount of solid contaminants are reported. 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 $\mu(c)$ 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.



FILTER ASSEMBLIES

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 $\geq 5 \mu\text{m}$ and $\geq 15 \mu\text{m}$ 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

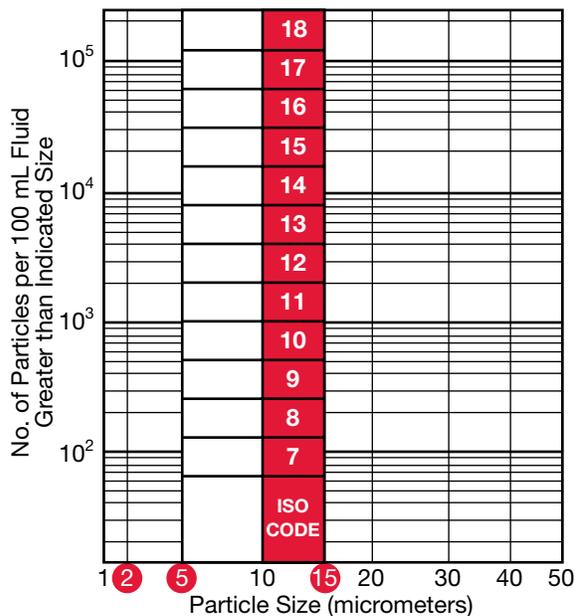
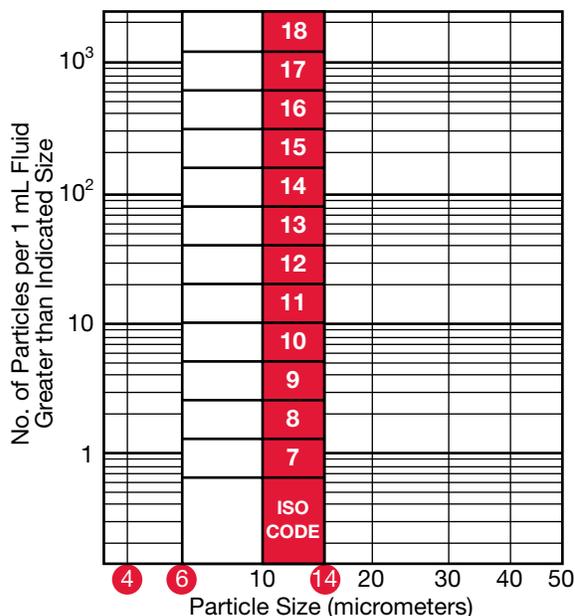


Figure 3(b). Graphing Particle Counts per ISO 4406:1999



Particle Size Diameter Comparison

$$1 \mu\text{m} = 0.001 \text{ mm} = 0.000039 \text{ in.}$$

The human eye can only see particles sized down to 40 microns.

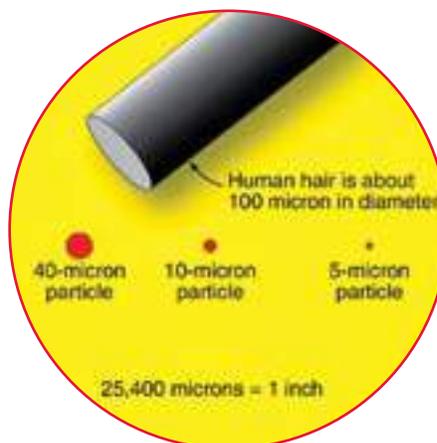


Table 3(a). ISO Code 4406 Hydraulic Fluid Power–
Solid Contamination Code

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 $\geq 5 \mu\text{m}$ and $\geq 15 \mu\text{m}$. Showing a third scale number, $\geq 2 \mu\text{m}$ 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.

What types of wear are there?

1. **Abrasion** caused by particles between reciprocating surfaces.
2. **Erosion** caused by particles and high fluid velocity.
3. **Adhesion** caused by metal-to-metal friction (loss of fluid).
4. **Surface fatigue** surfaces damaged by particles are subjected to repeated stress.
5. **Corrosion** caused by water or chemicals.

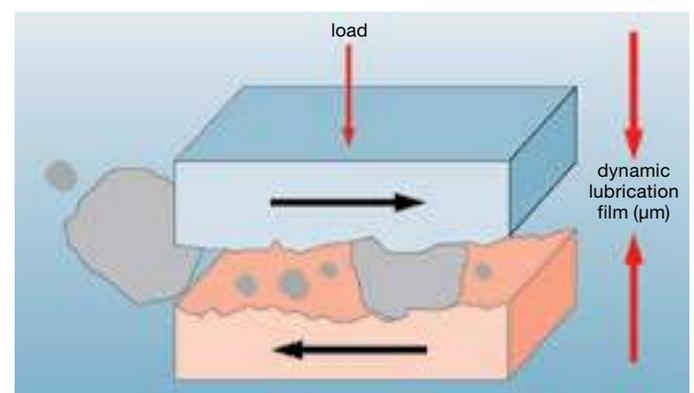
Table 3(b). ISO 4406:1999 Hydraulic Fluid Power–
Solid Contamination Code (New)

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 $\geq 4 \mu\text{m}(c)$, $\geq 6 \mu\text{m}(c)$ and $\geq 14 \mu\text{m}(c)$. The particle count is expressed as the number of particles per mL.

Example Effects of Abrasion:

- Changes to tolerances
- Leakage
- Reduced efficiency
- Particles produced in the system create more wear!



FILTER ASSEMBLIES

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.

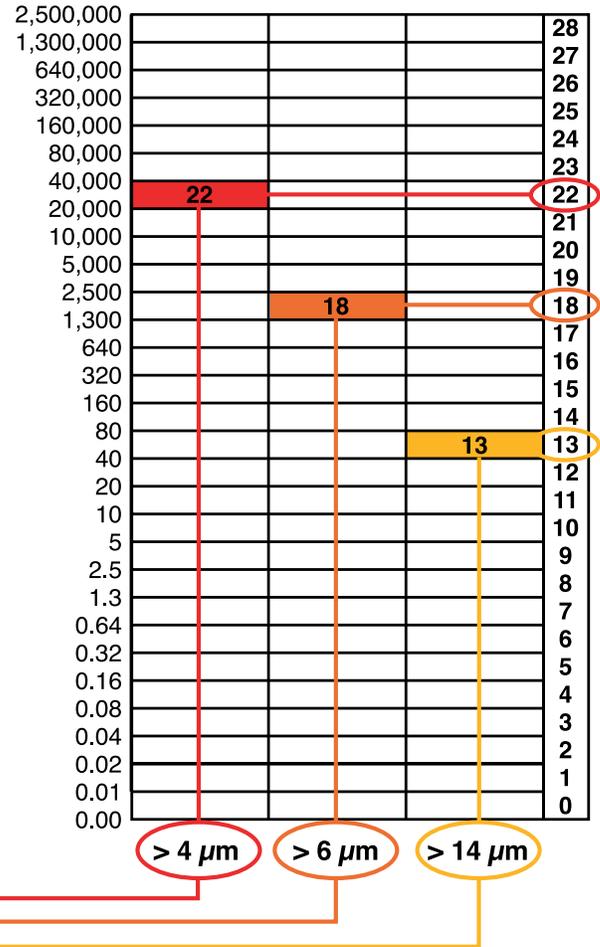
Example:

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 monitor and control component and system cleanliness—they include:

Solid Contamination

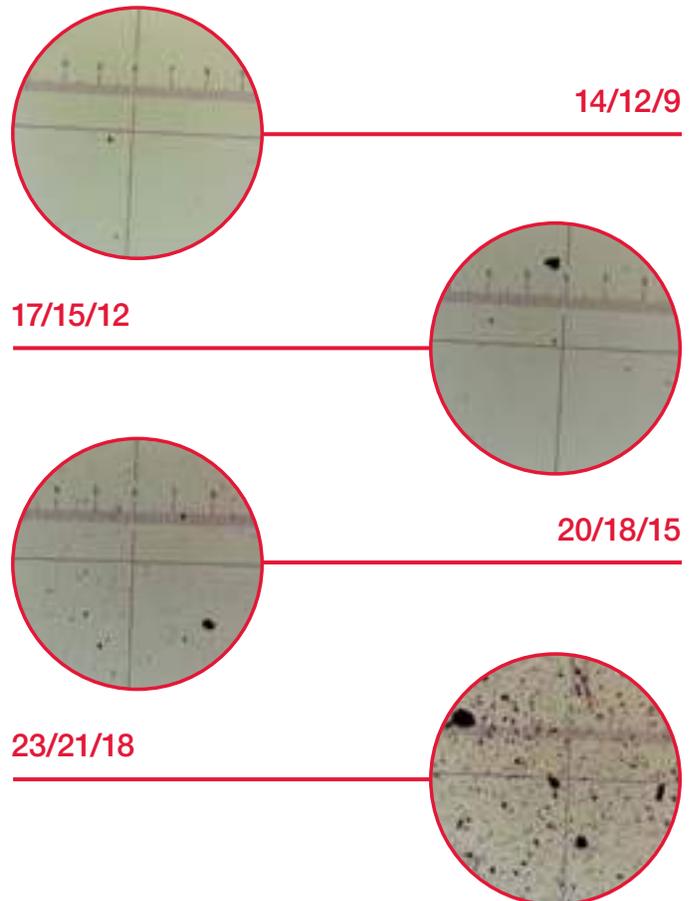
- pressure filters
- return line filters
- offline filtration loops
- oil transfer units for precleaning new oil
- portable and online contamination monitors
- reservoir breathers and filler/breathers

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	If Particle Count Falls Between	Scale Number is*
≥ 2 µm	300,000	250,000-500,000	19
≥ 5 µm	20,000	16,000-32,000	15
≥ 10 µm	4,000	1,000-2,000	11
≥ 15 µm	1,500		
≥ 20 µm	1,000		
≥ 30 µm	0.3		

*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	If Particle Count Falls Between	Scale Number is*
≥ 4 µm(c)	3,000	2,500-5,000	19
≥ 5 µm(c)	700	160-320	15
≥ 6 µm(c)	200	10-20	11
≥ 10 µm(c)			
≥ 14 µm(c)	15		
≥ 15 µm(c)			
≥ 20 µm(c)	10		
≥ 30 µm(c)	3		

*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 National Aerospace Standard (NAS)1638 and Military Standard 1246A, as well as the new SAE AS4059 standard.

Table 5. ISO Cleanliness Level Correlation

ISO Code 4 µm(c)/6 µm(c)/14 µm(c)	NAS 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		
16/14/11	5			6
15/13/10	4		0.1	5
14/12/9	3			4
13/11/8	2			3
12/10/8		100		
11/10/7	1			2

FILTER ASSEMBLIES

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.

Table 6. Cleanliness Level Required by a System

	ISO Target Levels		
	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)
Pumps			
Fixed Gear or Fixed Vane	20/18/15	19/17/14	18/16/13
Fixed Piston	19/17/14	18/16/13	17/15/12
Variable Vane	18/16/13	17/15/12	not applicable
Variable Piston	18/16/13	17/15/12	16/14/11
Valves			
Check Valve	20/18/15	20/18/15	19/17/14
Directional (solenoid)	20/18/15	19/17/14	18/16/13
Standard Flow Control	20/18/15	19/17/14	18/16/13
Cartridge Valve	19/17/14	18/16/13	17/15/12
Proportional Valve	18/16/13	17/15/12	16/14/11
Servo Valve	16/14/11	16/14/11	15/13/10
Actuators			
Cylinders, Vane Motors, Gear Motors	20/18/15	19/17/14	18/16/13
Piston Motors, Swash Plate Motors	19/17/14	18/16/13	17/15/12
Hydrostatic Drives	16/15/12	16/14/11	15/13/10
Test Stands	15/13/10	15/13/10	15/13/10
Bearings			
Journal Bearings	17/15/12	not applicable	not applicable
Industrial Gearboxes	17/15/12	not applicable	not applicable
Ball Bearings	15/13/10	not applicable	not applicable
Roller Bearings	16/14/11	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

NOTES:

- Results above assume a properly maintained system with filter elements being changed out upon indication or after a maximum operation time of 6 months.
- Results above assume the system is relatively tight with properly torqued system penetration access covers, flange connections and all penetrations to the system closed and properly sealed.
- Results above assume there are no openings to the system due to improper access – all covers and lids in place and all connections closed, bagged and capped to minimize dirt ingress.
- Two or more system filters may be required to achieve and maintain the desired Target Cleanliness Level.

Section 2: 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 filter element Beta rating and resulting percent efficiency,
- (2) dirt holding capacity (DHC), and
- (3) the pressure drop across the element over a range of flow conditions (PQ).

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 Beta 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. The fluid is monitored upstream and downstream of the test element to determine the element contamination removal efficiency.

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

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*)

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 (*in microns*).

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 (*in microns*).

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

This particle capture efficiency can also be expressed as a percent by subtracting the number 1 from the Beta value, dividing by Beta value and multiplying the result by 100:

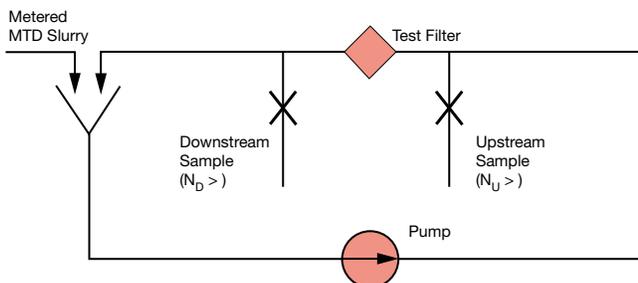
$$\text{Beta}_{10(c)} \text{ efficiency} = 75 = \frac{(\beta - 1)}{\beta} \times 100$$

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

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.

Figure 5. Multi-Pass Test Schematic



FILTER ASSEMBLIES

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.

Table 7. Filter Element Percent Efficiency

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: $74 \div 75 = 0.987$	$74 \div 75 = 0.987$
Step 4: $0.987 \times 100 = 98.7\%$	$0.987 \times 100 = 98.7\%$

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: $199 \div 200 = 99.5\%$	$199 \div 200 = 99.5\%$

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 a 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 Betamicon® 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 an element should be on the order of 3 times higher than the filter bypass setting. 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 (*in this Overview*) by reference to the customer's component manuals 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 tools and equipment.

Table 8. HYDAC Element Media Recommendations
Oil cleanliness to ISO 4406
Filtration rating x ($\beta_{x(c)} \geq 200$)

Desired Cleanliness Levels (ISO Code 4406)	HYDAC Media
19/16/13 to 22/19/16	25 μm
18/15/12 to 21/18/15	20 μm
17/14/11 to 20/17/14	15 μm
15/12/9 to 19/16/13	10 μm
12/9/6 to 17/14/11	5 μm
10/7/4 to 13/10/7	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 ingress in combination with the desired cleanliness level should be considered when selecting the media to be used for a particular application.

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.

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 0.86, we are often asked how to size a filter with a viscosity other than 141 SUS (30 cSt) or a specific gravity other than 0.86. 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

- 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.
- 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.

Table 9. Typical Pressure Drop Maximum Targets for Filter sizing:

Max. Pressure Drop	Type
10 – 15 psid	Pressure Filters
4 – 8 psid	Return Filters
2 – 6 psid	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.

FILTER ASSEMBLIES

Fluid Compatibility: 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 base 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 US manufactured Betamicon® elements are compatible with both (HFA & HFC) 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, subject to manufacturer stated compatibility.
- 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, subject to manufacturer stated compatibility.

Water Glycols

Water glycols consist of a mixture of water, glycol, and various additives. HYDAC Betamicon® 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, subject to manufacturer stated compatibility.

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 Betamicon® 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 =

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

Section 3: 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 (kidney loop) filtration: While usually not utilized as a system's primary filtration, re-circulating, or off-line, filtration is often used to supplement in-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. 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

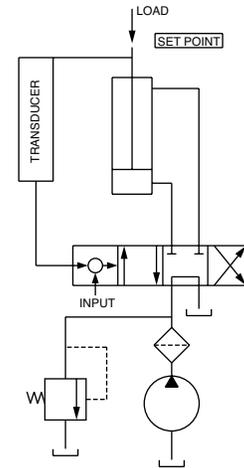


Figure 6(b). Return Line Filtration Circuit

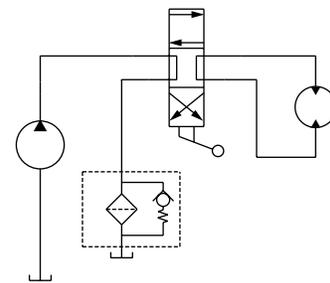


Figure 6(c). Re-circulating Filtration Circuit

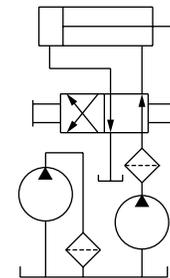
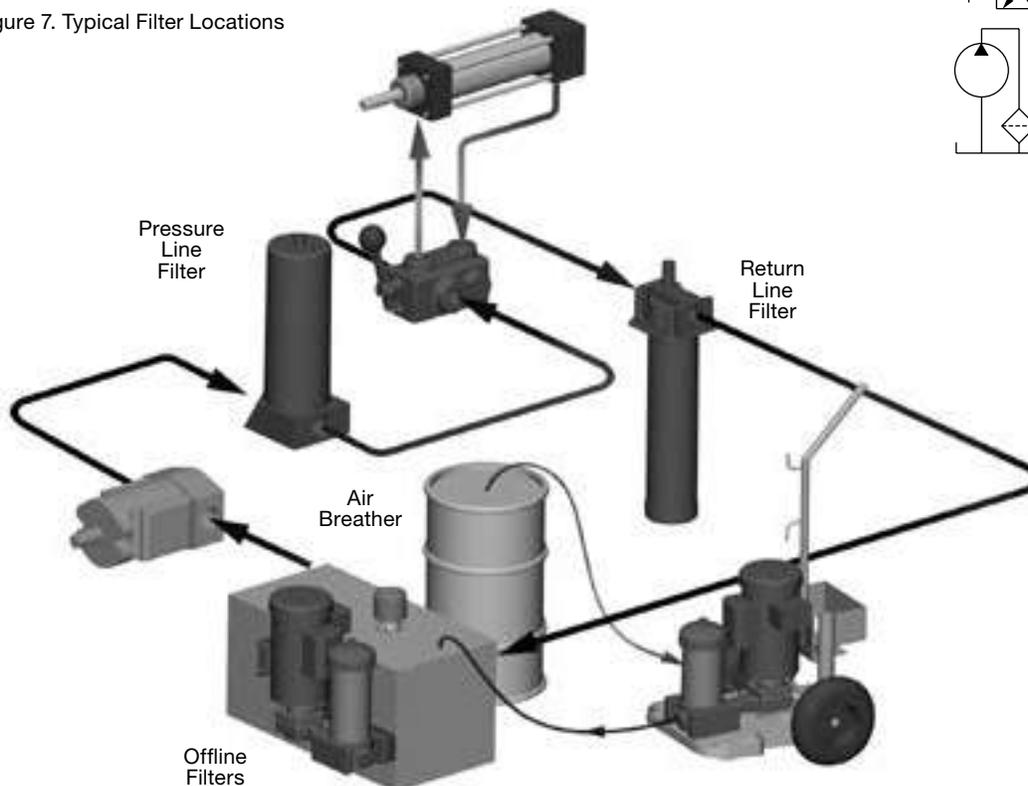


Figure 7. Typical Filter Locations



FILTER ASSEMBLIES

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, designing and 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 (*in this Overview*), review of component manuals or by contacting the component manufacturer directly.

Operating pressure levels and system environmental conditions also have a bearing on cleanliness requirements.
- 2. Selecting correct medium** Step 2. Using Table 9 (*in this Overview, respectively*), identify the proper HYDAC filter media rating to employ.
- 3. Where to filter** Step 3. Determine where to locate the filters, using the information on "Filter Location" (*Section 3, in this Overview*).
- 4. Selecting filter housing** Step 4. Refer to Filter Products in the Table of Contents or the Quick Reference Guide 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 where the particular filter will be located.

Consideration should also be given to installation convenience for your particular application. Use the filter selection charts shown on the catalog pages to determine the specific filter model number for the desired media rating 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. Take periodic fluid samples on a regular basis to monitor cleanliness, water content and variations on amounts of wear metals. 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.

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.

The NFPA has established that the maximum allowable Work Pressure is equal to the Rated Fatigue Pressure (*RFP*).

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:

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

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 pages 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 the test Hydraulic Fluid (0.86). The formula for calculation of the housing ΔP is shown as follows:

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

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 centistokes*) 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 (ISO-32)	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 – 10 μm	Bypass - YES (<i>Low collapse element</i>)
	Fluid Temperature - 104°F normal	Viscosity = 141 SUS @ 104°F

Filter Type Selected - Pressure Filter

HYDAC Model No. DF ON 240 TE 10 D 1.0 / 12 V -B6

HOUSING

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

$$\Delta P \text{ Housing} = 1.5 \text{ psid} \times \frac{0.86}{0.86} = 1.5 \text{ psid}$$

ELEMENT

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

$$\Delta P \text{ Clean Element} = 30 \text{ GPM} \times 0.175 \times \frac{0.86}{0.86} \times \frac{141 \text{ SSU}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 5.25 \times 1 \times 1 = 5.25 \text{ psid}$$

FILTER ASSEMBLY

$$\Delta P \text{ Filter Assembly} = \Delta P \text{ Housing} + \Delta P \text{ Clean Element} \quad \left. \begin{array}{l} 1.5 \text{ psid} + 5.25 \text{ psid} = 6.75 \text{ psid} \end{array} \right\} \text{Clean assembly } \Delta P \text{ is less than 10 – 15 psid per "Typical Targets" on Table 9 (in this Overview)}$$

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 severe conditions with significantly higher viscosity.

See the next page for Cold Start Calculation.

FILTER ASSEMBLIES

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

Conditions:	Fluid – Hydraulic Oil (ISO 32)	Flow Rate – 30 GPM
	Specific Gravity – 0.86	Max. Operating Pressure – 4,500 psi
	Viscosity – 400 SSU	Normal Operating Pressure – 4,000 psi
	Micron Rating - 10µm	Bypass - YES <i>(Low collapse element)</i>
	Fluid Temperature - 32°F cold	Viscosity @ Cold Start = 1350 SUS @32°F

Filter Type Selected

HYDAC Model No. **DF ON 240 TE 10 D 1.0 / 12 V - B6**

HOUSING

ΔP Housing = ΔP Calculation *(From Curve in catalog)* x $\frac{\text{Actual Specific Gravity}}{0.86}$

$$\Delta P \text{ Housing} = 1.5 \text{ psid} \times \frac{0.86}{0.86} \text{ or } (1.0) = 1.5 \text{ psid}$$

ELEMENT

ΔP Clean Element = ΔP Calculation x $\frac{\text{Actual Specific Gravity}}{0.86}$ x $\frac{\text{Actual Viscosity}}{141 \text{ SSU}}$

$$\Delta P \text{ Clean Element} = 30 \text{ GPM} \times 0.175 \times \frac{0.86}{0.86} \times \frac{1350 \text{ SSU}}{141 \text{ SSU}}$$

$$\Delta P \text{ Clean Element} = 5.25 \times 1.0 \times 9.6 = 50.40 \text{ psid}$$

FILTER ASSEMBLY

ΔP Filter Assembly = ΔP Housing + ΔP Clean Element
 $1.5 \text{ psid} + 50.40 \text{ psid} = 51.90 \text{ psid}$ *(Almost 8 times normal clean assembly ΔP)*

NOTE:

When the element is partially loaded with some contamination and the system is cold started, the indicator may trip or possibly go into bypass, until the fluids in the system warm up. This information is relative and important for our customers to understand as they operate their systems under diverse conditions. This additional performance data helps our customers to define their system operating procedures, assist in component selection and finalize design.

Additional Filter Sizing Considerations for Industrial Machines by Flow Rate

1. Initial filter assembly clean differential pressure drop <20 - 30% of indicator trip pressure at average flow

EXAMPLE - DF 330: Indicator Trip Pressure is 72 psid
 →max assembly pressure drop with clean element: 72 psid x 0.25 = 18 psid

2. Check pressure drop at maximum flow (especially when cylinders used)

If pressure drop at maximum flow is >50% of indicator trip pressure use one size larger.
 Check again if pressure drop is now <50%.

3. Check behavior under cold start conditions

If you have a lot of cold starts or work with cold oil chose one size larger.

4. Make sure that the port size is large enough to handle the flow

Suction	Return Line	Pressure <1,500 psi	Pressure <4000 psi	Pressure <6000 psi
15 ft/sec	15 ft/sec	15 ft/sec	26 ft/sec	40 ft/sec

5. Always contact Product Management to double check

Additional Filter Sizing Considerations for Mobile Machines by Flow Rate

1. Initial filter assembly clean differential pressure drop <20-30% of indicator trip pressure at average flow

EXAMPLE - RFM 270: Indicator Trip Pressure is 29 psi
 →max assembly pressure drop with clean element: 29 psi x 0.25 = 7.25 psi

2. Check pressure drop at maximum flow (especially when cylinders are used)

If pressure drop at maximum flow is >50% of indicator trip pressure use one size larger.
 Check again if pressure drop is now <50%.

3. Check behavior under cold start conditions

If you have a lot of cold starts or work with cold oil choose one size larger.

4. Make sure that the port size is large enough to handle the flow

Return Line	Pressure <1,500 psi	Pressure <4000 psi	Pressure <6000 psi
15 ft/sec	15 ft/sec	26 ft/sec	40 ft/sec

5. Always contact Product Management to double check

Filter Applications Worksheet

*Name: _____ *Title: _____

*Company: _____ *Email: _____

*Address: _____ State: _____ Zip: _____

*Phone: _____ Mobile: _____ Fax: _____

End User System Application		
*System Critical Components <i>(i.e. Servo's, Proportional Valves)</i>		
*Fluid Operating Temperature Range		
From:	°F	
To:	°F	
*Ingested Dirt Levels <i>(check one)</i>		
<input type="checkbox"/> Heavy	<input type="checkbox"/> Medium	<input type="checkbox"/> Light
*Clean Filter Differential Pressure Limit		
		psid <i>(typically 40%-50% Indicator trip setting)</i>
*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 @ nominal	SUS	Cs
Viscosity @ cold start	SUS	Cs
Specific Gravity		

*Special Operating Requirements <i>(reverse flow, bidirectional flow duplex, or other special requirements)</i>
Mounting Orientation & Port Configuration
Inlet
Outlet
Inlet/Outlet Configuration <i>(i.e. inline, side inlet/bottom outlet)</i>
Filter Changeout Access <i>(i.e. top or bottom)</i>
Bypass Requirements
<input type="checkbox"/> 87 <input type="checkbox"/> 43 <input type="checkbox"/> 25 <input type="checkbox"/> 15 <input type="checkbox"/> 3 (psid) <input type="checkbox"/> Non Bypass KB
*Indicator Requirements <i>(check one)</i>
<input type="checkbox"/> B <input type="checkbox"/> BM <input type="checkbox"/> C <input type="checkbox"/> D <input type="checkbox"/> E/ES <input type="checkbox"/> F <input type="checkbox"/> G <input type="checkbox"/> GC <input type="checkbox"/> GW <input type="checkbox"/> H <input type="checkbox"/> J <input type="checkbox"/> J4 <input type="checkbox"/> K <input type="checkbox"/> LE <input type="checkbox"/> LZ <input type="checkbox"/> UE <input type="checkbox"/> UF <input type="checkbox"/> UG <input type="checkbox"/> V <input type="checkbox"/> Other
Supply Voltage <i>(LED for D Indicators):</i>
<input type="checkbox"/> Diff. Pressure <input type="checkbox"/> Static <input type="checkbox"/> Vacuum <i>(check one)</i> Indication
*Filtration Rating Requirements
Micron Rating
Depth / Surface
Element Media
ISO Cleanliness Target
System Maintenance Comments <i>(Sampling/changeout frequency, maintenance practices)</i>

*Required Information to properly quote.

C Overview of Elements

FILTER ELEMENTS

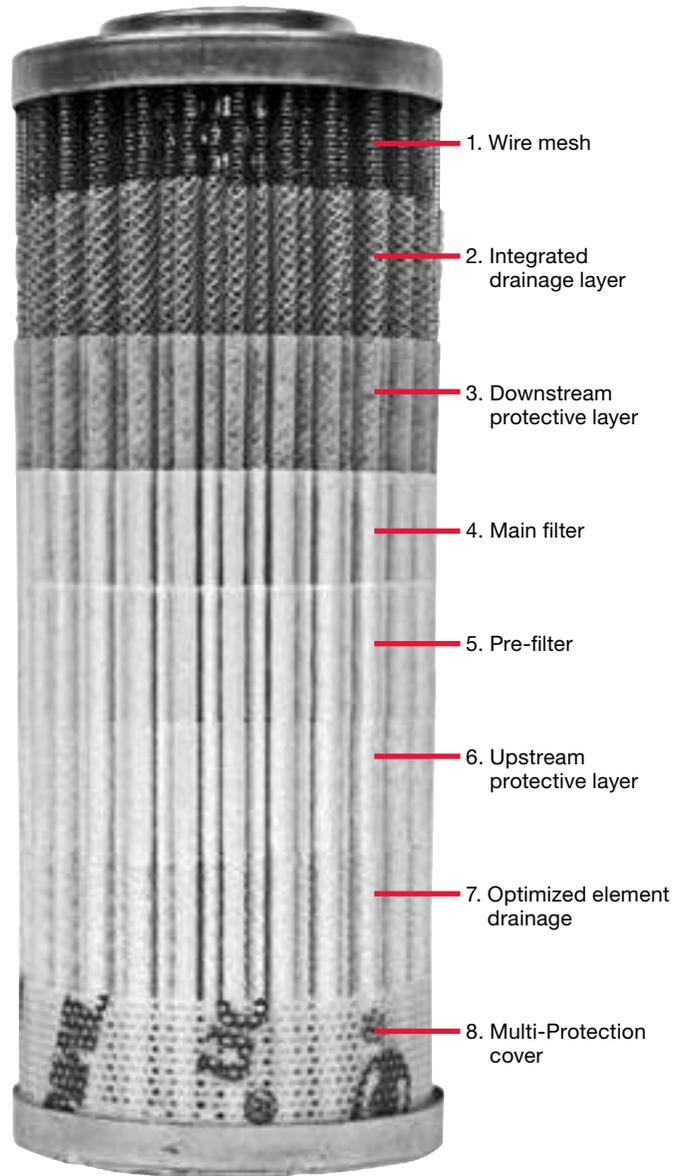
Overview of Elements

Optimicon® Elements

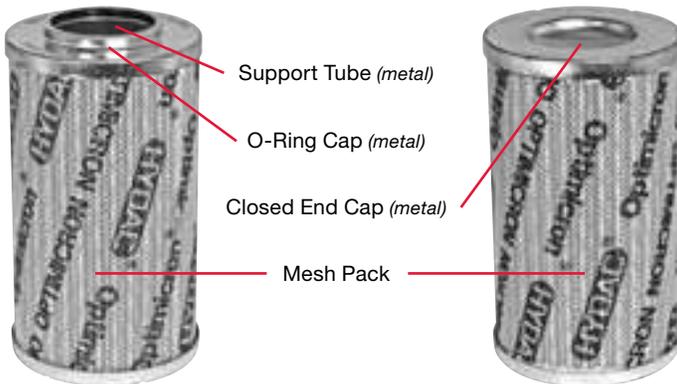
- ON - code designation
- Glass fiber, multi-layered with support
- Collapse rating - 290 psid (20 bar)
- 1, 3, 5, 10, 15, 20 micron
- Filtration Rating $\beta_{x(e)} \geq 1000$
- Depth Filtration
- Pressure and Return elements available
- Disposable - single use element
- Plastic outerwrap



Element Construction

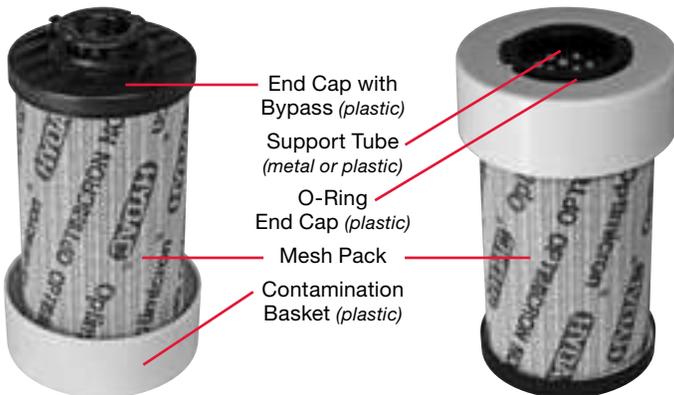


Optimicon® Pressure Element



Optimicon® Return Element

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



Optimicon® Power Elements

- ON/PO - code designation
- Synthetic Fiber, multi-layered with support
- All Plastic Construction
- Collapse Rating - 145 psid
- 3, 5, 10, 20 micron
- Stat-Free Technology included
- Depth Filtration
- Disposable - single use element
- Plastic outerwrap
- API 614 Approved



Betamicon® Elements

- BN4HC - Low Collapse (290 psid)
- BH4HC - High Collapse (3045 psid)
- Fiberglass, Non-Woven
- 1, 3, 5, 10, & 20 micron
- Filtration Rating $\beta_{x(c)} \geq 1000$
- High Beta Stability
- Structurally Designed for Dynamic Flow Conditions
- Collapse Rating 290 psid
- Depth Filtration
- Disposable



Betamicon® / Aquamicon® Combination Elements

- BN4AM - code designation
- Collapse Rating - 145 psid
- Undissolved (free) **Water Removal ONLY!**
- 3 & 10 micron
- Filtration Rating $\beta_{x(c)} > 200$
- Depth Filtration
- Disposable



ECOmicron® Elements

- ECON2 - code designation
- Fiberglass
- All Plastic Construction
- Collapse Rating - 145 psid
- 3, 5, 10, & 20 micron
- Filtration Rating $\beta_{x(c)} \geq 1000$
- Depth Filtration
- Disposable



Aquamicon® Elements

- AM - code designation
- Collapse Rating - 145 psid
- Undissolved (free) **Water Removal ONLY!**
- 40 micron
- Surface filtration
- Disposable



Wire Mesh Elements

- W/HC - code designation
- Wire Mesh
- Collapse Rating - 290 psid
- 25, 50, 74, 100, 149, 200 micron
- Surface Filtration
- Cleanable
- Corrosion protection - Stainless Steel filter media and Tin/Nickel plated hardware



Polyester Elements

- P/HC - code designation
- Polyester media - plastic coating eliminates swelling
- Collapse Rating - 145 psid
- 10 & 20 micron
- Surface Filtration
- Disposable
- Higher contamination retention than cellulose
- Low flow resistance = low $\Delta P/Q$
- Media supported by wire mesh



Metal Fiber Elements

- V - code designation
- Stainless Steel media; Tin plated steel hardware
- Collapse Rating - 3045 psid
- 3, 5, 10, & 20 micron
- High Efficiency Rated available on request 1, 3, 5, 10, & 20 micron (*Depth filtration optional*)
- Surface Filtration (*standard*)
- Cleanable
- High filtration efficiency curve even under extreme dynamic loads
- Low flow resistance = low $\Delta P/Q$



Mobilemicron Elements

- MM - code designation
- Melt blown - Fiberglass
- Extremely low clean element ΔP / flow rate for cold start applications
- Filtration Efficiency Rating $\beta_{x(c)} \geq 200$
- 8, 10, 15 micron
- Good Beta Stability
- Good Dirt Holding Capacity
- Collapse Rating - 145 psid
- Depth Filtration
- Disposable



FILTER ELEMENTS

Optimicron® Series

Energy efficient filtration



Description

The Optimicron filter elements have been optimized with respect to filtration performance and energy efficiency. These elements offer the best optimization of separation efficiency, service life and differential pressure versus flow rate.

As a complete element package, the innovative characteristics of the HYDAC technology has a very positive impact on the differential pressure of the elements and high degree of filtration efficiency and performance.

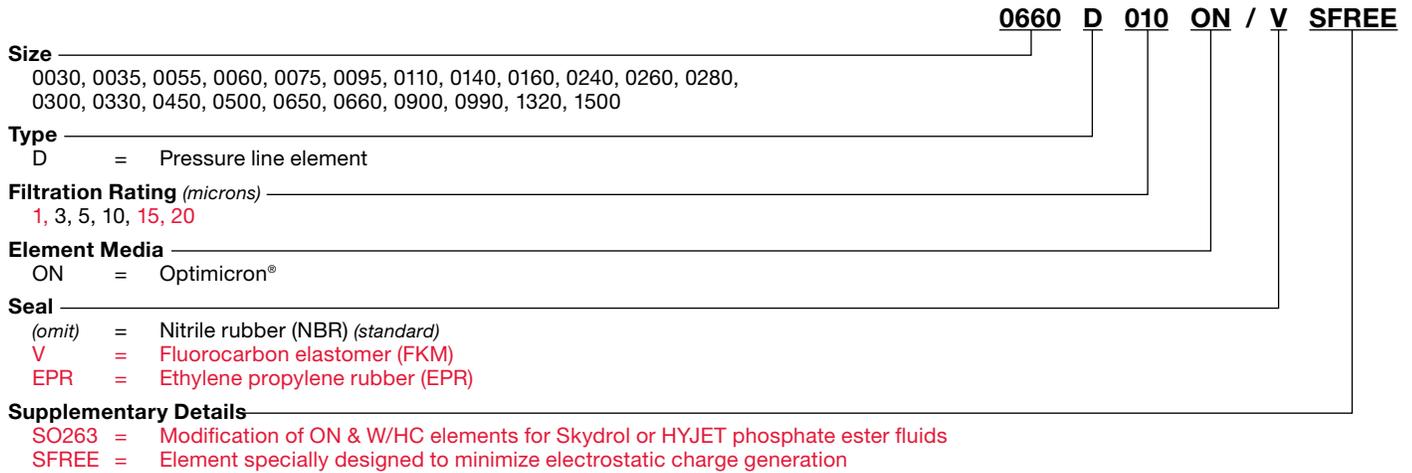
Features

- Unique HELIOS pleat geometry – optimizes media area open to flow to calm the flow in areas between pleats reducing ΔP .
- Outer wrap perforations insure optimized flow onto the filter pleats and help to minimize pressure losses.
- Outer wrap perforations also help to distribute the fluid incidence stresses evenly in the axial and radial directions and thus increase tear resistance.

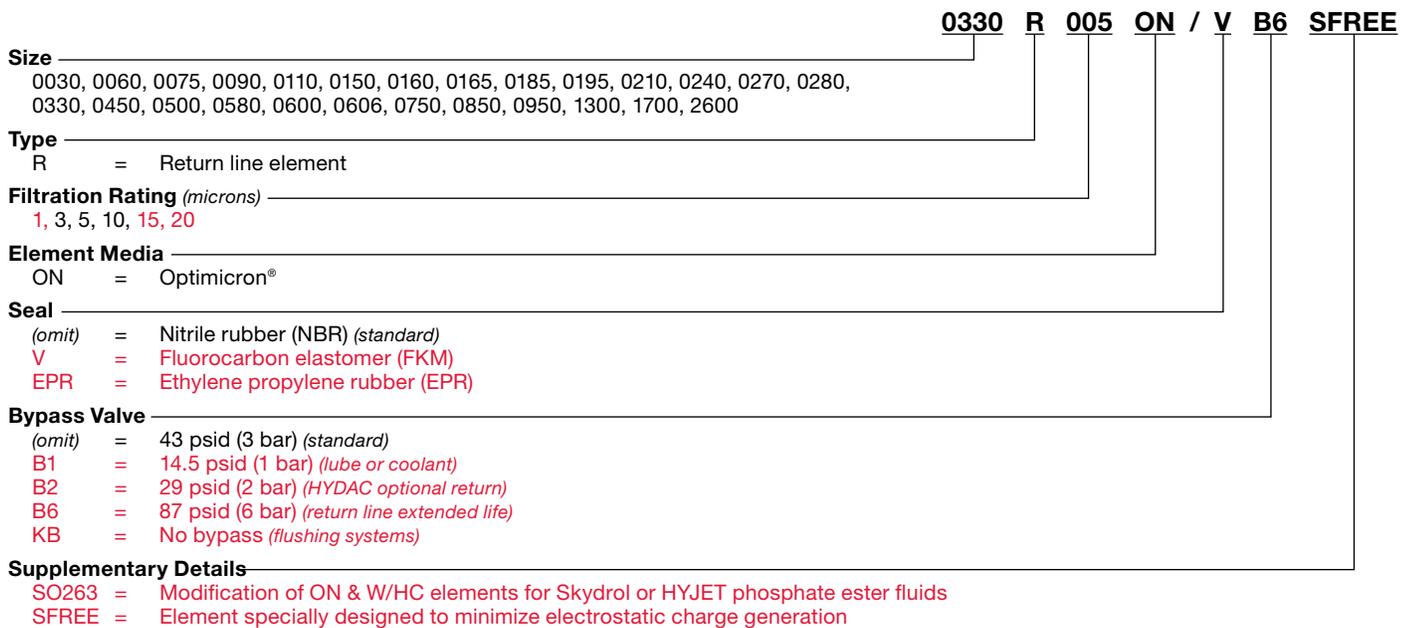
Technical Specifications

Collapse Rating	290 psid (20 bar)
Temperature range	-22°F to 212°F (-30°C to 100°C)
Flow direction	outside to inside
Category	Disposable - single use
Bypass Cracking Pressure	R (only) = 43 psid (3 bar) (standard, others available)

“D” Pressure Elements Model Code

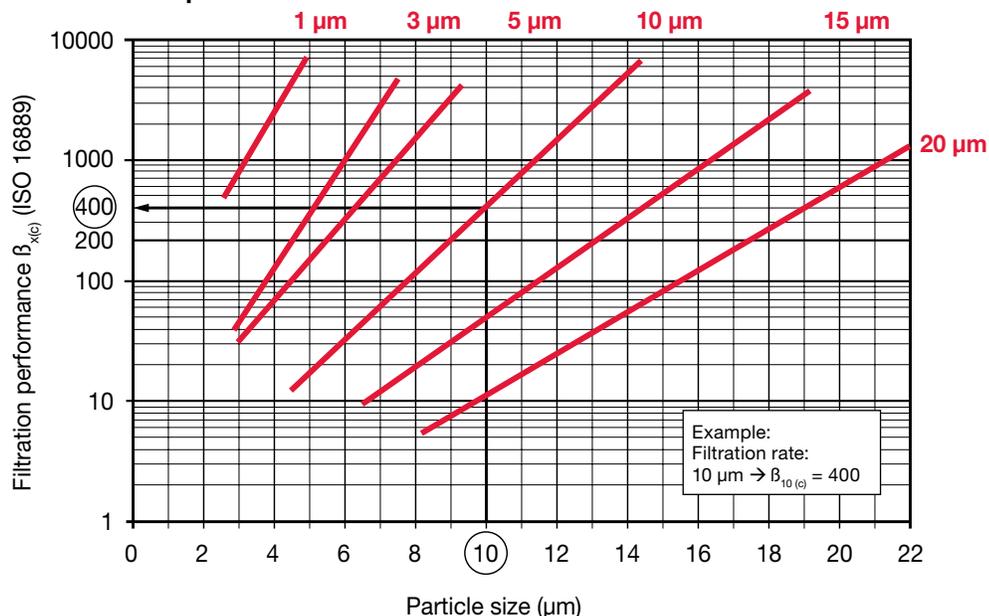


“R” Return Elements Model Code



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

Beta Ratio (β) Values for Optimicron



FILTER ELEMENTS

Optimicon® Power Series

Optimized Elements in Power Stations



Description

Optimicon Power elements have been developed to both meet the heavy demands of power plant applications and comply with API-614 specifications. The elements are designed to meet stringent requirements of applications such as turbine lubrication, hydraulic turbine lift systems, and rotary compressors. Key considerations for this type of filtration are low resistance to flow (low differential pressures through the elements) and safety with regard to electrostatic discharge. This element incorporates Stat-Free® technology which safeguards and inhibits the dangerous generation of static electricity (ESD) which can cause fires and destroy sensitive electronic components and sensors.

As a complete element package, the innovative characteristics of this new technology provide low energy losses, and the compact nature of the element assures better conditioning of the flow. This homogenous flow results in better access to the contaminates and more efficient usage of the surface areas to better filter the contamination.

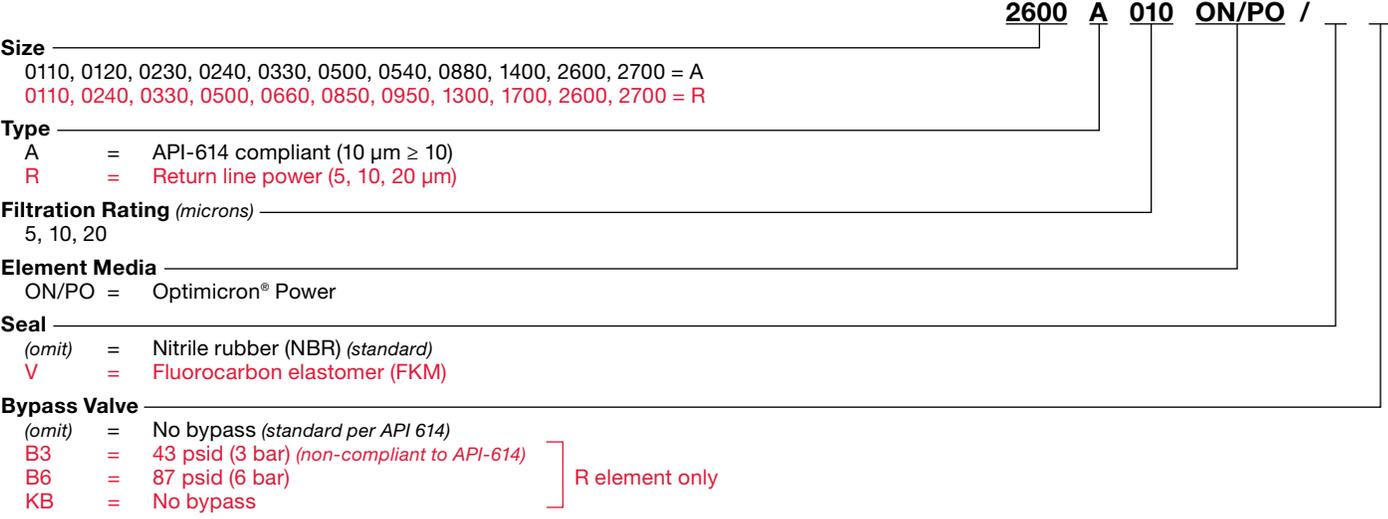
Features

- API 614 compliant
- Glass fiber media, single-layer with support
- Innovative outer wrap with increased strength & better diffuser effect = homogenous flow
- Integrated Stat-Free® technology
- Low collapse only - 145 psid (10 bar)

Technical Specifications

Collapse Rating	145 psi (10 bar)
Temperature range	-22°F to 212°F (-30°C to 100°C)
Flow direction	outside to inside
Filtration Rating	5, 10, 20 µm
Category	Disposable - single use
Compatibility with hydraulic fluids	Mineral oils: Test criteria to ISO 2943 Lubricating oils: Test criteria to ISO 2943
Bypass Cracking Pressure	No bypass (standard per API 614) 43 psid (3 bar) (optional) - Others available for non-API applications

Model Code



Supplementary Details

Optimicron® Power was developed including integrated Stat-Free® technology. It will replace all elements labeled with G/HC/-SFREE. This change also applies to filter housings currently using G/HC/-SFREE elements.

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

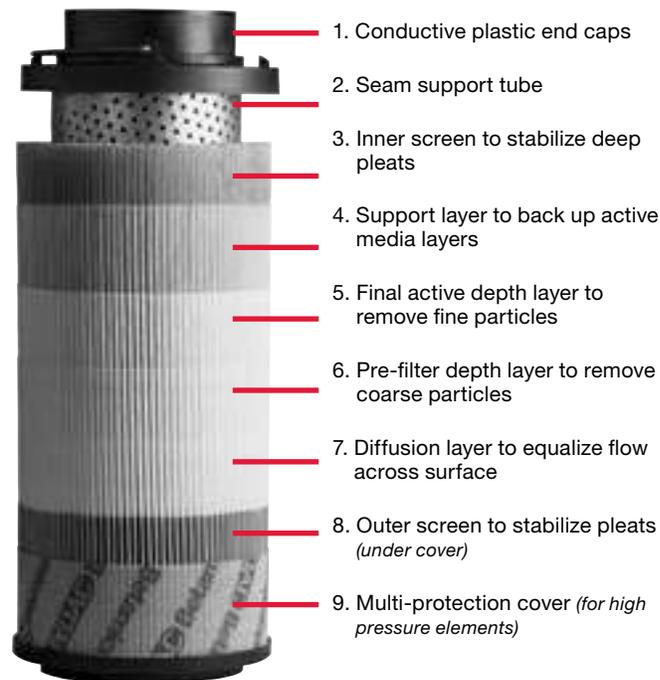
FILTER ELEMENTS

Betamicron® Series

High Pressure and Return Filter Elements



Element Construction



Description

Betamicron® filter elements have been optimized with respect to filtration performance, in fluid cleanliness, lower $\Delta P/Q$, pleat and element protection while handling and operating, and high stability level throughout its life. These elements offer a superior level of optimization of separation efficiency, service life and differential pressure versus flow rate.

As a complete element package, the innovative characteristics of this technology have a very positive impact on the differential pressure of the elements and a high degree of filtration efficiency and performance.

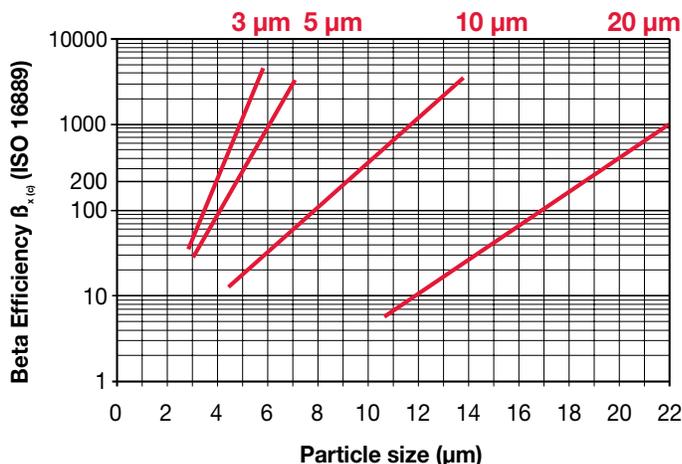
Features

- Optimized mesh pack structure maximizes the media area available to capture dirt particles and minimizes resistance to fluid flow. Optional SFREE mesh pack insures that static electricity will not be generated to dangerous levels where arcing can result.
- Improved performance (optimized Beta efficiency, contamination retention, $\Delta P/Q$ characteristics and Beta stability) and lowered weight due to plastic spiral lock seam support tubes.
- All plastic end caps and support tubes are carbon impregnated to conduct electricity, which ensures that static electricity will not be generated to levels high enough to arc.
- Element outer wraps are made of plastic (polyester) to reduce environment a impact and improve fatigue resistance.
- Zinc-free construction prevents zinc soaping.

Technical Specifications

Collapse Rating	290 psid (20 bar) (R/RN, BN4HC, D/DN, BN4HC) 3045 psid (210 bar) (D, BH/HC)
Temp. range	-22°F to 212°F (-30°C to 100°C)
Flow direction	outside to inside
Filtration Rating	3, 5, 10, 20 μm
Category	Disposable - single use
Bypass Cracking Pressure	
	R (only) = 43 psid (3 bar) (standard, others available)
	D...BN = 87 psid (6 bar) (standard, others available)
	D...BH = No bypass (standard)

Beta Ratio (β) Values for Betamicron



“D / DN” Pressure Elements Model Code

	0660	D	005	BH4HC / V	SO263
Size					
D = 0030, 0035, 0055, 0060, 0075, 0095, 0110, 0140, 0160, 0240, 0280, 0330, 0500, 0660, 0990, 1320, 1500					
DN = 0040, 0063, 0100, 0160, 0250, 0400, 0630, 1000					
Pressure Element Type					
D = HYDAC pressure element					
DN = DIN Spec. 24550 pressure element					
Filtration Rating (micron)					
3, 6, 10, 25 = BN4HC (DN only)					
3, 5, 10, 20 = BH4HC					
Element Media					
BN4HC = Betamicon®-N element (Low Collapse)					
BH4HC = Betamicon®-H element (High Collapse)					
Seals					
(omit) = Nitrile rubber (NBR) (standard)					
V = Fluorocarbon elastomer (FKM)					
EPR = Ethylene propylene rubber (EPR)					
Supplementary Details					
SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids					
SFREE = Element specially designed to minimize electrostatic charge generation					

“R / RN” Return Elements Model Code

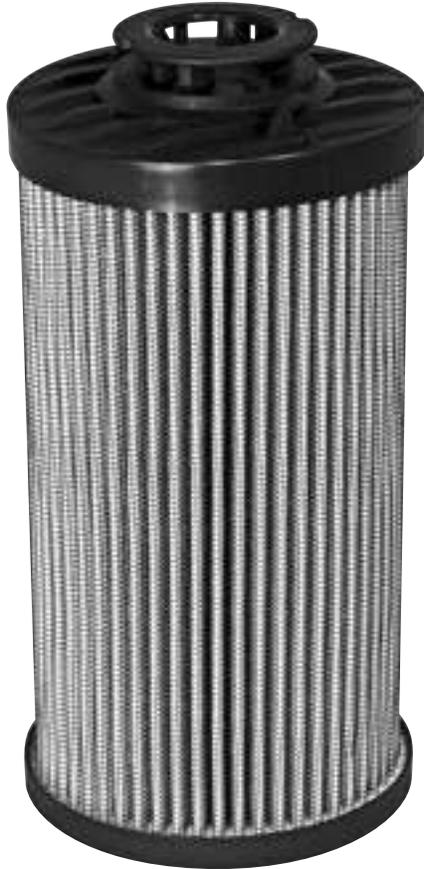
	1300	R	005	BN4HC /	B6	SO263
Size						
R = 0030, 0060, 0050, 0075, 0090, 0110, 0150, 0160, 0165, 0185, 0210, 0240, 0270, 0330, 0500, 0660, 0850, 0950, 1300, 1700, 2600, 2700						
RN = 0040, 0063, 0100, 0160, 0250, 0400, 0630, 1000						
Return Element Type						
R = HYDAC low pressure return element						
RN = DIN Spec. 24550 return element						
Filtration Rating (micron)						
3, 5, 10, 20 = BN4HC						
Element Media						
BN4HC = Betamicon® (Low Collapse) high efficiency depth element						
Seals						
(omit) = Nitrile rubber (NBR) (standard)						
V = Fluorocarbon elastomer (FKM)						
EPR = Ethylene propylene rubber (EPR)						
Bypass Cracking Pressure						
(omit) = 43 psid (3 bar) (standard)						
B1 = 14.5 psid (1 bar) (tube or coolant)						
B2 = 29 psid (2 bar) (HYDAC optional return)						
B6 = 87 psid (6 bar) (return line extended life)						
KB = No bypass (flushing systems)						
Supplementary Details						
SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids						
SFREE = Element specially designed to minimize electrostatic charge generation						

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

FILTER ELEMENTS

Betamicron® / Aquamicron® Series

Combination Filter Elements



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 fluid. Solid particle filtration ($3 \mu\text{m}$, $10 \mu\text{m}$ absolute) is achieved due to the Betamicron® element construction.

Features

- High water retention capacity
- High dirt holding capacity
- Filtration rating $\beta_{x(c)} \geq 200$
- 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 and rod components 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 a water removal system, HYDAC BN4AM technology has been developed to provide an economically sound and effective method of separating free water from hydraulic fluid. At the same time, these elements provide absolute filtration of solid particles down to 3 or 10 micron levels.

Technical Specifications

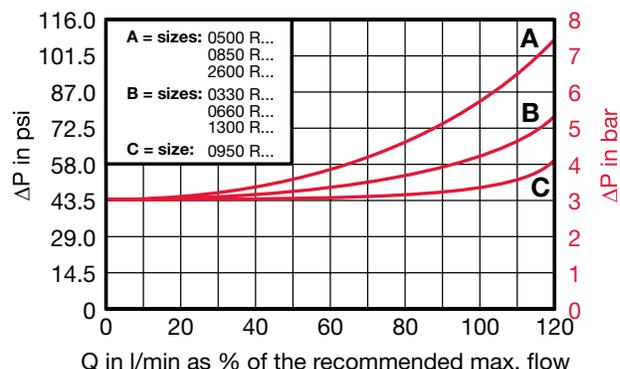
Collapse Pressure Rating	145 psid/10 bar
Temperature range:	32°F to 160°F (0°C to 71°C)
Compatibility with hydraulic media	Test criteria to ISO 2943
Flow fatigue resistance to ISO 3724	High fatigue resistance due to solid filter material supports on both sides and high inherent stability of the filter materials.
Opening pressure of bypass valve	$\Delta P_0 = 43 \text{ psid} + 10\%$ (3 bar + 10%)

Principles of the BN4AM combined filter elements.

- BN4AM 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 ($3 \mu\text{m}$, $10 \mu\text{m}$ 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)

Bypass Valve Curves

The bypass 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

0660 R 010 BN4AM / V

Size _____
 0160, 0240, 0270, 0330, 0500, 0660, 0750, 0850, 0950, 1300, 1700, 2600

Type _____
 R

Filtration Rating (microns) _____
 003
 010

Element Media _____
 BN4AM = combined Betamicron®/Aquamicron®

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B6 = 87 psid (6 bar)
 KB = no bypass

Supplementary Details _____
 SFREE = Element specially designed to minimize electrostatic charge generation

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)
3 μm	β3(c) ≥ 100	β3(c) ≥ 500
10 μm	β10(c) ≥ 100	β10(c) ≥ 500

FILTER ELEMENTS

ECOmicon® Series

Environmentally Compatible



Features

- All plastic construction
Note: Bypass valve in the end cap contains a metal spring for efficient operation. The spring can be removed 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

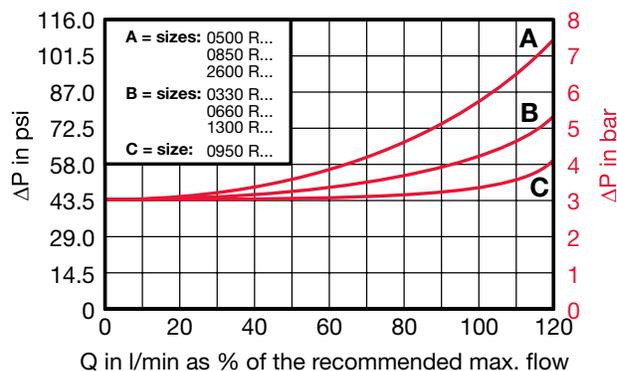
- Compatible with most hydraulic and lubrication fluids. Please consult factory for synthetic fluid use.
- Compatible for high water based fluid application use.
- Media seam welded with patented HYDAC ultrasonic welding process, which prevents media migration.
- $B_{x(0)} \geq 1000$ absolute filtration rating

Technical Specifications

Collapse Pressure Rating	145 psid (10 bar)
Temperature Range	-22°F to 212°F (-30°C 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.
Opening Pressure of Bypass Valve	$\Delta P_0 = 43 \text{ psid} \pm 7 \text{ psi}$ (3 bar \pm 0.5 bar)

Bypass 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

1300 R 03 ECON2 / V

Element Size —————
0040, 0090, 0110, 0150, 0160, 0165, 0185, 0240, 0330, 0660, 0850, 0950, 1300, 1700, 2600

Type —————
R

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

Element Media —————
ECON2 = ECOmicron®

Seals —————
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)

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

Element Construction



FILTER ELEMENTS

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 drop 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 Damages Systems and Components

The presence of water in hydraulic systems causes many problems. Examples would be the saturation of very fine filters or the jamming of valves and rod components. 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 shows that water, too, represents a serious "contaminant" in a hydraulic system.

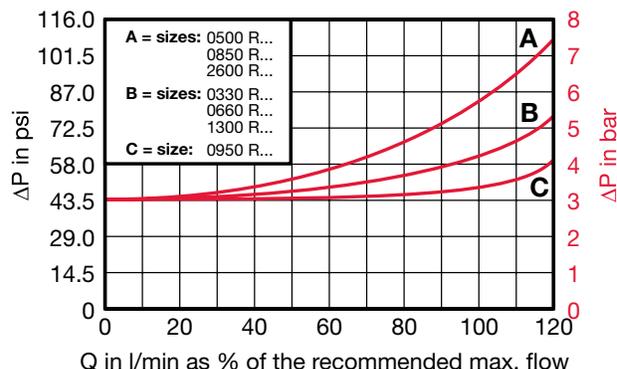
Previously, methods commonly used for extraction of water have proven to be uneconomical in relation to the purchase price of a water removal system. The HYDAC Aquamicron® technique offers an economically sound and yet an effective method of separating free water from hydraulic fluids.

Technical Specifications

Collapse Rating	145 psid (10 bar)
Temperature range	32°F to 212°F (0°C to 100°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 valves	$\Delta P_0 = 43 \text{ psid} \pm 7 \text{ psi}$ (3 bar ± 0.5 bar)
Bypass valve curves	The bypass 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.

Bypass Valve Curves

The bypass 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

Size _____	0330	R	040	AM /
0330, 0500, 0660, 0850, 0950, 1300, 2600				
Type _____				
R = Return Line Element				
Filtration Rating (microns) _____				
040				
Element Media _____				
AM = Aquamicon® water removal				
Seal _____				
(omit) = Nitrile rubber (NBR) (standard)				
V = Fluorocarbon elastomer (FKM)				

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

Aquamicon® Element Size Recommendations

Size	Recommended Flow rate	Water retention capacity C _w at ΔP = 36 psi (2.5 bar) with an oil viscosity of 141 SUS (30mm ² /sec)	Part No.
0330	3.4 gpm (13 l/min) advised 26.4 gpm (100 l/min) max.	0.27 quarts (260cm ³) 0.19 quarts (180cm ³)	00315268
0500	5 gpm (19 l/min) advised 40.9 gpm (155 l/min) max.	0.42 quarts (400cm ³) 0.30 quarts (280cm ³)	00315355
0660	7.4 gpm (28 l/min) advised 67.4 gpm (255 l/min) max.	0.60 quarts (570cm ³) 0.42 quarts (400cm ³)	00315356
0850	9.2 gpm (35 l/min) advised 75.6 gpm (286 l/min) max.	0.77 quarts (730cm ³) 0.55 quarts (520cm ³)	00315357
0950	10.3 gpm (39 l/min) advised 83 gpm (314 l/min) max.	0.85 quarts (800cm ³) 0.60 quarts (570cm ³)	00315358
1300	14.3 gpm (54 l/min) advised 115.4 gpm (437 l/min) max.	1.18 quarts (1120cm ³) 0.83 quarts (790cm ³)	00315269
2600	28.2 gpm (109 l/min) advised 229.9 gpm (870 l/min) max.	2.36 quarts (2230cm ³) 1.66 quarts (1570cm ³)	00316102

FILTER ELEMENTS

Mobilemicron® Series

Mobile filtration - low cold start ΔP



Description

The HYDAC Mobilemicron® filter elements are designed to efficiently handle applications in the demanding mobile industry. Applications utilizing these elements will experience safe, reliable operation of the mobile device.

The Mobilemicron® is characterized by an especially low pressure drop which makes them particularly suitable for use wherever high viscosity fluids are employed, especially at low temperatures producing cold start behavior. Under these conditions, this element exhibits far lower pressure drops than competitive depth elements resulting in lower energy requirements to operate the hydraulic systems.

This filter element is also a prime candidate for gear lubrication systems using high viscosity oils with high temperature variations during operations.

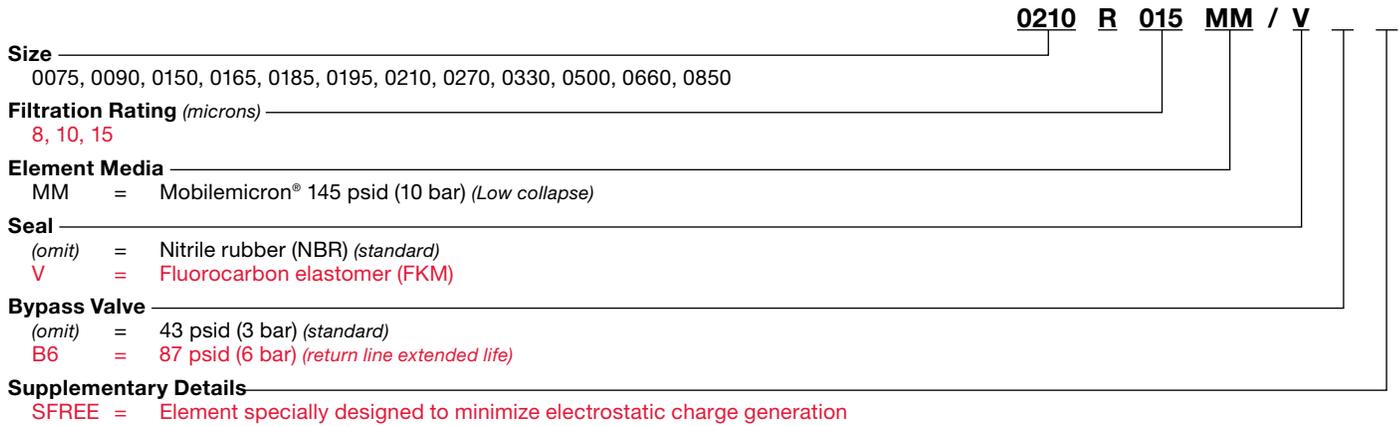
Features

- Unique filter media has a very low resistance to fluid flow – thus, reducing element ΔP .
- Synthetic fiber media, multi-layered with support
- Low collapse – 10 bar (145 psid)
- For use in HYDAC RF, RFD, RFL, RFLD, RFM, RKM, MFX Filters

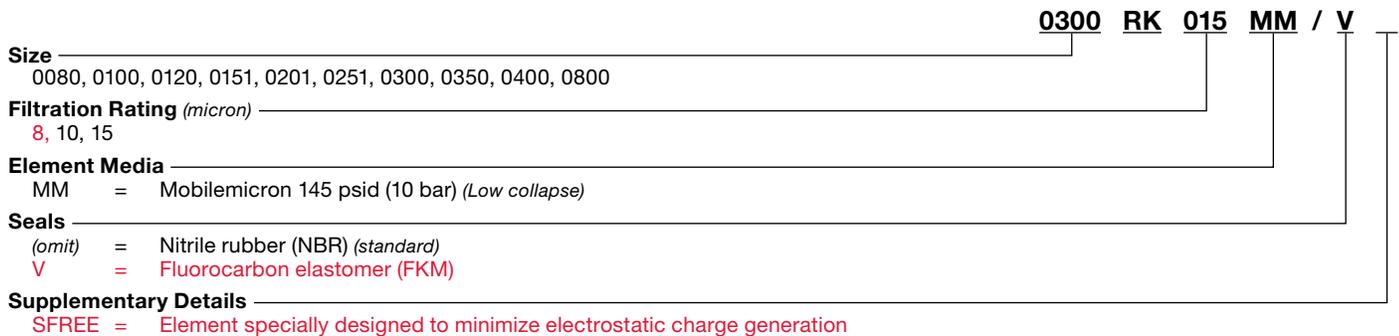
Technical Specifications

Collapse Rating	145 psid (10 bar) (...R...MM)
Temperature range	-22°F to 212°F (-30°C to 100°C)
Flow direction	outside to inside
Filtration Rating	8, 10, 15 μm
Category	Disposable - single use
Bypass Cracking Pressure	
	R = 43 psid (3 bar) (standard)
	RK = 50.75 psid (3.5 bar)
	MX = 50.75 psid (3.5 bar)

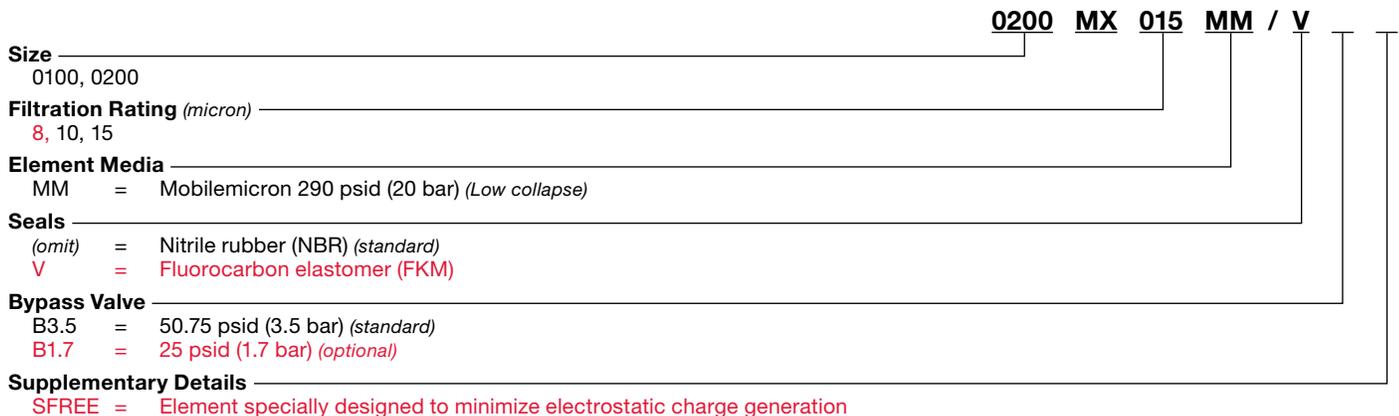
“R” Return Elements Model Code



“RK” RKM Element Model Code



“MX” Element Model Code



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

FILTER ELEMENTS

MA & MG Series

Spin-On Elements



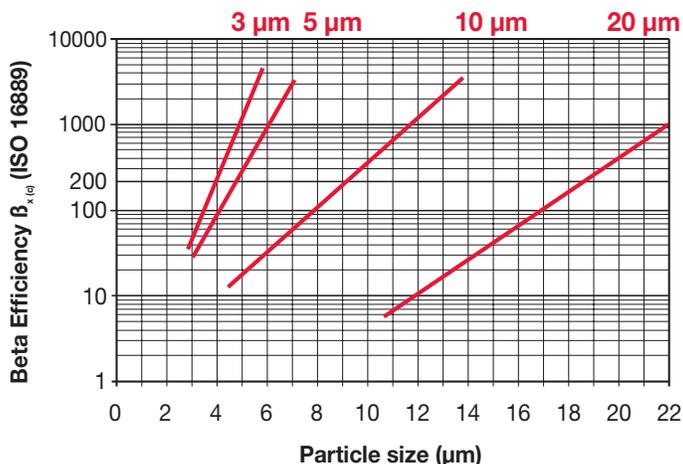
Features

- HYDAC Betamicon® elements are available with Multi-Layer Betamicon® media with absolute ratings of 3, 5, 10, and 20 microns.
- 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.
- Betamicon® filter media is firmly supported to achieve flow 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 Specifications

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, M	80 psid (5.5 bar)
Fluid Temperature Range	-22°F to 212°F (-30°C to 100°C)
Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all petroleum oils rated for use with Nitrile rubber (NBR) seals.
Bypass Valve Cracking Pressure	
$\Delta P = 3 \text{ psid (0.2 bar) + 10\% (for suction applications)}$ $\Delta P = 25 \text{ psid (1.7 bar) + 10\% (standard for nominal filters)}$ $\Delta P = 43 \text{ psid (3 bar) + 10\% (standard for absolute [BN] filters)}$ $\Delta P = 50 \text{ psid (3.4 bar) + 10\% (standard for absolute [BN] filters, MF 90/95/190/195)}$	

Beta Ratio (β) Values for Betamicon



Model Code

0080 MA 005 BN

Size	0040, 0080, 0090 = Standard Length Elements (not available with 3 µm BN elements)		
	0085 (not available with BN or AM elements)		
	0095 (not available with 20 µm BN elements)		
	0160		
	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	Not required for BSPP ported heads produced in the USA, MA elements used on USA port codes "1.0"
	0160	1 1/4" BSPP	
Filtration Rating (microns)	3, 5, 10, 20 = BN Filtration Rating ($\beta_{x(e)} \geq 200$)		
	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

FILTER ELEMENTS

Element K-Factors

Optimicon® “D...ON” Pressure Elements

K-Factors (gradient coefficients) for Filter Elements: These K-factors in (psi/gpm) apply to hydraulic and lubricating fluids with kinematic viscosity of 141 SSU/(30mm²/S). The pressure drop changes proportionally to the change in viscosity.



Optimicon Size	...D...ON (Pressure Element)						Wgt. (lbs.)
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	
0030 D XXX ON	4.27	3.507	2.376	1.251	0.768	0.62	0.19
0035 D XXX ON	2.755	1.169	0.938	0.752	0.549	0.408	0.26
0055 D XXX ON	1.427	0.675	0.543	0.434	0.284	0.211	0.37
0060 D XXX ON	2.936	1.427	1.004	0.664	0.537	0.347	0.23
0075 D XXX ON	0.916	0.461	0.37	0.296	0.183	0.136	0.49
0095 D XXX ON	0.724	0.37	0.296	0.238	0.144	0.105	0.59
0110 D XXX ON	1.416	0.735	0.527	0.333	0.254	0.164	0.54
0140 D XXX ON	1.092	0.631	0.406	0.24	0.194	0.126	0.44
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175	0.58
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115	0.78
0260 D XXX ON	0.449	0.272	0.212	0.127	0.1	0.079	0.71
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064	1.75
0300 D XXX ON	0.801	0.488	0.391	0.268	0.154	0.143	0.66
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067	1.13
0450 D XXX ON	0.401	0.244	0.193	0.131	0.077	0.069	1.36
0500 D XXX ON	0.277	0.141	0.114	0.068	0.052	0.041	1.50
0650 D XXX ON	0.245	0.148	0.121	0.081	0.047	0.044	2.04
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031	2.53
0900 D XXX ON	0.185	0.115	0.092	0.06	0.036	0.035	2.56
0990 D XXX ON	0.138	0.07	0.057	0.033	0.026	0.02	3.29
1320 D XXX ON	0.102	0.053	0.042	0.025	0.019	0.015	8.39
1500 D XXX ON	0.09	0.053	0.038	0.026	0.02	0.015	10.44

Optimicon® “R...ON” Return Elements



Optimicon Size	...R...ON (Return Element - Low Pressure)						Wgt. (lbs.)
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm	
0030 R XXX ON	4.928	3.754	2.409	1.471	0.922	0.807	0.142
0060 R XXX ON	2.59	1.295	0.944	0.539	0.494	0.376	0.286
0075 R XXX ON	1.405	1.065	0.735	0.401	0.263	0.241	0.508
0090 R XXX ON	1.235	0.719	0.521	0.333	0.236	0.176	0.364
0110 R XXX ON	1.224	0.719	0.487	0.296	0.234	0.178	0.46
0150 R XXX ON	0.735	0.428	0.31	0.198	0.14	0.105	0.502
0160 R XXX ON	0.878	0.439	0.312	0.177	0.148	0.182	0.682
0165 R XXX ON	0.774	0.518	0.404	0.221	0.123	0.133	0.77
0185 R XXX ON	0.571	0.408	0.315	0.161	0.091	0.077	0.873
0195 R XXX ON	0.42	0.301	0.232	0.119	0.067	0.057	1.115
0210 R XXX ON	0.311	0.18	0.14	0.084	0.055	0.048	1.684
0240 R XXX ON	0.571	0.284	0.201	0.125	0.101	0.077	0.848
0270 R XXX ON	0.201	0.116	0.091	0.054	0.036	0.031	2.358
0280 R XXX ON	0.28	0.141	0.114	0.078	0.058	0.044	1.763
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056	1.54
0450 R XXX ON	0.347	0.174	0.126	0.077	0.055	0.047	1.798
0500 R XXX ON	0.289	0.143	0.104	0.06	0.046	0.038	2.28
0580 R XXX ON	0.137	0.068	0.049	0.029	0.022	0.019	3.975
0600 R XXX ON	0.129	0.068	0.06	0.033	0.023	0.019	3.321
0660 R XXX ON	0.196	0.093	0.066	0.037	0.031	0.025	3.488
0750 R XXX ON	0.116	0.061	0.05	0.029	0.019	0.018	4.764
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.020	4.328
0950 R XXX ON	0.131	0.057	0.043	0.026	0.021	0.017	5.076
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012	9.188
1700 R XXX ON	0.074	0.035	0.029	0.015	0.014	0.010	7.564
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006	11.964

Optimicon® Power “ON/PO” Elements



Optimicon Power Size	...A...ON			
	5 µm	10 µm	20 µm	Wgt. (lbs.)
0110 R XXX ON/PO	0.199	0.169	0.111	0.562
0240 R XXX ON/PO	0.072	0.061	0.040	0.873
0330 R XXX ON/PO	0.044	0.038	0.024	2.12
0500 R XXX ON/PO	0.029	0.025	0.016	2.372
0660 R XXX ON/PO	0.019	0.016	0.010	3.697
0850 R XXX ON/PO	0.015	0.013	0.009	5.357
0950 R XXX ON/PO	0.010	0.012	0.008	7.317
1300 R XXX ON/PO	0.010	0.008	0.005	7.848
1700 R XXX ON/PO	0.007	0.006	0.004	10.02
2600 R XXX ON/PO	0.004	0.004	0.003	15.18
2700 R XXX ON/PO	0.004	0.004	0.003	21.94

Optimicon Power Size	API Compliant	
	10 µm	Wgt. (lbs.)
0110 A XXX ON/PO	0.169	0.259
0120 A XXX ON/PO	0.075	0.937
0230 A XXX ON/PO	0.037	2.731
0240 A XXX ON/PO	0.061	1.011
0330 A XXX ON/PO	0.038	1.671
0500 A XXX ON/PO	0.025	2.447
0540 A XXX ON/PO	0.018	6.15
0880 A XXX ON/PO	0.008	9.034
1400 A XXX ON/PO	0.005	16.18
2600 R XXX ON/PO	0.004	16.73
2700 A XXX ON/PO	0.004	20.61

Element K-Factors

Betamicon® “D...BN4HC” Pressure Elements



Betamicon Size	...D...BN4HC (Low Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030 D XXX BN4HC	3.507	2.376	1.251	0.620	0.19
0035 D XXX BN4HC	1.295	1.043	0.812	0.510	0.26
0055 D XXX BN4HC	0.752	0.604	0.444	0.263	0.37
0060 D XXX BN4HC	1.586	1.119	0.724	0.433	0.23
0075 D XXX BN4HC	0.510	0.411	0.290	0.170	0.49
0095 D XXX BN4HC	0.411	0.329	0.225	0.132	0.59
0110 D XXX BN4HC	0.818	0.587	0.362	0.203	0.54
0140 D XXX BN4HC	0.702	0.450	0.263	0.159	0.44
0160 D XXX BN4HC	0.719	0.483	0.252	0.192	0.58
0240 D XXX BN4HC	0.450	0.335	0.198	0.126	0.78
0280 D XXX BN4HC	0.220	0.170	0.093	0.071	1.75
0300 D XXX BN4HC	0.582	0.445	0.291	0.159	0.66
1.11.04DXXBN					
0330 D XXX BN4HC	0.296	0.214	0.165	0.093	1.13
0450 D XXX BN4HC	0.291	0.220	0.143	0.077	1.36
1.11.08DXXBN					
0500 D XXX BN4HC	0.181	0.132	0.082	0.060	1.50
0650 D XXX BN4HC	0.176	0.137	0.088	0.049	2.04
1.11.13DXXBN					
0660 D XXX BN4HC	0.137	0.099	0.060	0.044	2.53
0900 D XXX BN4HC	0.137	0.104	0.066	0.038	2.56
1.11.16DXXBN					
0990 D XXX BN4HC	0.088	0.066	0.038	0.027	3.29
1320 D XXX BN4HC	0.066	0.049	0.027	0.022	8.39
1500 D XXX BN4HC	0.060	0.044	0.033	0.022	10.44

Betamicon® “D...BH4HC” Pressure Elements

Betamicon Size	...D...BH4HC (High Collapse)				
	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0030 D XXX BH4HC	5.005	2.782	1.992	1.043	0.30
0060 D XXX BH4HC	3.216	1.789	0.993	0.670	0.58
0110 D XXX BH4HC	1.394	0.818	0.489	0.307	0.76
0140 D XXX BH4HC	1.092	0.620	0.445	0.236	0.79
0160 D XXX BH4HC	0.922	0.571	0.324	0.241	1.23
0240 D XXX BH4HC	0.582	0.373	0.214	0.159	1.82
0280 D XXX BH4HC	0.313	0.187	0.099	0.088	2.55
0300 D XXX BH4HC	0.878	0.488	0.390	0.181	1.83
1.11.04DXXBH					
0330 D XXX BH4HC	0.423	0.247	0.154	0.110	2.26
0450 D XXX BH4HC	0.428	0.236	0.187	0.088	2.61
1.11.08DXXBH					
0500 D XXX BH4HC	0.230	0.143	0.082	0.066	3.60
0650 D XXX BH4HC	0.258	0.143	0.115	0.055	3.64
1.11.13DXXBH					
0660 D XXX BH4HC	0.181	0.104	0.055	0.049	4.05
0900 D XXX BH4HC	0.192	0.110	0.088	0.038	4.66
1.11.16DXXBH					
0990 D XXX BH4HC	0.120	0.071	0.044	0.033	7.38
1320 D XXX BH4HC	0.088	0.055	0.033	0.022	9.82
1500 D XXX BH4HC	0.077	0.044	0.033	0.027	11.56

Indicates PALL 9600 geometry element.

FILTER ELEMENTS

Element K-Factors

Betamicron® “D...W/HC” Pressure Elements



Wire Mesh Size	...D...W/HC	
	25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)
0030 D XXX W/HC	0.185	0.32
0060 D XXX W/HC	0.092	0.53
0110 D XXX W/HC	0.050	0.83
0140 D XXX W/HC	0.040	0.69
0160 D XXX W/HC	0.035	1.22
0240 D XXX W/HC	0.023	1.17
0280 D XXX W/HC	0.020	2.37
0330 D XXX W/HC	0.020	2.40
0500 D XXX W/HC	0.011	2.20
0660 D XXX W/HC	0.008	3.50
0990 D XXX W/HC	0.006	5.19
1320 D XXX W/HC	0.004	6.03

Betamicron® “D...V” Pressure Elements



Metal Fiber Size	...D...V				Wgt. (lbs.)
	3 µm	5 µm	10 µm	20 µm	
0030 D XXX V	1.011	0.740	0.411	0.200	0.18
0060 D XXX V	0.877	0.511	0.296	0.183	0.25
0110 D XXX V	0.452	0.304	0.182	0.118	0.40
0140 D XXX V	0.320	0.261	0.172	0.126	1.08
0160 D XXX V	0.251	0.177	0.123	0.079	0.73
0240 D XXX V	0.169	0.137	0.093	0.062	1.16
0280 D XXX V	0.126	0.093	0.064	0.041	1.65
0330 D XXX V	0.121	0.097	0.065	0.043	2.37
0500 D XXX V	0.081	0.065	0.044	0.028	4.38
0660 D XXX V	0.063	0.050	0.034	0.021	4.69
0990 D XXX V	0.043	0.034	0.023	0.015	8.81
1320 D XXX V	0.032	0.026	0.018	0.012	6.77
1500 D XXX V	0.016	0.011	0.011	0.005	7.97

All Element K Factors in psi / gpm.

Element K-Factors

“DN” Pressure Elements



Betamicon		...DN...BN/HC (Low Collapse)				
Size	3 µm	6 µm	10 µm	25 µm	Wgt. (lbs.)	
0040 DN XXX BN4HC	1.312	0.818	0.472	0.362	2.161	
0063 DN XXX BN4HC	0.895	0.543	0.330	0.252	0.331	
0100 DN XXX BN4HC	0.653	0.362	0.220	0.176	0.507	
0160 DN XXX BN4HC	0.434	0.280	0.187	0.143	N/A*	
0250 DN XXX BN4HC	0.280	0.176	0.115	0.099	1.411	
0400 DN XXX BN4HC	0.176	0.110	0.071	0.055	2.161	

Wire Mesh		...DN...W/HC (Low Collapse)				
Size	3 µm	6 µm	10 µm	25 µm	Wgt. (lbs.)	
0160 DN XXX W/HC	0.009	0.009	0.009	0.009	1.26	
0250 DN XXX W/HC	0.006	0.006	0.006	0.006	1.41	
0400 DN XXX W/HC	0.004	0.004	0.004	0.004	2.16	

Betamicon		...DN...BH/HC (High Collapse)				
Size	3 µm	6 µm	10 µm	25 µm	Wgt. (lbs.)	
0040 DN XXX BH4HC	2.217	1.361	0.900	0.598	0.57	
0063 DN XXX BH4HC	1.591	0.999	0.642	0.417	0.84	
0100 DN XXX BH4HC	1.043	0.642	0.423	0.291	1.01	
0160 DN XXX BH4HC	0.439	0.280	0.209	0.137	1.86	
0250 DN XXX BH4HC	0.296	0.187	0.154	0.104	2.90	
0400 DN XXX BH4HC	0.187	0.115	0.093	0.060	4.28	

Pressure Elements for the Automotive Industry

Autospec HF4		5.03.XXDXXBN (Low Collapse)				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)	
5.03.09DXXBN	0.168	0.141	0.079	0.044	1.67	
5.03.18DXXBN	0.080	0.067	0.038	0.021	3.03	
5.03.27DXXBN	0.052	0.043	0.024	0.014	4.50	

Autospec HF4		5.03.XXDXXBH (High Collapse)				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)	
5.03.09DXXBH	0.207	0.146	0.089	0.047	4.57	
5.03.18DXXBH	0.097	0.068	0.041	0.022	8.19	
5.03.27DXXBH	0.063	0.044	0.027	0.014	12.16	

Autospec HF4 Wire Mesh		5.03.XXDXXW		
Size	25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)		
5.03.09DXXW	0.007	1.71		
5.03.18DXXW	0.004	3.29		
5.03.27DXXW	0.002	N/A*		

Autospec HF3		1.11.08DXXBN (Low Collapse)				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)	
1.11.04DXXBN	0.590	0.500	0.266	0.153	0.69	
1.11.08DXXBN	0.289	0.241	0.135	0.076	1.02	
1.11.13DXXBN	0.175	0.146	0.082	0.046	1.51	
1.11.16DXXBN	0.132	0.110	0.062	0.035	1.89	

Autospec HF3		1.11.08DXXBH (High Collapse)				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)	
1.11.04DXXBH	0.937	0.660	0.401	0.210	1.83	
1.11.08DXXBH	0.460	0.321	0.195	0.102	2.61	
1.11.13DXXBH	0.274	0.193	0.117	0.615	3.64	
1.11.16DXXBH	0.206	0.145	0.089	0.046	4.66	

Autospec HF2		1.07.08DXXBN (Low Collapse)				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)	
1.07.04DXXBN	2.046	1.735	0.925	0.531	0.26	
1.07.08DXXBN	0.975	0.815	0.457	0.257	0.39	

Autospec HF2		1.07.08DXXBH (High Collapse)				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)	
1.07.04DXXBH	2.400	1.690	1.027	0.538	0.51	
1.07.08DXXBH	1.165	0.820	0.499	0.262	0.85	

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

All Element K Factors in psi / gpm.

FILTER ELEMENTS

Element K-Factors

Betamicon® “R...BN4HC” Return Elements



Betamicon Size	...R...BN4HC (Low Collapse)				Wgt. (lbs.)
	3 µm	5 µm	10 µm	20 µm	
0030 R XXX BN4HC	3.754	2.409	1.471	0.807	0.142
0060 R XXX BN4HC	1.471	1.004	0.598	0.379	0.286
0075 R XXX BN4HC	1.207	0.779	0.445	0.241	0.508
0110 R XXX BN4HC	0.818	0.516	3.293	0.176	0.46
0150 R XXX BN4HC	0.489	0.329	0.220	0.104	0.68
0160 R XXX BN4HC	0.521	0.324	0.209	0.159	0.682
0165 R XXX BN4HC	0.615	0.428	0.247	0.132	0.77
0185 R XXX BN4HC	0.488	0.335	0.181	0.099	0.882
0210 R XXX BN4HC	0.214	0.143	0.099	0.060	1.684
0240 R XXX BN4HC	0.340	0.209	0.143	0.099	0.848
0270 R XXX BN4HC	0.137	0.093	0.060	0.038	2.358
0280 R XXX BN4HC	0.170	0.121	0.088	0.055	1.76
0330 R XXX BN4HC	0.232	0.150	0.093	0.066	1.54
0500 R XXX BN4HC	0.164	0.104	0.071	0.044	2.28
0660 R XXX BN4HC	0.104	0.066	0.044	0.027	3.488
0750 R XXX BN4HC	0.071	0.049	0.033	0.022	4.764
0850 R XXX BN4HC	0.082	0.055	0.038	0.022	4.328
0950 R XXX BN4HC	0.066	0.044	0.027	0.022	5.076
1300 R XXX BN4HC	0.044	0.033	0.022	0.016	9.188
1700 R XXX BN4HC	0.038	0.027	0.016	0.011	7.564
2600 R XXX BN4HC	0.022	0.016	0.011	0.005	11.964
2700 R XXX BN4HC	0.022	0.016	0.011	0.005	16.5

Betamicon®/Aquamicron® “R...BN4AM”



Betamicon/ Aquamicron Size	...R...BN4AM		
	3 µm	10 µm	Wgt. (lbs.)
0330 R XXX BN4AM	0.477	0.165	1.596
0500 R XXX BN4AM	0.313	0.11	2.266
0660 R XXX BN4AM	0.192	0.066	1.991
0750 R XXX BN4AM	0.126	0.044	4.760
0850 R XXX BN4AM	0.154	0.049	5.225
0950 R XXX BN4AM	0.132	0.044	5.85
1300 R XXX BN4AM	0.088	0.033	6.946
1700 R XXX BN4AM	0.071	0.027	7.452
2600 R XXX BN4AM	0.055	0.016	10.211
2700 R XXX BN4AM	0.055	0.016	16.445

Aquamicron “AM”



Aquamicron Size	...AM	
	40 µm	Wgt. (lbs.)
0330 R XXX AM	0.115	0.740
0500 R XXX AM	0.076	1.023
0660 R XXX AM	0.051	1.580
0750 R XXX AM	0.030	1.855
0850 R XXX AM	0.040	1.990
0950 R XXX AM	0.036	2.900
1300 R XXX AM	0.026	3.550
1700 R XXX AM	0.020	5.661
2600 R XXX AM	0.013	6.210
2700 R XXX AM	0.014	6.356

All Element K Factors in psi / gpm.

Element K-Factors

ECOmicon® “R...ECON2” Return Elements



ECOmicon Size	...R...ECON2				Wgt. (lbs.)
	3 µm	5 µm	10 µm	20 µm	
0075 R XXX ECON2	1.207	0.779	0.445	0.241	0.115
0090 R XXX ECON2	0.818	0.554	0.368	0.176	0.126
0110 R XXX ECON2	0.818	0.516	0.329	0.176	0.332
0150 R XXX ECON2	0.488	0.329	0.220	0.104	0.385
0160 R XXX ECON2	0.521	0.324	0.209	0.159	0.398
0165 R XXX ECON2	0.615	0.428	0.247	0.132	0.422
0185 R XXX ECON2	0.488	0.335	0.181	0.099	0.586
0195 R XXX ECON2	0.362	0.247	0.132	0.071	0.702
0240 R XXX ECON2	0.340	0.209	0.143	0.099	0.711
0280 R XXX ECON2	0.170	0.121	0.088	0.055	0.954
0330 R XXX ECON2	0.230	0.148	0.093	0.066	1.069
0500 R XXX ECON2	0.165	0.104	0.071	0.044	2.118
0660 R XXX ECON2	0.104	0.066	0.044	0.027	4.389
0750 R XXX ECON2	0.071	0.049	0.033	0.022	4.855
0850 R XXX ECON2	0.082	0.055	0.038	0.022	5.211
0950 R XXX ECON2	0.066	0.044	0.027	0.022	4.400
1300 R XXX ECON2	0.044	0.033	0.022	0.016	5.290
1700 R XXX ECON2	0.038	0.027	0.016	0.011	11.31
2600 R XXX ECON2	0.022	0.016	0.011	0.005	9.544

ECOmicon Fit SIZE	1.14.XXDXXECO/N			
	3 µm	6 µm	12 µm	25 µm
1.14.16DXXECO/N	0.046	0.041	0.022	0.015
1.14.39DXXECO/N	0.017	0.016	0.008	0.006

Wire Mesh “R...W/HC” Return Elements



Wire Mesh Size	...R...W/HC	
	25, 50, 74, 100, 149, 200 µm	Wgt. (lbs.)
0030 R XXX W/HC	0.110	0.08
0060 R XXX W/HC	0.055	0.328
0075 R XXX W/HC	0.043	0.687
0110 R XXX W/HC	0.030	0.588
0160 R XXX W/HC	0.021	0.86
0165 R XXX W/HC	0.020	0.52
0240 R XXX W/HC	0.015	1.174
0330 R XXX W/HC	0.010	1.844
0500 R XXX W/HC	0.007	1.876
0660 R XXX W/HC	0.005	4.138
0850 R XXX W/HC	0.004	2.535
0950 R XXX W/HC	0.003	5.674
1300 R XXX W/HC	0.003	4.61
1700 R XXX W/HC	0.002	11
2600 R XXX W/HC	0.001	8.3

Polyester “R...P/HC” Return Elements



Polyester Size	...R...P/HC		
	10 µm	20 µm	Wgt. (lbs.)
0030 R XXX P/HC	0.458	0.458	0.154
0060 R XXX P/HC	0.255	0.255	0.308
0075 R XXX P/HC	0.156	0.156	0.701
0110 R XXX P/HC	0.128	0.128	0.488
0160 R XXX P/HC	0.077	0.077	0.692
0165 R XXX P/HC	0.086	0.086	0.816
0240 R XXX P/HC	0.049	0.049	0.978
0330 R XXX P/HC	0.037	0.037	1.536
0500 R XXX P/HC	0.024	0.024	2.142
0660 R XXX P/HC	0.016	0.016	3.278
0850 R XXX P/HC	0.012	0.012	4.320
0950 R XXX P/HC	0.010	0.010	5.838
1300 R XXX P/HC	0.007	0.007	6.944
1700 R XXX P/HC	0.006	0.006	8.721
2600 R XXX P/HC	0.003	0.003	12.166

FILTER ELEMENTS

Element K-Factors

Mobilemicron® “R...MM” Return Elements



Mobilemicron R	...RK...MM	
Size	10 µm	Wgt. (lbs.)
0060 R XXX MM	0.420	N/A*
0075 R XXX MM	0.265	N/A*
0090 R XXX MM	0.252	N/A*
0110 R XXX MM	0.199	N/A*
0150 R XXX MM	0.114	N/A*
0160 R XXX MM	0.149	N/A*
0165 R XXX MM	0.146	N/A*
0185 R XXX MM	0.108	N/A*
0210 R XXX MM	0.052	N/A*
0240 R XXX MM	0.095	N/A*
0270 R XXX MM	0.032	N/A*
0330 R XXX MM	0.078	N/A*
0500 R XXX MM	0.052	N/A*
0660 R XXX MM	0.030	N/A*
0850 R XXX MM	0.023	N/A*
0950 R XXX MM	0.023	N/A*
1300 R XXX MM	0.016	N/A*
1700 R XXX MM	0.010	N/A*
2600 R XXX MM	0.008	N/A*

Mobilemicron® “RK” Return Elements



Mobilemicron RK	...RK...MM			Wgt. (lbs.)
Size	8 µm	10 µm	15 µm	
0080 RK XXX MM	0.136	0.136	0.087	0.588
0100 RK XXX MM	0.095	0.095	0.061	0.624
0120 RK XXX MM	0.077	0.077	0.049	0.658
0151 RK XXX MM	0.054	0.054	0.036	0.892
0201 RK XXX MM	0.041	0.041	0.026	1.820
0251 RK XXX MM	0.032	0.032	0.020	1.986
0300 RK XXX MM	0.034	0.034	0.021	2.020
0350 RK XXX MM	0.016	0.016	0.011	2.211
0400 RK XXX MM	0.031	0.031	0.019	2.496
0800 RK XXX MM	0.024	0.024	0.015	4.122

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

All Element K Factors in psi / gpm.

Element K-Factors

Stainless Steel Wire Mesh “R...V”



SS Wire Mesh Size	...R...V				Wgt. (lbs.)
	3 µm	5 µm	10 µm	20 µm	
0030 R XXX V	1.065	0.779	0.434	0.209	N/A*
0060 R XXX V	0.873	0.510	0.296	0.181	N/A*
0110 R XXX V	0.417	0.280	0.165	0.110	N/A*
0160 R XXX V	0.269	0.192	0.132	0.082	N/A*
0240 R XXX V	0.176	0.143	0.093	0.066	N/A*
0280 R XXX V	0.077	0.060	0.038	0.027	N/A*
0330 R XXX V	0.115	0.093	0.060	0.044	N/A*
0450 R XXX V	0.093	0.071	0.049	0.033	N/A*
0500 R XXX V	0.082	0.066	0.044	0.027	N/A*
0580 R XXX V	0.038	0.027	0.016	0.016	N/A*
0660 R XXX V	0.055	0.044	0.033	0.022	N/A*
0750 R XXX V	0.033	0.027	0.016	0.011	N/A*
0850 R XXX V	0.044	0.033	0.022	0.016	N/A*
0950 R XXX V	0.038	0.033	0.022	0.011	N/A*
1300 R XXX V	0.027	0.022	0.016	0.011	N/A*
1700 R XXX V	0.022	0.016	0.011	0.005	N/A*
2600 R XXX V	0.016	0.011	0.005	0.005	N/A*
2700 R XXX V	0.011	0.005	0.005	0.005	N/A*

Suction “RS...W” Elements

Suction Size	...RS...W		Wgt. (lbs.)
	75 µm	125 µm	
0060 RS XXX W	0.057	0.030	N/A*
0110 RS XXX W	0.029	0.014	N/A*
0160 RS XXX W	0.020	0.010	N/A*
0240 RS XXX W	0.014	0.007	N/A*
0330 RS XXX W	0.010	0.005	N/A*
0400 RS XXX W	0.011	0.009	N/A*
0500 RS XXX W	0.011	0.009	N/A*
0950 RS XXX W	0.003	0.002	N/A*
1300 RS XXX W	0.003	0.002	N/A*

“RN” Return Elements



Betamicron Size	...RN...BN4HC				Wgt. (lbs.)
	3 µm	5 µm	10 µm	20 µm	
0040 RN XXX BN4HC	0.779	0.428	0.263	0.143	0.298
0063 RN XXX BN4HC	0.521	0.285	0.187	0.099	0.398
0100 RN XXX BN4HC	0.373	0.181	0.126	0.066	0.606
0160 RN XXX BN4HC	0.198	0.099	0.066	0.027	0.895
0250 RN XXX BN4HC	0.154	0.077	0.049	0.022	2.085
0400 RN XXX BN4HC	0.121	0.088	0.071	0.055	3.122
0630 RN XXX BN4HC	0.115	0.066	0.049	0.038	3.728
1000 RN XXX BN4HC	0.038	0.027	0.022	0.016	6.104

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

All Element K Factors in psi / gpm.

FILTER ELEMENTS

Element K-Factors

ECOMICRON®-fit "R...ECO/N"



ECOMICRON-fit	1.14.XXDXXECO/N					
Size	1 µm	3 µm	6 µm	12 µm	25 µm	Wgt. (lbs.)
1.14.16DXXECO/N	0.084	0.046	0.041	0.022	0.015	N/A*
1.14.39DXXECO/N	0.032	0.017	0.016	0.008	0.006	N/A*

"MA" Spin-on Elements



Spin-on	...MA...BN				
Size	3 µm	5 µm	10 µm	20 µm	Wgt. (lbs.)
0040 MA XXX BN	1.391	1.780	0.629	0.361	0.73
0080 MA XXX BN	0.522	0.442	0.236	0.135	1.35
0085 MA XXX BN	N/A*	N/A*	N/A*	N/A*	N/A*
0090 MA XXX BN	0.484	0.37	0.345	0.191	1.5
0095 MA XXX BN	0.276	0.211	0.197	0.109	2.04
0160 MA XXX BN	0.237	0.198	0.111	0.063	2.56
0180 MA XXX BN	0.123	0.103	0.058	0.033	3.69

Spin-on	...MA...P				
Size	3 µm	10 µm	25 µm	Wgt. (lbs.)	
0040 MA XXX P	7.763	2.348	1.516	0.6	
0080 MA XXX P	1.606	0.486	0.314	1.08	
0085 MA XXX P	1.161	0.351	0.227	1.42	
0090 MA XXX P	1.594	0.482	0.311	1.29	
0095 MA XXX P	0.894	0.270	0.174	1.47	
0160 MA XXX P	0.839	0.192	0.145	2.15	
0180 MA XXX P	0.443	0.134	0.087	2.68	

Spin-on	...MA...AM	
Size	10 µm	Wgt. (lbs.)
0080 MA XXX AM	0.513	1.35
0085 MA XXX AM	N/A*	N/A*
0090 MA XXX AM	0.507	1.50
0095 MA XXX AM	0.284	2.00
0160 MA XXX AM	0.233	2.50
0180 MA XXX AM	0.136	3.60

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

All Element K Factors in psi / gpm.

Element Hydraulic Data

Permissible ΔP across element

- Optimicron® (ON) - 290 psid (20 bar)
- Optimicron® Power (ON/PO) - 145 psid (10 bar)
- Betamicon®-H (*high collapse*) (BH4HC) - 3045 psid (210 bar)
- Betamicon®-N (*low collapse*) (BN4HC) - 290 psid (20 bar)
- Betamicon®/Aquamicron® (BN4AM) - 145 psid (10 bar)
- ECOmicron® (ECON2) - 145 psid (10 bar)
- Aquamicron® (AM) - 145 psid (10 bar)
- Wire Mesh (W/HC) - 290 psid (20 bar)
- Polyester (P/HC) - 145 psid (10 bar)
- Metal Fiber (V) - return (R...V) - 435 psid (30 bar); pressure (D...V) - 3045 psid (210 bar)
- Mobilemicron (MM/RK) - 145 psid (10 bar)

Temperature Range

- -22°F to 212°F (-30°C to 100°C)
Note: Consult HYDAC for applications below 14°F (-10°C)

Compatibility with Hydraulic Media

- Suitable for use with mineral oils, lubrication oils, non-flammable fluids, synthetic and rapidly biodegradable oils.
Note: 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 elements.

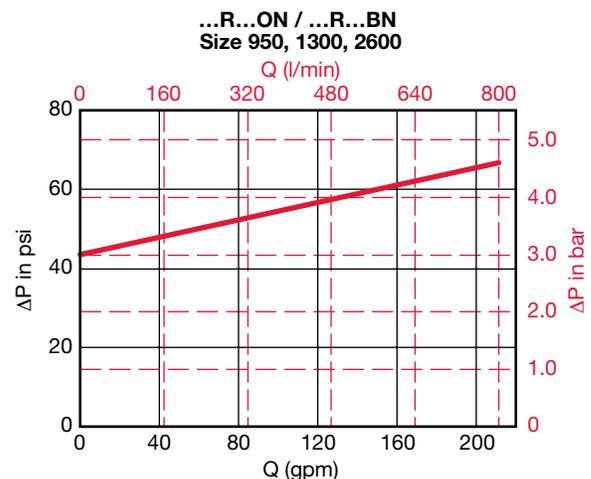
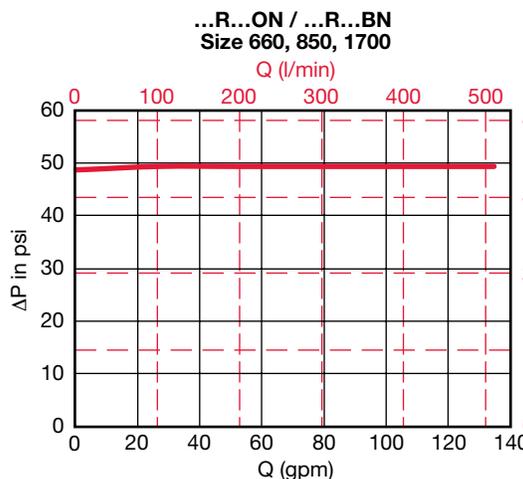
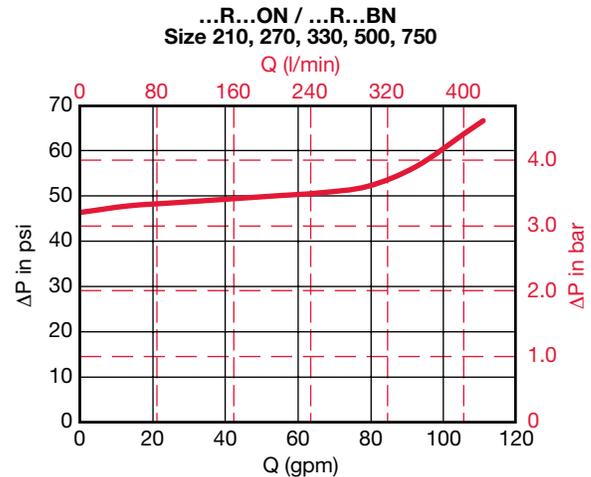
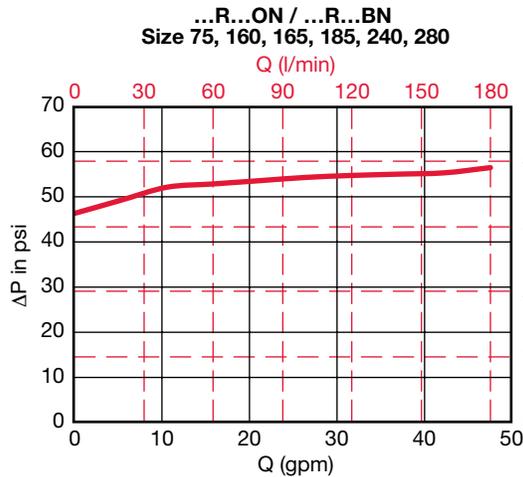
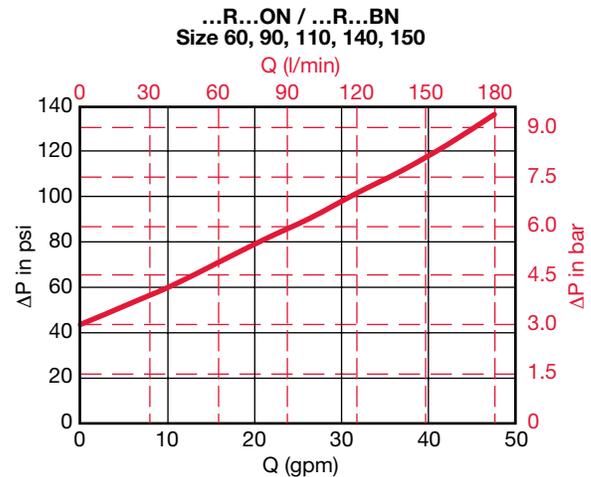
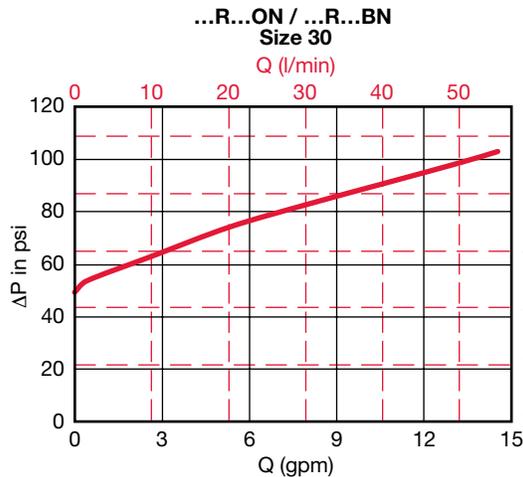
Cracking Pressure of Bypass Valve (...R only)

- $\Delta P = 3 \text{ bar} + 0.5 \text{ bar}$

Bypass Valve Curves (...R...ON / ...R...BN 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. **See graphs below.**

Bypass Valve Curves (...R...ON / ...R...BN only)



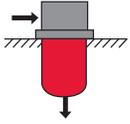
D Low Pressure (Return) Filters 100-600 psi

In-tank, inline, and duplex configurations provide flexibility for use in mobile, industrial, and lube applications. Light weight construction and low ΔP (cold start) options make these filters ideal for agriculture and construction vehicles. Duplex filters allow for uninterrupted operation during element change-out. Modular versions accommodate high flow requirements.

LOW PRESSURE FILTERS

RF Series

In-tank / Inline Filters
360 psi • up to 400 gpm



Features

- RF 30 filters are constructed of polyamide plastic.
- RF 60 - 330 filters are constructed of aluminum material. Aluminum alloy is water tolerant - anodization is not required for high water based fluids (HWBF).
- RF 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, 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 rubber, fluorocarbon elastomer, ethylene propylene rubber) 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.
- Single piece casting provides rigidity for inline or in-tank mounting.

Note: This filter is configured with an R type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Applications



Agricultural



Automotive



Construction



Gearboxes

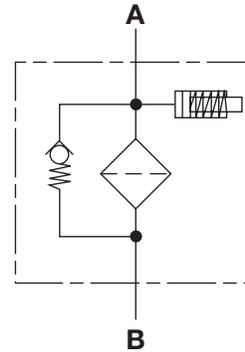


Industrial



Steel / Heavy Industry

Hydraulic Symbol



Technical Specifications

Mounting Method	4 Mounting holes - filter housing	
Port Connections	Inlet / Outlet	
30	1/2" Threaded / 0.71" Dia Smooth	
60/110	SAE-12 / SAE-12; 3/4" NPT / SAE-12	
160/240	SAE-20 / SAE-20; 1 1/4" NPT (with adapter) / SAE-20	
330	SAE-20 / 2" NPT (with flange port adapter)	
660	2" Threaded (NPT/BSPP/SAE) / same as inlet	
950	2" SAE Flange, Code 61 / 2" NPT	
1300	3" SAE Flange, Code 61 / 3" NPT	
	3" SAE Flange, Code 61 / 3" SAE Flange, Code 61	
	3-1/2" SAE Flange, Code 61 / 3-1/2" SAE Flange, Code 61	
	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. Allowable		
Working Pressure*	360 psi (25 bar); (size 30 - 145 psi, 10 bar)	
Fatigue Pressure	478 psi (33 bar) @ 700,000 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	3045 psi (210 bar)
Element Collapse Pressure Rating		
ON, W/HC,	290 psid (20 bar)	
ECON2, BN4AM, P/HC, AM	145 psid (10 bar)	
V	435 psid (30 bar)	
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C)	
	Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
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)	

*Note: All RF Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VMF" and "VR" indicators: B, BM, E, ES, GC, LE, LZ.

LOW PRESSURE FILTERS

Model Code

RF ON 330 D L 10 C 1 . X / 16 - V - B6

Filter Type
RF = Return Line Filter

Element Media
ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
ECON2 = ECOmicron® AM = Aquamicron®
W/HC = Wire Mesh P/HC = Polyester
V = Metal Fiber

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)
V = 101.5 psi (7 bar) when using following "VR" indicators: B, BM, E, ES, GC, LE, LZ

Type of Connection
B = 1/2" Threaded (size 30 - NPT / BSPP inlet/0.71" Outlet)
C = 3/4" Threaded (sizes 60, 110 - NPT / BSPP inlet/3/4" SAE Outlet)
E = 1 1/4" Threaded Inlet (SAE/NPT) / 1 1/4" threaded outlet (sizes 160 - 240) or 2" NPT outlet (size 330)] **NPT available with Adapter (to size 240)**
G = 2" Threaded (size 330 - NPT / BSPP / SAE Inlet / Outlet - same as inlet)
L = 2" SAE 32 Flange Inlet / 2" NPT Outlet (size 330)
M = SAE 48 Flange Inlet / SAE 48 Flange Outlet (size 660)
N = SAE 48 Flange Inlet / 3" NPT Outlet (size 660)
O = SAE 56 Flange (size 950) - Inlet & Outlet
P = SAE 64 Flange (size 1300) - Inlet & Outlet

Filtration Rating (micron)
1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = ECON2 40 = AM
25, 50, 74, 100, 149, 200 = W/HC 10, 20 = P/HC 3, 5, 10, 20 = V

Type of Static or ΔP Clogging Indicator
A, B, BM, C, D, E, LE (Others available upon request)

Type Number
1 = Standard Connection

Modification Number (latest version always supplied)

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

Seals
(omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve
(omit) = 43 psid (3 bar) (standard)
B1 = 14.5 psid (1 bar) (lube or coolant) B6 = 87 psid (6 bar) (return line extended life)] not available with ECON2
B2 = 29 psid (2 bar) KB = No Bypass (flushing systems)

Supplementary Details
SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
DE = ΔP Indicator - For in-line applications (sizes 660, 950, 1300)
T = With tank breather (size 30 only)
W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)
SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0330 R 010 ON / V B6

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

Filtration Rating (micron)
1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
3, 5, 10, 20 = ECON2 40 = AM
25, 50, 74, 100, 149, 200 = W/HC
10, 20 = P/HC 3, 5, 10, 20 = V

Element Media
ON, ECON2, BN4AM, AM, P/HC, W/HC, V

Seals
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

Bypass Valve
(omit) = 43 psid (3 bar) (standard) B6 = 87 psid (6 bar)
B1 = 14.5 psid (1 bar) KB = no bypass
B2 = 29 psid (2 bar)

Supplementary Details
SO263 = (same as above) W = (same as above)
SFREE = (same as above)

Clogging Indicator Model Code

VR 5 C . X /

Indicator Prefix
VR = Return Filters
VM = ΔP G 1/2 Indicator (sz. 660+, w/DE opt.)
VD = ΔP LE Indicator (sz. 660+, w/DE opt.)

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

Type of Indicator
A = No indicator, plugged port
B = Pop-up indicator (auto reset - static only)
BM = Pop-up indicator (manual reset)
C = Electric switch - SPDT
D = Electric switch and LED light - SPDT
E = Visual pressure gauge
LE = Electric switch and pop-up

Modification Number

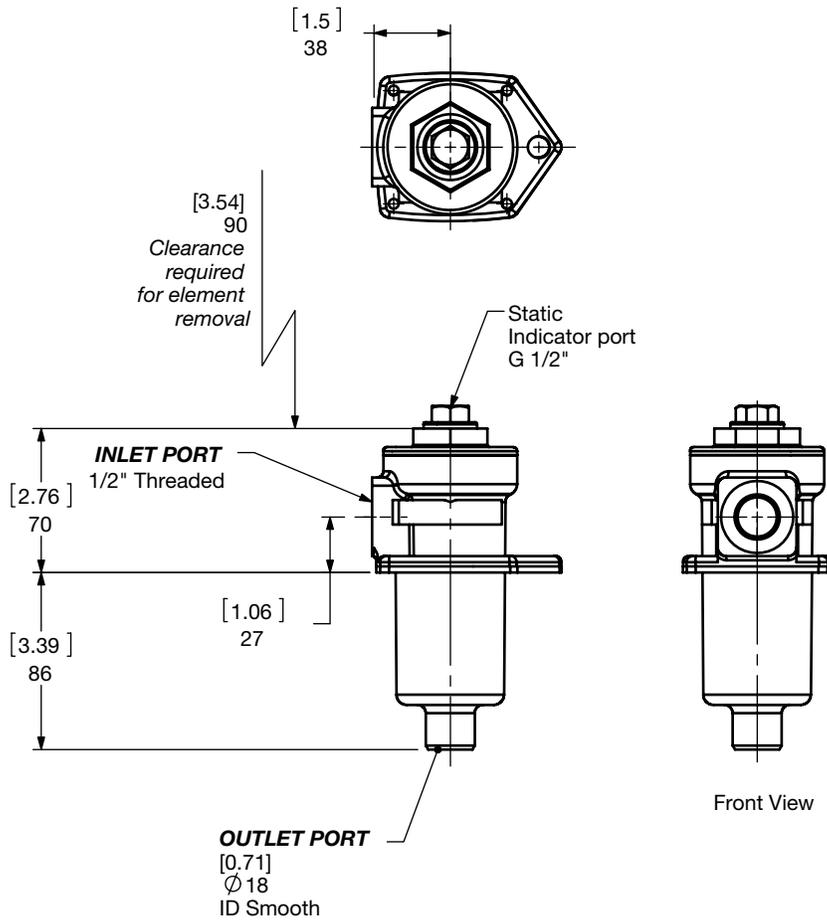
Supplementary Details
Seals
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)
Light Voltage (D type indicators only)
L24 = 24V L48 = 48V L110 = 110V L220 = 220V
(For additional details and options, see Section G - Clogging Indicators.)

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

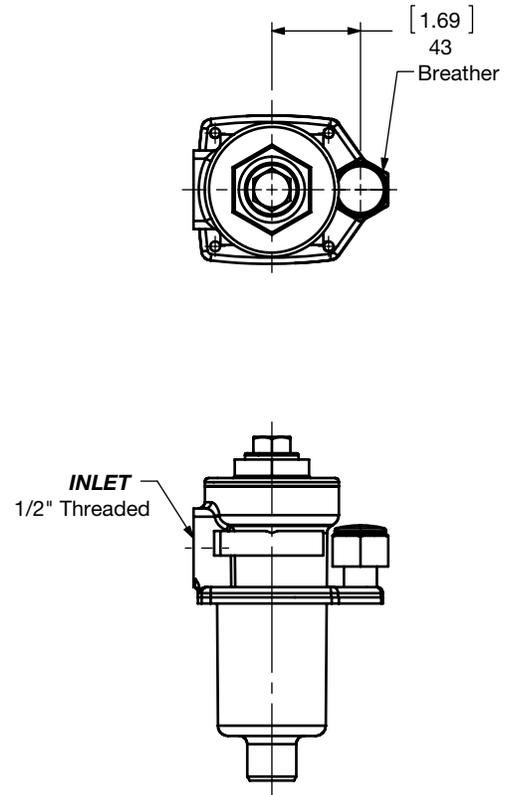
LOW PRESSURE FILTERS

Dimensions

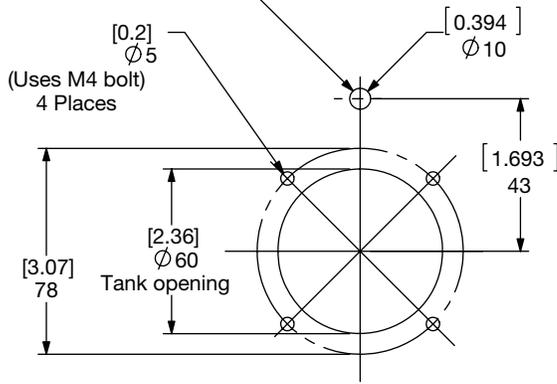
RF 30 (No Breather)



RF 30...T (With Breather)



Hole drilled in tank top only with RF30 including breather

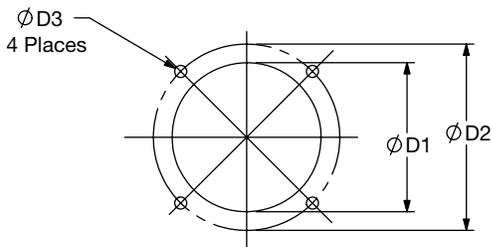
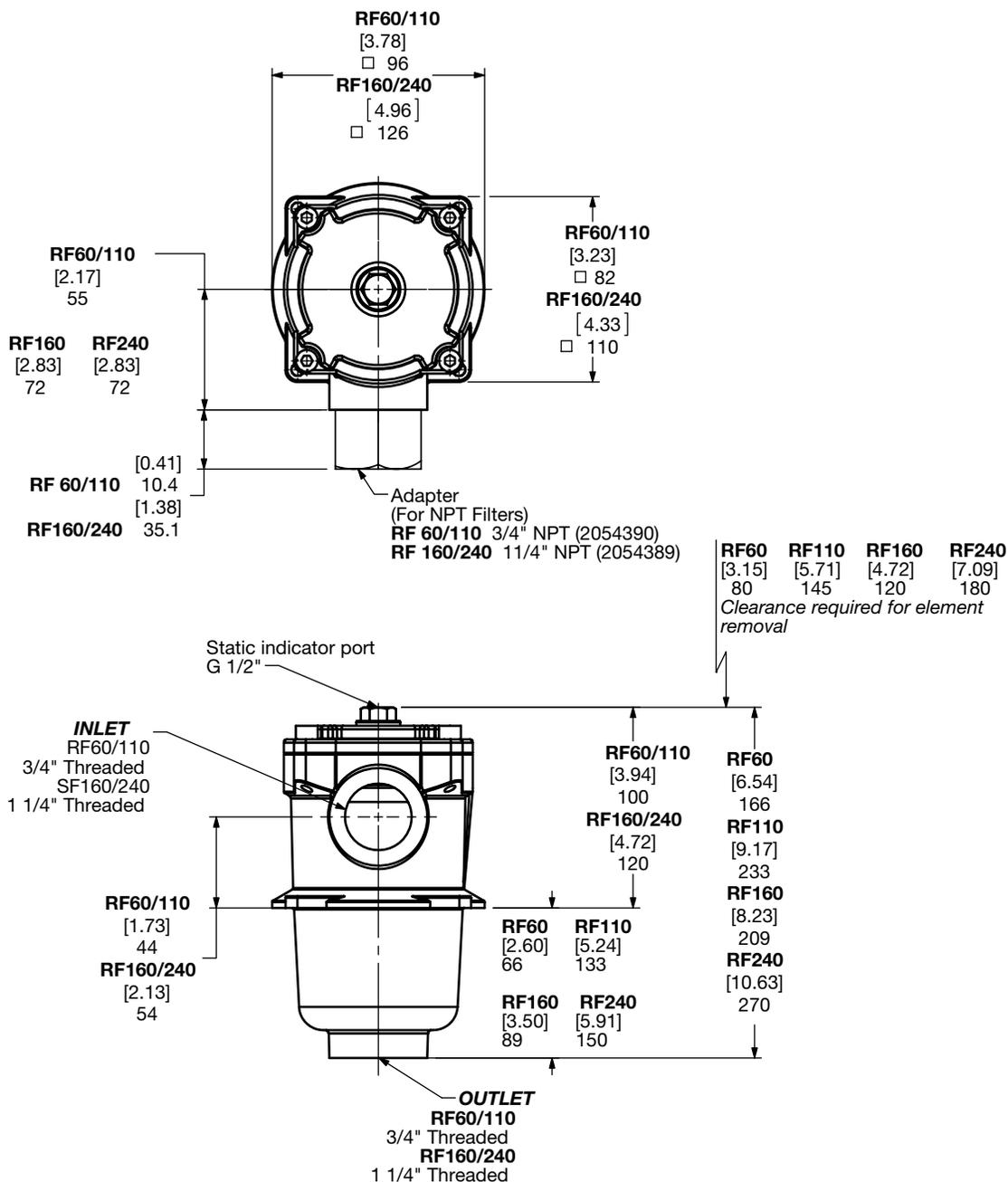


Mounting Pattern

Size	30
Weight (lbs.)	0.9

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RF 60 - 240



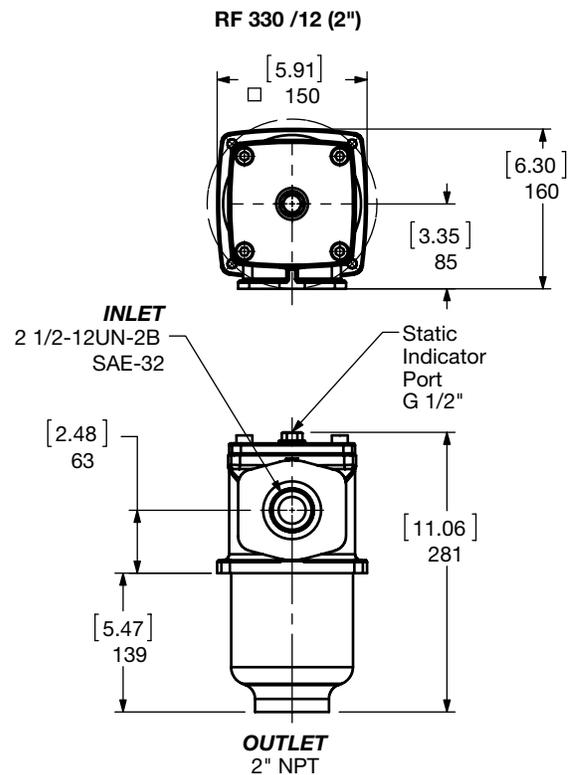
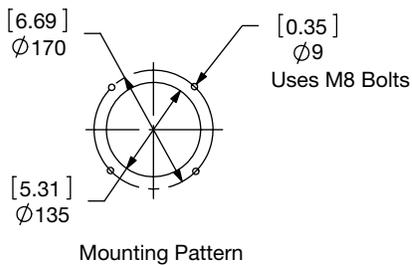
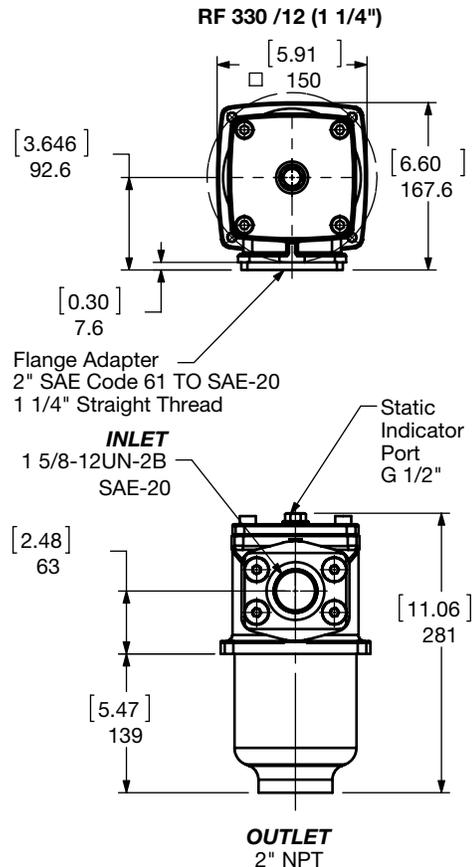
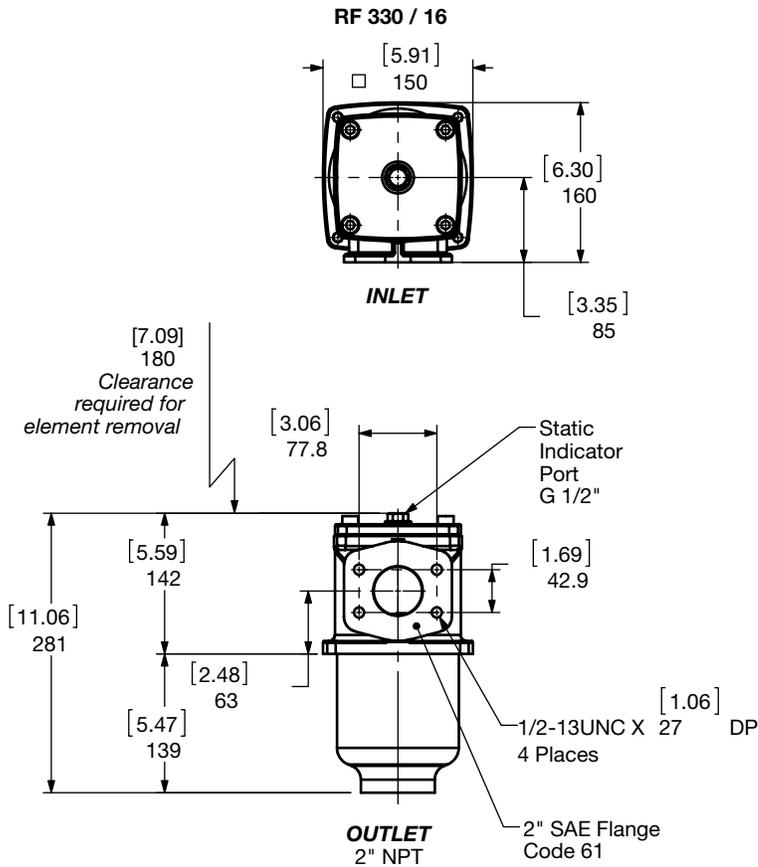
Size	øD1	øD2	øD3	Bolts
60 / 110	3.15" (80mm)	3.94" (100mm)	0.26" (6.5mm)	M5
160 / 240	4.17" (106mm)	5.32" (135mm)	0.30" (7.5mm)	M6

Size	60	110	160	240
Weight (lbs.)	2.0	2.5	4.0	5.0

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

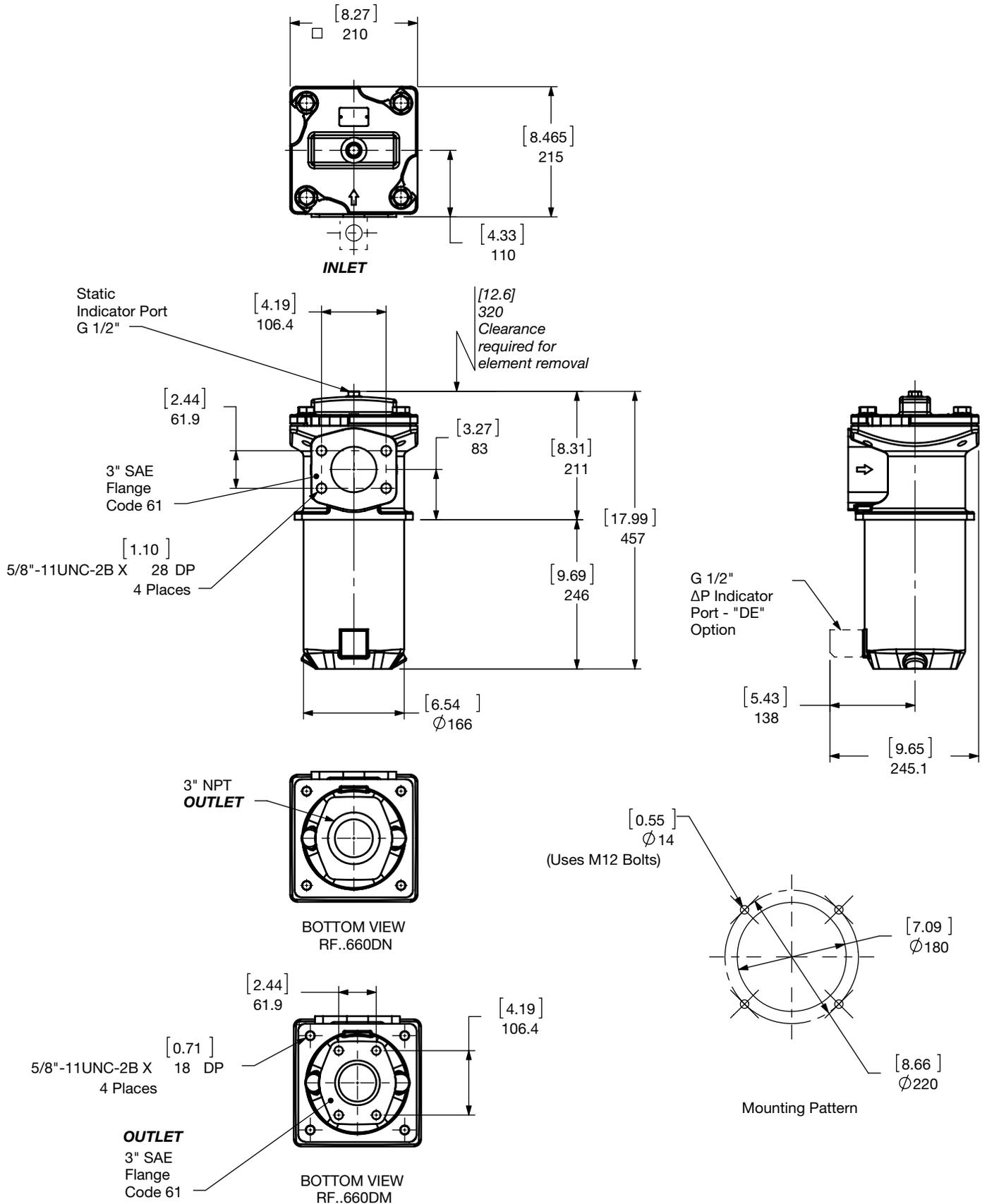
Dimensions RF 330



Size	330
Weight (lbs.)	9.0

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RF 660

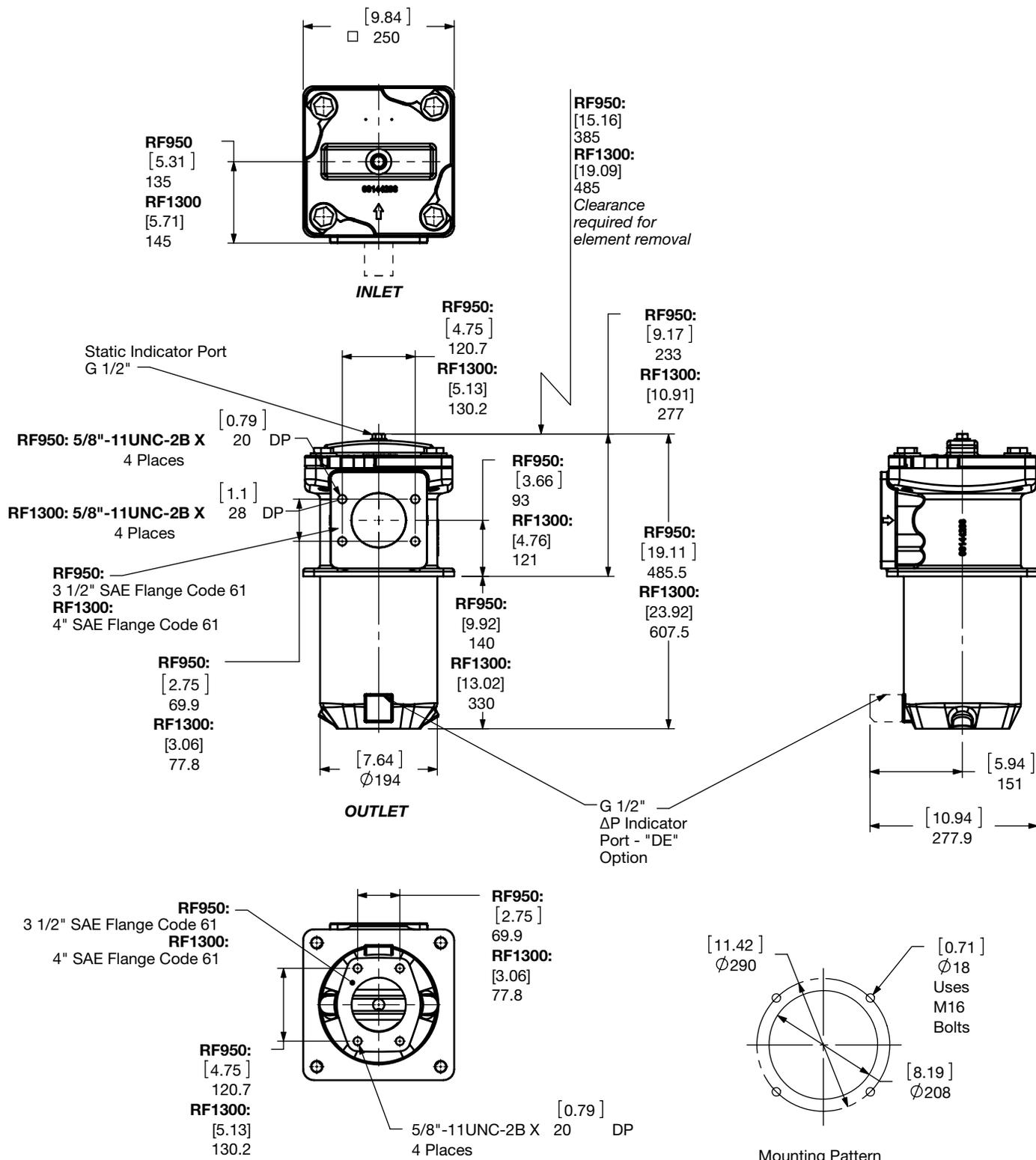


Size	660
Weight (lbs.)	158.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions RF 950 - 1300



Size	950	1300
Weight (lbs.)	232	260

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

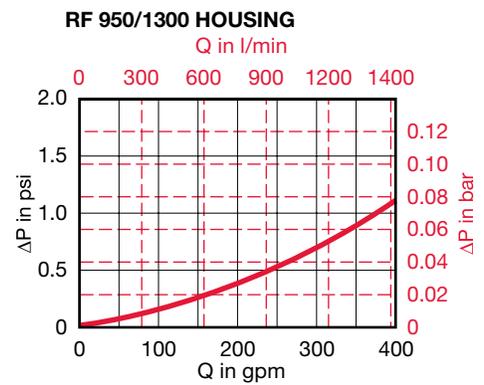
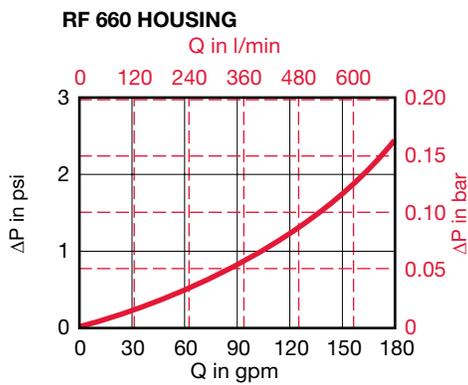
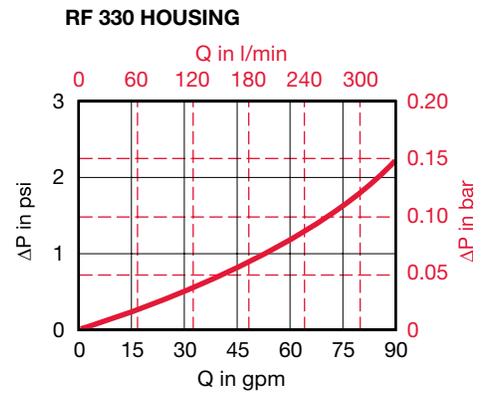
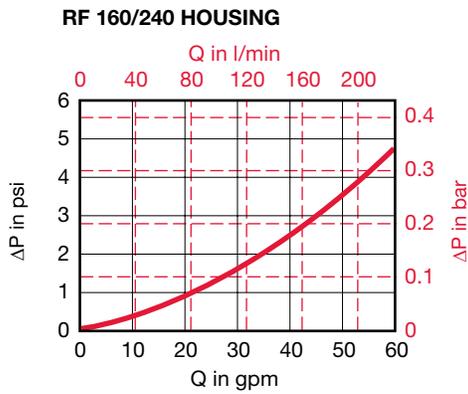
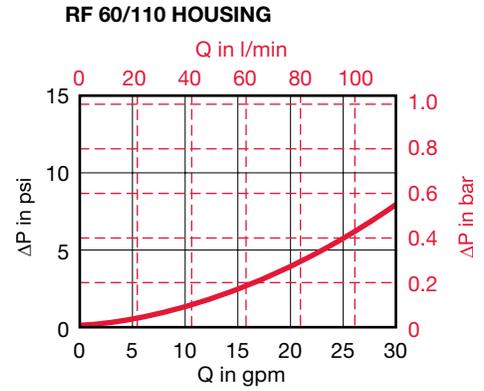
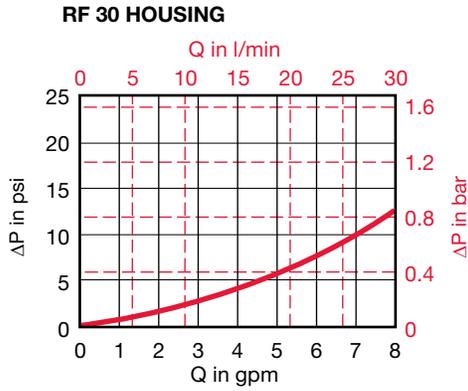
$$\text{Assembly P} = \text{Housing P} + \text{Element P}$$

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 HYDAC Filter Assemblies" in Section B - Overview)



LOW PRESSURE FILTERS

Element K Factors

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

(From Tables Below)

Optimicron	...R...ON					
Size	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0030 R XXX ON	4.928	3.754	2.409	1.471	0.922	0.807
0060 R XXX ON	2.59	1.295	0.944	0.539	0.494	0.376
0110 R XXX ON	1.224	0.719	0.487	0.296	0.234	0.178
0160 R XXX ON	0.878	0.439	0.312	0.177	0.148	0.182
0240 R XXX ON	0.571	0.284	0.201	0.125	0.101	0.077
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056
0660 R XXX ON	0.196	0.093	0.066	0.037	0.031	0.025
0950 R XXX ON	0.131	0.057	0.043	0.026	0.021	0.017
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012

ECOMICRON	...R...ECON2			
Size	3 µm	5 µm	10 µm	20 µm
0160 R XXX ECON2	0.521	0.324	0.209	0.159
0240 R XXX ECON2	0.340	0.209	0.143	0.099
0330 R XXX ECON2	0.230	0.148	0.093	0.066
0660 R XXX ECON2	0.104	0.066	0.044	0.027
0950 R XXX ECON2	0.066	0.044	0.027	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016

BETAMICRON/AQUAMICRON	...R...BN4AM	
Size	3 µm	10 µm
0330 R XXX BN4AM	0.477	0.165
0660 R XXX BN4AM	0.192	0.066
0950 R XXX BN4AM	0.132	0.044
1300 R XXX BN4AM	0.088	0.033

AQUAMICRON	...R...AM
Size	40 µm
0330 R 040 AM	0.115
0660 R 040 AM	0.051
0950 R 040 AM	0.036
1300 R 040 AM	0.026

Wire Mesh	...R...W/HC
Size	25, 50, 74, 100, 149, 200 µm
0030 R XXX W/HC	0.067
0060 R XXX W/HC	0.034
0110 R XXX W/HC	0.016
0160 R XXX W/HC	0.011
0240 R XXX W/HC	0.007
0330 R XXX W/HC	0.011
0660 R XXX W/HC	0.004
0950 R XXX W/HC	0.003
1300 R XXX W/HC	0.002

Polyester	...R...P/HC	
Size	10 µm	20 µm
0030 R XXX P/HC	0.181	0.092
0060 R XXX P/HC	0.092	0.046
0110 R XXX P/HC	0.050	0.025
0160 R XXX P/HC	0.035	0.017
0240 R XXX W/HC	0.023	0.012
0330 R XXX W/HC	0.016	0.008
0660 R XXX W/HC	0.008	0.004
0950 R XXX W/HC	0.006	0.003
1300 R XXX W/HC	0.004	0.002

S.S. Wire Mesh "R"	...R...V US UNITS			
Size	3 µm	5 µm	10 µm	20 µm
0030 R XXX V	1.065	0.779	0.434	0.209
0060 R XXX V	0.873	0.510	0.296	0.181
0110 R XXX V	0.417	0.280	0.165	0.110
0160 R XXX V	0.269	0.192	0.132	0.082
0240 R XXX V	0.176	0.143	0.093	0.066
0330 R XXX V	0.115	0.093	0.060	0.044
0660 R XXX V	0.055	0.044	0.033	0.022
0950 R XXX V	0.038	0.033	0.022	0.011
1300 R XXX V	0.027	0.022	0.016	0.011

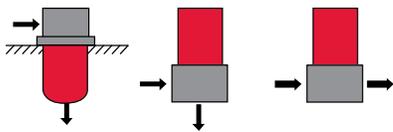
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

NF Series

In-Tank / Inline Filters

360 psi • up to 450 gpm (4" piping) • up to 1350 gpm (6" piping)



1.0 Version

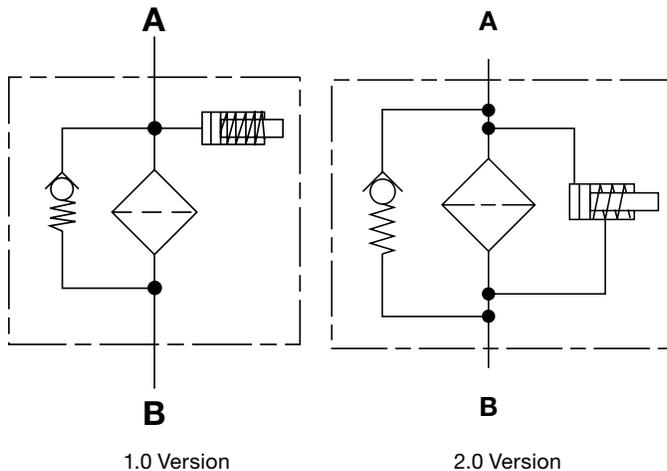


2.0 Version



1350 / 2650

Hydraulic Symbol



Features

- NF Filters have an extremely large filtration area and flow capacity of 450 gpm (4" pipe size limitation)
 - 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 high 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 (1.0 Version only)
 - Filters can be fitted with clogging indicators to monitor the contamination level of the element
 - Flange connection bolts included for all SAE-DIN flange ports
- Note: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Applications



Agricultural



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Technical Specifications

Mounting Method	See drawings	
Port Connection	4" SAE-64 Flange Code 61 (with M16 bolts included)	
Flow Direction	1.0 version 2.0 version 1350 / 2650	Inlet: Side Outlet: Bottom Inlet: Side Outlet: Bottom Inlet: Side Outlet: Side
Construction Materials	Head, Housing, Lid Elbows, Manifolds	Aluminum Ductile Iron
Flow Capacity	330 500 750 1310, 1350 2610, 2650, 5210, 7810, 10410	4" Headers 80 gpm (303 lpm) 132 gpm (500 lpm) 200 gpm (757 lpm) 343 gpm (1300 lpm) 450 gpm (1700 lpm) 6" Headers 900 gpm (3407 lpm) 1350 gpm (5110 lpm) 1350 gpm (5110 lpm)
Housing Pressure Rating	Max. Allowable Working Pressure* Fatigue Pressure Burst Pressure	360 psi (25 bar) 360 psi (25 bar) 1754 psi (121 bar)
Element Collapse Pressure Rating	ON, W/HC ECON2, BN4AM, P/HC, AM V	290 psid (20 bar) 145 psid (10 bar) 435 psid (30 bar)
Fluid Temperature Range	-22°F to 212°F (-30°C to 100°C) Consult HYDAC for applications below -22°F (-30°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% $\Delta P = 72$ psid (5 bar) -10%	1.0 - Static 2.0 - Differential
Bypass Valve Cracking Pressure	$\Delta P = 14.5$ psid (1 bar) +10% $\Delta P = 43$ psid (3 bar) +10% (standard) $\Delta P = 87$ psid (6 bar) +10%	

*Note: All NF...1.0 Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VMF" and "VR" indicators: B, BM, E, ES, GC, LE, LZ.

Model Code

NF ON 1310 D P 3 BM 1.0 / A V

Filter Type
 NF = In-Tank Return Line Filter

Element Media
 ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester
 V = Metal Fiber

Size
 330, 500, 750, 1310, 1350, 2610, 2650, 5210, 7810, 10410

Operating Pressure
 D = 360 psi (25 bar)
 V = 101.5 psi (7 bar) (When using the following "VR" indicators: B, BM, E, ES, GC, LE, LZ - 1.0 Ver.)

Type of Connection
 P = SAE DN 100 (4") flange L = SAE DN 50 (2") flange
 K = SAE DN 38 (1 1/2") flange M = SAE DN 65 (2 1/2") flange (1350/2650 only)
 7 = 6" ANSI CS 300lb. flange N = SAE DN 80 (3") flange

Filtration Rating (micron)
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2 3, 10 = BN4AM 40 = AM
 10, 20 = P/HC 25, 74, 149 = W/HC 3, 5, 10, 20 = V

Type of Static or ΔP Clogging Indicator
 A, B, BM, C, D, LE (Others available upon request)

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

Flow Path (facing Inlet manifold headers)
 (omit) = Sizes 330, 500, 750, 1310 and 2610 only C = Left inlet, Right outlet
 A = Left inlet, Left outlet D = Right inlet, Left outlet (sizes 5210 - 10410 only)
 B = Right inlet, Right outlet (sizes 5210 - 10410 only)

Seals
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system)] not available with ECON2

Supplementary Details
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 EM = Manual vent valve set
 VKD = Drain manifold
 W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

1300 R 003 ON / V

Size
 330, 500, 750,
 1300 - for housings: 1310, 1350
 2600 - for housings: 2610, 2650,
 5210, 7810, 10410

Filtration Rating (micron)
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2
 3, 10 = BN4AM 40 = AM 10, 20 = P/HC
 25, 74, 149 = W/HC 3, 5, 10, 20 = V

Element Media
 ON, ECON2, BN4AM, AM, P/HC, W/HC, V

Seals
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details
 SO263 = (same as above) W = (same as above)
 SFREE = (same as above)

Clogging Indicator Model Code

VR 2 BM . X / V

Indicator Prefix
 VR = Static Pressure, G 1/2" (1.0 ver.)
 VM = ΔP G 1/2" 3000 psi (2.0 ver.)
 VD = ΔP G 1/2" 6000 psi
 (2.0 ver. - LE Indicators only)

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

Type of Indicator
 A = No indicator, plugged port
 B = Pop-up indicator (auto reset - static only)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT
 LE = Electric switch and pop-up

Modification Number

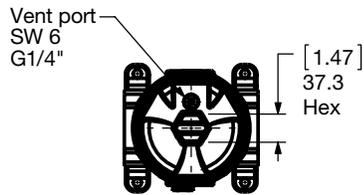
Supplementary Details
Seals
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)
Light Voltage (D type indicators only)
 L24 = 24V L110 = 110V
 W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)
 (For additional details and options, see Section G - Clogging Indicators.)

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

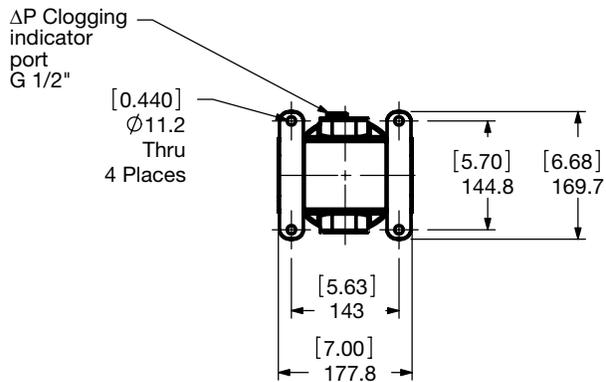
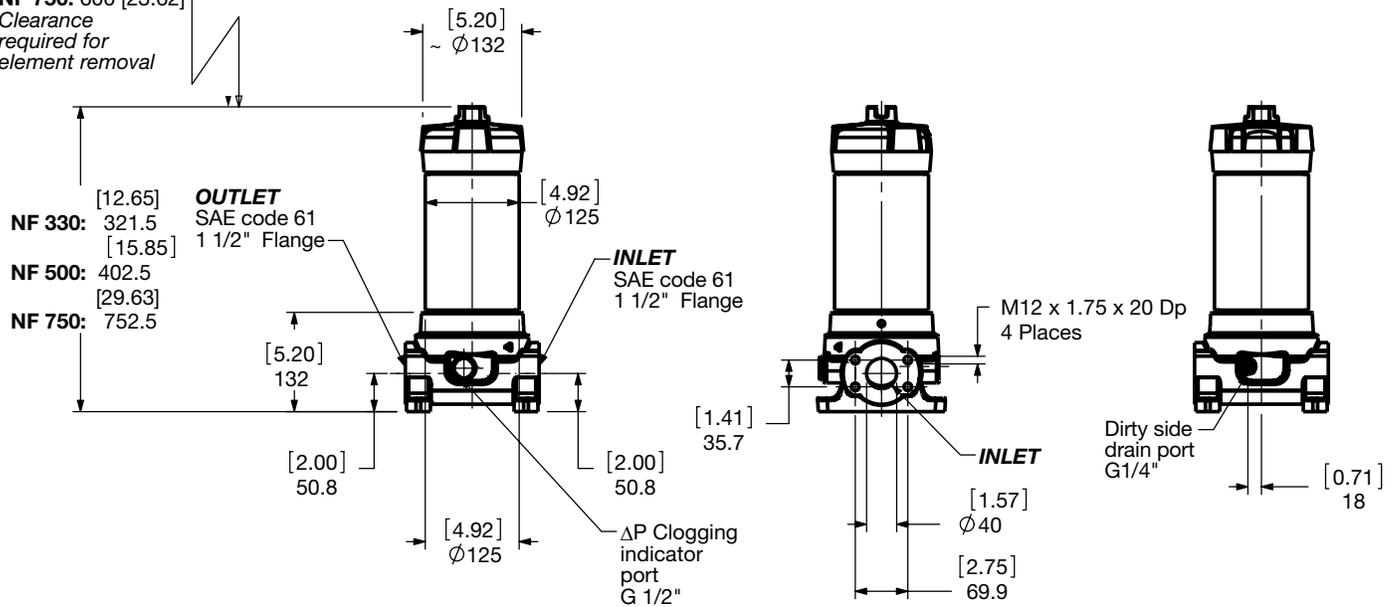
LOW PRESSURE FILTERS

Dimensions

NF 330 - 750 2.0 Version (In-line)



NF 330: 170 [6.69]
 NF 500: 250 [9.84]
 NF 750: 600 [23.62]
 Clearance
 required for
 element removal

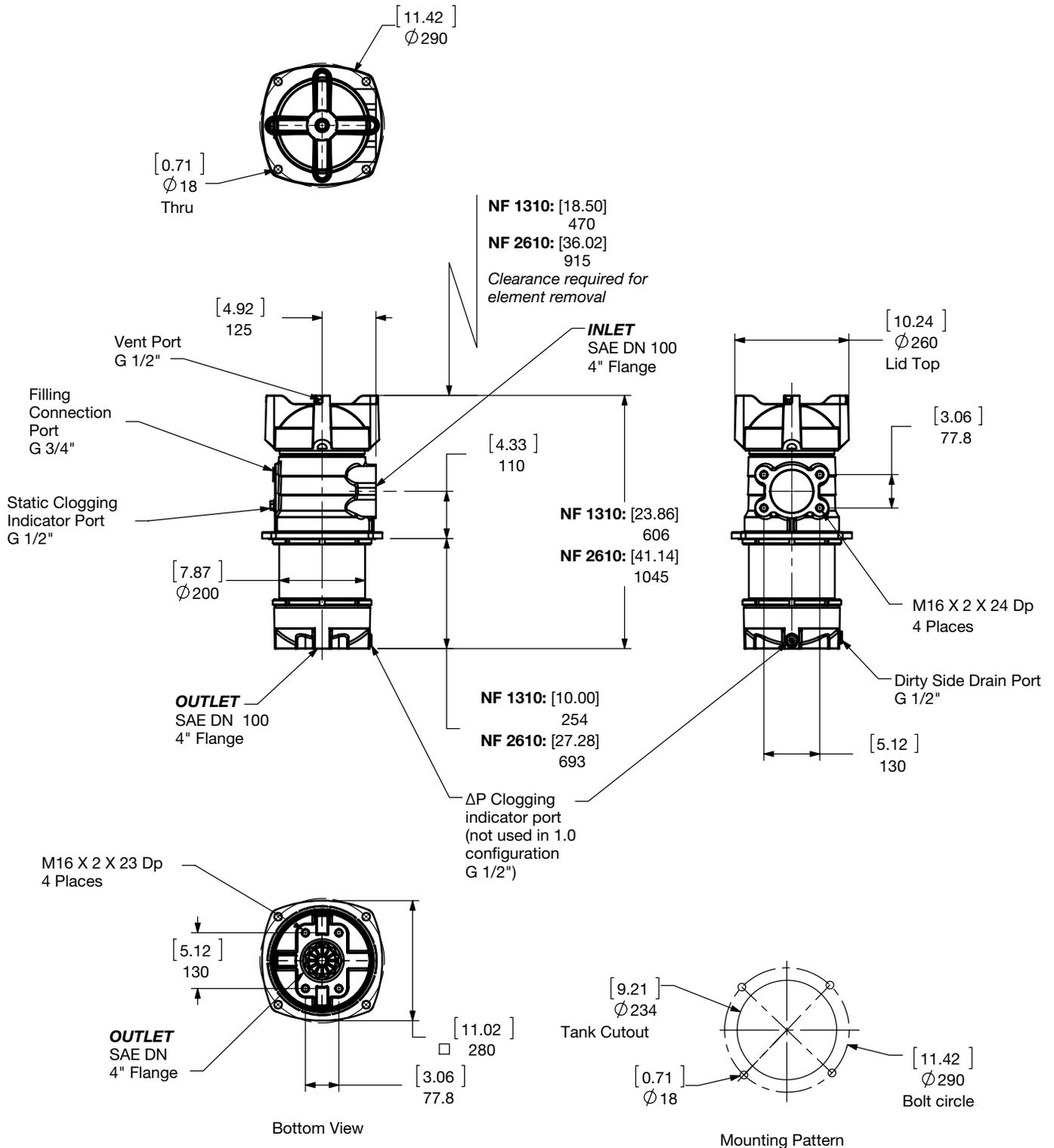


Bottom View
 Mounting Pattern

Size	330	500	750
Weight (lbs.)	17.2	19.9	31.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
 For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 1310 / 2610 1.0 Version (In-Tank)



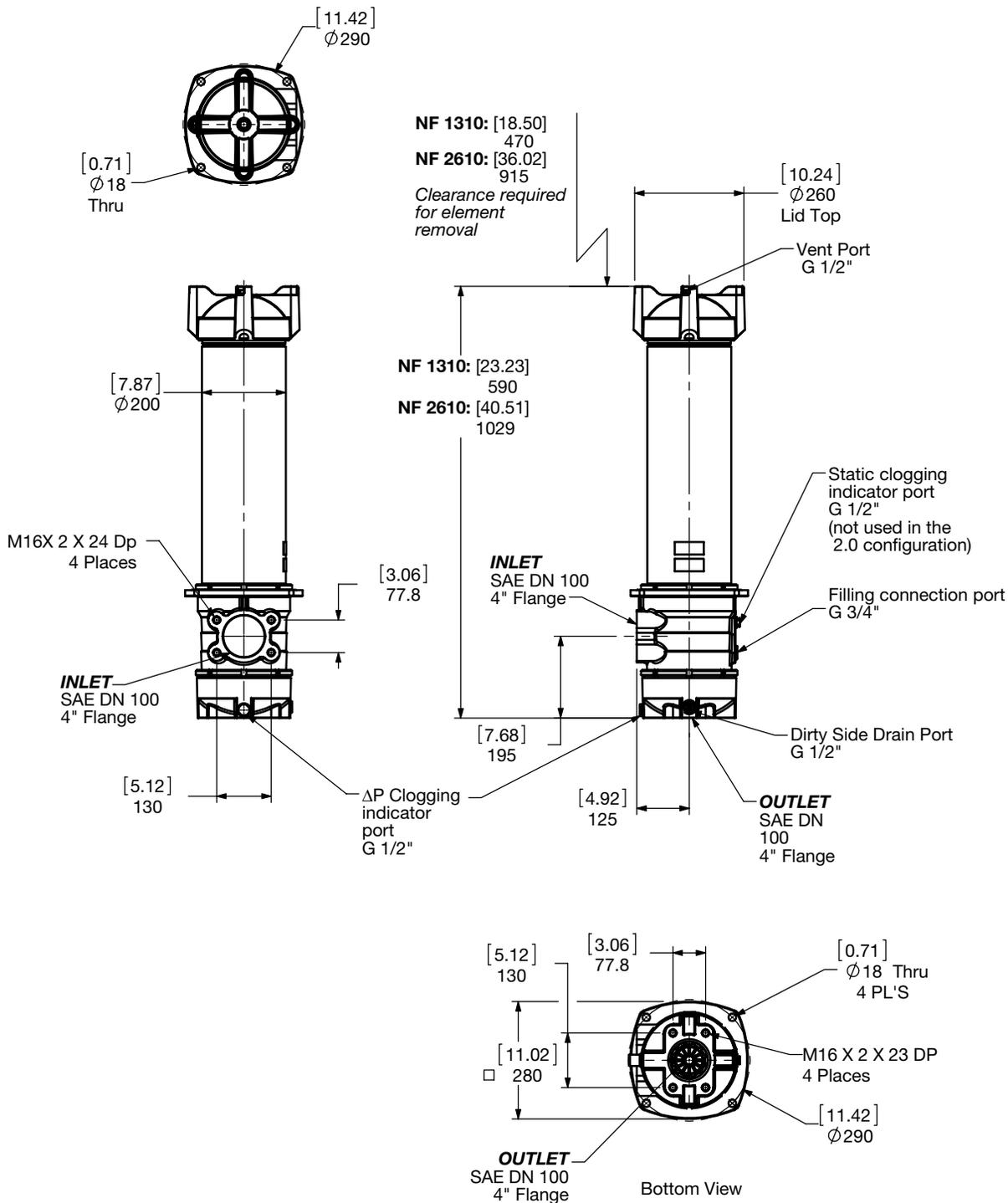
Size	1310	2610
Weight (lbs.)	37.5	50.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:

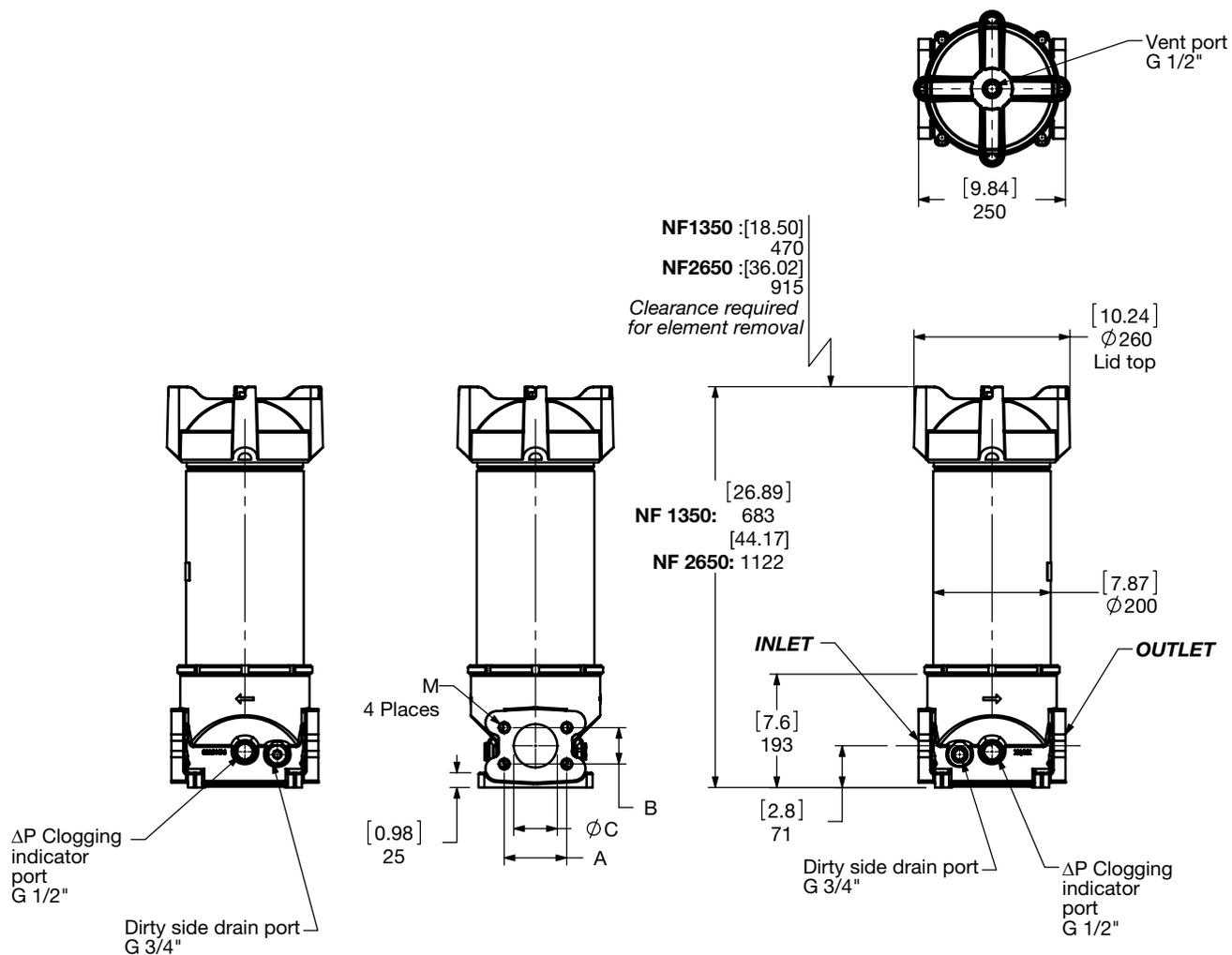
NF 1310 / 2610 2.0 Version (In-line)



Size	1310	2610
Weight (lbs.)	37.5	50.7

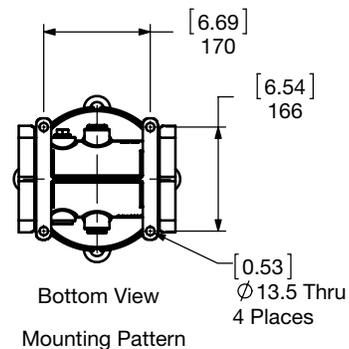
Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 1350 / 2650 2.0 Version



Port Connections

Flange	A	B	øC	M
2" SA-DN 50	77.8	42.9	50	M12 x 1.79 x 19 DP
2 1/2" SAE-DN 65	88.9	50.8	65	M12 x 1.79 x 19 DP
3" SAE-DN 80	106.4	62.9	75	M16 x 2.0 x 24 DP
4" SA-DN 100	130.2	77.8	100	M16 x 2.0 thru

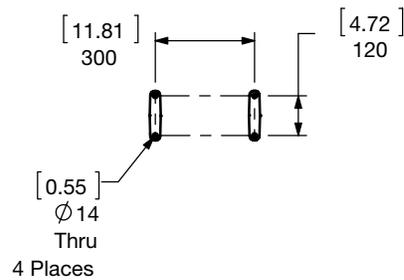
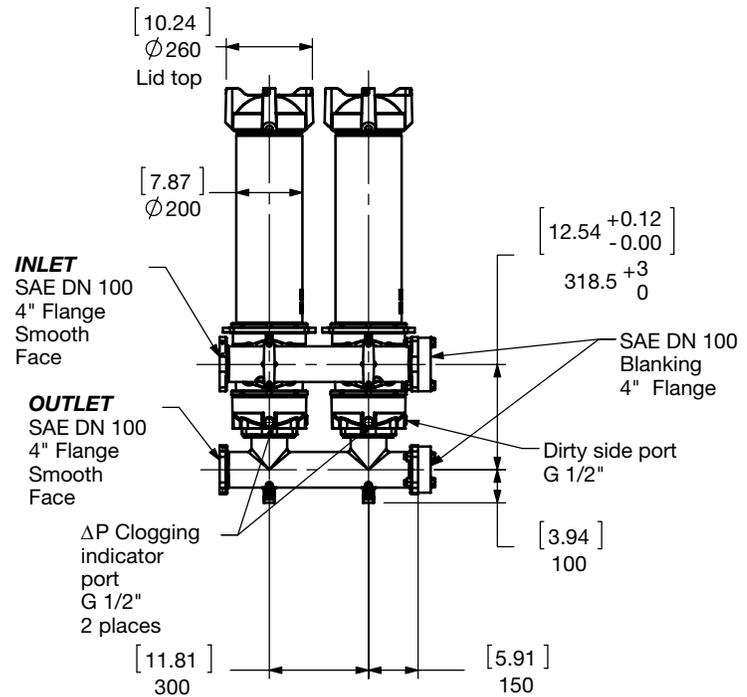
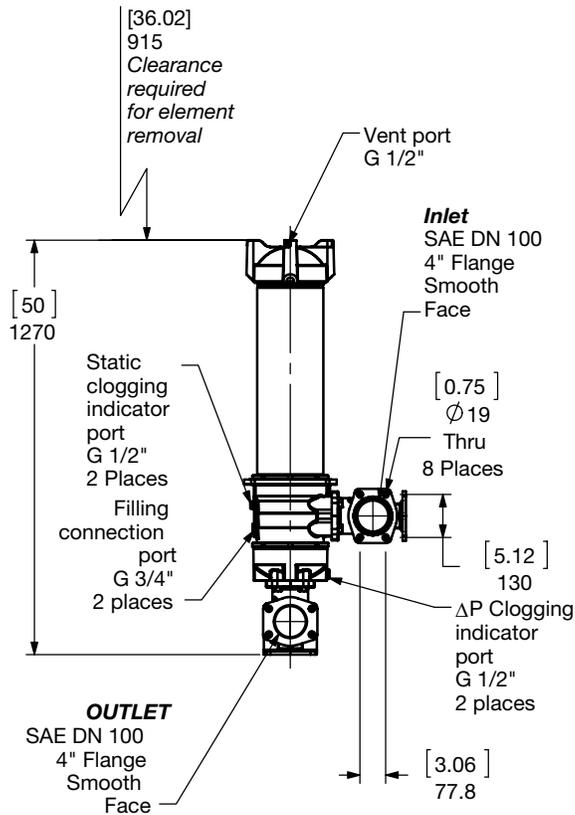
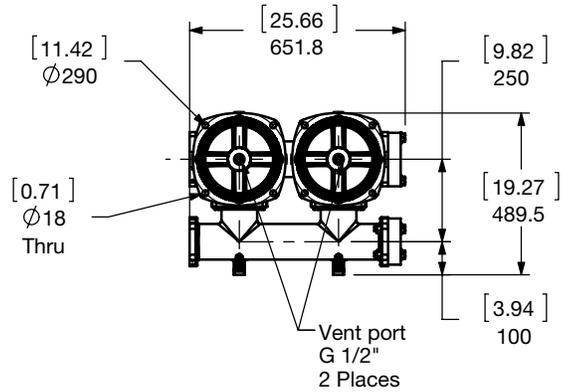


Size	1350	2650
Weight (lbs.)	39.7	55.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:
NF 5210 2.0 Version

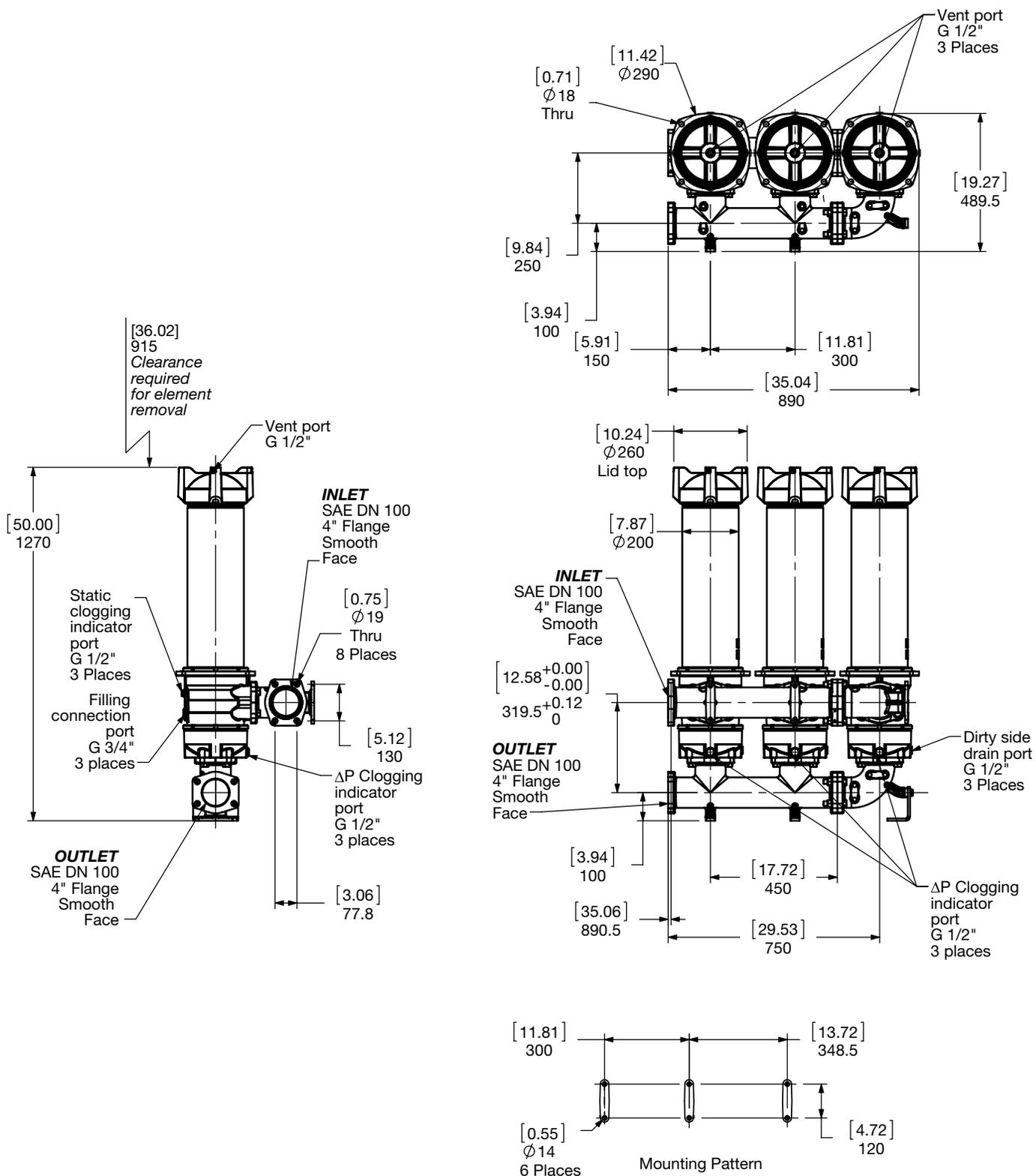


Mounting Pattern

Size	5210
Weight (lbs.)	198.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 7810 2.0 Version

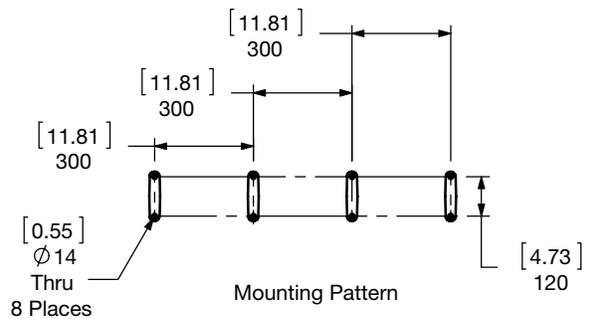
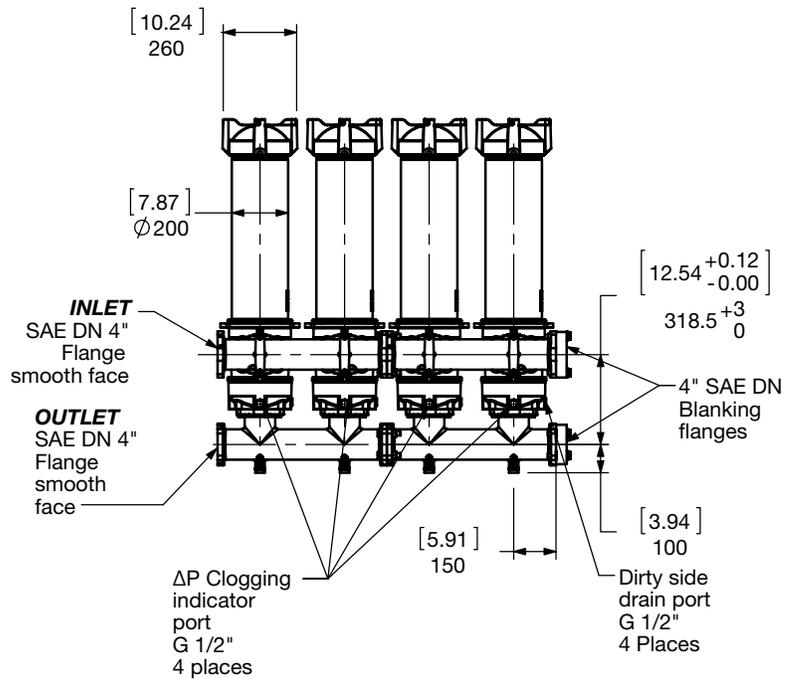
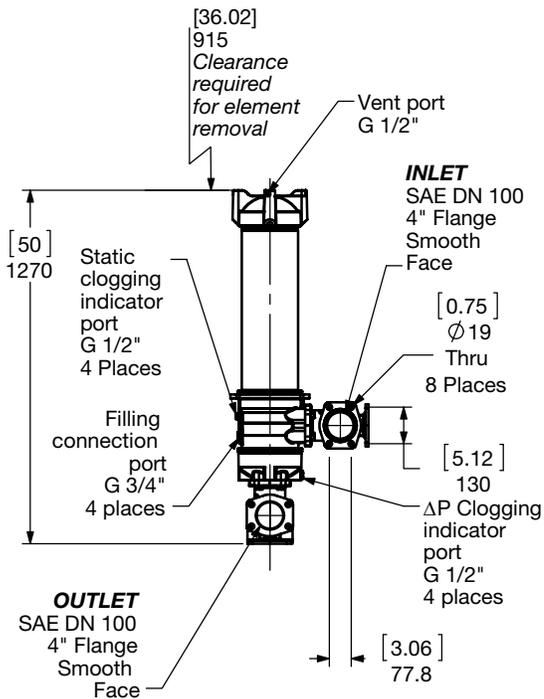
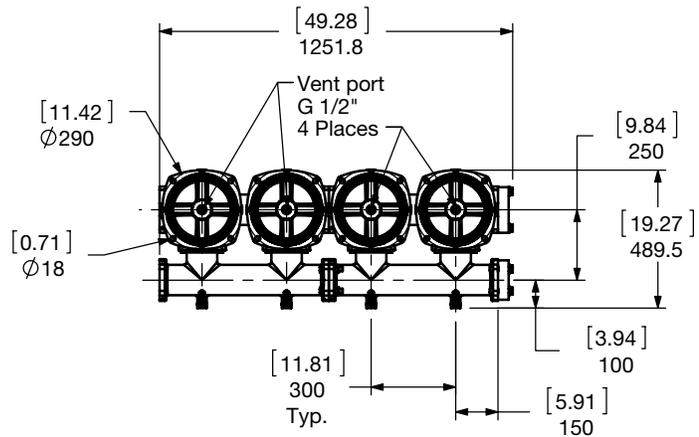


Size	7810
Weight (lbs.)	275.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

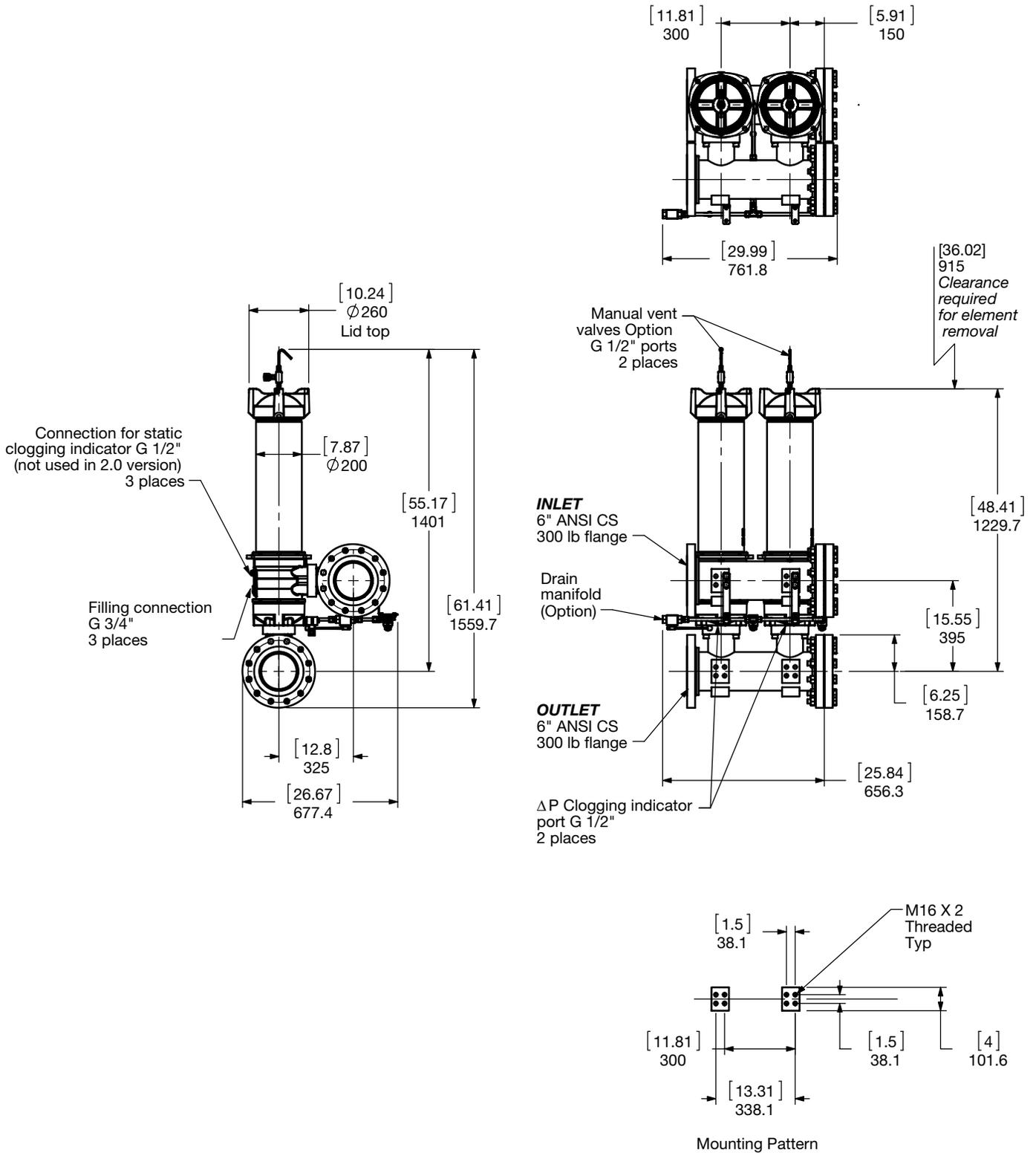
Dimensions:
NF 10410 2.0 Version



Size	10410
Weight (lbs.)	397

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 5210DC7XX2.0/A EM-VKD (Modular Parallel High Flow)



Size	5210DC7XX2.0/A EM-VKD
Weight (lbs.)	485

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

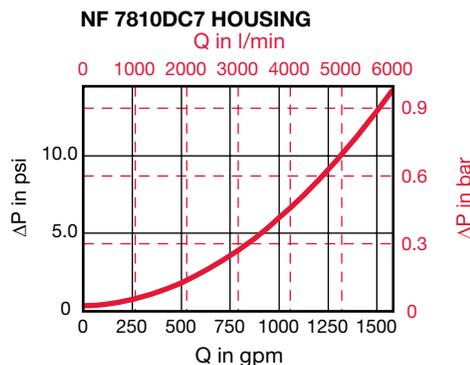
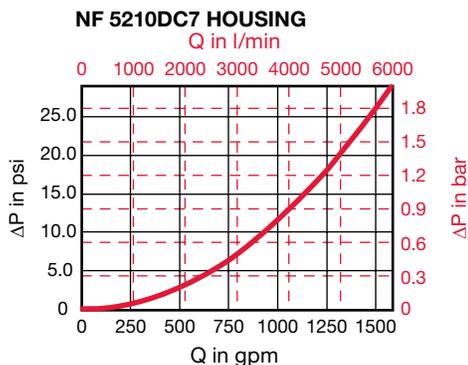
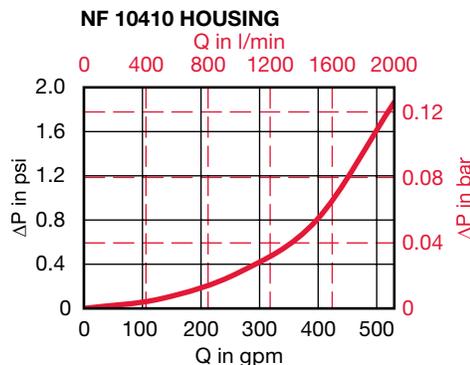
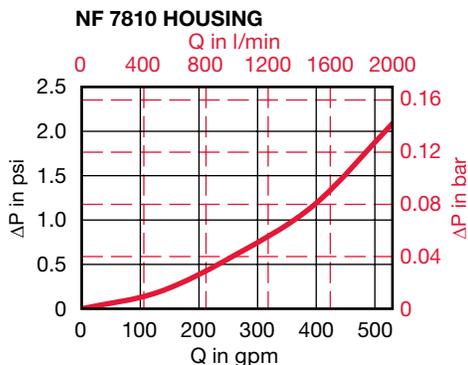
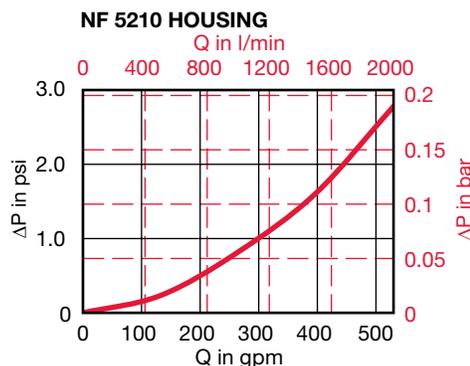
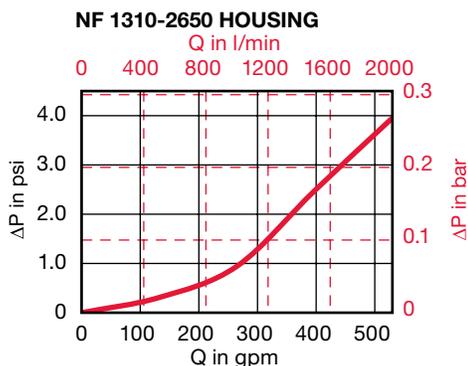
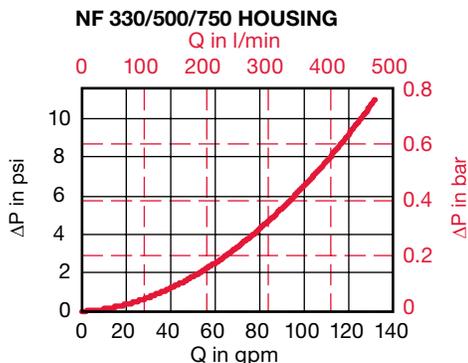
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



LOW PRESSURE FILTERS

Element K Factors

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

(From Tables Below)

Optimicron	...R...ON					
Size	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056
0500 R XXX ON	0.289	0.143	0.104	0.06	0.046	0.038
0750 R XXX ON	0.116	0.061	0.05	0.029	0.019	0.018
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECOMICRON	...R...ECON2			
Size	3 µm	5 µm	10 µm	20 µm
0330 R XXX ECON2	0.230	0.148	0.093	0.066
0500 R XXX ECON2	0.165	0.104	0.071	0.044
0750 R XXX ECON2	0.071	0.049	0.033	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicron	...R...BN4AM	
Size	3 µm	10 µm
0330 R XXX BN4AM	0.477	0.165
0500 R XXX BN4AM	0.313	0.11
0750 R XXX BN4AM	0.126	0.044
1300 R XXX BN4AM	0.088	0.033
2600 R XXX BN4AM	0.055	0.016

Aquamicron	...R...AM
Size	40 µm
0330 R 040 AM	0.115
0500 R 040 AM	0.076
0750 R 040 AM	0.030
1300 R 040 AM	0.026
2600 R 040 AM	0.013

Wire Mesh	...R...W/HC
Size	25, 50, 74, 100, 149, 200 µm
0330 R XXX W/HC	0.011
0500 R XXX W/HC	0.007
0750 R XXX W/HC	0.003
1300 R XXX W/HC	0.002
2600 R XXX W/HC	0.001

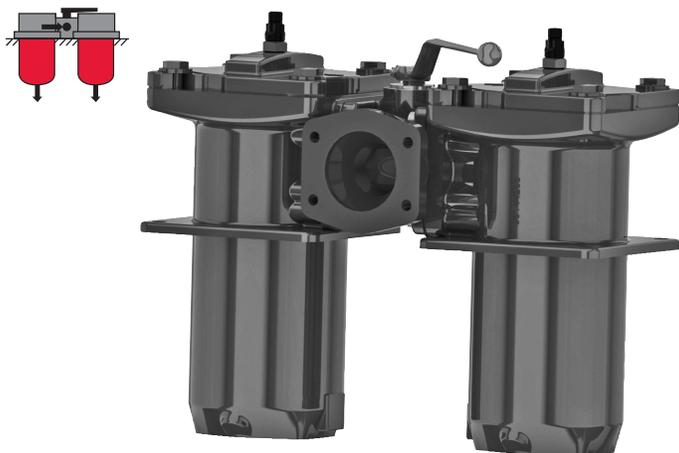
Polyester	...R...P/HC	
Size	10 µm	20 µm
0330 R XXX P/HC	0.016	0.008
0500 R XXX P/HC	0.011	0.005
0750 R XXX P/HC	0.004	0.002
1300 R XXX P/HC	0.004	0.002
2600 R XXX P/HC	0.002	0.001

LOW PRESSURE FILTERS

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 60-240 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 rubber, fluorocarbon elastomer, ethylene propylene rubber) 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.
- All RFD duplex filters have a ball-type selector valve to provide continuous filtration without system shut-down to change clogged elements.
- Single piece housing castings provide strength and rigidity for in-line or in-tank mounting

Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



Power Generation

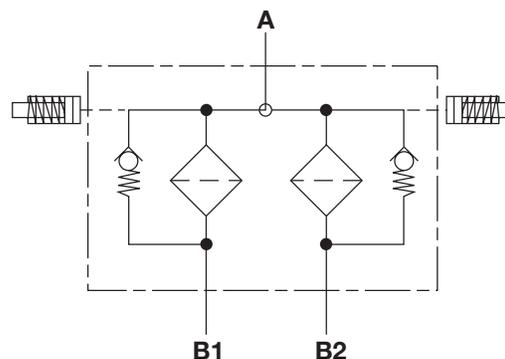


Pulp & Paper



Steel / Heavy Industry

Hydraulic Symbol



Technical Specifications

Mounting Method	4 Mounting holes in the filter housing		
Port Connections	Inlet / Outlet		
60/110	SAE-12 / SAE-12; 3/4"NPT (adapter) / SAE-12		
160/240	SAE-16 (adapter) / G-1-1/4" female; 1"NPT (adapter) / G-1-1/4" female		
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. Allowable Working Pressure*	360 psi (25 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			
ON, W/HC,	290 psid (20 bar)		
ECON2, BN4AM, P/HC, AM	145 psid (10 bar)		
V	435 psid (30 bar)		
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)		
Consult HYDAC for applications below 14°F (-10°C)			
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.		
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)		

*Note: All RFD Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VMF" and "VR" indicators: B, BM, E, ES, GC, LE, LZ.

Model Code

RFD ON 330 D A L 10 D 1 . X / 16 - V - B6

Filter Type _____
 RFD = Duplex In-Tank Return Line Filter

Element Media _____
 ON = Optimicron® BN/AM = Betamicon®/Aquamicron®
 ECON2 = ECOmicron® AM* = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester
 V = Metal Fiber

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

Pressure Rating _____
 D = 360 psi (25 bar)
 V = 101.5 psi (7 bar) (When using the following "VR" indicators: B, BM, E, ES, GC, LE, LZ)

Type of Changeover Valve _____
 A = Ball Valve

Type of Connection _____
 C = 3/4" Threaded (sizes 60, 110); 3/4" NPT w/ Adapter
 D = 1" Threaded Inlet (adapter) / G-1-1/4" female Outlet (szs 160, 240); 1" NPT & SAE-16 inlet w/Adapter
 G = 2" Threaded (NPT/BSPP only size 330)
 L = 2" SAE Flange Inlet / 2" NPT Outlet (size 330)
 M = 3" SAE Flange Inlet / 3" Flange Outlet (size 660)
 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 Inlet / 4" SAE Flange Outlet (size 1300)

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2 3, 10 = BN/AM 40 = AM
 10, 20 = P/HC 25, 74, 149 = W/HC 3, 5, 10, 20 = V

Type of Static or ΔP Clogging Indicator _____
 A, B, BM, C, D, E (Others available upon request) - Note: 2 required

Type Number _____
 1 = Standard Connection

Modification Number (latest version always supplied) _____

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

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B2 = 29 psid (2 bar)
 B6 = 87 psid (6 bar) (return line extended life)] not available with ECON2
 KB = no bypass (flushing system)

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 SFREE = Element specially designed to minimize electrostatic charge generation

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

Replacement Element Model Code

0330 R 010 ON / V B6

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

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149 = W/HC 10, 20 = P/HC
 3, 5, 10, 20 = V

Element Media _____
 ON, BN4AM, ECON2, AM, W/HC, P/HC, V

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B2 = 29 psid (2 bar) B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details _____
 SO263 = (same as above) SFREE = (same as above)

Clogging Indicator Model Code

VR 5 D . X / V

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 = Pop-up indicator (auto reset - static only)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT
 E = Visual pressure gauge

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

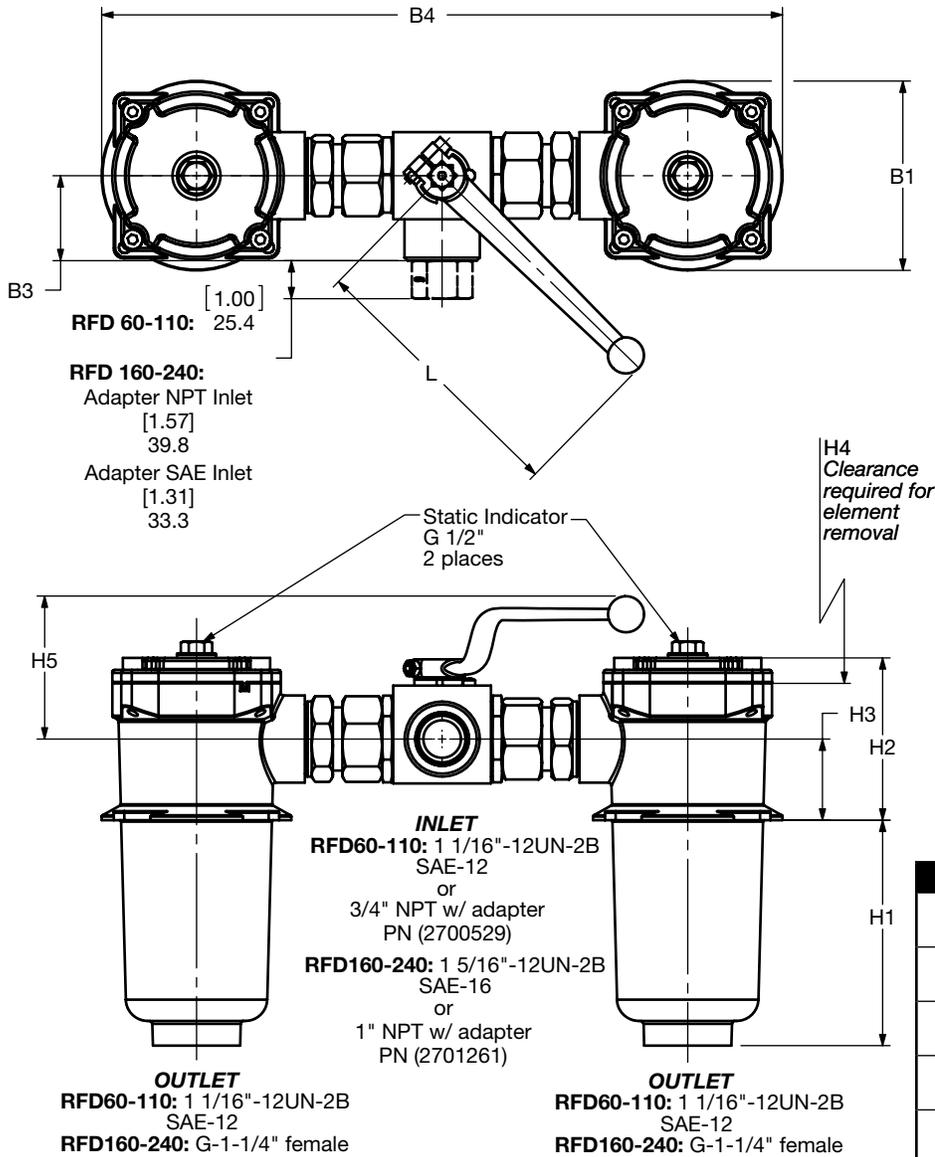
Light Voltage (D type indicators only) _____
 L24 = 24V L48 = 48V L110 = 110V L220 = 220V

(For additional details and options, see Section G - Clogging Indicators.)

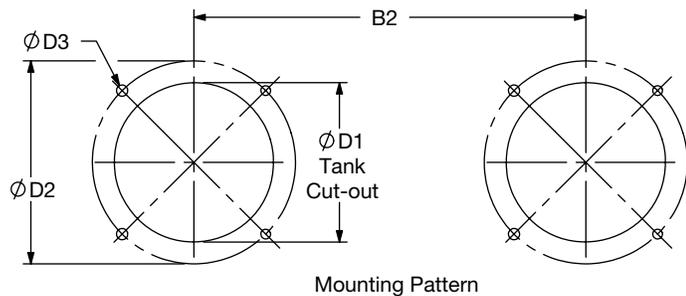
Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

LOW PRESSURE FILTERS

Dimensions RFD 60 - 240



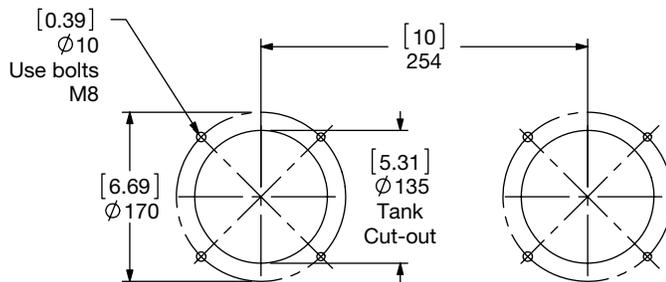
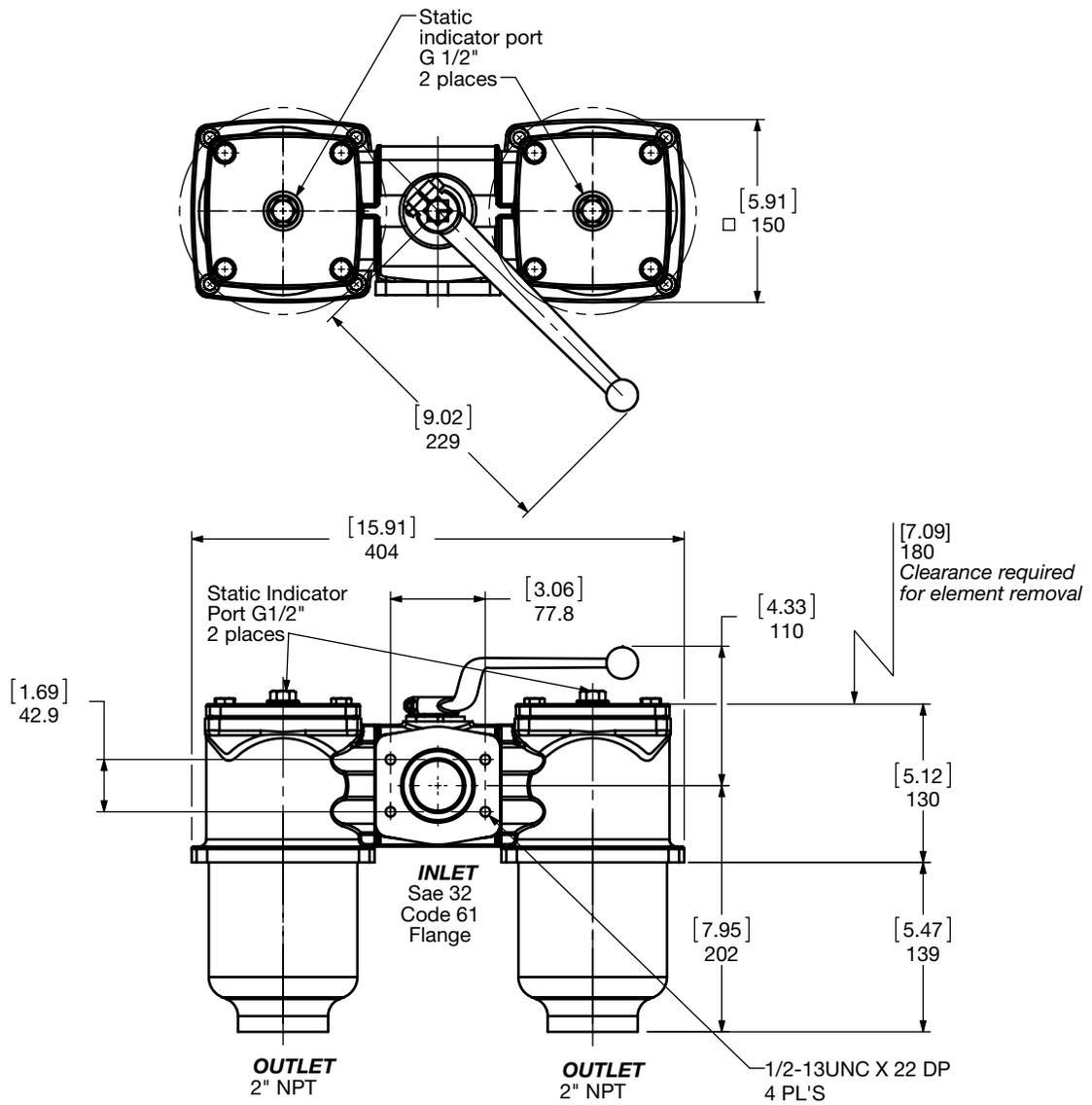
Size	60	110	160	240
B1	[3.77] 96	[3.77] 96	[4.96] 126	[4.96] 126
B2	[10.26] 260.5	[10.26] 260.5	[13.2] 335.5	[13.2] 335.5
B3	[1.87] 47.5	[1.87] 47.5	[2.22] 56.5	[2.22] 56.5
B4	[14] 357	[14] 357	[18.14] 461	[18.14] 461
D1	[3.15] 80	[3.15] 80	[4.17] 106	[4.17] 106
D2	[3.9] 100	[3.9] 100	[5.3] 135	[5.3] 135
D3	[0.315] 8	[0.315] 8	[0.374] 9.5	[0.374] 9.5
H1	[2.59] 66	[5.24] 133	[3.50] 89	[5.91] 150
H2	[3.46] 88	[3.46] 88	[4.25] 108	[4.25] 108
H3	[1.73] 44	[1.73] 44	[2.13] 54	[2.13] 54
H4	[3.15] 80	[5.71] 145	[4.72] 120	[7.1] 180
H5	[3.62] 92	[3.62] 92	[3.74] 95	[3.74] 95
L	[6.81] 173	[6.81] 173	[6.81] 173	[6.81] 173
Use bolts	M5	M5	M6	M6



Size	60	110	160	240
Weight (lbs.)	7.1	8.2	15.5	17.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFD 330



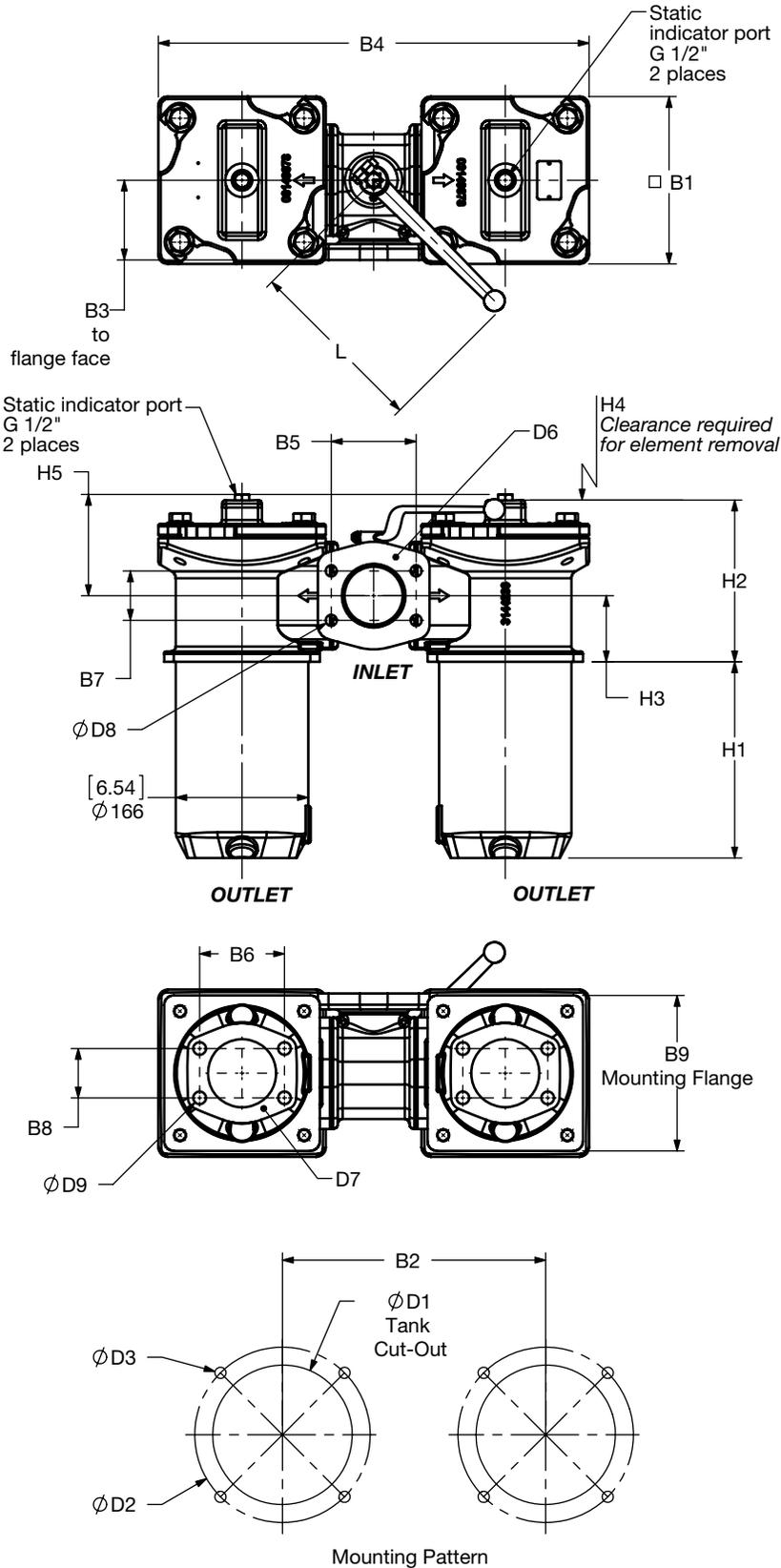
Mounting Pattern

Size	330
Weight (lbs.)	29.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions RFD 660 - 1300



Size	660	950	1300
B1	[8.27] 210	[9.61] 244	[9.61] 244
B2	[12.99] 330	[15.35] 390	[16.14] 410
B3	[3.9] 100	[5.51] 140	[5.51] 140
B4	[21.26] 540	[25.2] 640	[25.98] 660
B5	[4.19] 106.5	[5.13] 130.2	[5.13] 130.2
B6	[4.19] 106.4	[4.75] 120.7	[5.13] 130.2
B7	[2.43] 61.9	[3.06] 77.8	[3.06] 77.8
B8	[2.43] 61.9	[2.75] 69.9	[3.06] 77.8
B9	[7.68] 195	[9.84] 250	[9.84] 250
D1	[7.1] 180	[8.19] 208	[8.19] 208
D2	[8.66] 220	[11.42] 290	[11.42] 290
D3	[0.55] 14	[0.71] 18	[0.63] 16
D6	3" SAE FLANGE CODE 61	4" SAE FLANGE CODE 61	4" SAE FLANGE CODE 61
D7	3" NPT or 3" SAE FLANGE CODE 61	3 1/2" SAE FLANGE CODE 61	4" SAE FLANGE CODE 61
D8	5/8-11UN x [1.19] 30	5/8-11UN x [1.19] 30	5/8-11UN x [1.19] 30
D9	5/8-11UN x [1.19] 30	5/8-11UN x [1.29] 33	5/8-11UN x [1.19] 30
H1	[9.68] 246	[9.94] 252.5	[13.01] 330.5
H2	[7.99] 203	[8.85] 225	[10.6] 269
H3	[3.27] 83	[[3.66] 93	[4.76] 121
H4	[12.6] 320	[15.16] 385	[19.09] 485
H5	[4.48] 114	[6.69] 170	[6.69] 170
L	[9.02] 229	[12.52] 318	[12.52] 318
Use bolts	M12	M16	M16

Size	660	950	1300
Weight (lbs.)	158.8	231.5	260.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

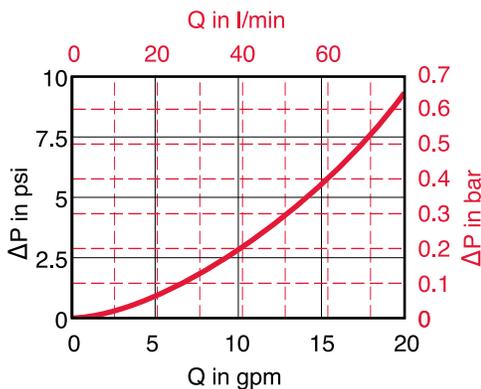
Housing Curve:

Pressure loss through housing is as follows:

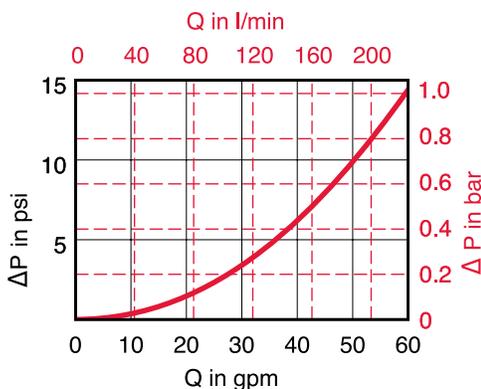
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

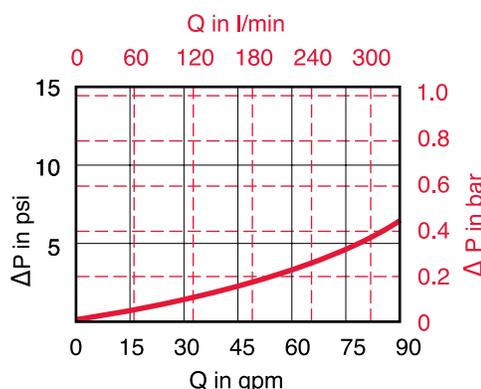
RFD 60/110 HOUSING & TRANSFER VALVE



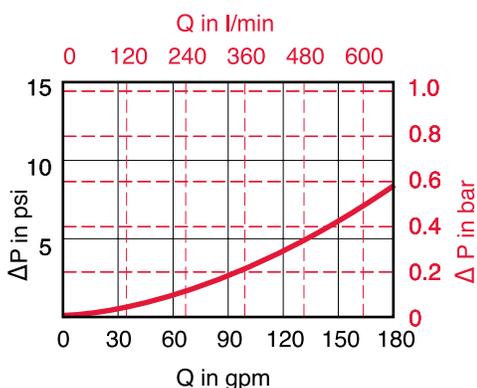
RFD 160/240 HOUSING & TRANSFER VALVE



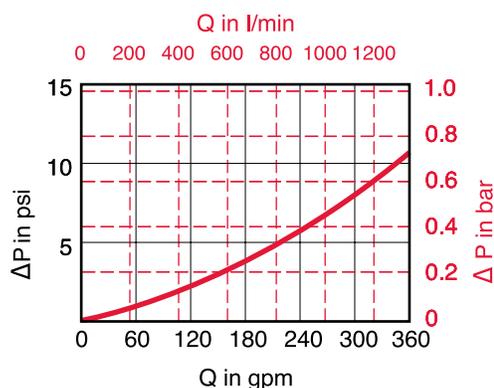
RFD 330 HOUSING & TRANSFER VALVE



RFD 660 HOUSING & TRANSFER VALVE



RFD 950/1300 HOUSING & TRANSFER VALVE



LOW PRESSURE FILTERS

Element K Factors

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

(From Tables Below)

Optimicron Size	...R...ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0060 R XXX ON	2.59	1.295	0.944	0.539	0.494	0.376
0110 R XXX ON	1.224	0.719	0.487	0.296	0.234	0.178
0160 R XXX ON	0.878	0.439	0.312	0.177	0.148	0.182
0240 R XXX ON	0.571	0.284	0.201	0.125	0.101	0.077
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056
0660 R XXX ON	0.196	0.093	0.066	0.037	0.031	0.025
0950 R XXX ON	0.131	0.057	0.043	0.026	0.021	0.017
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012

ECOMICRON Size	...R...ECON2			
	3 µm	5 µm	10 µm	20 µm
0160 R XXX ECON2	0.521	0.324	0.209	0.159
0240 R XXX ECON2	0.340	0.209	0.143	0.099
0330 R XXX ECON2	0.230	0.148	0.093	0.066
0660 R XXX ECON2	0.104	0.066	0.044	0.027
0950 R XXX ECON2	0.066	0.044	0.027	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016

Betamicron/Aquamicron Size	...R...BN4AM	
	3 µm	10 µm
0330 R XXX BN4AM	0.477	0.165
0660 R XXX BN4AM	0.192	0.066
0950 R XXX BN4AM	0.132	0.044
1300 R XXX BN4AM	0.088	0.033

Aquamicron Size	...R...AM
	40 µm
0330 R 040 AM	0.115
0660 R 040 AM	0.051
0950 R 040 AM	0.036
1300 R 040 AM	0.026

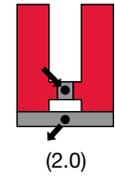
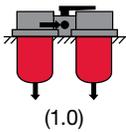
Wire Mesh Size	...R...W/HC
	25, 50, 74, 100, 149, 200 µm
0030 R XXX W/HC	0.067
0060 R XXX W/HC	0.034
0110 R XXX W/HC	0.016
0160 R XXX W/HC	0.011
0240 R XXX W/HC	0.007
0330 R XXX W/HC	0.011
0660 R XXX W/HC	0.004
0950 R XXX W/HC	0.003
1300 R XXX W/HC	0.002

Polyester Size	...R...P/HC	
	10 µm	20 µm
0030 R XXX P/HC	0.181	0.092
0060 R XXX P/HC	0.092	0.046
0110 R XXX P/HC	0.050	0.025
0160 R XXX P/HC	0.035	0.017
0240 R XXX W/HC	0.023	0.012
0330 R XXX W/HC	0.016	0.008
0660 R XXX W/HC	0.008	0.004
0950 R XXX W/HC	0.006	0.003
1300 R XXX W/HC	0.004	0.002

LOW PRESSURE FILTERS

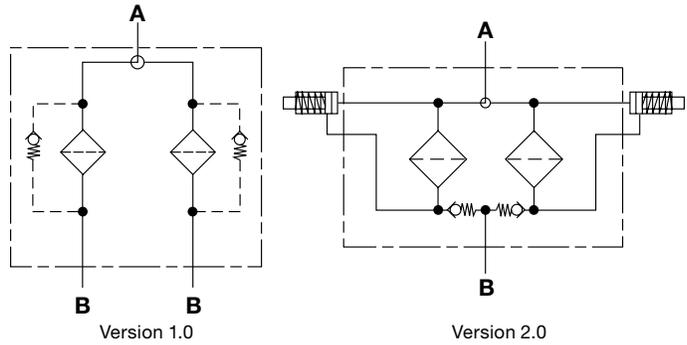
NFD Series

In-Tank / Inline Duplex Filters
360 psi • up to 450 gpm



Version 2.0 pictured

Hydraulic Symbol



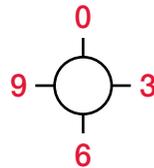
Inlet / Outlet Port Location Configurator

NFD1310/2610 2.X Inlet/Outlet
Available Configurations

	03		09
	33		39
	93		99

NFD5210/7810/10410 2.X Inlet/Outlet
Available Configurations

	00	03		09
	30	33		39
	60			69
		93		99



0 = Pointed to Top
3 = Pointed to Front
6 = Pointed to Bottom
9 = Pointed to Back
33 = Stand Configuration (not given as supplementary details)
First Number = Inlet Orientation
Second Number = Outlet Orientation

Features

- NFD Filters have an extremely large filtration area and flow capacity of 450 gpm (4" pipe size limitation).
 - 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 high 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 (1.0 Version only)
 - Filters can be fitted with clogging indicators to monitor the contamination level of the element
 - NFD duplex filters have a ball-type diverter valve to provide continuous filtration and eliminate the need to shut-down the system during element changeout
 - Flange connection bolts included for all SAE-DIN flange ports
- Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



Offshore



Power Generation



Pulp & Paper

Technical Specifications

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. Allowable Working Pressure*	360 psi (25 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	Contact HYDAC office	
Element Collapse Pressure Rating		
ON, W/HC	290 psid (20 bar)	
ECON2, BN4AM, P/HC, AM	145 psid (10 bar)	
V	435 psid (30 bar)	
Fluid Temperature Range	-22°F to 212°F (-30°C to 100°C)	
Consult HYDAC for applications below -22°F (-30°C)		
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure		
ΔP = 29 psid (2 bar) -10%	1.X - Static	
ΔP = 72 psid (5 bar) -10%	2.X - Differential	
Bypass Valve Cracking Pressure		
ΔP = 14.5 psid (1 bar) +10%		
ΔP = 43 psid (3 bar) +10% (standard)		
ΔP = 87 psid (6 bar) +10%		

*Note: All NFD...1.0 Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VMF" and "VR" indicators: B, BM, E, ES, GC, LE, LZ.

Model Code

NFD ON 1310 D A P 3 B 1.X /

Filter Type _____
 NFD = Duplex In-Tank Return Line Filter

Element Media _____
 ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester
 V = Metal Fiber

Size _____
 1310, 2610, 5210, 7810, 10410

Operating Pressure _____
 D = 360 psi (25 bar)
 V = 101.5 psi (7 bar) (When using the following "VR" indicators: B, BM, E, ES, GC, LE, LZ)

Type of Change Over _____
 A = Ball valve

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

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = ECON2 40 = AM
 25, 50, 74, 100, 149, 200 = W/HC 10, 20 = P/HC 3, 5, 10, 20 = V

Type of Static (1.X Configuration) or ΔP (2.X Configuration) Clogging Indicator _____
 A, B, BM, C, D (Others available upon request)

Type Number / Modification Number _____
 1.X = In-Tank Filter - Static Indicator 2.X = Inline Filter - ΔP Indicator

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system) } not available with ECON2

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 LED = 2 light emitting diodes for up to 24V DC
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 SB = Equalization valve set
 EM = Manual vent valve set
 VKD = Drain manifold
 W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)
 SFREE = Element specially designed to minimize electrostatic charge generation

Flow Path _____
 00, 03, 09, 30, 39, 60, 69, 93, 99
 (omit) = 33 - Front Inlet/Front Outlet (standard)
 Note: See previous page of "Inlet / Outlet Port Configurator" for flow path positions.

Replacement Element Model Code

1300 R 003 ON / V

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

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 50, 74, 100, 149, 200 = W/HC 3, 5, 10, 20 = V
 10, 20 = P/HC

Element Media _____
 ON, BN4AM, ECON2, AM, W/HC, P/HC, V

Seals _____
 (omit) = standard - Nitrile rubber (NBR)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details _____
 SO263 = (same as above) W = (same as above)
 SFREE = (same as above)

Note: Element contamination retainer = P/N 01204141

Clogging Indicator Model Code

VR 2 B . X /

Indicator Prefix _____
 VR = Static Indicators (1.X version)
 VM = ΔP Indicators (2.X 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 = Pop-up indicator (auto reset - static only - 1.0)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

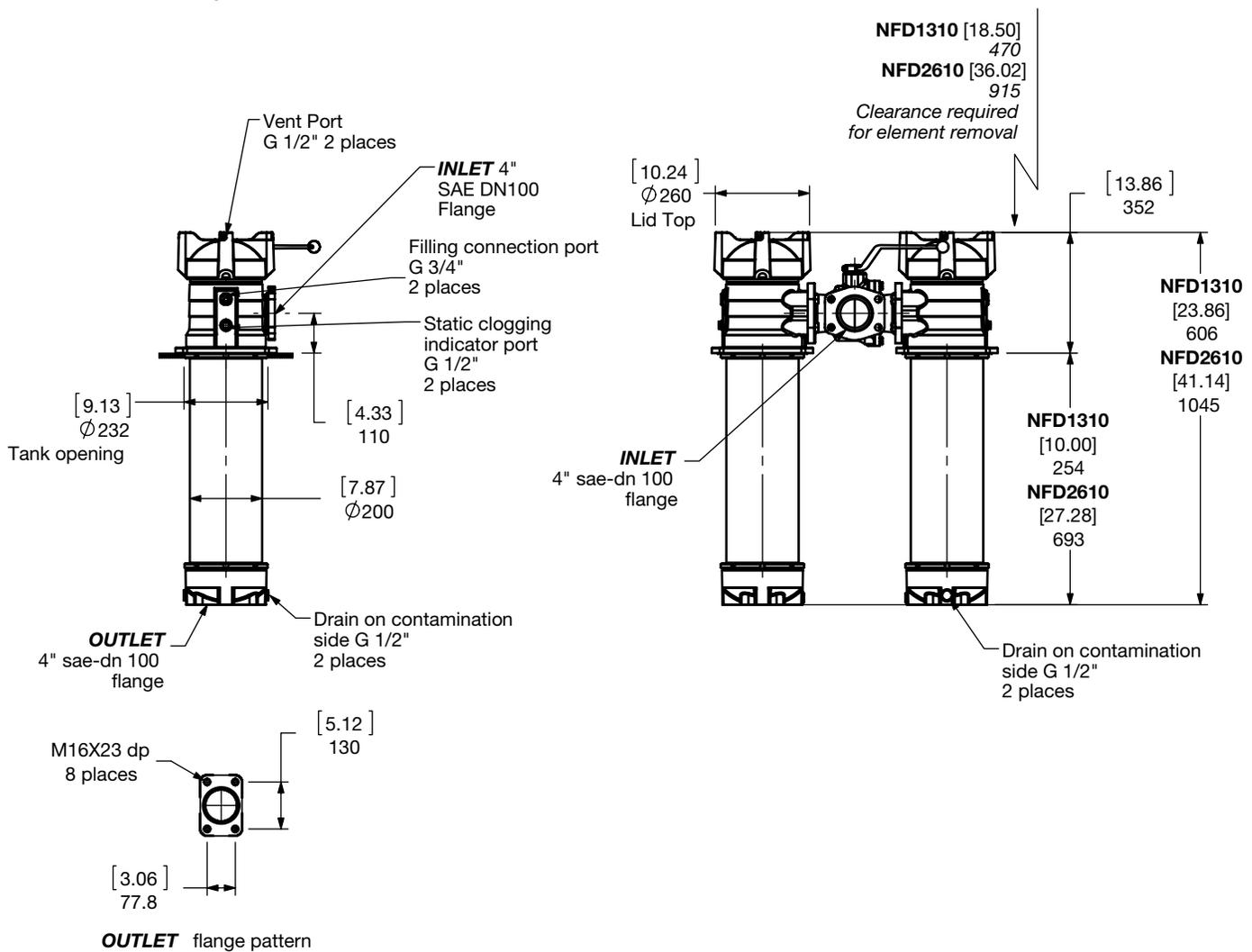
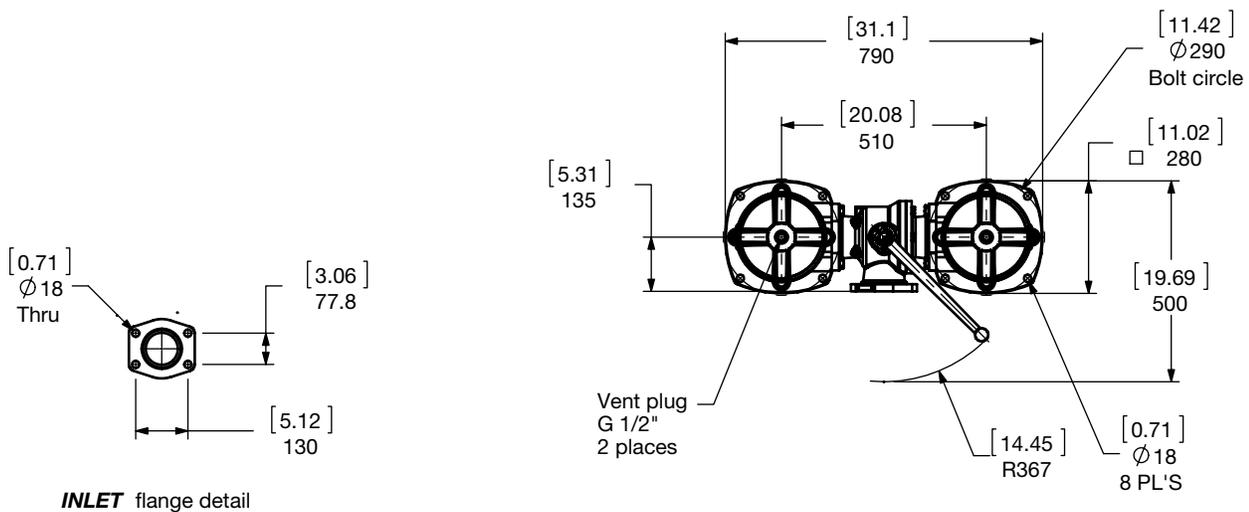
Supplementary Details _____
Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)
Light Voltage (D type indicators only) _____
 L24 = 24V L48 = 48V L110 = 110V L220 = 220V
 (For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

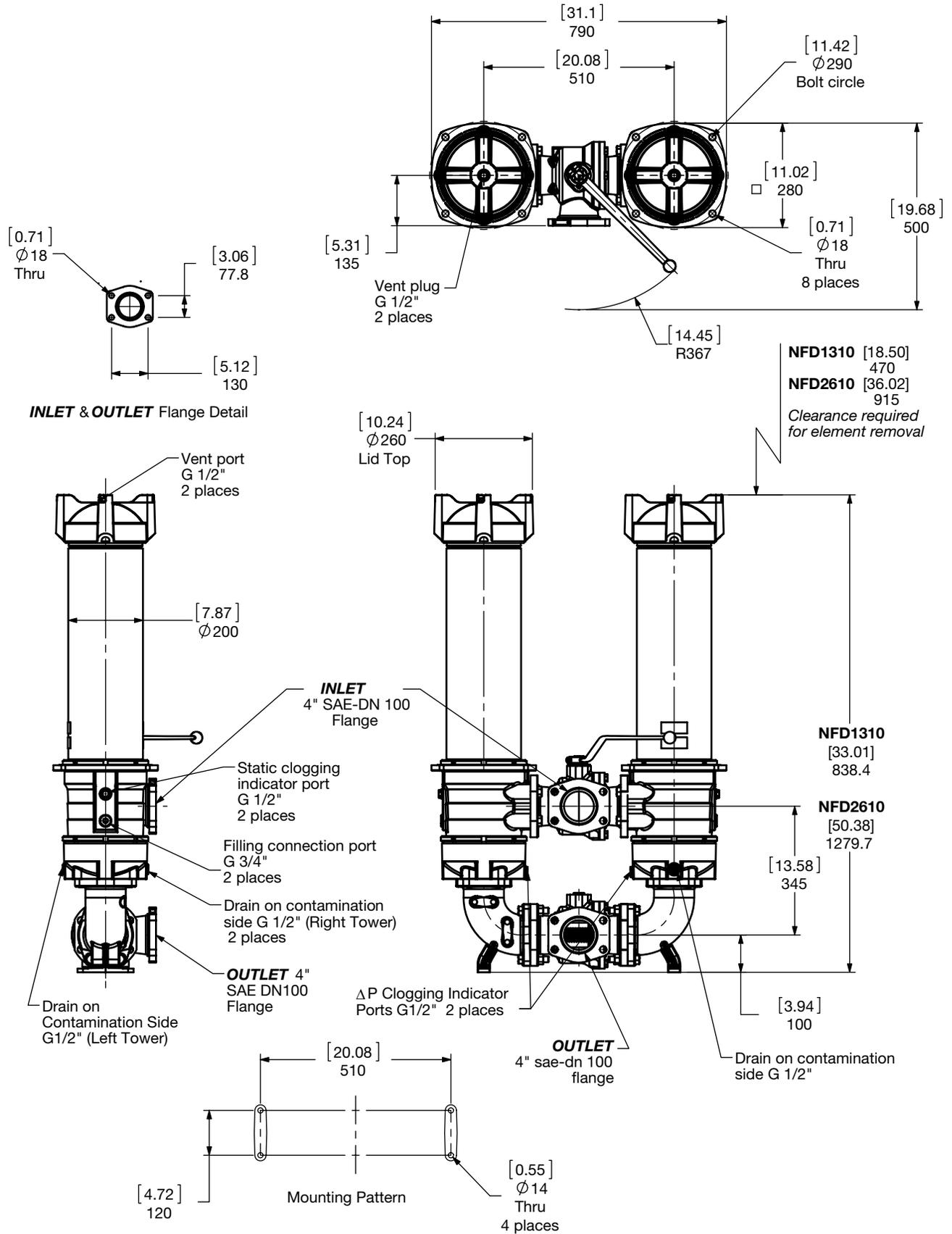
NFD 1310 / 2610 – 1.0 Version



Size	1310 Version 1.0	2610 Version 1.0
Weight (lbs)	197.6	230.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions NFD 1310 / 2610 – 2.0 Version

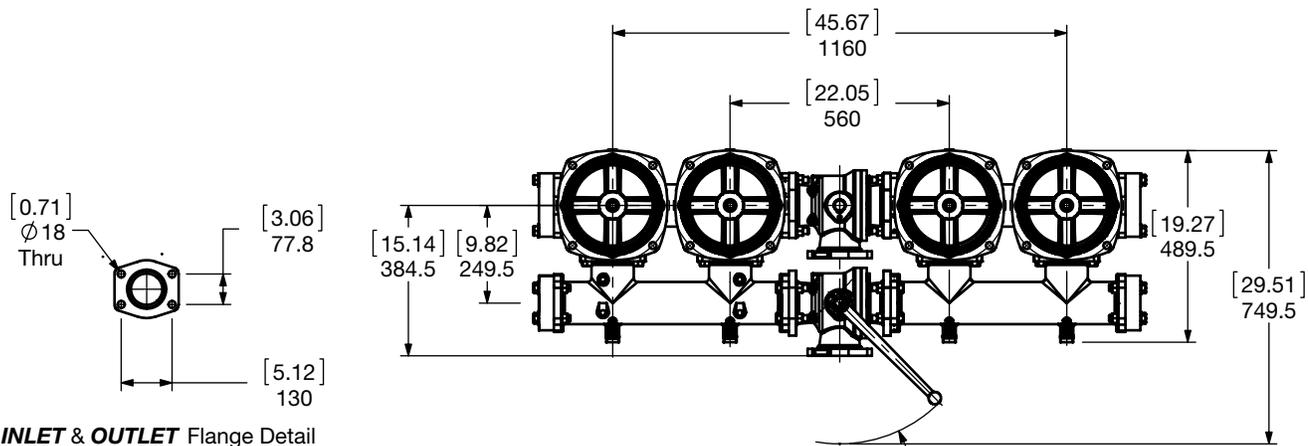


Size	1310 Version 2.0	2610 Version 2.0
Weight (lbs)	270.6	308.7

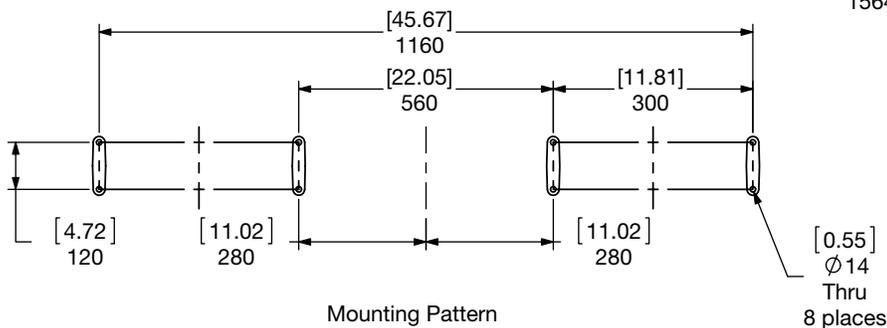
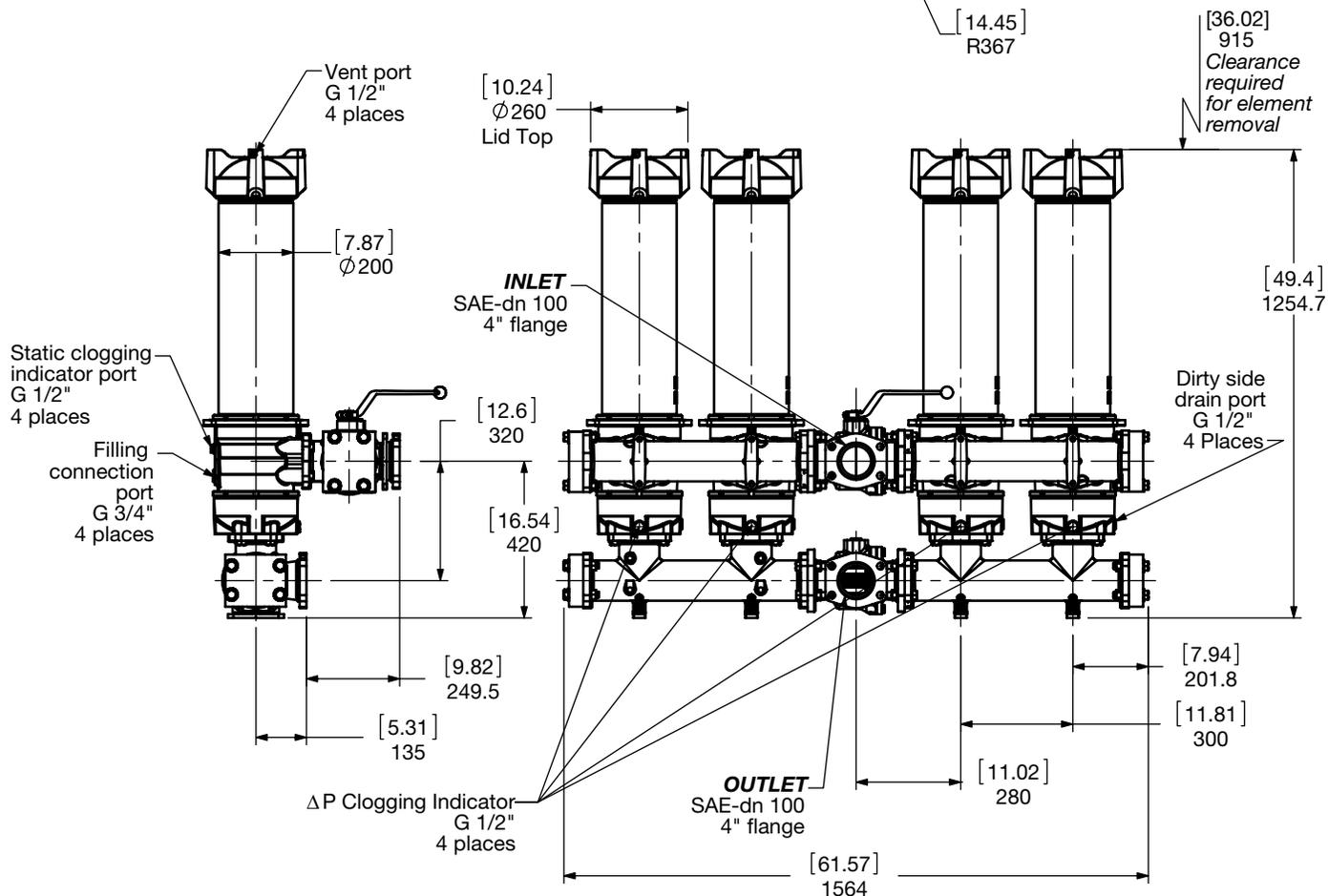
Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:
NFD 5210 – 2.0 Version



INLET & OUTLET Flange Detail



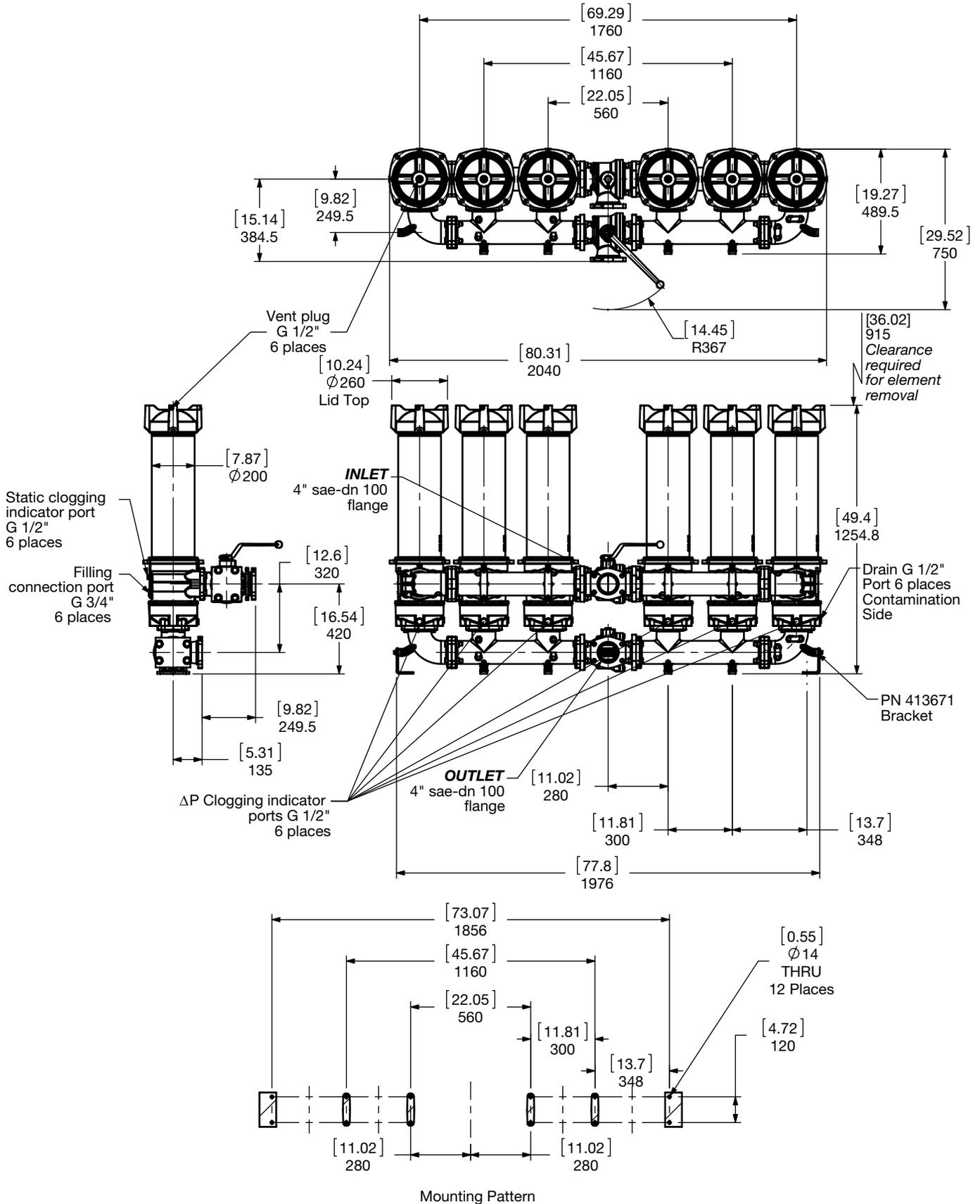
Mounting Pattern

Size	5210 Version 2.0
Weight (lbs.)	610.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:
NFD 7810 – 2.0 Version

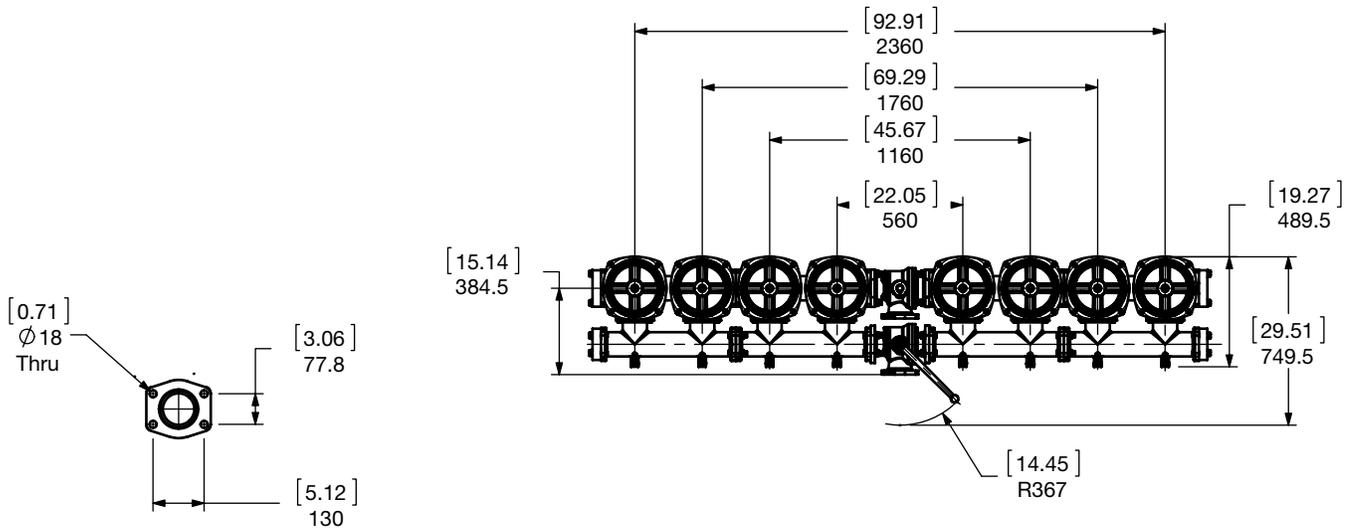


Size	7810 Version 2.0
Weight (lbs.)	863.4

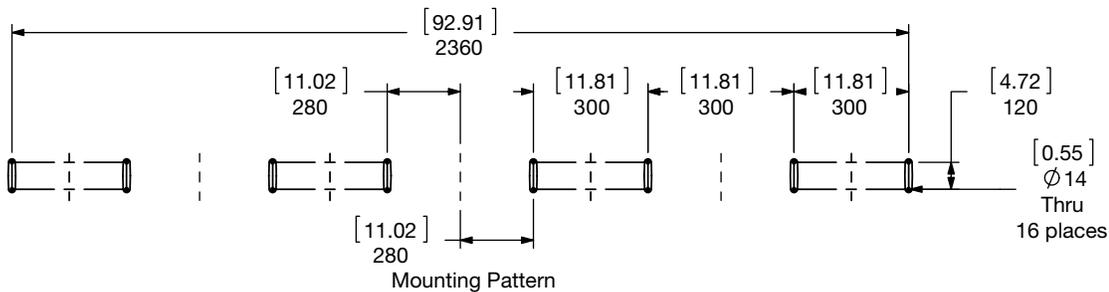
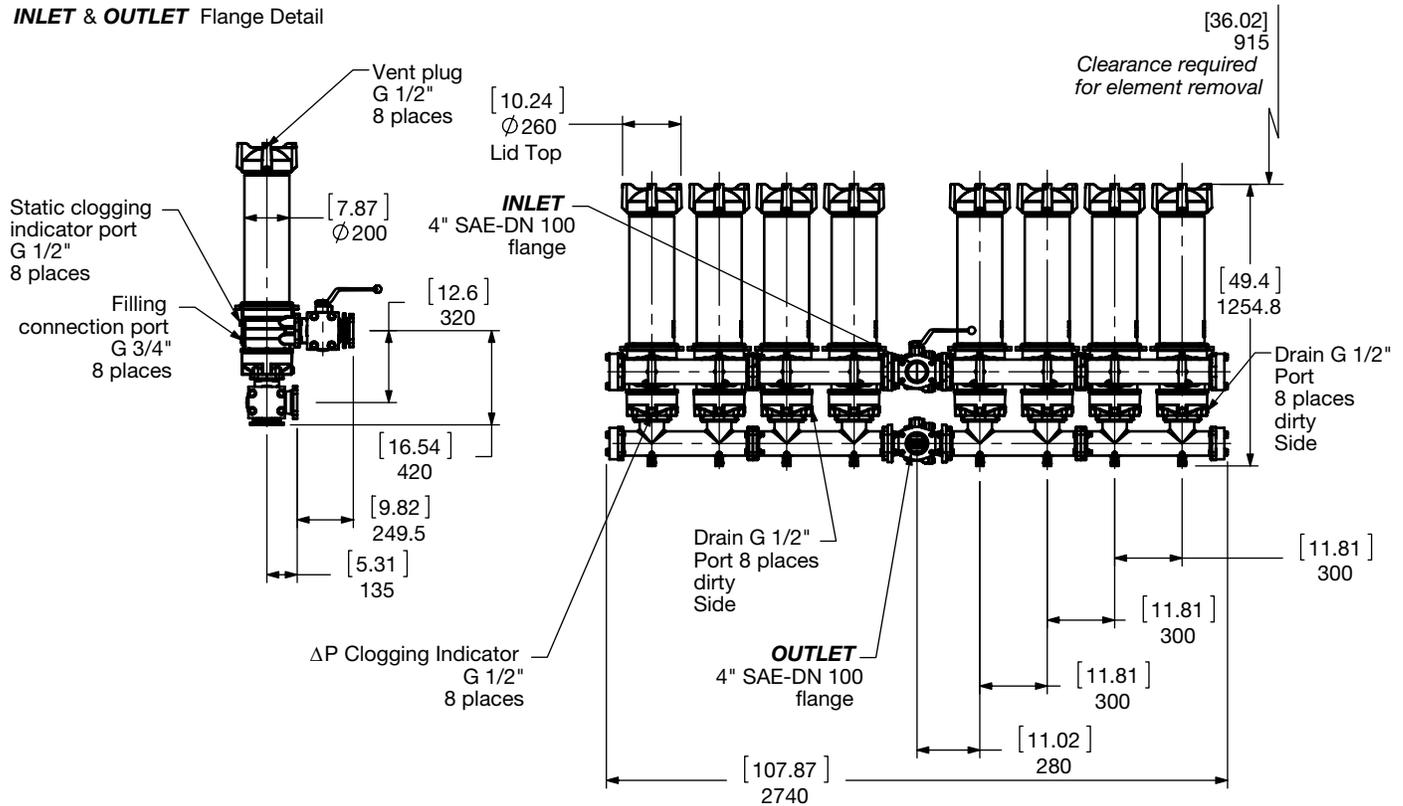
Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:
NFD 10410 – 2.0 Version



INLET & OUTLET Flange Detail



Size	10410 Version 2.0
Weight (lbs.)	1125.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

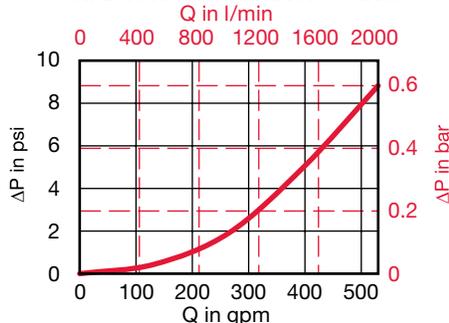
Housing Curve:

Pressure loss through housing is as follows:

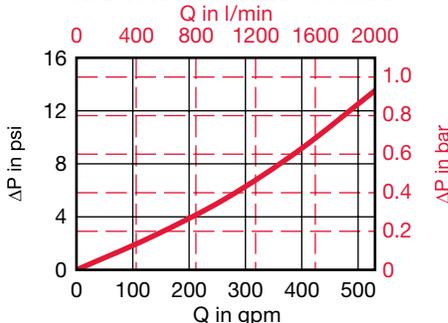
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

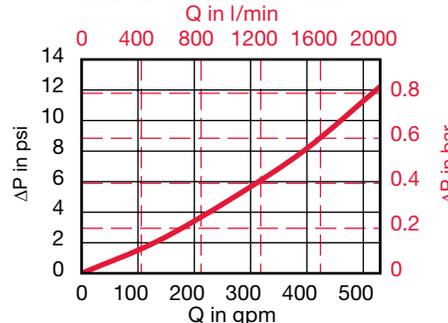
NFD 1310-2610 ...1.X HOUSING



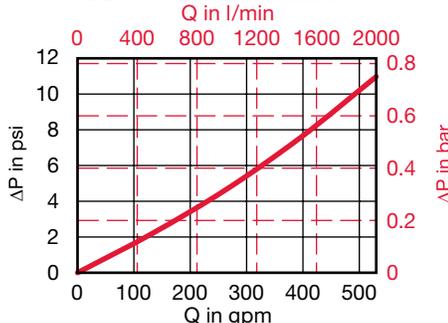
NFD 1310-2610 ...2.X HOUSING



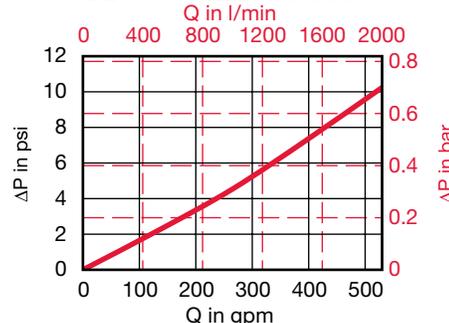
NFD 5210 ...2.X HOUSING



NFD 7810 ...2.X HOUSING



NFD 10410 ...2.X HOUSING



Element K Factors

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

(From Tables Below)

Optimicron	...R...ON					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECOMICRON	...R...ECON2			
Size	3 μm	5 μm	10 μm	20 μm
1300 R XXX ECON2	0.044	0.033	0.022	0.016
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicron	...R...BN4AM	
Size	3 μm	10 μm
1300 R XXX BN4AM	0.088	0.033
2600 R XXX BN4AM	0.055	0.016

Aquamicron	...R...AM
Size	40 μm
1300 R 040 AM	0.026
2600 R 040 AM	0.013

Wire Mesh	...R...W/HC
Size	25, 50, 74, 100, 149, 200 μm
1300 R XXX W/HC	0.002
2600 R XXX W/HC	0.001

Polyester	...R...P/HC	
Size	10 μm	20 μm
1300 R XXX P/HC	0.004	0.002
2600 R XXX P/HC	0.002	0.001

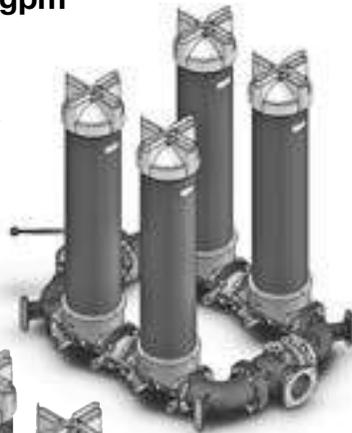
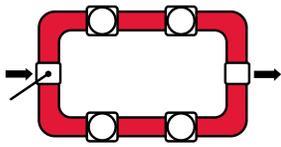
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

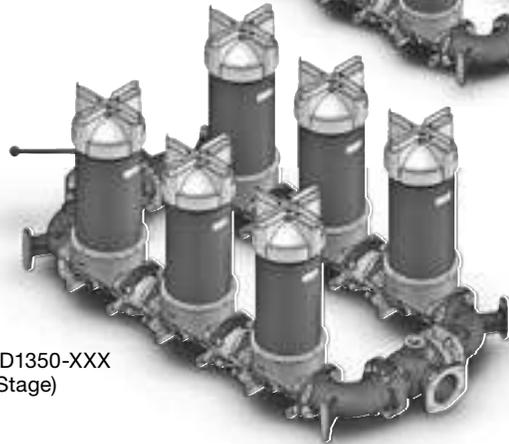
NFD UHE Series

Ultra High Efficiency Inline Duplex Filters

360 psi • up to 450 gpm



NFD2650-XX
(2 Stage)

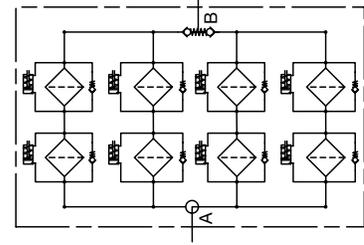
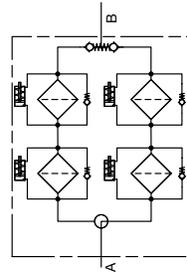


NFD1350-XXX
(3 Stage)

Hydraulic Symbol

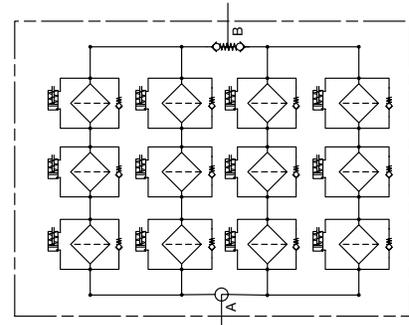
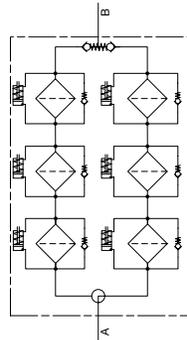
NFD 1350-2650 UHE 2 Stage

NFD 5250 UHE 2 Stage



NFD 1350-2650 UHE 3 Stage

NFD 5250 UHE 3 Stage



Features

- Multi-pass filtration in a single pass!
- Beta efficiency values > 5000 in a single pass are possible
- Conventional NF housings are piped in a series to achieve multi-levels of filtration in one pass.

Note: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Configurations

NFD Size 1350, 2650, 5250 - Two Stage

- Fine-Fine Filtration in Duplex Arrangement
- Coarse-Fine Filtration in Duplex Arrangement
- Medium-Fine Filtration in a Duplex Arrangement
- Fine Filtration with Water Removal in a Duplex Arrangement
- Customer Defined Arrangement

NFD Size 1350, 2650, 5250 - Three Stage

- Fine-Fine Fine Filtration Arrangement
- Coarse-Medium Fine Filtration Arrangement
- Coarse-Fine with Water Removal Arrangement
- Medium-Fine Fine Filtration Arrangement
- Customer Defined Arrangement

Applications



Agricultural



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Technical Specifications

Mounting Method	See drawings	
Port Connection	4" SAE-64 Flange Code 61 <i>(with M16 bolts included)</i>	
Flow Direction	1350 / 2650 / 5250	Inlet: Side Outlet: Side (<i>opp.</i>)
Construction Materials	Head, Housing, Lid Aluminum Filter Stage Connections Carbon Steel Elbows, Manifolds Ductile Iron	
Flow Capacity	1350	343 gpm (1300 lpm)
	2650, 5250	450 gpm (1700 lpm) (<i>4" pipe limit</i>)
Housing Pressure Rating	Max. Allowable Working Pressure 360 psi (25 bar) Fatigue Pressure 360 psi (25 bar) Burst Pressure Contact HYDAC	
Element Collapse Pressure Rating	ON	290 psid (20 bar)
	ECON2, BN4AM, AM	145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
ΔP 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

NFD ON-ON-AM 1350 D A P 5-3-40 C 2.0 / V 3

Filter Type _____
 NFD = Return Line Filter Duplex

Element Media _____
 ON = Optimicron® BN/AM = Betamicon®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 Note: Include filtration media from each stage, inlet to outlet.

Size _____
 1350, 2650, 5250

Operating Pressure _____
 D = 360 psi (25 bar)

Type of Change Over _____
 A = Ball valve (diverter)

Type of Connection _____
 P = SAE DN 100 (4") Flange (Mates with 4" SAE code 61 flange ports with metric connection bolts)

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2 3, 10 = BN/AM 40 = AM
 Note: Include filtration rating from each stage, inlet to outlet.

Type of ΔP Clogging Indicator _____
 A = No Indicator (plugged) BM, C, D (Others available upon request)

Type Number / Modification Number _____
 2.0 = Inline Filter - ΔP indicator

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B6 = 87 psid (6 bar) (return line extended life)] not available with ECON2
 KB = no bypass (flushing system)

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 cRUUs = Electrical Indicator with underwriter's recognition
 SFREE = Element specially designed to minimize electrostatic charge generation

Number of Filtration Stages _____
 2 = Two Stages (2 in a series)
 3 = Three Stages (3 in a series)

Replacement Element Model Code

1300 R 003 ON / V

Size _____
 1300 - for housings: 1350
 2600 - for housings: 2650, 5210

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM

Element Media _____
 ON, ECON2, BN4AM, AM

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B6 = 87 psid (6 bar)
 KB = no bypass

Supplementary Details _____
 SO263 = (same as above)
 SFREE = (same as above)

Clogging Indicator Model Code

VM 2 C . X / V

Indicator Prefix _____
 VM = ΔP, G 1/2" 3000 psi

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

Type of Indicator _____
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Light Voltage (D type indicators only) _____
 L24 = 24V L48 = 48V L110 = 110V L220 = 220V

Thermal Lockout (VM type C, D, J, J4 only) _____
 T100 = Lockout below 100°F

Underwriter's Recognition (VM type C, D, J, J4 only) _____
 cRUUs = Electrical Indicator with underwriter's recognition

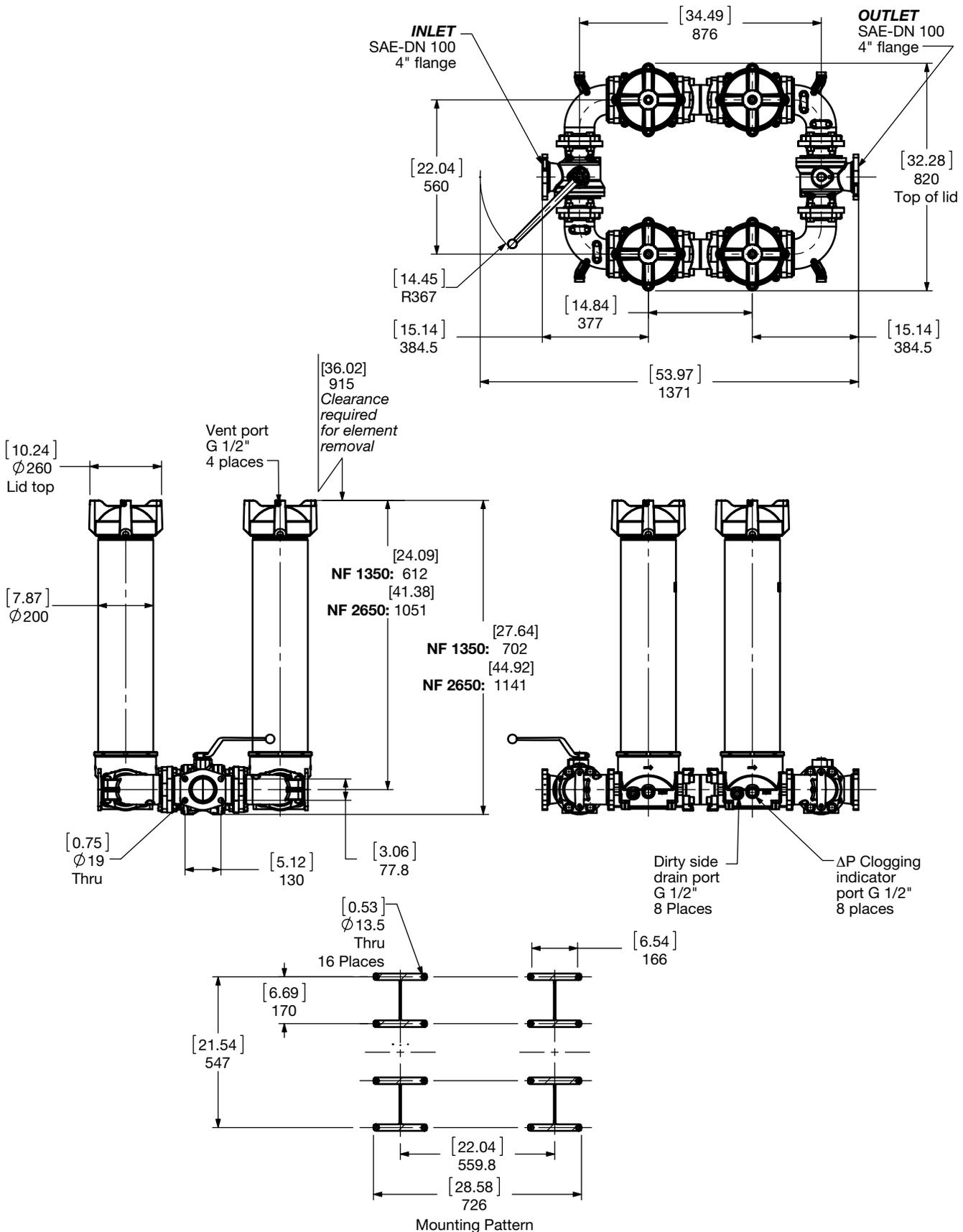
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

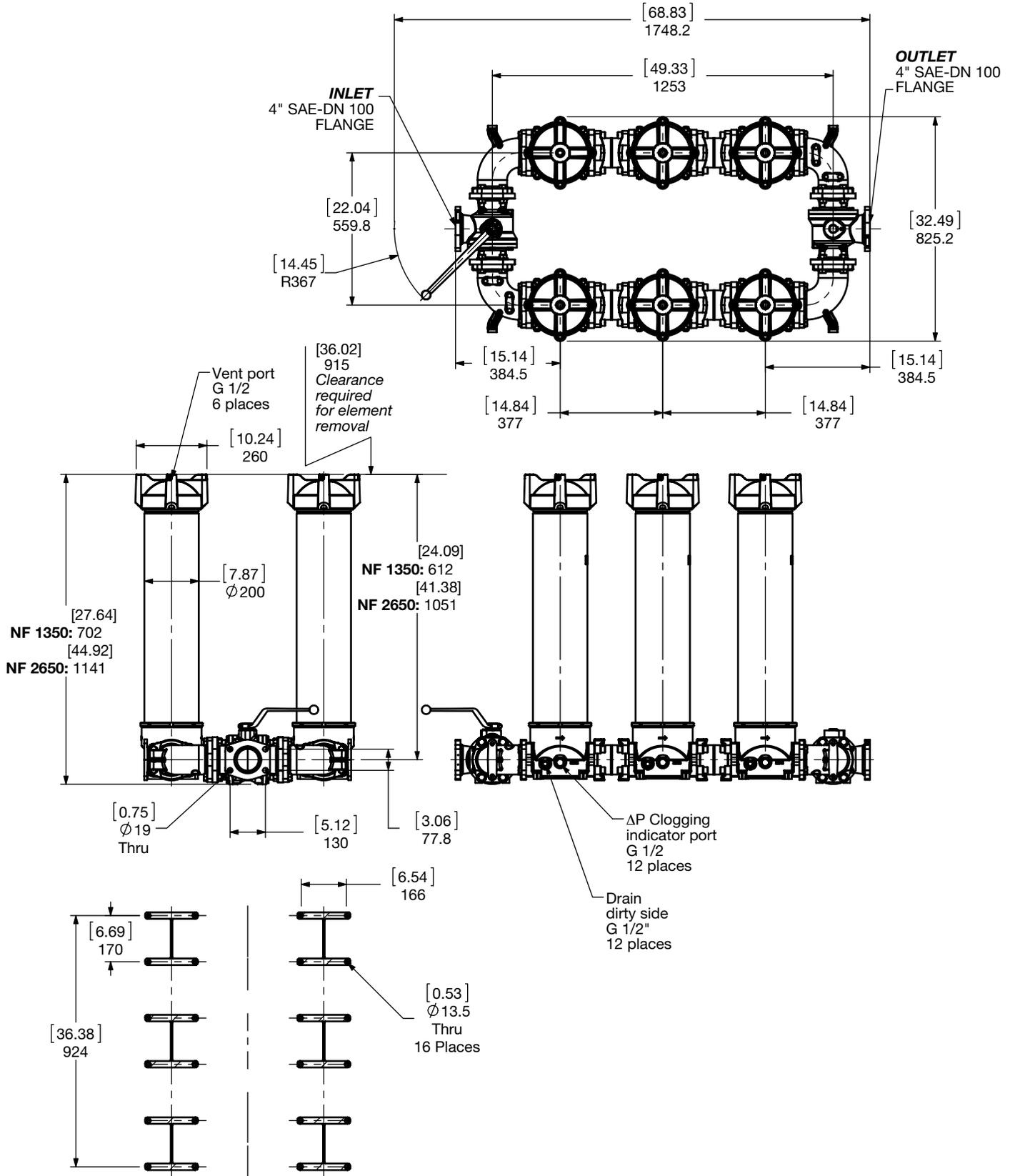
NFD 1350 / 2650 - 2 Stage Duplex UHE



Size	1350	2650
Weight (lbs.)	323.2	433.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NFD 1350 / 2650 - 3 Stage Duplex UHE

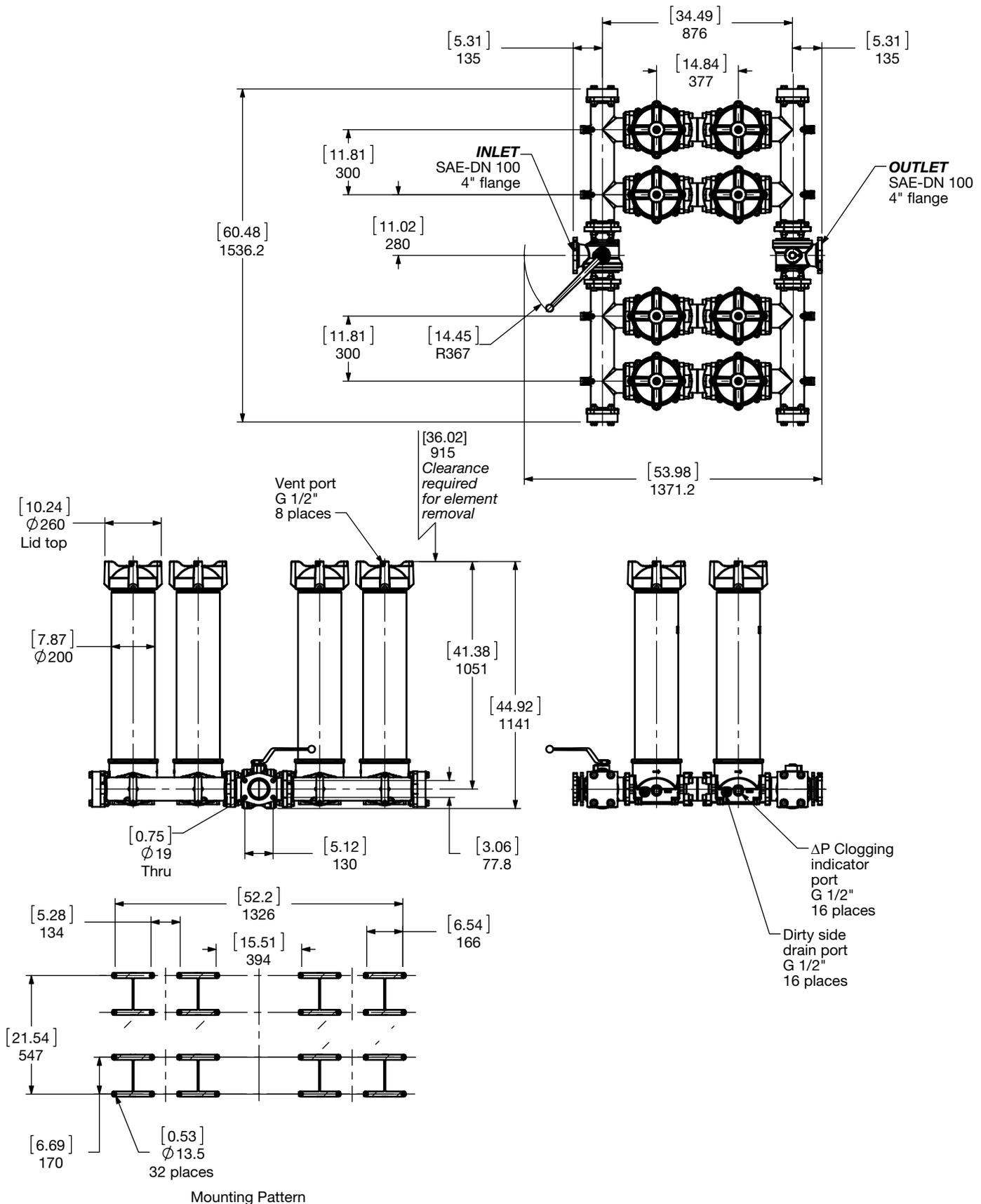


Size	1350	2650
Weight (lbs.)	435.2	584.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

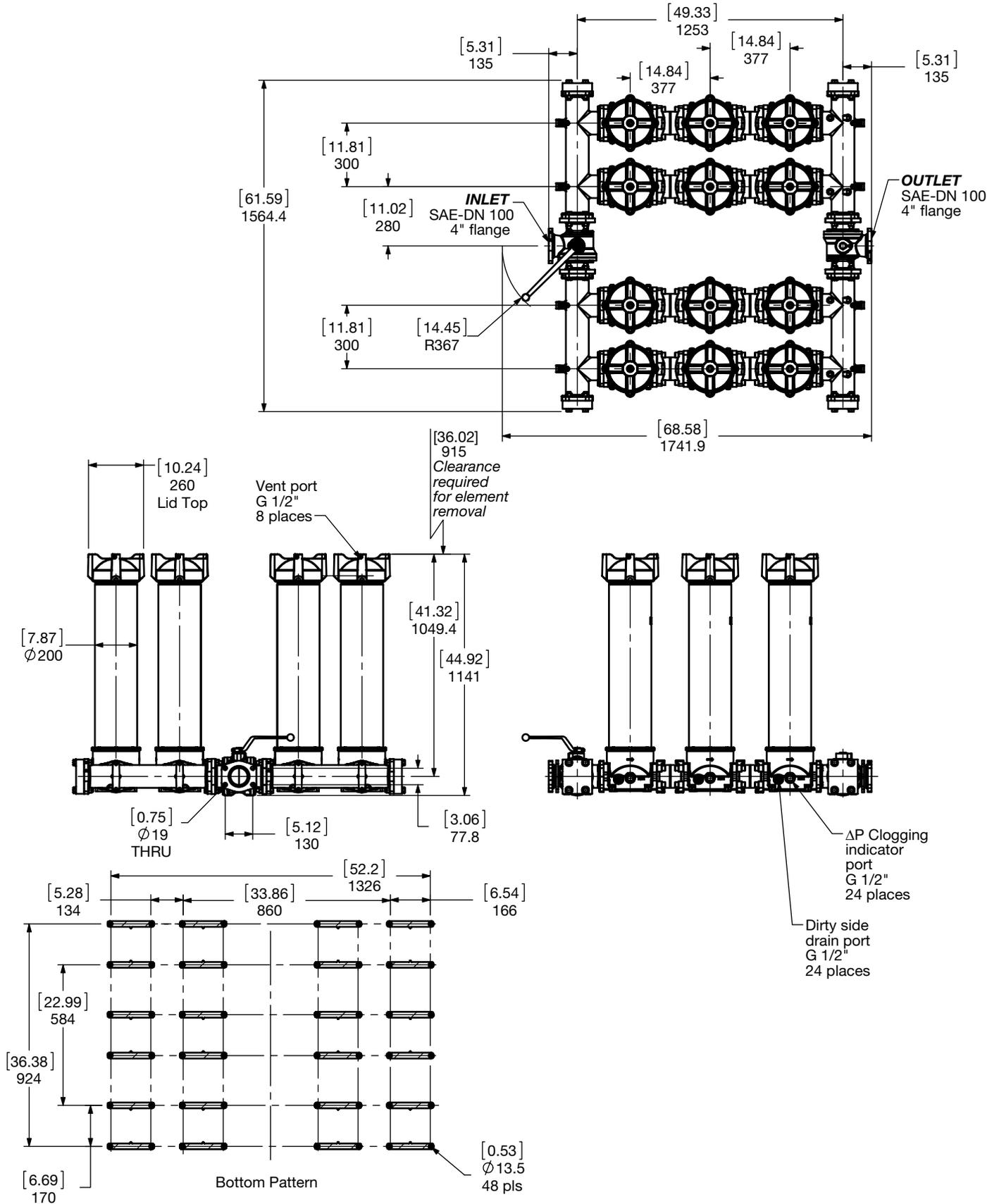
Dimensions:
NFD 5250 - 2 Stage UHE



Size	5250
Weight (lbs.)	906.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NFD 5250 - 3 Stage UHE



Size	5250
Weight (lbs.)	1207.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

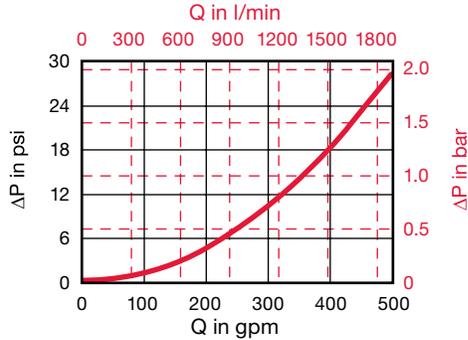
Housing Curve:

Pressure loss through housing is as follows:

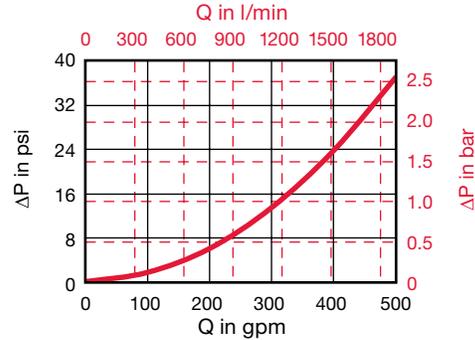
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

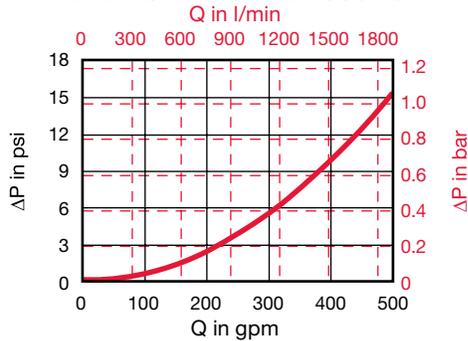
NFD 1350-2650 UHE - 2 STAGE HOUSING



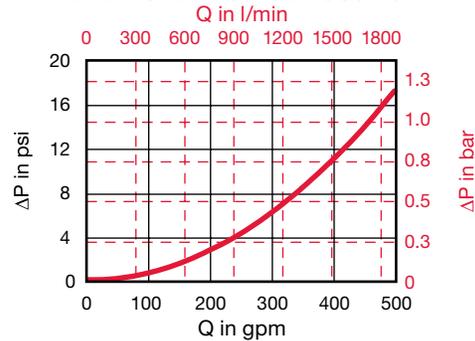
NFD 1350-2650 UHE - 3 STAGE HOUSING



NFD 5250 UHE - 2 STAGE HOUSING



NFD 5250 UHE - 3 STAGE HOUSING



Element K Factors

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

(From Tables Below)

Optimicon	...R...ON					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECOMicon	...R...ECON2			
Size	3 μm	5 μm	10 μm	20 μm
1300 R XXX ECON2	0.044	0.033	0.022	0.016
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicon	...R...BN4AM	
Size	3 μm	10 μm
1300 R XXX BN4AM	0.088	0.033
2600 R XXX BN4AM	0.055	0.016

Aquamicon	...R...AM
Size	40 μm
1300 R 040 AM	0.026
2600 R 040 AM	0.013

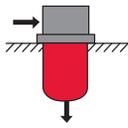
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

RFM Series

In-Tank Return Line Filters

145 psi • up to 224 gpm



Technical Specifications

Mounting Method				
75/90/150/165/185		2 mounting holes - filter housing		
50/75/90/150/165/185/210/270/ 330/500/661/851/975/1100		4 mounting holes - filter housing		
Port Connections				
50		SAE-8 / 0.9"		
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		
661/851		1 1/2" SAE Flange, Code 61 / 2" NPT		
975/1100		2 1/2" SAE Flange, Code 61 / G 2 1/2" BSPP		
		2" SAE Straight Thread / 2" NPT 2 1/2" NPT Threaded / 2" NPT M 2 1/2" SAE Code 61 Flange / 2" NPT M		
Direction of Flow				
Side inlet and bottom outlet.				
Mat. of Construc.				
50/90/150/75/165/185		Head	Bowl	Lid
210/270		Aluminum	Polyamide	Polyamide
330/500/661/851		Aluminum	Steel	Polyamide
975/1100		Aluminum	Polyamide	Aluminum
		Aluminum	Steel	Steel
Flow Capacity				
50 - 13 gpm (50 lpm)		270 - 71 gpm (270 lpm)		
75 - 20 gpm (75 lpm)		330 - 87 gpm (330 lpm)		
90 - 24 gpm (90 lpm)		500 - 132 gpm (500 lpm)		
150 - 40 gpm (150 lpm)		661 - 174 gpm (660 lpm)		
165 - 43 gpm (165 lpm)		851 - 225 gpm (850 lpm)		
185 - 49 gpm (185 lpm)		975 - 258 gpm (950 lpm)		
210 - 55 gpm (210 lpm)		1100 - 300 gpm (1100 lpm)		
Housing Pressure Rating				
Max. Allowable Working Pressure*		145 psi (10 bar), 101.5 psi (7 bar) (Sizes 975 & 1100)		
Fatigue Pressure		145 psi (10 bar) @ 1 million cycles		
Burst Pressure		75-500 >580 psi (40 bar)		
		50, 661/851 536 psi (37 bar)		
		975/1100 Consult Factory		
Element Collapse Pressure Rating				
BN4HC (size 50, 975 & 1100 only)		145 psid (10 bar)		
ON (size 50-851 only), W/HC		290 psid (20 bar)		
ECON2, BN4AM, AM, P/HC, MM		145 psid (10 bar)		
V		435 psid (30 bar)		
Fluid Temperature Range				
-22°F to 212°F (-30°C to 100°C)				
Consult HYDAC for applications below -22°F (-30°C)				
Fluid Compatibility				
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.				
Indicator Trip Pressure				
P = 20 psi (1.4 bar) - 10%				
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 - All sizes except 50, 975, 1100)				
ΔP = 87 psid (6 bar) +10% (Optional - Sizes 50, 975 & 1100 not available)				
ΔP = 25 psid (1.7 bar) +10% (Standard for Sizes 50, 975 & 1100)				

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 in replacement for "Tank Topper" filters.
- Sizes 50 - 851 aluminum alloy is water tolerant - anodization is not required for water based fluids (HWBF).
- The filter bowl on models 50 - 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.
- Sizes 75/90/150/165/185 available with 4- or 2-bolt tank flange.
- Second inlet optional port available for sizes 75, 165, 185 only with 4-bolt mounting head.
- Sizes 975 & 1100 added for increased flow capacities
- Sizes 50, 975 and 1100 utilize separate bypass assemblies
- Size 50 only available with BN4HC elements

Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element. (Exception - sizes 50, 975, 1100)

Applications



Agricultural

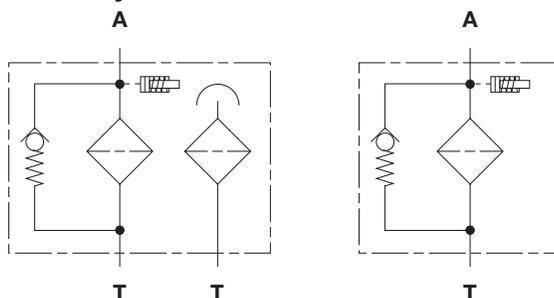


Automotive



Construction

Hydraulic Symbol



*Note: All RFM Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VMF" and "VR" indicators: B, BM, E, ES, GC, LE, LZ.

Model Code

RFM ON 330 B F F 3 D 1 . X / 12 - V - - L24

Filter Type _____
RFM = In-Tank Return Line Filter

Element Media _____
ON = Optimicron® BN/HC = Betamicon® (Sizes 50, 975, 1100 only)
BN/AM = Betamicon®/Aquamicron® (Sizes 330 to 851 only)
ECON2 = ECOmicron® (Not for sizes 50, 75, 210, 270)
AM = Aquamicron® (Sizes 330 to 851 only)
W/HC = Wire Mesh (Sizes 75 to 851) P/HC = Polyester (Sizes 330 to 851 only)
MM = Mobilemicron® (Sizes 75 to 851)

Size _____
50, 75, 90, 150, 165, 185, 210, 270, 330, 500, 661, 851, 975, 1100

Working Pressure _____
B = 145 psi (10 bar) V = 101.5 psi (7 bar) (975 & 1100 Standard* - Note previous page)

Optional Second Inlet Connection _____
(omit) = no second port M = 2 1/2" SAE Flange Code 61 (sz. 661, 851, 975 & 1100 only)
D = 1" Threaded (SAE-16) (sz. 75, 165, 185) N = 2 1/2" NPT Threads (sz. 975, 1100 only)
F = 1 1/2" Threaded (SAE-24) (sz. 330, 500 only) V = 2 x 1" (SAE-16) (sz. 210, 270 only)
G = 2" Threaded Port (sz. 975, 1100 only)
K = 1 1/2" SAE Flange Code 61 (sz. 330, 500 only)

Inlet Connection/Port Size (1 Inlet) _____
B = 1/2" Threaded (SAE-8) (sz. 50 only) N = 2 1/2" NPT Threads (sz. 975, 1100 only)
C = 3/4" Threaded (SAE-12) (sz. 90, 150 only) Z = Customer Specific
D = 1" Threaded (SAE-16) (sz. 75, 165 & 185 only)
E = 1 1/4" Threaded (SAE-20) (sz. 210, 270 only)
F = 1 1/2" Threaded (SAE-24) (sz. 210, 270, 330, & 500 only)
G = 2" Threaded Port (sz. 975 & 1100 only)
K = 1 1/2" SAE Flange Code 61 (sz. 330, 500 only)
M = 2 1/2" SAE Flange Code 61 (sz. 661, 851, 975 & 1100 only)

Filtration Rating (microns) _____
1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = BN/HC 3, 10 = BN/AM 3, 5, 10, 20 = ECON2
40 = AM 25, 74, 149 = W/HC 10, 20 = P/HC 10, 15 = MM

Type of Static Clogging Indicator _____
A, B, BM, C, D, E, F, FD (Others available upon request)

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

Modification Number (latest version always supplied) _____

Inlet Port Configuration _____
0 = BSPP Straight Thread Ports 3 = NPT Ports (sizes 975, 1100 only)
12 = SAE Straight Thread O-Ring Boss Ports (sz. 50-500, 975, 1100) 16 = SAE Flange Code 61 (sz. 330-851, 975, 1100)

Seals _____
(omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
(omit) = 43 psid (3 bar) (standard) B1.7 = 25 psid (1.7 bar) (50, 975 & 1100 only setting available for bypass)
B1 = 14.5 psid (1 bar) lube or coolant B6 = 87 psid (6 bar) (return line extended life) KB = no bypass (flushing systems)] not available with ECON2

Supplementary Details

- SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
- L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
- SO150H = Anodized for high water based fluids, phosphate esters and skydrol fluids (sz. 975 & 1100 only)
- T = Filter Breather (sz. 75, 90, 150, 165, 185, 210, 270 only) - (includes oil separator on 2 bolt versions sizes 75, 165, 185 only)
- C = Outlet check valves (sizes 975, 1100 only)
- DTxx = Down tube (xx length in inches - up to 12 inches) 4L = 4 Bolt mounting flange (sizes 90-185)
- DSxx = Dip stick (xx length in inches) 2MO = Indicator with Deutsch Connector (FD indicator only)
- D = Diffuser (sizes 75, 165, 185 only) SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0330 R 003 ON / V B6

Size _____
0050, 0075, 0090, 0150, 0165, 0185, 0210, 0270, 0330, 0500, 0660, 0850, 0975, 1100

Filtration Rating (micron) _____
1, 3, 5, 10, 15, 20 = ON
3, 5, 10, 20 = BN4HC (sz. 50, 975, 1100 only)
3, 10 = BN4AM 3, 5, 10, 20 = ECON2
40 = AM 25, 74, 149 = W/HC
10, 20 = P/HC 10, 15 = MM

Element Media _____
ON, BN4HC, BN4AM, ECON2, AM, W/HC, P/HC, MM

Seals _____
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
(omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
B1.7 = 25 psid (1.7 bar) B6 = 87 psid (6 bar)
KB = no bypass

Supplementary Details _____
SO263 = (same as above) SFREE = (same as above)

Clogging Indicator Model Code

VR 2 D . X / V

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

Trip Pressure _____
1.4 = 20 psid (1.4 bar) 2 = 29 psid (2 bar)
5 = 72 psid (5 bar) (optional)

Type of Indicator _____
A = No indicator, plugged port
BM = Pop-up indicator (manual reset)
C = Electric switch - SPDT
E = Visual pressure gauge
F = Electric pressure switch
FD = Electric pressure switch w/Deutsch Connector

Modification Number _____

Supplementary Details _____
2MO = Deutsch Connector (male)

Seals _____
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

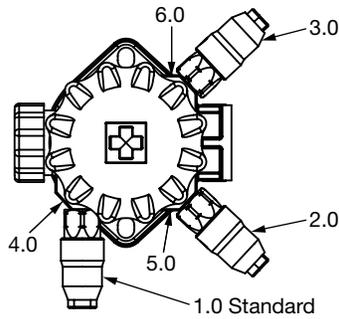
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Clogging Indicator Locations

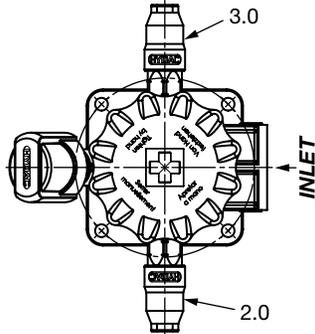
RFM 75/165/185



RFM 75/165/185 (2 Bolt Mount)

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...

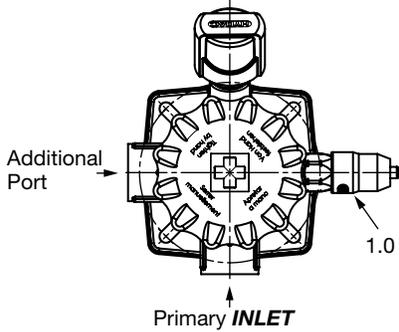
RFM 75/165/185/-4L



RFM 75/165/185 - Single Port (4 Bolt Mount)

Type No.	Location of Clogging Indicator	Indicator Model
2.X	Clogging Indicator left front 90° to Inlet	VMF...
3.X	Clogging Indicator right front 90° to Inlet	VMF...

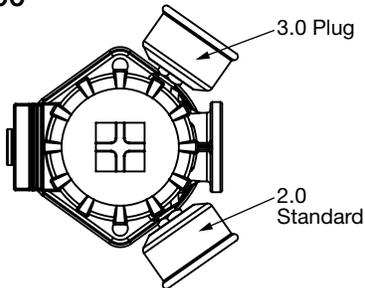
RFM 75/165/185/-4L - Multi-Port



RFM 75/165/185 - Multi-Port (4 Bolt Mount)

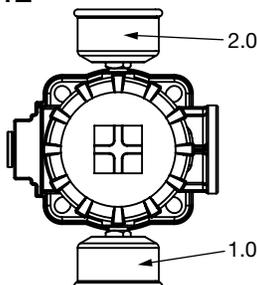
Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator right of primary Inlet, 90° to Inlet	VMF...

RFM 90/150



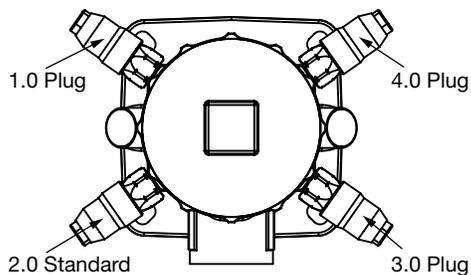
Type No.	Location of Clogging Indicator	Indicator Model
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...

RFM 90/150/-4L



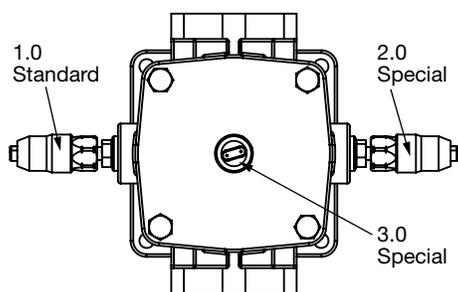
Clogging Indicator Locations (cont'd)

RFM 210/270



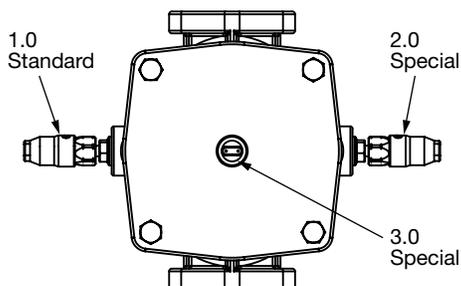
Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left back 45° to Inlet	VMF...
2.X	Clogging Indicator left front 45° to Inlet	VMF...
3.X	Clogging Indicator right front 45° to Inlet	VMF...
4.X	Clogging Indicator right back 45° to Inlet	VMF...

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

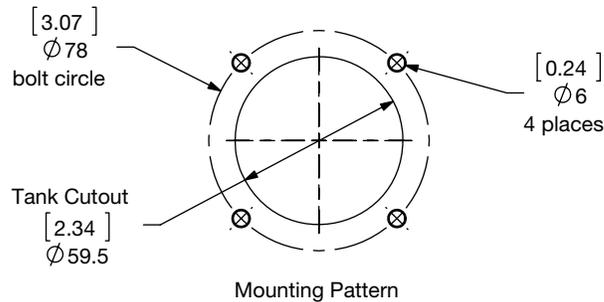
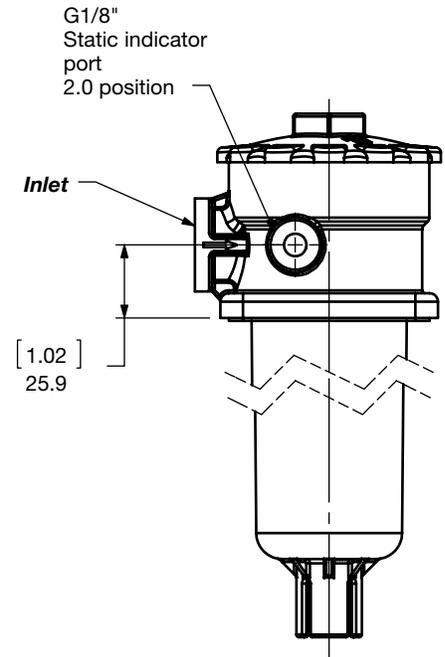
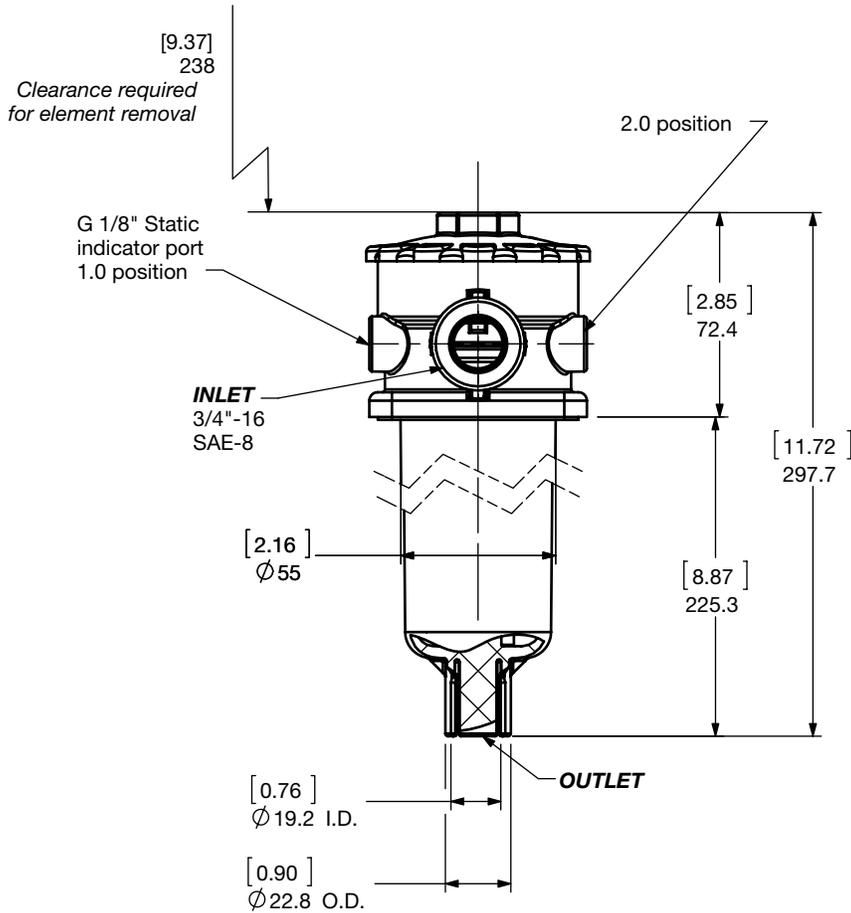
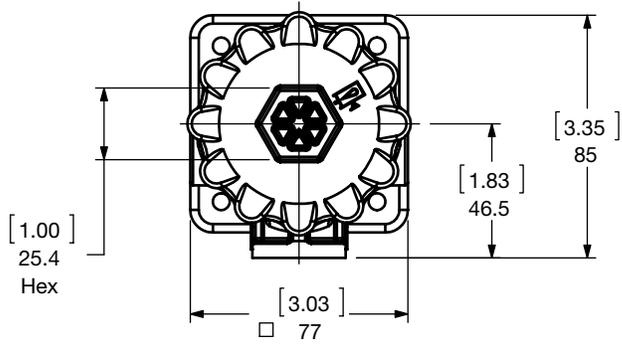


Type No.	Location of Clogging Indicator	Indicator Model
1.X	Clogging Indicator left 90° to Inlet	VR...
2.X	Clogging Indicator right 90° to Inlet	VR...
3.X	Clogging Indicator on Top	VR...

LOW PRESSURE FILTERS

Dimensions

RFM 50 - 4L

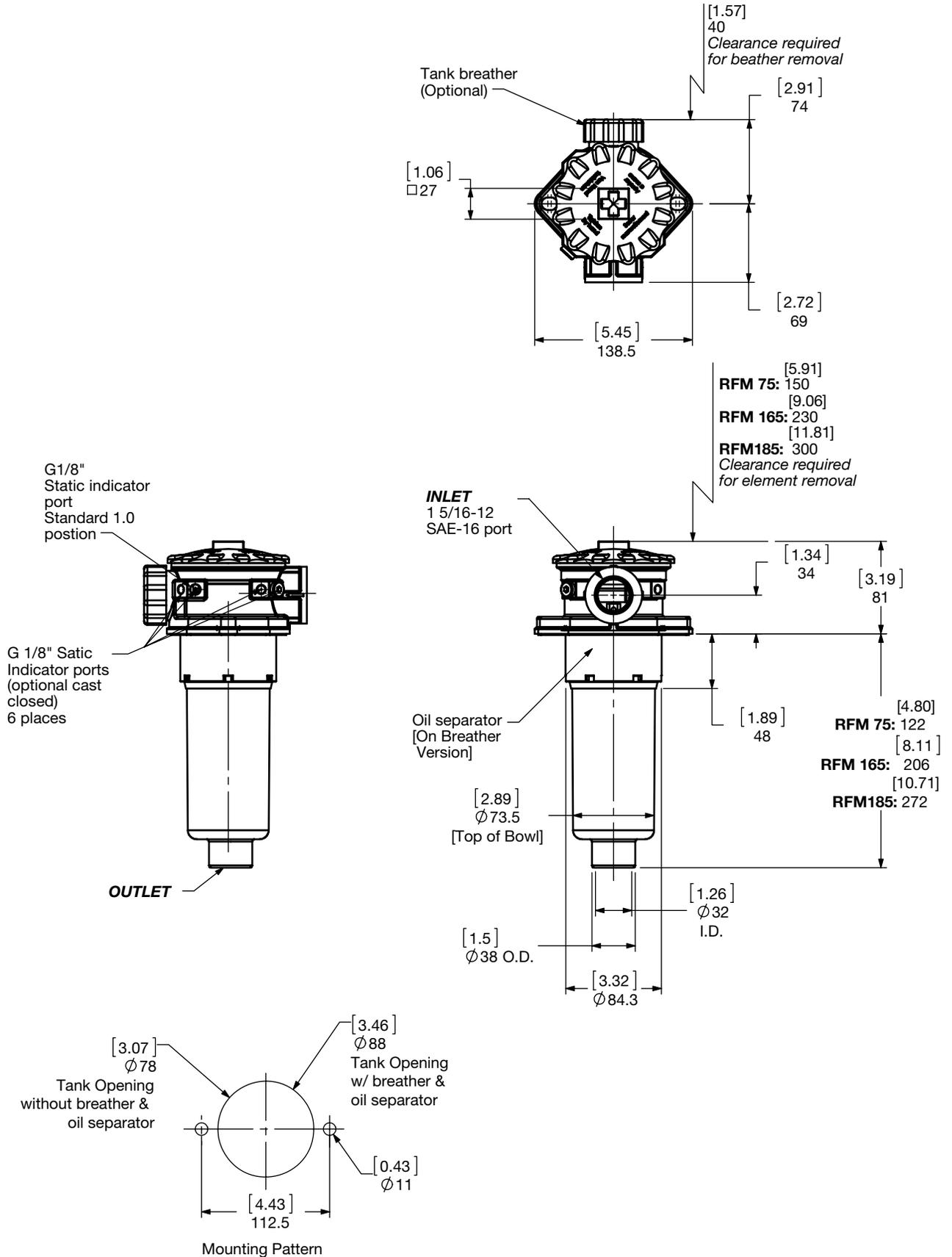


Size	50
Weight (lbs.)	1.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions

RFM 75/165/185 (2 Bolt)



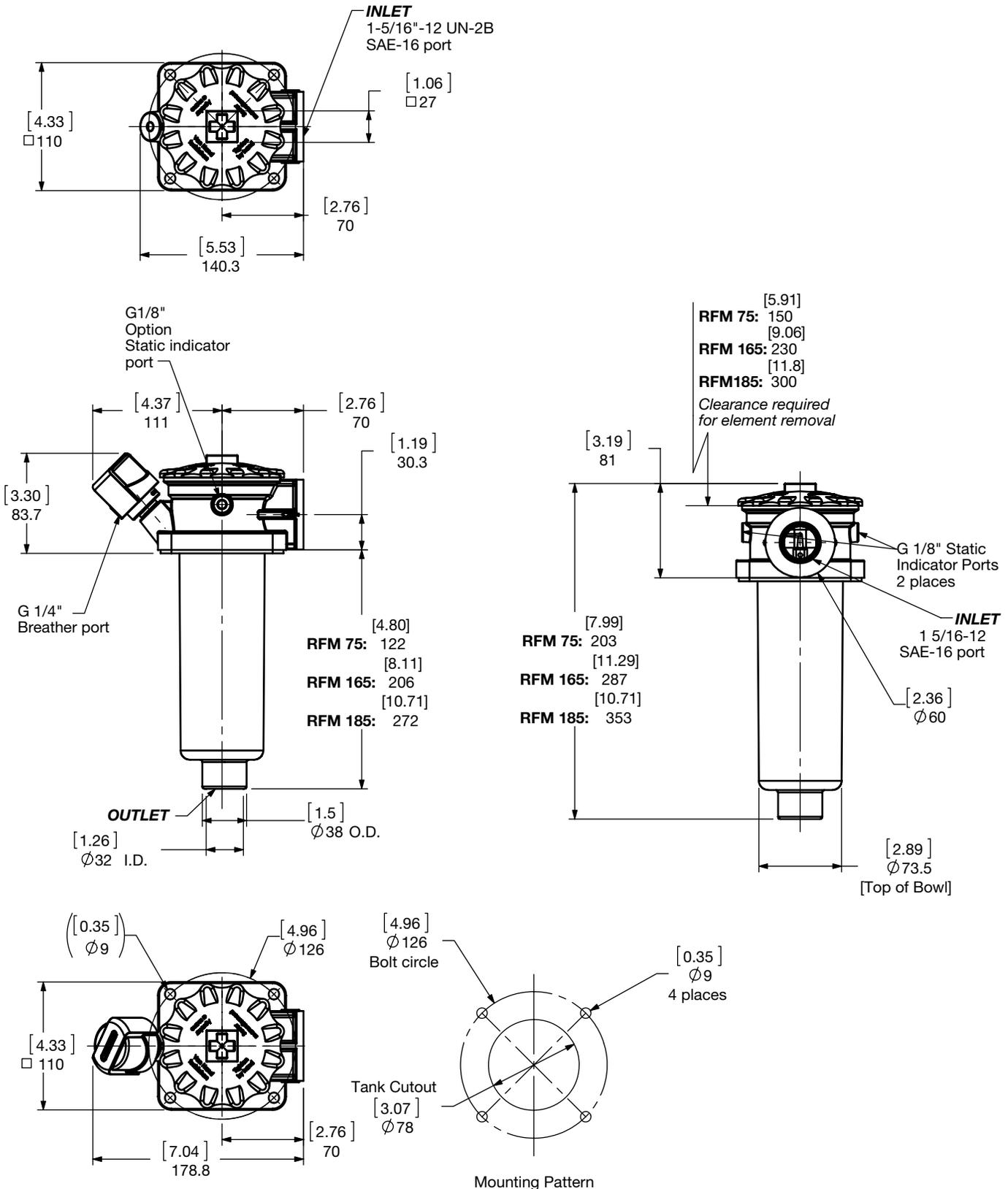
Size	75	165	185
Weight (lbs.)	2.0	2.5	2.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

RFM 75/165/185 - 4L Single Port (4 Bolt)



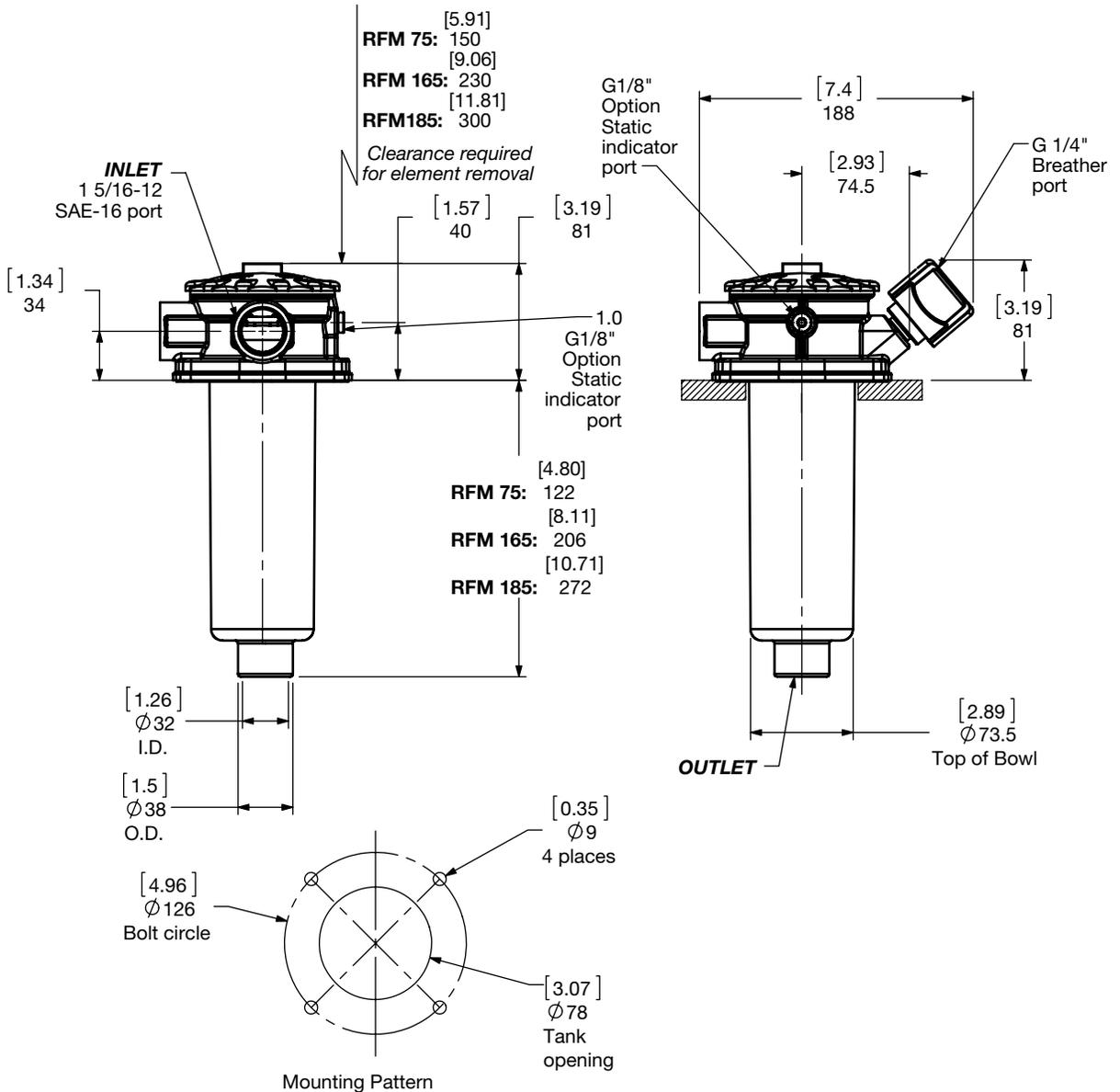
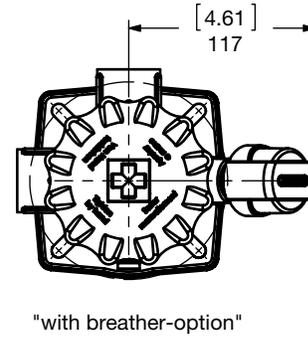
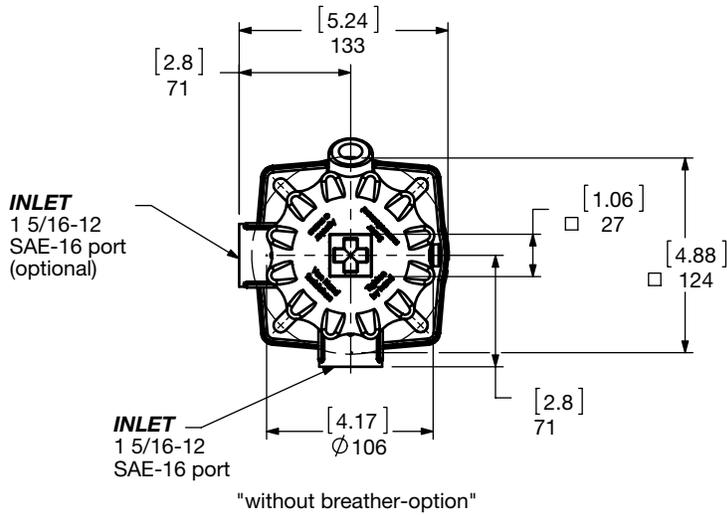
Note: Breather (BF10 With Anti Splash)

Size	75	165	185
Weight (lbs.)	2.0	2.5	2.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions

RFM 75/165/185 - 4L Multi Port (4 Bolt)



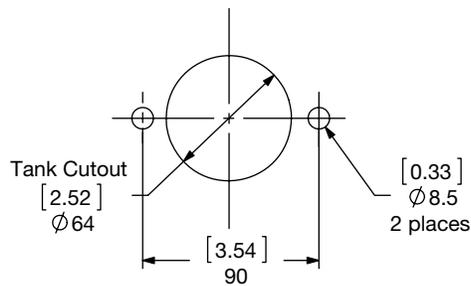
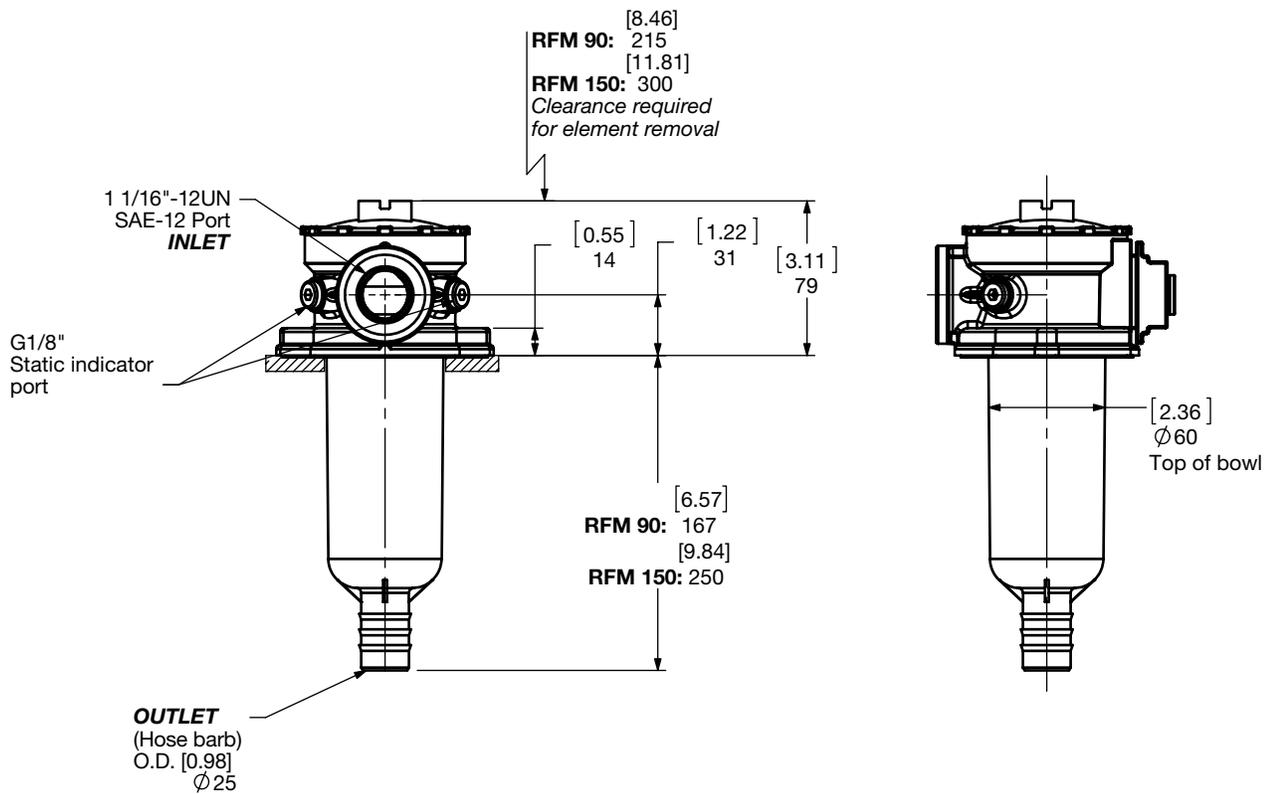
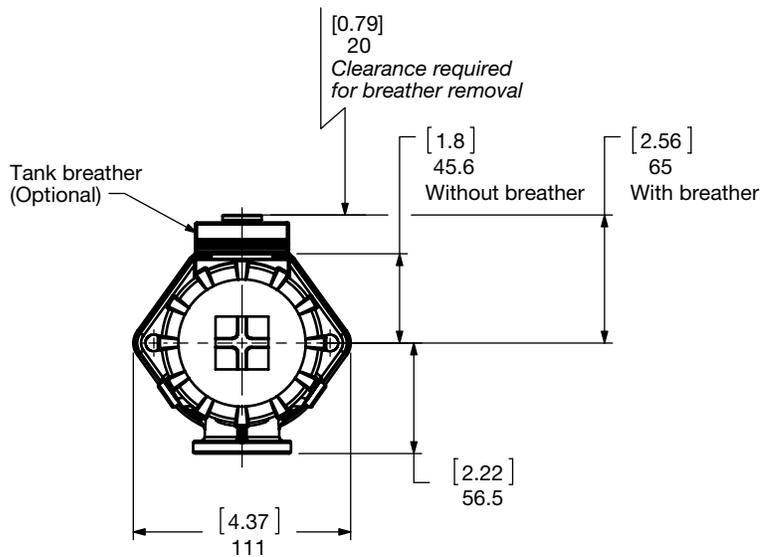
Size	75	165	185
Weight (lbs.)	2.0	2.5	2.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

RFM 90-150 (2 Bolt)



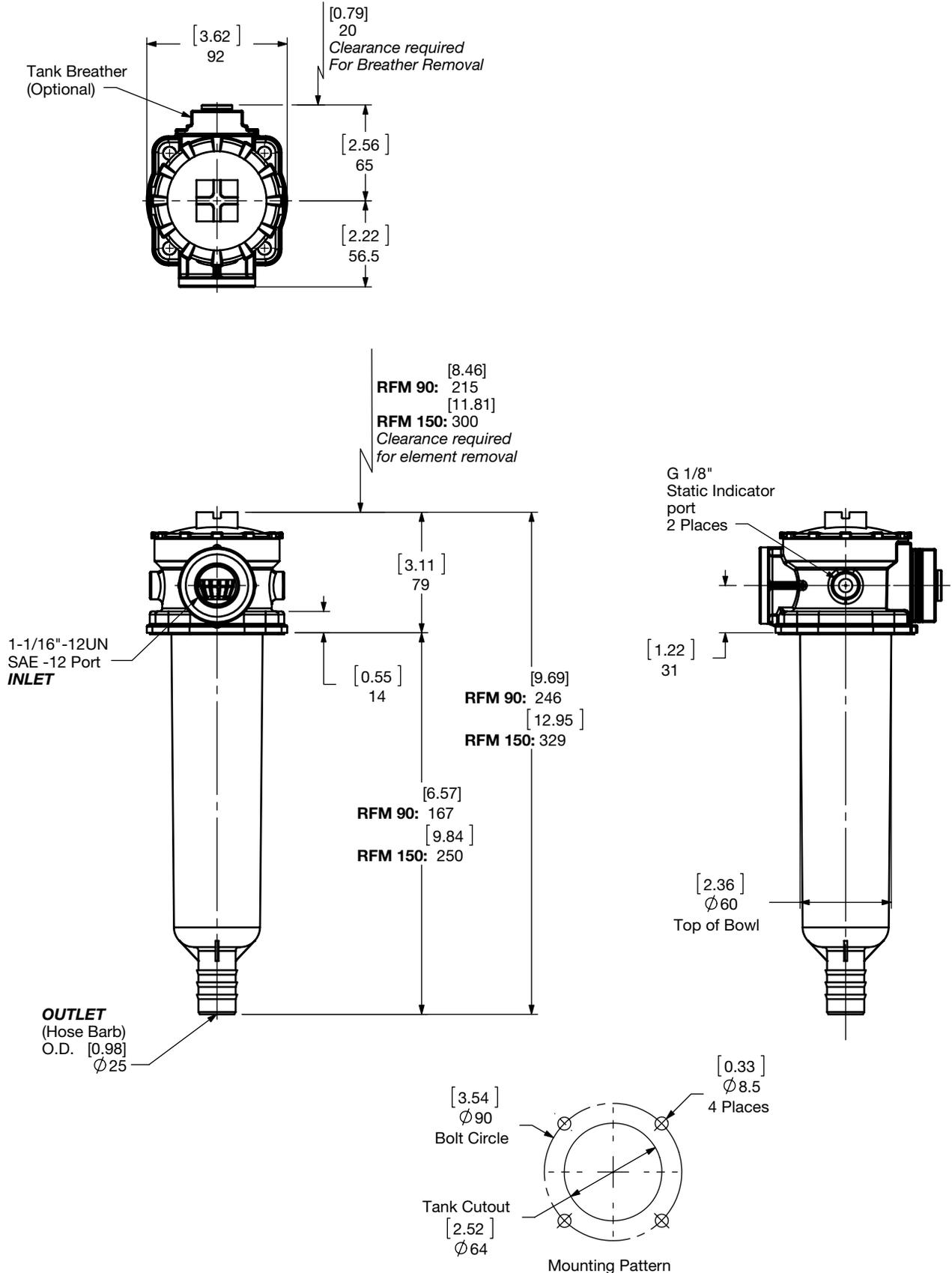
Mounting Pattern

Size	90	150
Weight (lbs.)	1.2	1.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions

RFM 90-150 - 4L (4 Bolt)



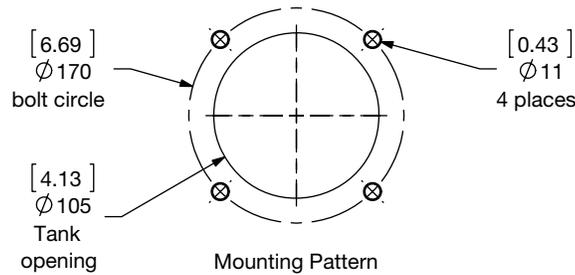
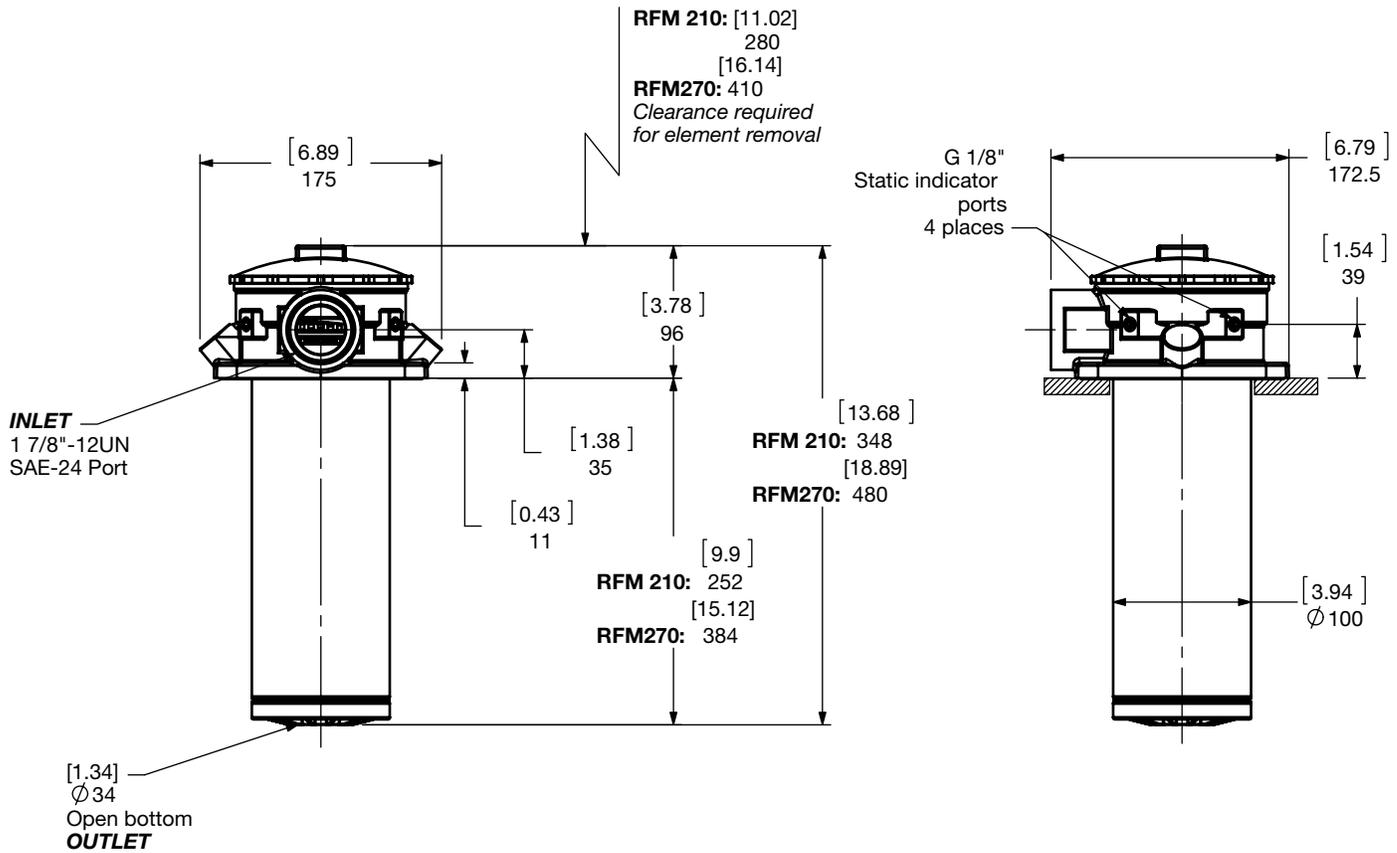
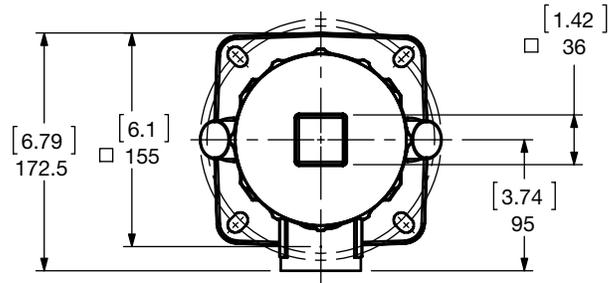
Size	90	150
Weight (lbs.)	1.2	1.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

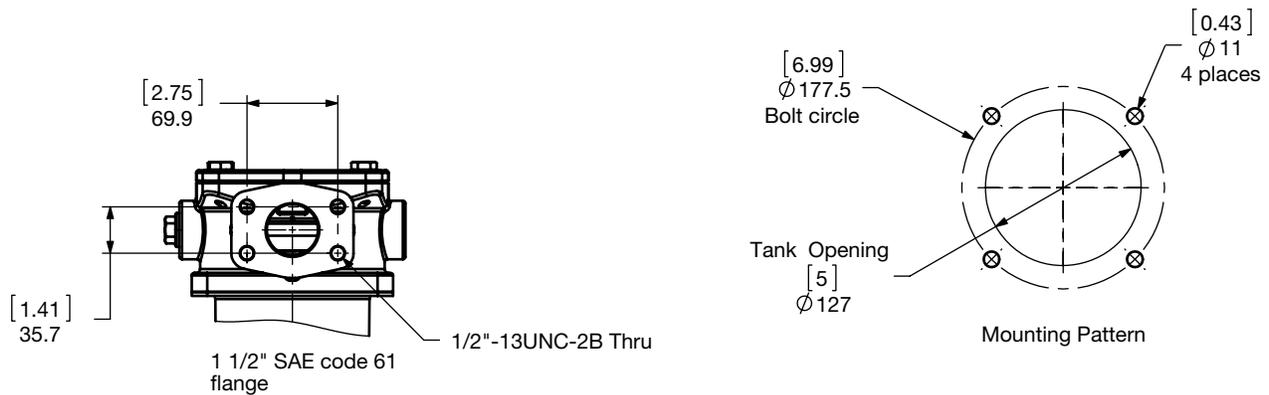
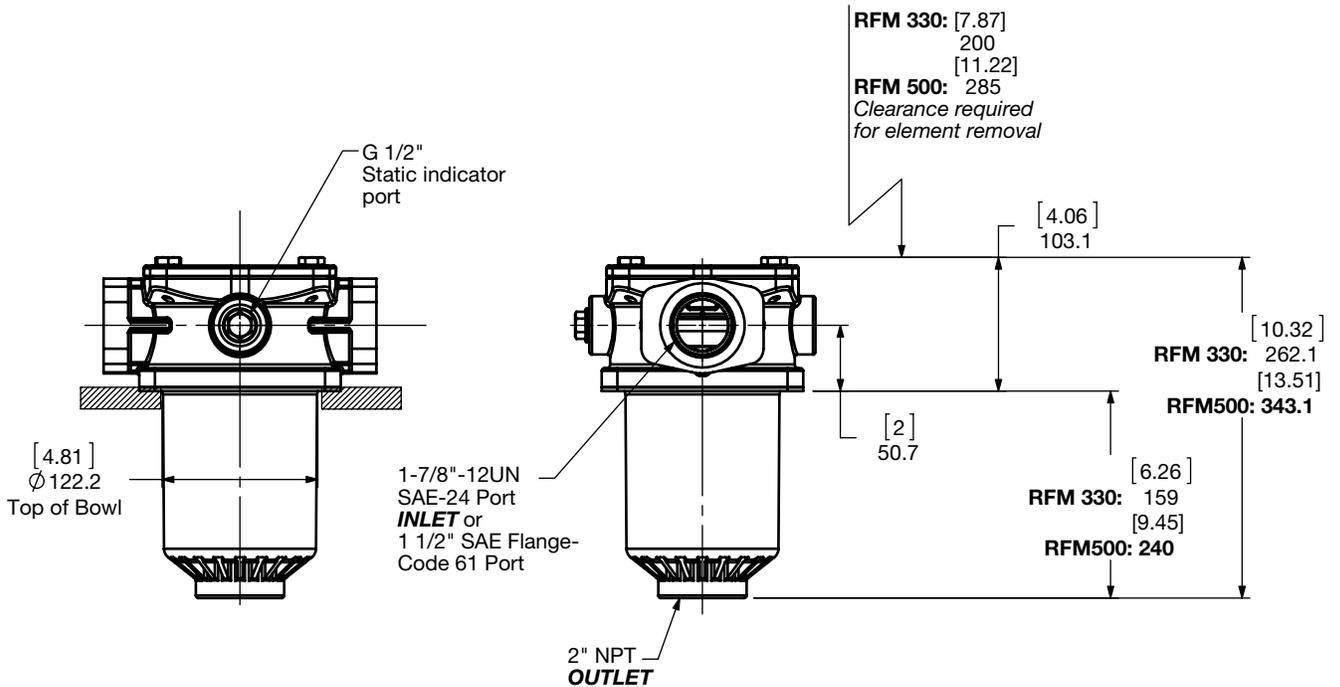
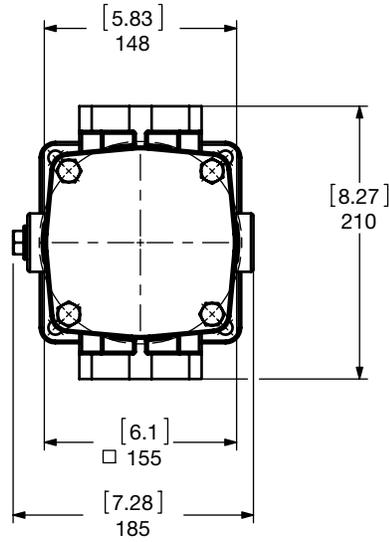
RFM 210/270



Size	210	270
Weight (lbs.)	7	9.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFM 330/500



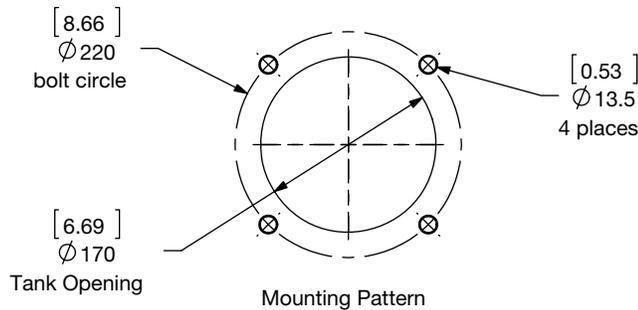
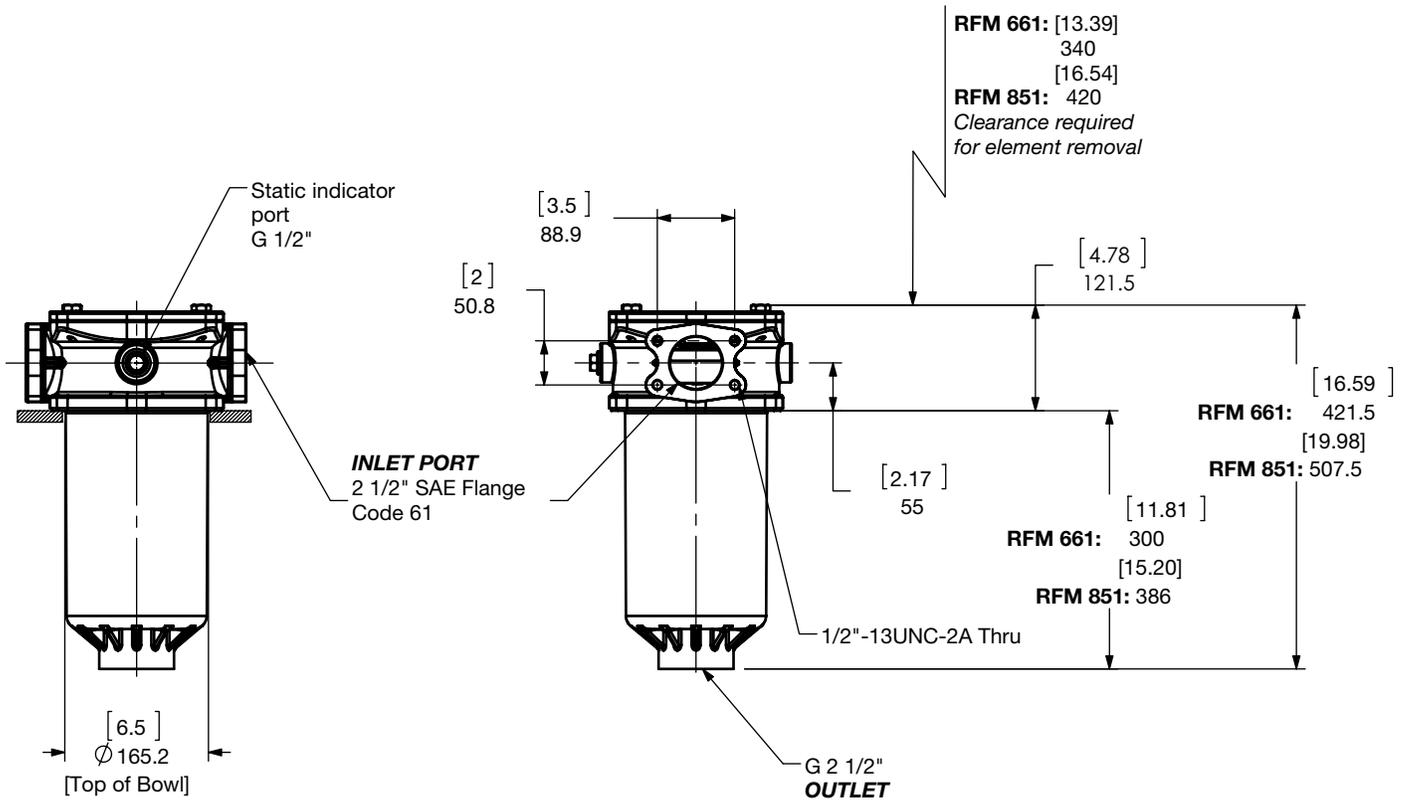
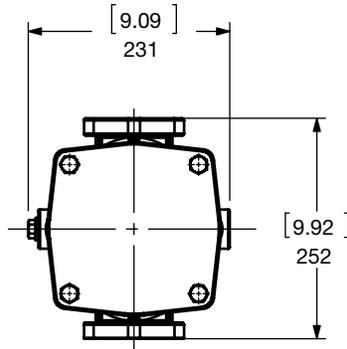
Size	330	500
Weight (lbs.)	8.6	10

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

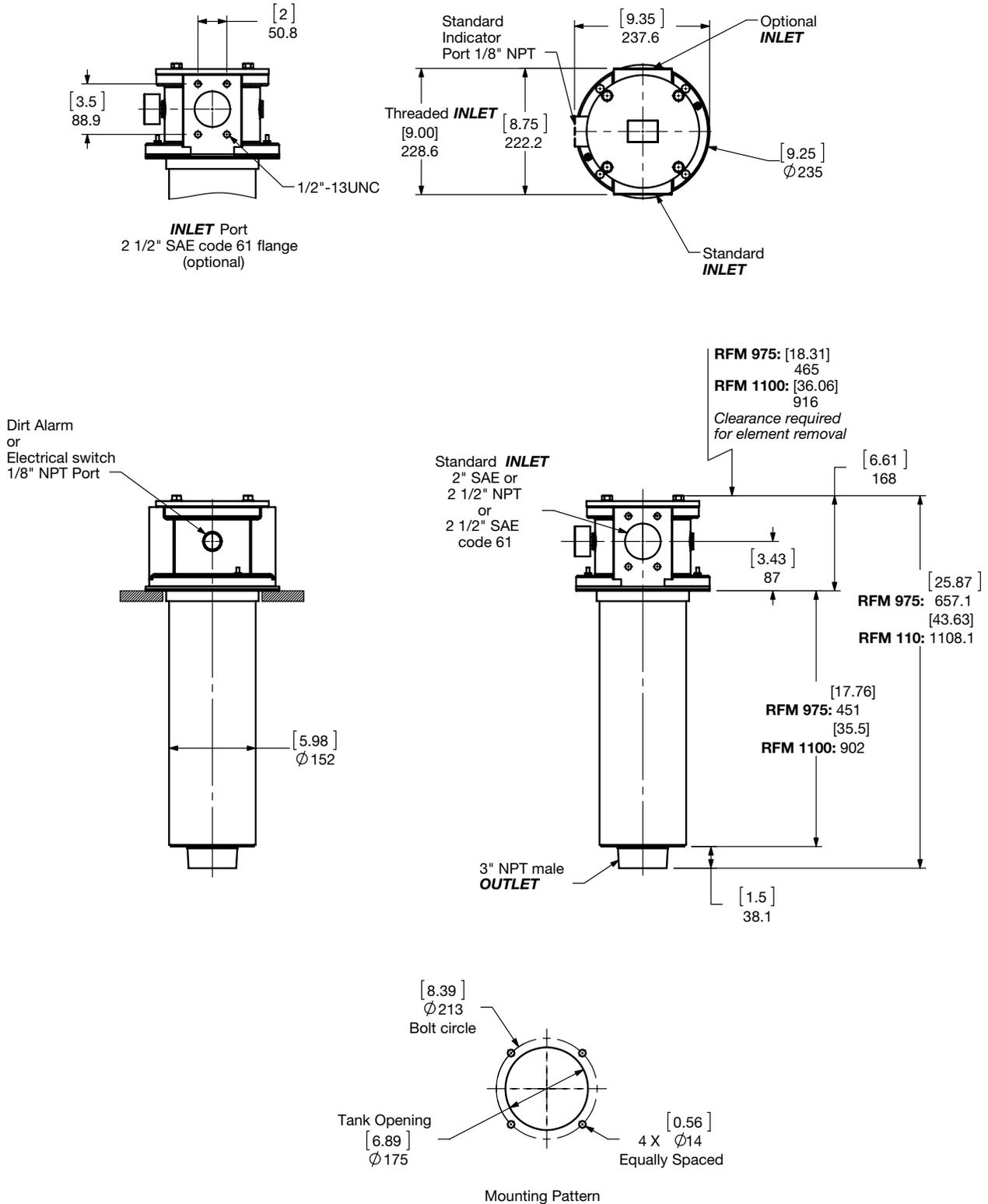
RFM 661/851



Size	661	851
Weight (lbs.)	19.9	23.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFM 975/1100



Size	975	1100
Weight (lbs.)	37	52

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

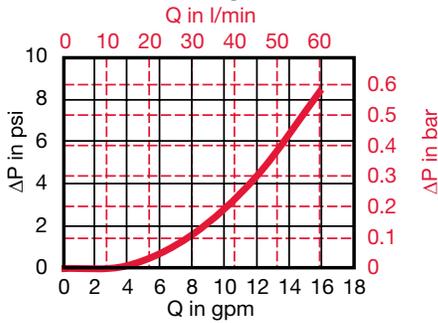
Housing Curve:

Pressure loss through housing is as follows:

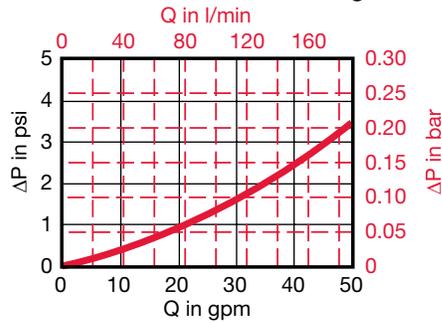
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

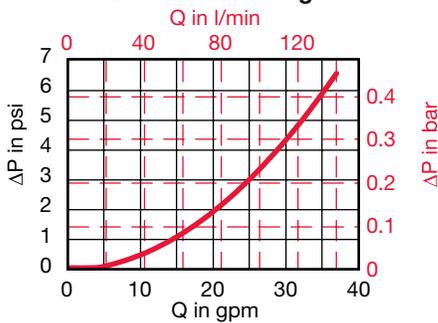
RFM 50/-4L Housing



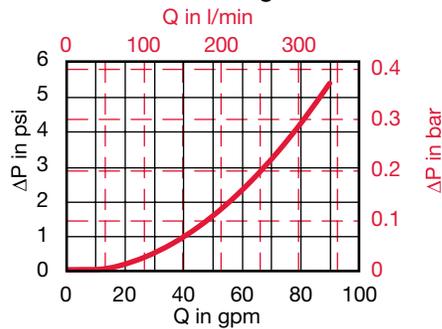
RFM 75/165/185 & RFM 75/165/185/-4L Housing



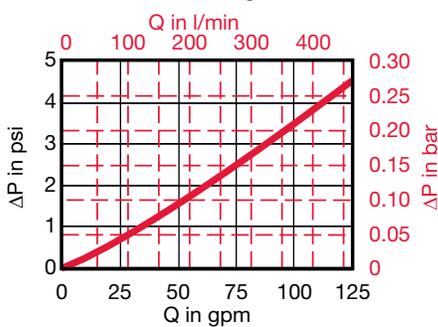
RFM 90/150 & RFM 90/150/-4L Housing



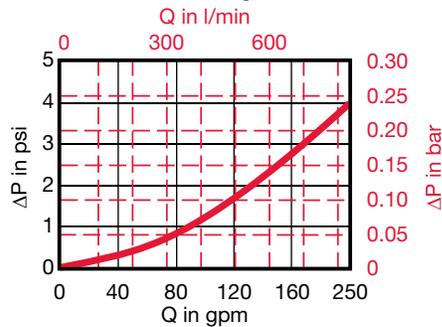
RFM 210 / 270 Housing



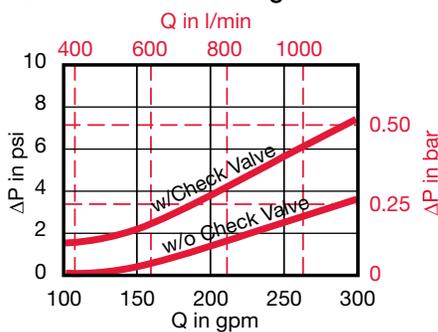
RFM 330/500 Housing



RFM 661/851 Housing



RFM 975 / 1100 Housing



Element K Factors

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

(From Tables Below)

Betamicron		...R...BN4HC			
Size	3 µm	5 µm	10 µm	20 µm	
0975 R XXX BN4HC	0.050	0.040	0.030	0.020	
1100 R XXX BN4HC	0.030	0.020	0.020	0.010	

Optimicron		...R...ON				
Size	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0050 R XXX ON	N.A.	N.A.	N.A.	0.296	N.A.	N.A.
0075 R XXX ON	1.405	1.065	0.735	0.401	0.263	0.241
0090 R XXX ON	1.235	0.719	0.521	0.333	0.236	0.176
0165 R XXX ON	0.774	0.518	0.404	0.221	0.123	0.133
0185 R XXX ON	0.571	0.408	0.315	0.161	0.091	0.077
0210 R XXX ON	0.311	0.18	0.14	0.084	0.055	0.048
0270 R XXX ON	0.201	0.116	0.091	0.054	0.036	0.031
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056
0500 R XXX ON	0.289	0.143	0.104	0.06	0.046	0.038
0660 R XXX ON	0.196	0.093	0.066	0.037	0.031	0.025
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.02

ECOMICRON		...R...ECON2			
Size	3 µm	5 µm	10 µm	20 µm	
0090 R XXX ECON2	0.818	0.554	0.368	0.176	
0150 R XXX ECON2	0.488	0.329	0.220	0.104	
0165 R XXX ECON2	0.615	0.428	0.247	0.132	
0185 R XXX ECON2	0.488	0.335	0.181	0.099	
0195 R XXX ECON2	0.362	0.247	0.132	0.071	
0330 R XXX ECON2	0.230	0.148	0.093	0.066	
0500 R XXX ECON2	0.165	0.104	0.071	0.044	
0660 R XXX ECON2	0.104	0.066	0.044	0.027	
0850 R XXX ECON2	0.082	0.055	0.038	0.022	

MOBILEMICRON		...R...MM		
Size	8 µm	10 µm	15 µm	
0075 R XXX MM	0.265	0.265	0.166	
0090 R XXX MM	0.252	0.252		
0150 R XXX MM	0.114	0.114	0.071	
0165 R XXX MM	0.146	0.146	0.091	
0185 R XXX MM	0.108	0.108	0.068	
0210 R XXX MM	0.052	0.052	0.032	
0270 R XXX MM	0.032	0.032	0.020	
0330 R XXX MM	0.078	0.078	0.049	
0500 R XXX MM	0.052	0.052	0.032	
0660 R XXX MM	0.030	0.030	0.019	
0850 R XXX MM	0.023	0.023	0.014	

Betamicron/Aquamicron		...R...BN4AM	
Size	3 µm	10 µm	
0330 R XXX BN4AM	0.477	0.165	
0500 R XXX BN4AM	0.313	0.11	
0660 R XXX BN4AM	0.192	0.066	
0850 R XXX BN4AM	0.154	0.049	

Aquamicron		...R...AM
Size	40 µm	
0330 R 040 AM	0.115	
0500 R 040 AM	0.076	
0660 R 040 AM	0.051	
0850 R 040 AM	0.040	

Wire Mesh		...R...W/HC
Size	25, 50, 74, 100, 149, 200 µm	
0075 R XXX W/HC	0.020	
0090 R XXX W/HC	0.017	
0150 R XXX W/HC	0.010	
0165 R XXX W/HC	0.011	
0185 R XXX W/HC	0.050	
0195 R XXX W/HC	0.037	
0210 R XXX W/HC	0.004	
0270 R XXX W/HC	0.002	
0330 R XXX W/HC	0.011	
0500 R XXX W/HC	0.007	
0660 R XXX W/HC	0.004	
0850 R XXX W/HC	0.003	

Polyester		...R...P/HC	
Size	10 µm	20 µm	
0075 R XXX P/HC	0.071	0.036	
0090 R XXX P/HC	0.058	0.029	
0150 R XXX P/HC	0.040	0.017	
0165 R XXX P/HC	0.033	0.016	
0185 R XXX P/HC	0.029	0.016	
0195 R XXX P/HC	0.018	0.009	
0210 R XXX P/HC	0.018	0.010	
0270 R XXX P/HC	0.009	0.004	
0330 R XXX P/HC	0.016	0.008	
0500 R XXX P/HC	0.011	0.005	
0660 R XXX P/HC	0.008	0.004	
0850 R XXX P/HC	0.007	0.003	

S.S. Wire Mesh "R"		...R...V US UNITS			
Size	3 µm	5 µm	10 µm	20 µm	
0330 R XXX V	0.115	0.093	0.060	0.044	
0500 R XXX V	0.082	0.066	0.044	0.027	
0660 R XXX V	0.055	0.044	0.033	0.022	
0850 R XXX V	0.044	0.033	0.022	0.016	

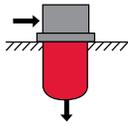
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

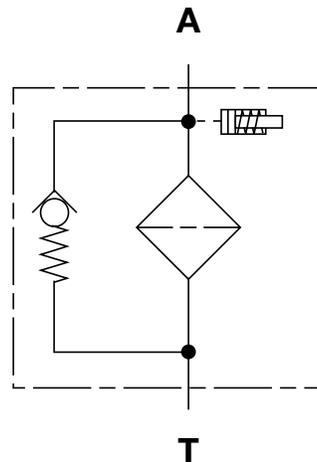
RFMP Series

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 integrate the 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.

Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Technical Specifications

Mounting Method	
165	4 mounting holes - filter housing
Port Connections	
165	Inlet / Outlet 1" Hose Barb/1.26" smooth port
Direction of Flow	
	Side inlet and bottom outlet.
Mat. of Construc.	
165	Housing Lid Polyamide Plastic
Flow Capacity	
165	26 gpm (100 lpm)
Housing Pressure Rating	
Max. Allowable Working Pressure*	101.5 psi (7 bar)
Element Collapse Pressure Rating	
ON	290 psid (20 bar)
ECON2, P/HC, MM	145 psid (10 bar)
Fluid Temperature Range	
	-22°F to 176°F (-30°C to 80°C)
Consult HYDAC for applications below -22°F (-30°C)	
Fluid Compatibility	
Compatible with all petroleum oils and synthetic fluids rated for use with nitrile rubber (NBR) seals.	
Indicator Trip Pressure	
P = 29 psi (2 bar) -10% (standard)	
Bypass Valve Cracking Pressure	
ΔP = 43 psid (3 bar) +10% (standard)	

*Note: All RFMP Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VMF" and "VR" indicators: B, BM, E, ES, GC, LE, LZ.

Applications

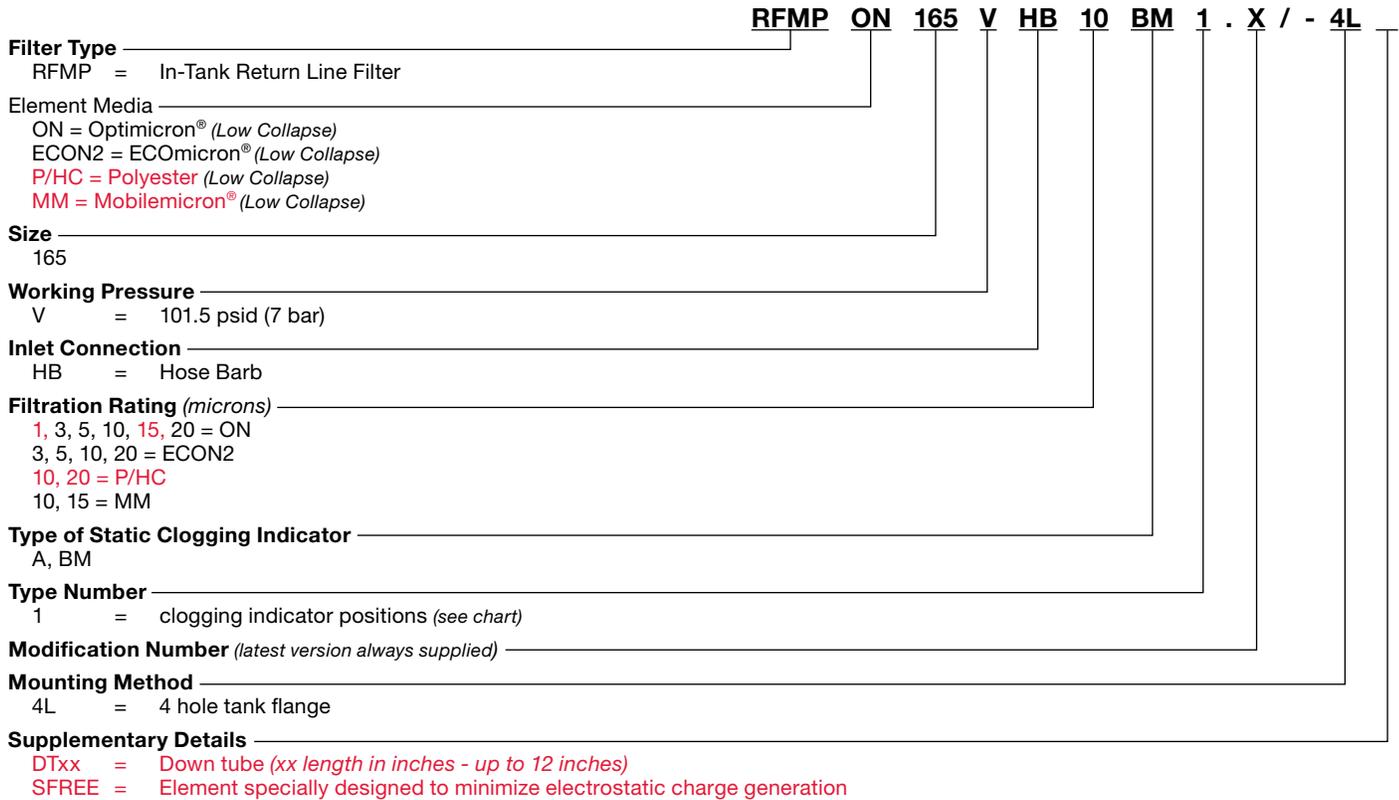


Agricultural

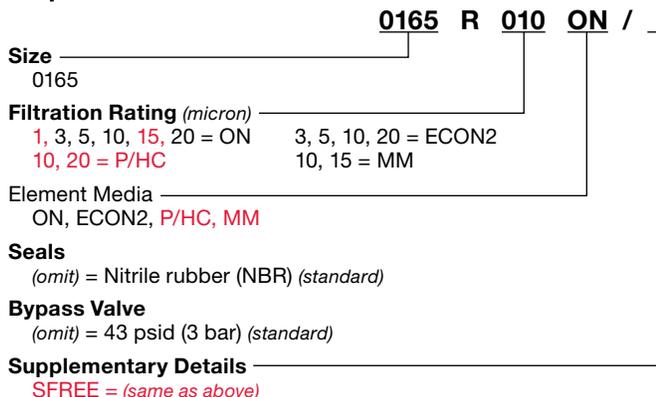


Construction

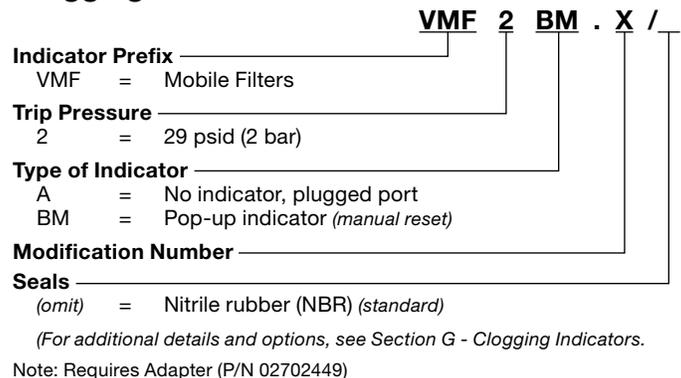
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

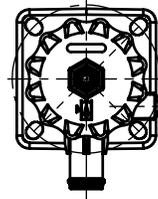


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

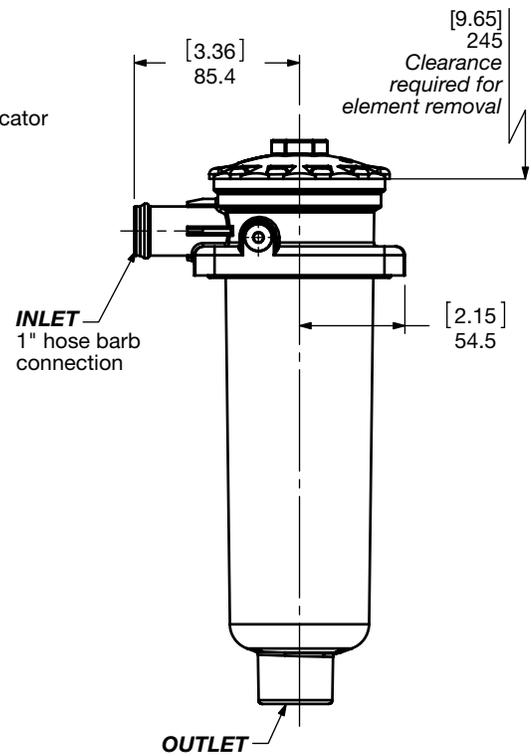
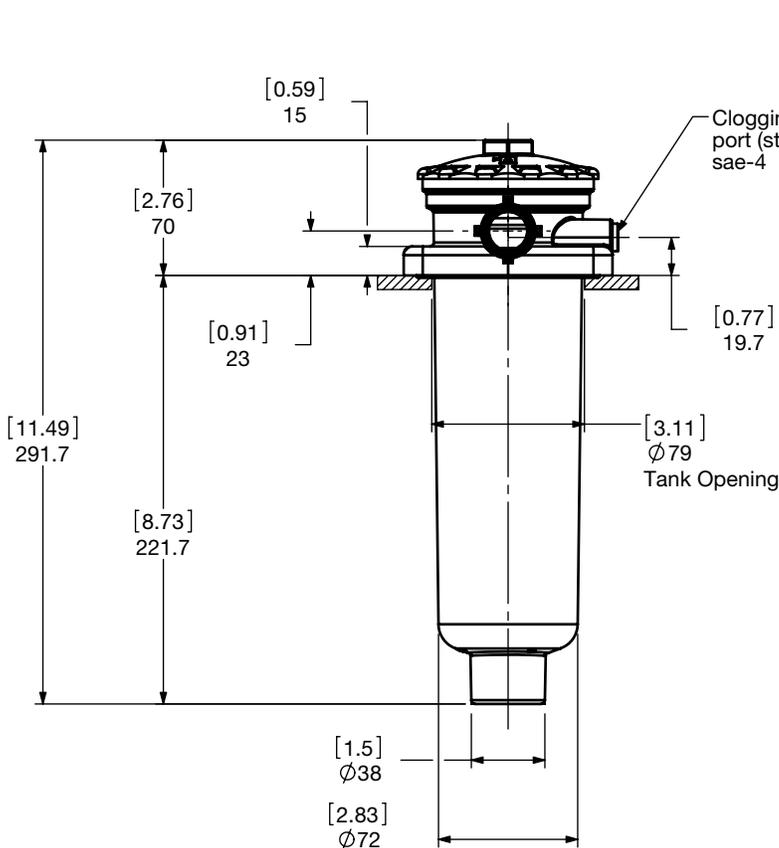
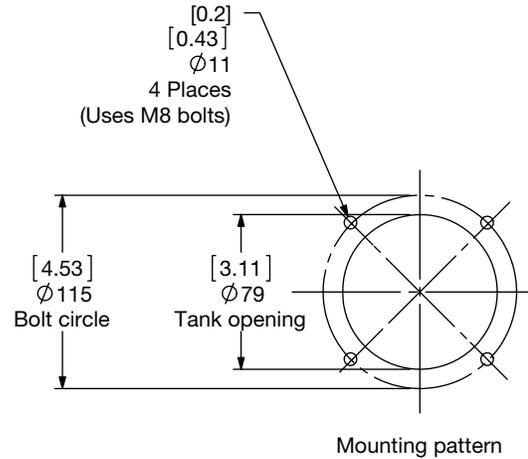
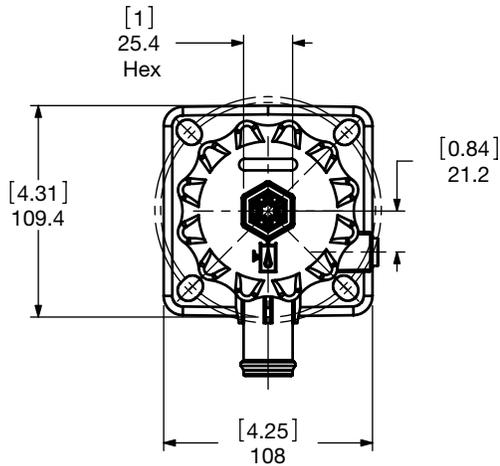
LOW PRESSURE FILTERS

Dimensions

RFMP 165



1.X
Clogging indicator
location
(right front)
Uses indicator model (VMF...)
with adapter (P/N: 02702449)



Size	165
Weight (lbs.)	2.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print

Sizing Information

Total pressure loss through the filter is as follows:

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

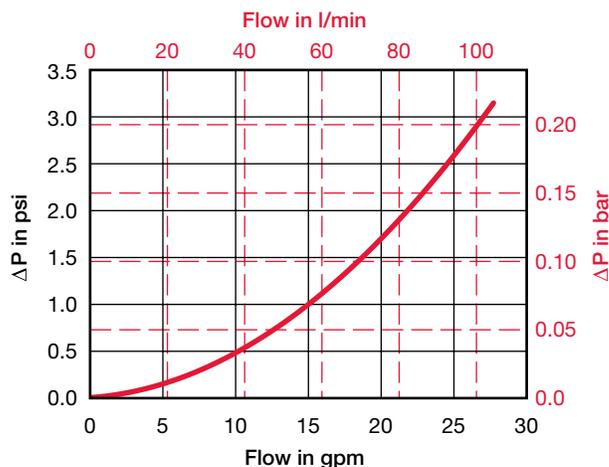
Housing Curve:

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 HYDAC Filter Assemblies" in Section B - Overview)

RFMP 165 Housing



Element K Factors

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

(From Tables Below)

Optimicron	...R...ON					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0165 R XXX ON	0.774	0.518	0.404	0.221	0.123	0.133

ECOMICRON	...R...ECON2			
Size	3 μm	5 μm	10 μm	20 μm
0165 R XXX ECON2	0.615	0.428	0.247	0.132

MOBILEMICRON	...R...MM		
Size	8 μm	10 μm	15 μm
0165 R XXX MM	0.146	0.146	0.091

POLYESTER	...R...P/HC	
Size	10 μm	20 μm
0165 R XXX P/HC	0.033	0.016

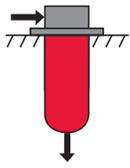
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

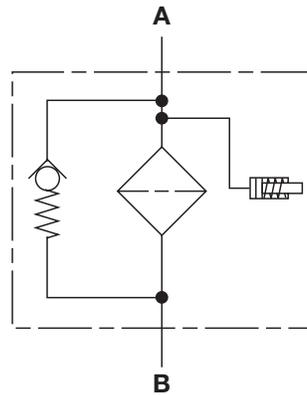
HF4R Series

In-Tank Return Line Filters

100 psi • up to 100 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, BSPP and NPT ports to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of Nitrile rubber (NBR), or Fluorocarbon elastomer (FKM) O-ring material provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and water based 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.
- Filters include 1 1/2" threaded NPT outlet connection.

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



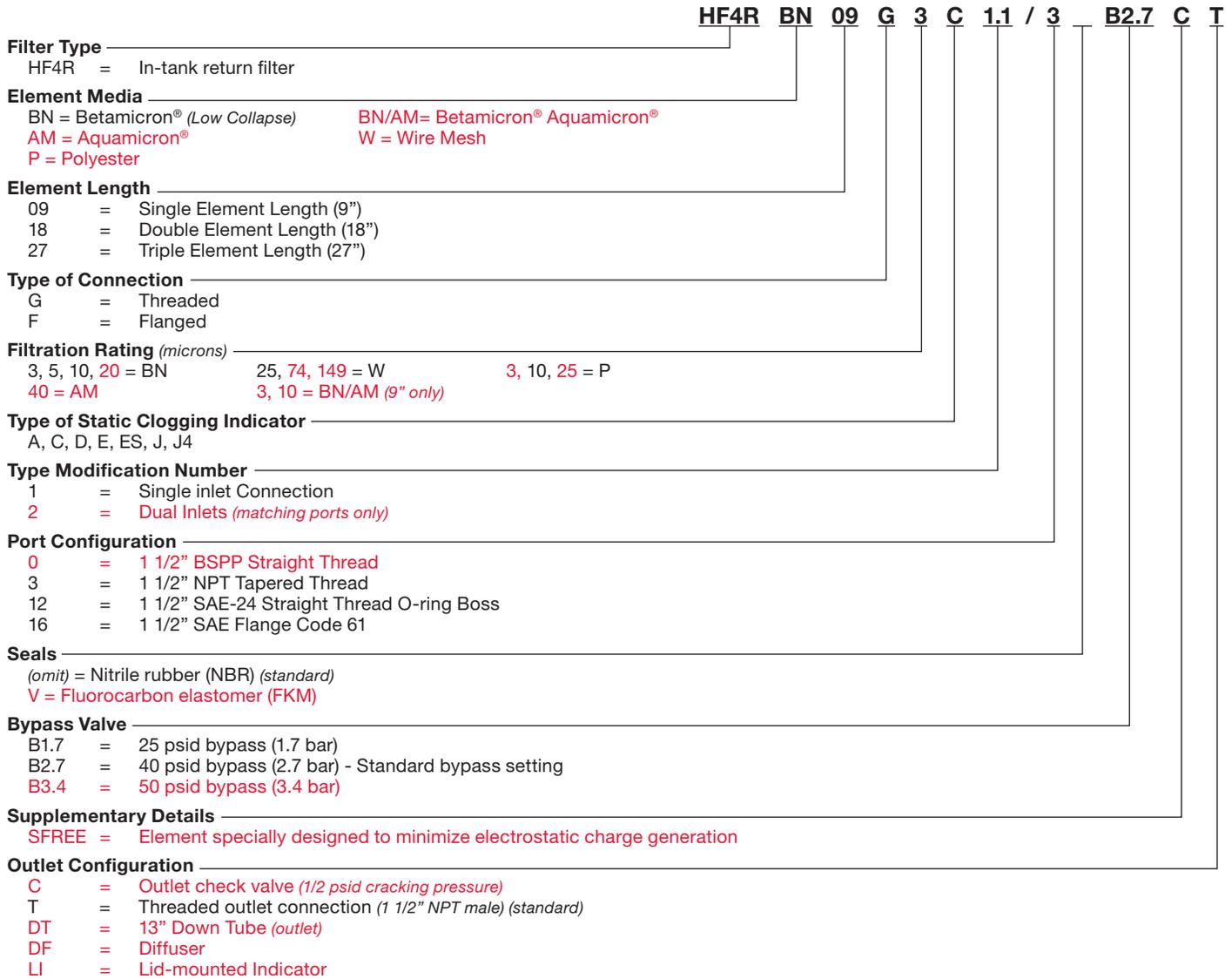
Steel / Heavy Industry

Technical Specifications

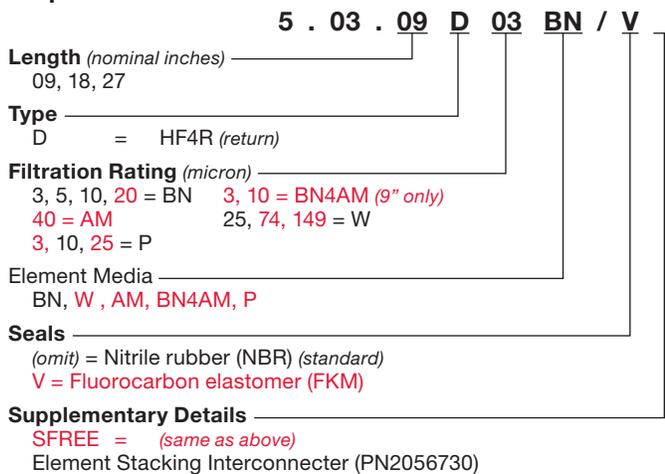
Mounting Method	4 mounting holes - filter housing	
Port Connection	Inlet SAE-24, 1 1/2" NPT, 1 1/2" BSPP, 1 1/2" Flange, Code 61	
Outlet HF4R 09/18/27	1 1/2" NPT male	
Flow Direction	Inlet	Outlet
HF4R	Side	Bottom
Construction Materials	Head, Lid Aluminum	
Bowl	Carbon Steel	
Flow Capacity	HF4R09 50 gpm (189 lpm)	
HF4R18	75 gpm (378 lpm)	
HF4R27	100 gpm (454 lpm)	
Housing Pressure Rating	Max. Allowable Working Pressure* 101.5 psi (7 bar)	
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating	BN, BN4AM, AM, W, P/HC 145 psid (10 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)	
Consult HYDAC for applications below 14°F (-10°C)		
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	All Other Indicators Gauges (E / ES)	
P = 14.5 psi (1 bar) -10%	P = 11.6 psi (0.8 bar)	
P = 29 psi (2 bar) -10%	P = 20 psi (1.4 bar)	
P = 36 psi (2.5 bar) -10%	P = 29 psi (2 bar)	
Bypass Valve Cracking Pressure	ΔP = 25 psid (1.7 bar) +10% (optional)	
	ΔP = 40 psid (2.7 bar) +10% (standard)	
	ΔP = 50 psid (3.4 bar) +10% (contact factory)	

*Note: All HF4R Filters MAWP reduce to 101.5 psi (7 bar) when using the following "VR" indicators: B, BM, E, ES, GC, LE, LZ.
Any filters incorporating a VMFXE.X/3 or VMFXES.X/3 static gauge indicator (1/8" NPT thread) will be de-rated to an MAWP of 60 psi (4 bar).

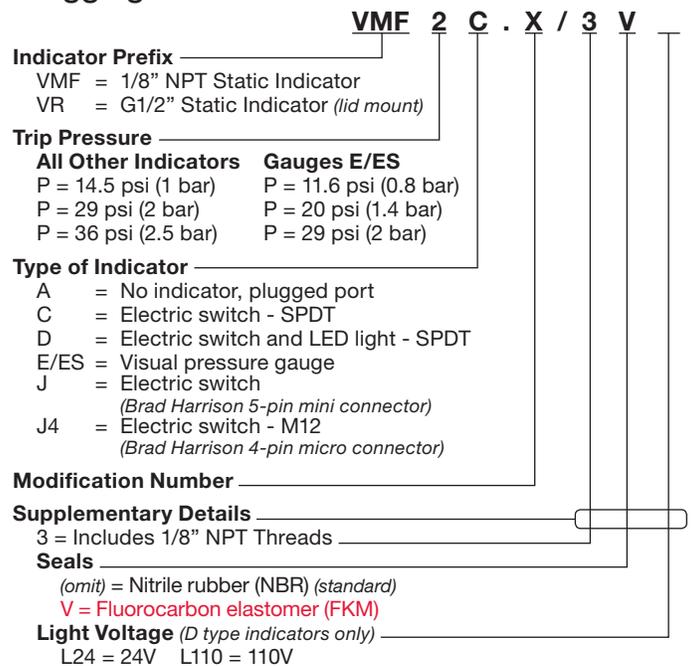
Model Code



Replacement Element Model Code



Clogging Indicator Model Code



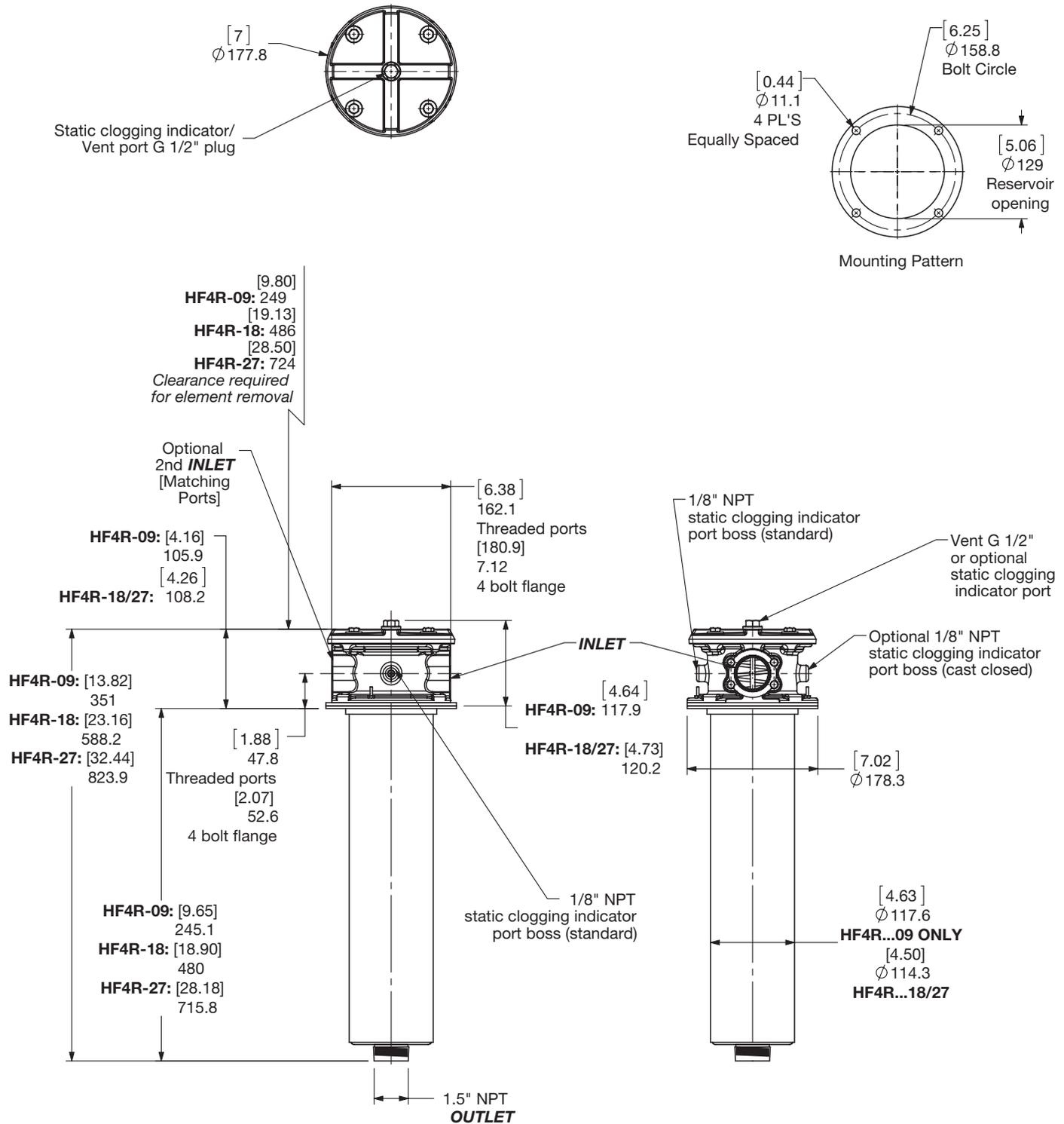
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

HF4R



Size	09	18	27
Weight (lbs.)	13	17.5	23.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

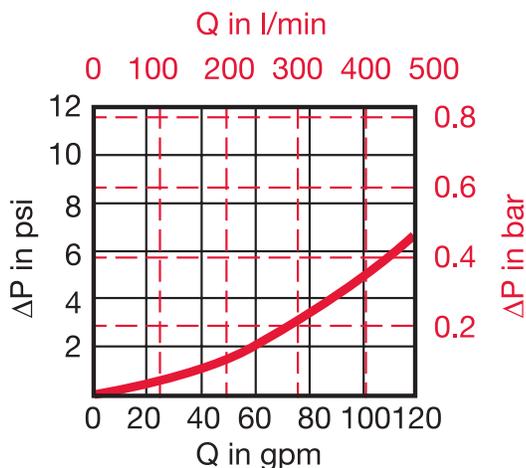
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Autospec HF4 Depth	5.03.XXDXXBN Low Collapse			
Size	3 μm	5 μm	10 μm	20 μm
5.03.09DXXBN	0.168	0.141	0.079	0.044
5.03.18DXXBN	0.080	0.067	0.038	0.021
5.03.27DXXBN	0.052	0.043	0.024	0.014

Autospec HF4 Paper	5.03.XXDXXP Low Collapse		
Size	3 μm	10 μm	25 μm
5.03.09DXXP	0.250	0.120	0.080
5.03.18DXXP	0.090	0.050	0.030
5.03.27DXXP	0.020	0.010	0.010

Autospec HF4 Water	5.03.09DXXAM & BN/AM		
Size	3 μm	10 μm	40 μm
5.03.09DXXAM	N/A	N/A	0.125
5.03.09DXXBN/AM	0.320	0.230	N/A

Note: requires stacking for 18" and 27" configurations.

Autospec HF4 Wire Mesh	5.03.XXDXXW
Size	25, 74, 149 μm
5.03.09DXXW	0.007
5.03.18DXXW	0.004
5.03.27DXXW	0.002

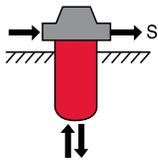
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

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 = 7 psi) 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 is drained via the back-pressure valve to the tank (*port T*).
- A bypass valve V2 (*standard = 36 psi*) is incorporated in the filter housing to relieve excessive back-pressures in the element (*important on cold starts*). Flow from the tank can be drawn via the anti-cavitation valve V3 to the suction side for a short time (*emergency function*).
- Full flow finest filtration (*10 μm, 15 μm absolute*) of the return line and hydrostatic feed pump extends the service life of your components.
- Outstanding cold start characteristics due to the precharge via the 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).
- RKM elements do not incorporate bypass in the end cap — the bypass is located in the RKM housing.

Applications

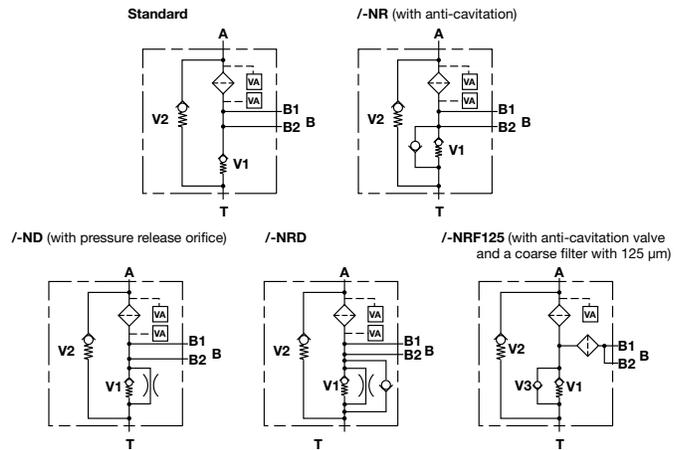


Agricultural



Construction

Hydraulic Symbol



Technical Specifications

Mounting Method	100 201 - 800	2 mounting holes 4 mounting holes
Port Connection	Return / Suction	
100	SAE-8 / SAE-8 SAE-12 / SAE-12 SAE-16 / SAE-16	
201/251	SAE-20 / 2 x SAE-16	
300	SAE 1 1/2" CS, Code 61-Split Flange (SF) / 2 x SAE 1 1/4" CS, Code 61-Split Flange (SF)	
350	SAE-24 / SAE-16	
400/800	R1-2" SAE flange / Cust. specified or R1-2 1/2" SAE flange / Cust. specified	
Flow Direction	Inlet: Side	Outlet: Side & bottom
Construction Materials		
Head	Aluminum	
Housing/Bowl	Steel (100/201/251/350/400/800) Polyamide (300)	
Lid	Polyamide (100/201/251/350) Aluminum (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. Allowable Working Pressure*	145 psi (10 bar)	
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
MM	145 psid (10 bar)	
Fluid Temp. Range 14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)		
Fluid Compatibility Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.		
Indicator Trip Pressure P = 29 psi (2 bar) -10% (<i>standard</i>) P = 72 psi (5 bar) -10% (<i>optional</i>)		
Bypass Valve Cracking Pressure ΔP = 36 psid (2.5 bar) +10% (<i>standard</i>) ΔP = 87 psid (6 bar) +10% (<i>optional</i>)		
Back Pressure Valve Cracking Pressure ΔP = 7 psid (0.5 bar) +10% (<i>standard</i>) ΔP = 43 psid (3 bar) +10% (<i>optional</i>)		

*Note: All RKM Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VR" and "VMF" indicators: B, BM, E, ES, GC, LE, LZ

Model Code

RKM MM 300 B T F 10 E 1 . X / 12-V-NR

Filter Type _____
 RKM = Low pressure multifunction

Element Media _____
 MM = Mobilemicron® (Low Collapse)

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

Operating Pressure _____
 B = 145 psi
 V = 101.5 psi (7 bar) (*Note previous page)

Type of Port / Size of Suction Line Port _____
 T = 2 x CS 1 1/4" Code 61 Split Flange (size 300 only) Y = 1 x 3/4" Threaded (size 100 only)
 V = 2 x 1" Threaded (sizes 201 & 251 only) Z = According to customer specification
 X = 1 x 1" Threaded (size 100 & 350 only)
For sizes 100 Multiport, 201/251 Multiport & 400/800 - see next page

Type of Port / Size of Return Line Port _____
 C = 3/4" Threaded (size 100 only) F = CS 1 1/2" Code 61 (size 300 only)
 D = 1" Threaded (size 100 only) G = 1 1/2" Threaded (size 350 only)
 E = 1 1/4" Threaded (sizes 201 & 251 only) Z = According to customer specification
*For Sizes 400/800, see below. Other port sizes on request.
 For sizes 100 Multiport, 201/251 Multiport & 400/800 - see next page*

Filtration Rating (microns) _____
 8, 10, 15 = MM

Type of Static 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)
 0 = BSPP ports
 12 = SAE O-Ring Boss Ports

Seals
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 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 coarse filter strainer 125 µm
 UT = suitable for use when horizontally mounted below reservoir fluid level
 MP4 = RKM Multi-port 2 x SAE-16 + 1 x SAE-20 Return Ports, 2 x SAE-Suction Ports
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0300 RK 010 MM / V

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

Type _____
 RK

Filtration Rating (micron) _____
 8, 10, 15 = MM

Supplementary Details _____
Seals
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 SFREE = (Same as above)

Clogging Indicator Model Code

VMF 2 E . X / V

Indicator Prefix _____
 VMF = Mobile Filters
 VM = Differential pressure indicators
 (size 350 - 1.0 position only)

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 rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 (For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Port Configuration - RKM 100, 201, 251 Multiport Head and RKM 400 / 800

Since there are numerous options for machining the ports on the multiport head and the head of the RKM 400 / 800, the general code BZZ is selected here. In order to determine the position and size of the ports, a 5-digit or a 9-digit code is added as a Supplementary Detail. This is determined using the table below. Unused ports are indicated by a "0".

R = Return line port; S = Suction port

Port Configuration RKM 100 Multiport

Position in code	1	2	3	4	5
Connection	R1	R2	R3	S1	S2
SAE-8		(B)	(B)	B	B
SAE-12	(C)	C	C	(C)	(C)
SAE-16	D				
Port plugged	0	0	0	0	0
Special port	Z	Z	Z	Z	Z

Example: RKM MM 100 BZZ 15 W 1.0 /-CBBCC



Port Configuration RKM 201 / 251 Multiport

Position in code	1	2	3	4	5
Connection	R1	R2	R3	S1	S2
SAE-12		(C)	(C)	C	C
SAE-16	D	D	D	(D)	(D)
SAE-20	(E)				
Port plugged	0	0	0	0	0
Special port	Z	Z	Z	Z	Z

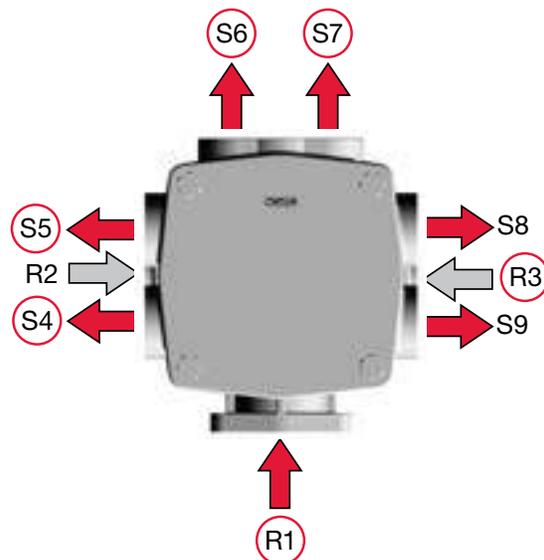
Example: RKM MM 201 BZZ 15 W 1.0 /-ECDD



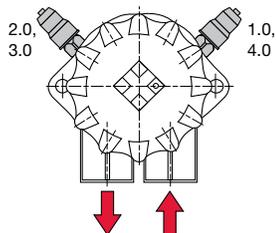
Port Configuration RKM 400 / 800

Position in code	1	2	3	4	5	6	7	8	9
Connection	R1	R2	R3	S4	S5	S6	S7	S8	S9
SAE 2" FLG	(1)								
SAE 2 1/2" FLG	2								
SAE-16		1	1	A	A	1	1	A	A
SAE-20		2	(2)	B	B	(2)	(2)	B	B
SAE-24		3	3	(C)	(C)	3	3	C	C
Port plugged		(0)	0	0	0	0	0	(0)	(0)
Special port		Z	Z	Z	Z	Z	Z	Z	Z

Example: RKM MM 400 BZZ 15 A 1.0 /-102CC2200

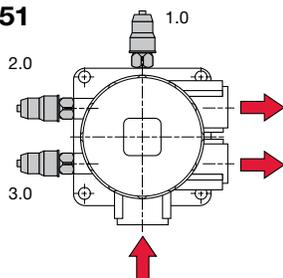


Clogging Indicator Locations Size 100



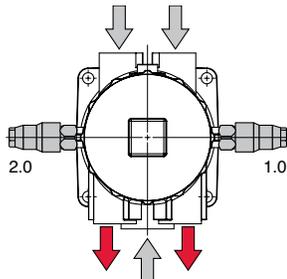
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – right-hand side, bottom	return line	before the filter element
2.0	on the filter inlet – left-hand side, bottom	return line	before the filter element
3.0	on the filter outlet – right-hand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



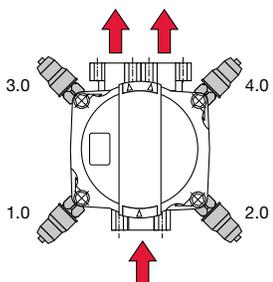
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – opposite side	return line	before the filter element
2.0	on the filter inlet – left-hand side	return line	before the filter element
3.0	on the filter outlet – right-hand side	vacuum	after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

Size 201/251/-MP1



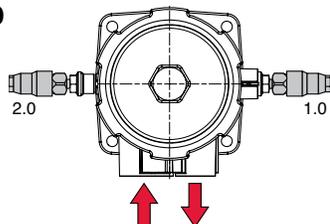
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter outlet – right-hand side	return line	before the filter element
2.0	on the filter outlet – left-hand side	return line	before the filter element

Size 300



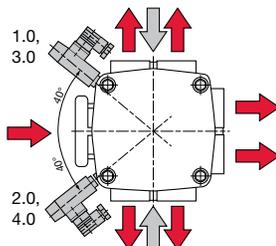
Type Code	Mounting Position of the Clogging Indicator	Type of Clogging Indicator	Measuring
1.0	on the filter inlet – left-hand side	return line	before the filter element
2.0	on the filter inlet – right-hand side	return line	before the filter element
3.0	on the filter outlet – left-hand side	vacuum	after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

LOW PRESSURE FILTERS

HYDAC RKM: Two Filters in One.

A design that saves money.

By using a HYDAC Return Line & Suction Boost Filter RKM you will benefit from:

- **Space saving**
Just one filter required instead of two
- **Easy maintenance**
Half the time required for installation and maintenance
- **Cost saving**
Lower investment, storage and service costs
- **Increased operating safety**
Cavitation at the pump is reliably prevented and finely filtered oil is supplied even in the suction line.

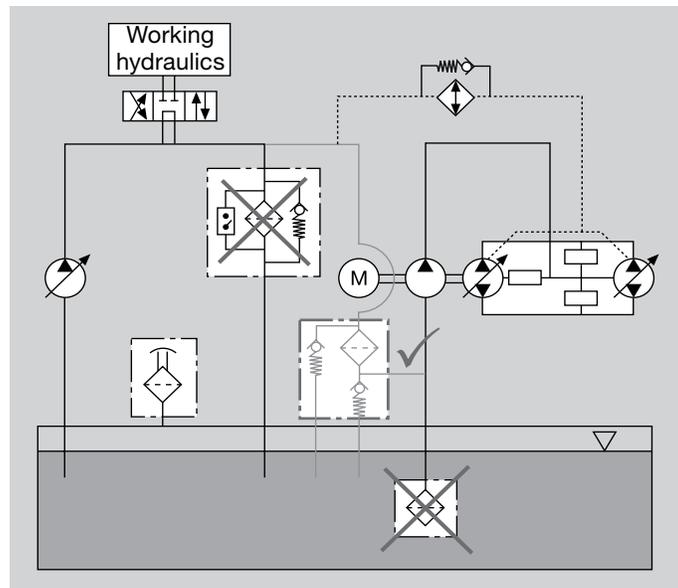
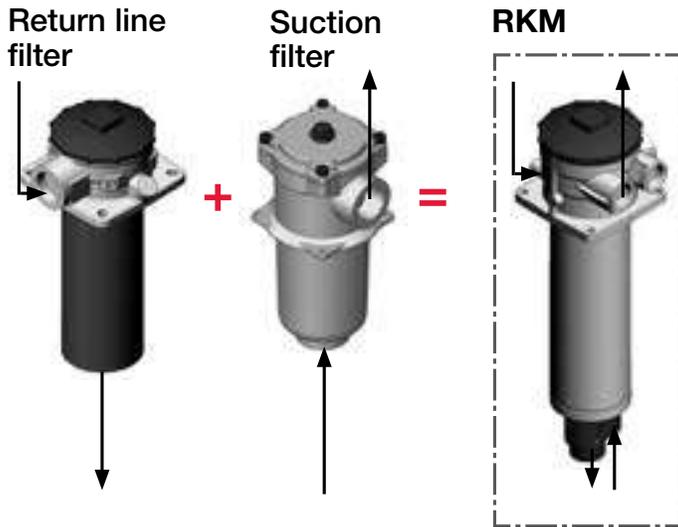
One filter.

Two functions.

All the advantages.

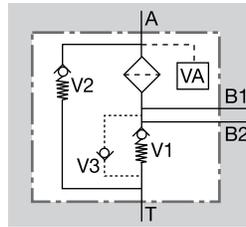
The RKM combines the advantages of a return line filter with those of a suction filter in a single product!

Return line & suction boost filters are particularly suitable for use in machines with two or more circuits, such as mobile working machines with hydrostatic traction drives (wheel loaders, forklifts).



Application example for the RKM in mobile machines.

Function.

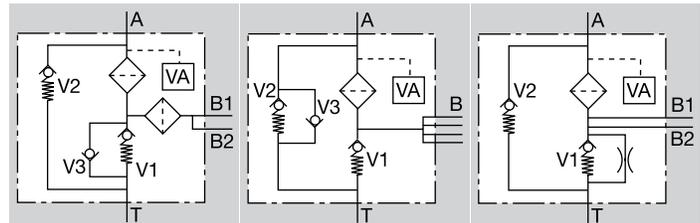


The return line flow Q_R is supplied to the element via one or more inlets "A". Once the element has been subjected to flow from the outside to the inside, the back-pressure valve "V1" in the element builds 0.5 bar positive pressure. Particularly in cold start conditions this positive pressure supports the suction characteristics of the pump(s) connected to "B" (e.g. boost pumps).

This considerably reduces the risk of cavitation.

To ensure that the return line volume in operating conditions is always greater than the volume which is supplied on the suction side the surplus volume drains to tank via "T". The bypass valve "V2" is fitted to relieve excessive backpressure. Part of the flow then drains directly to tank, bypassing the element. This configuration of valves ensures that only finely filtered oil reaches the suction port during operation*. The gradual increase of the valve characteristics contributes to keeping the back pressure in the return lines sufficiently low, even with high viscosity levels. With optional valve "V3", oil can be drawn from the tank for short periods*, e.g. for initial filling and for venting.

Further options:

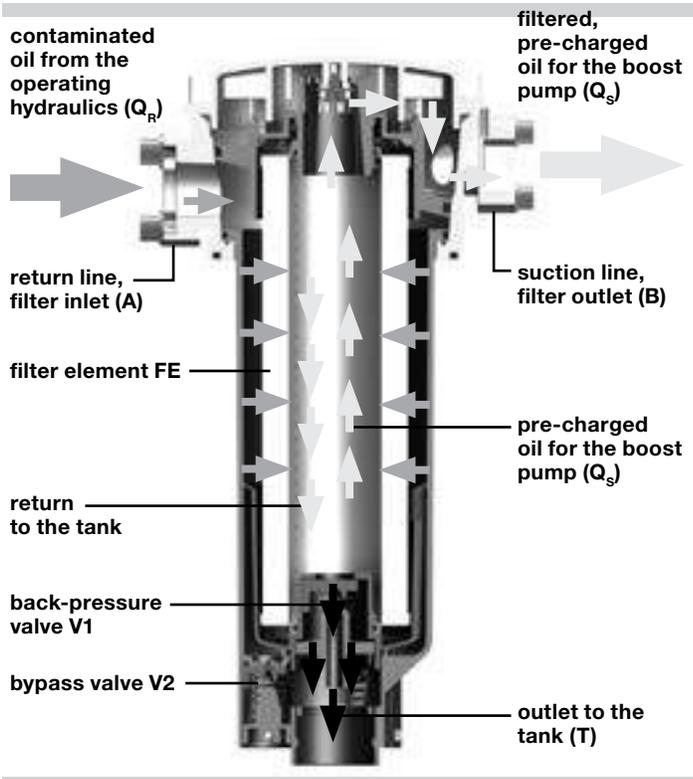


Anti-cavitation valve* with coarse strainer
for filtered oil also in anti-cavitation mode

Anti-cavitation valve* in the element bypass valve "V2"
for finely filtered oil also in anti-cavitation mode

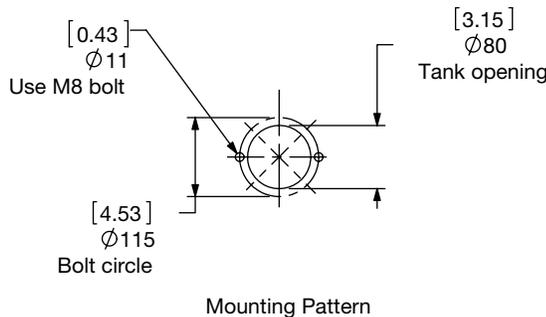
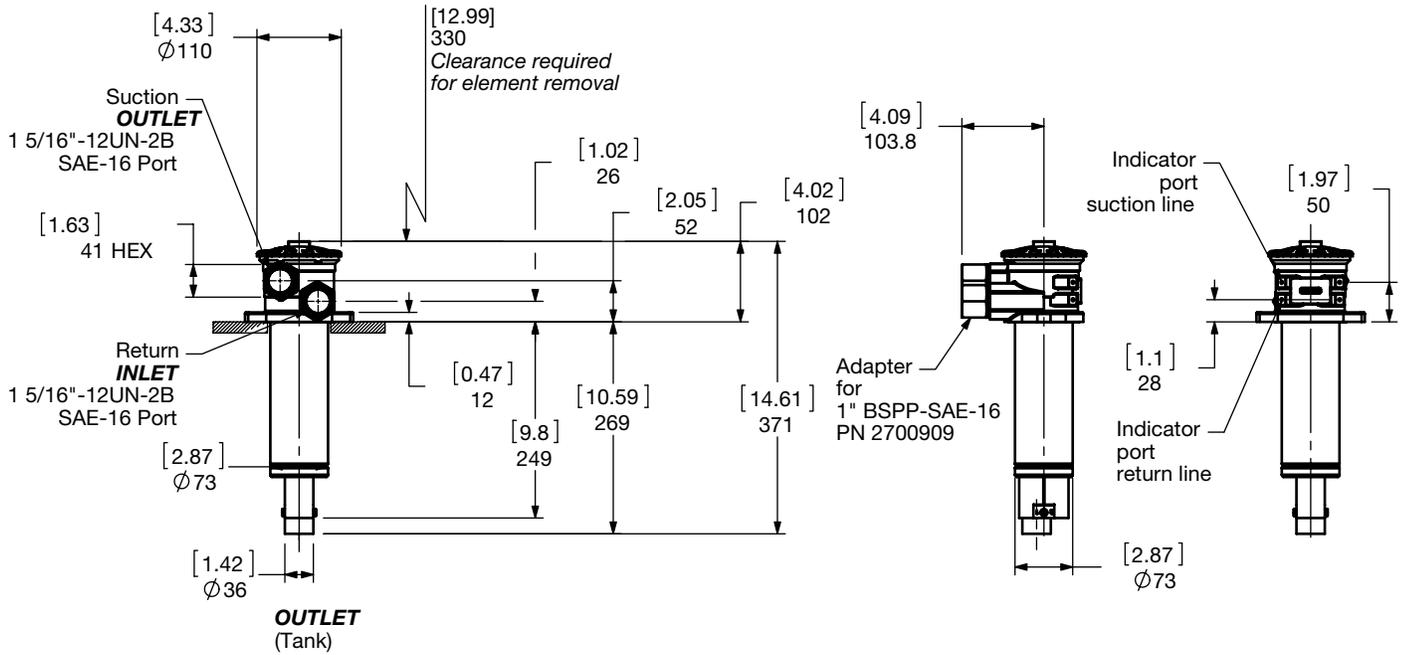
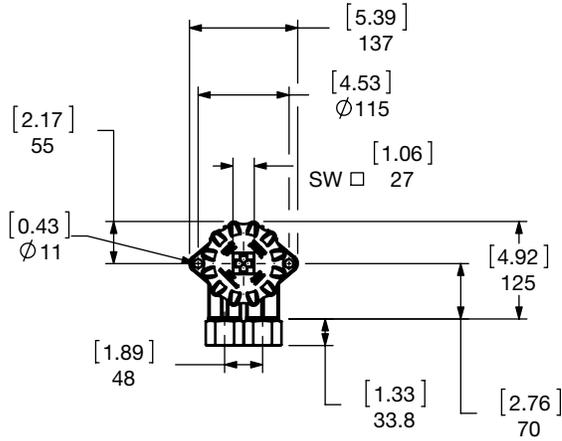
Throttle in back pressure valve "V1"
for reducing pressure and draining oil

*not for RKM 355
VA = clogging indicator



Function of the RKM.

Dimensions RKM 100



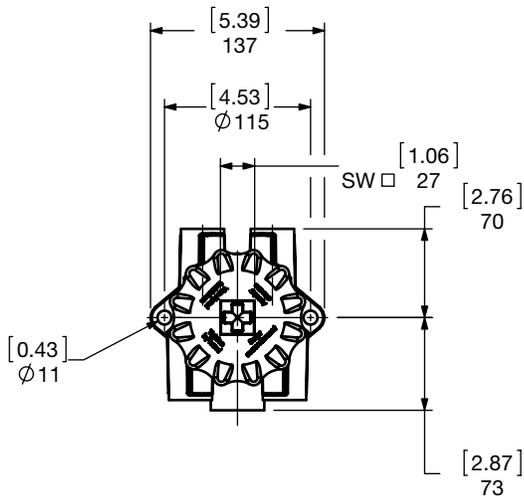
Size	100
Weight (lbs.)	3.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

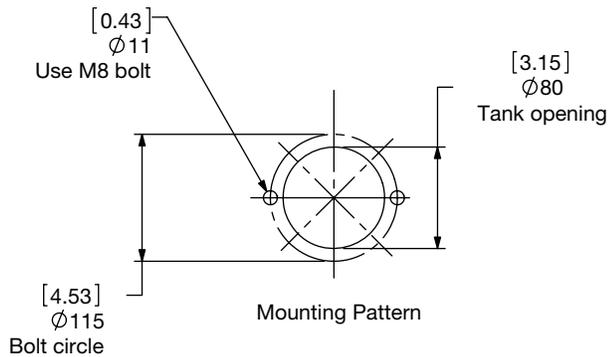
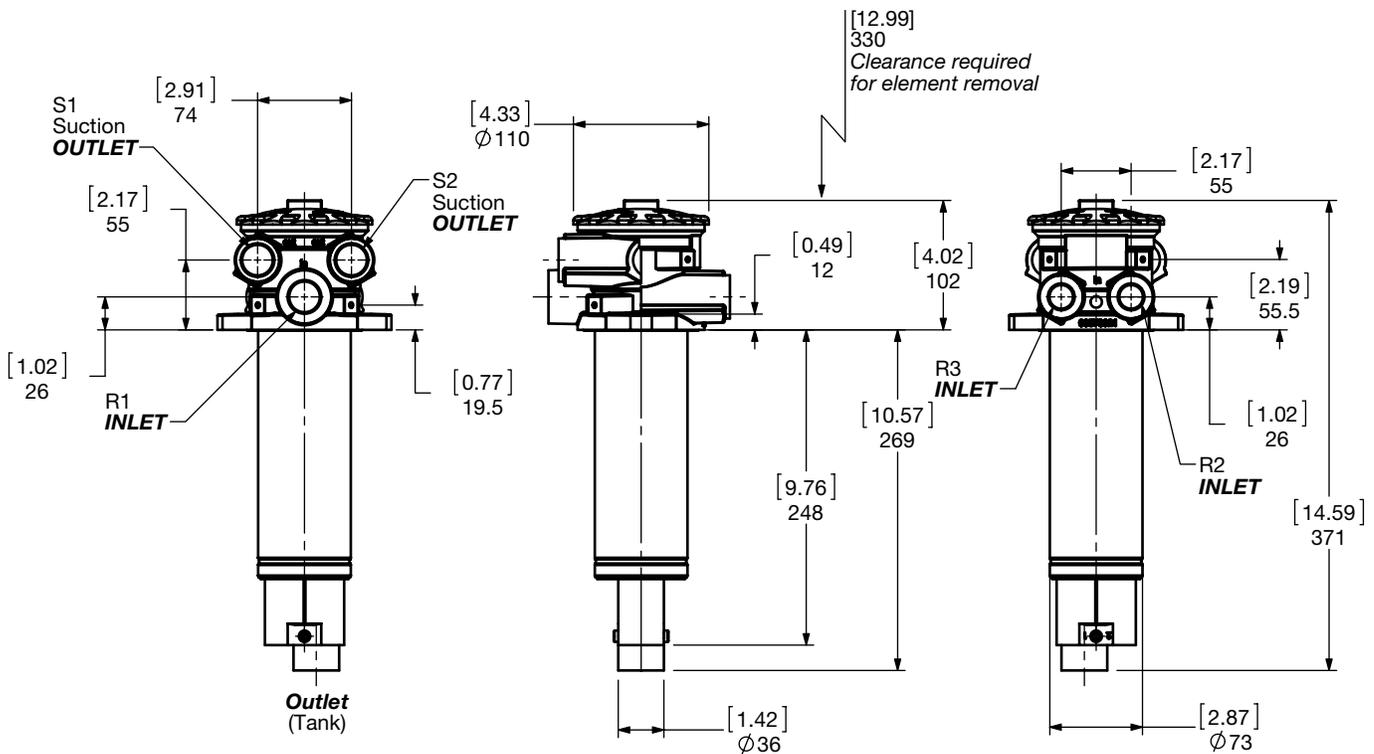
RKM 100 Multiport



Port Configuration RKM 100 Multiport

Position in code	1	2	3	4	5
Connection	R1	R2	R3	S1	S2
SAE-8		(B)	(B)	B	B
SAE-12	(C)	C	C	(C)	(C)
SAE-16	D				
Port plugged	0	0	0	0	0
Special port	Z	Z	Z	Z	Z

Example: RKM MM 100 BZZ 15 W 1.0 /-CBBCC



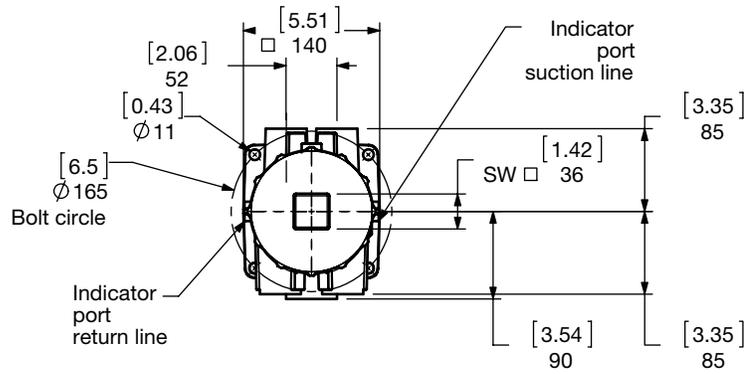
Size	100
Weight (lbs.)	4.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

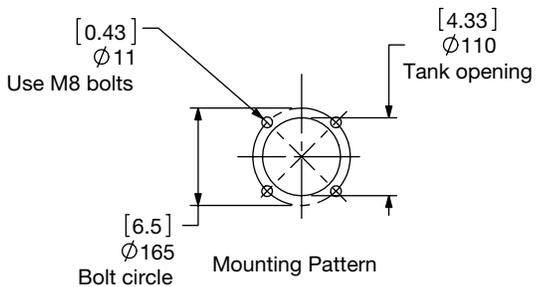
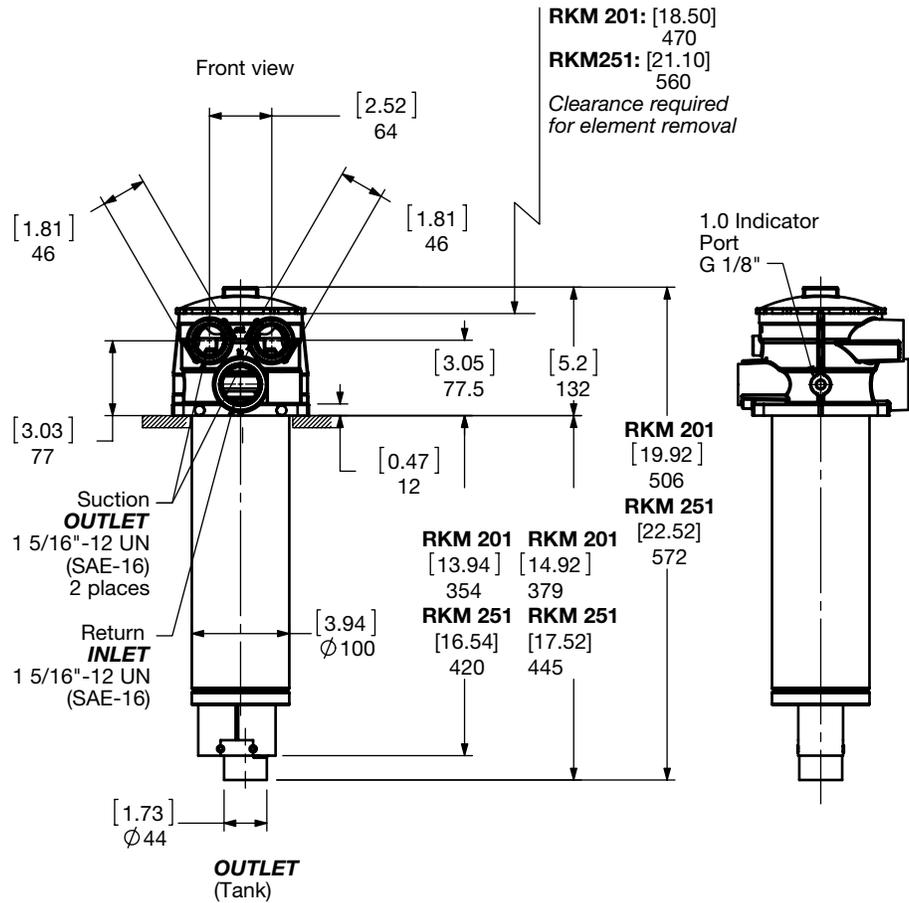
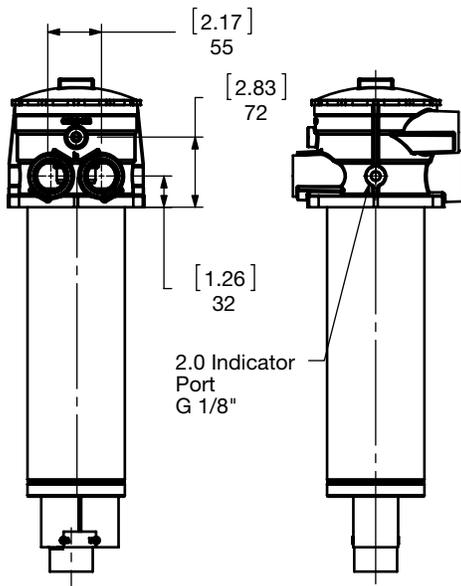
LOW PRESSURE FILTERS

Dimensions

RKM 201 / 251 Multiport



Back view



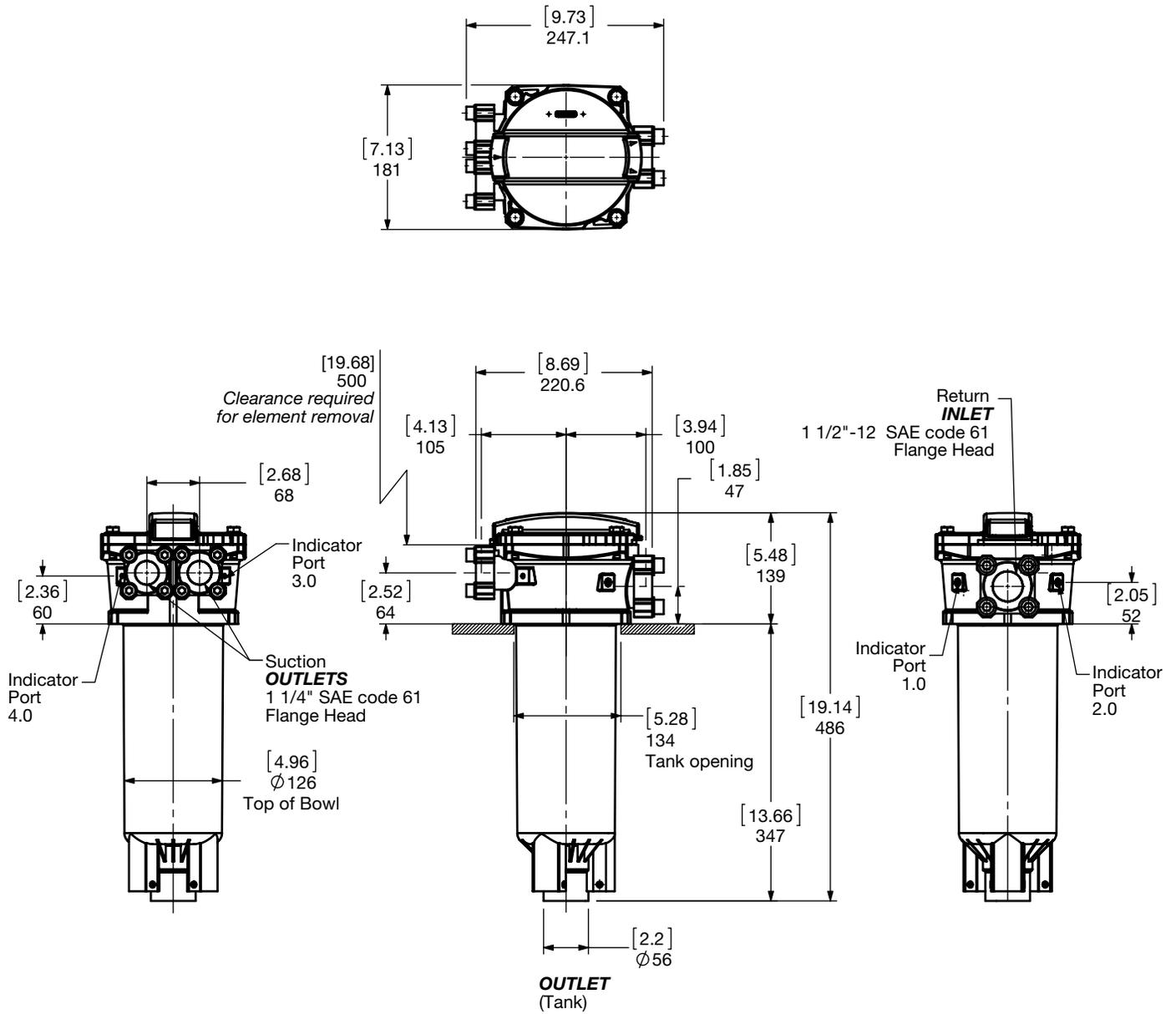
Port Configuration RKM 201 / 251 Multiport

Position in code	1	2	3	4	5
Connection	R1	R2	R3	S1	S2
SAE-12		(C)	(C)	C	C
SAE-16	D	D	D	(D)	(D)
SAE-20	(E)				
Port plugged	0	0	0	0	0
Special port	Z	Z	Z	Z	Z

Size	201	251
Weight (lbs.)	9.3	10

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RKM 300

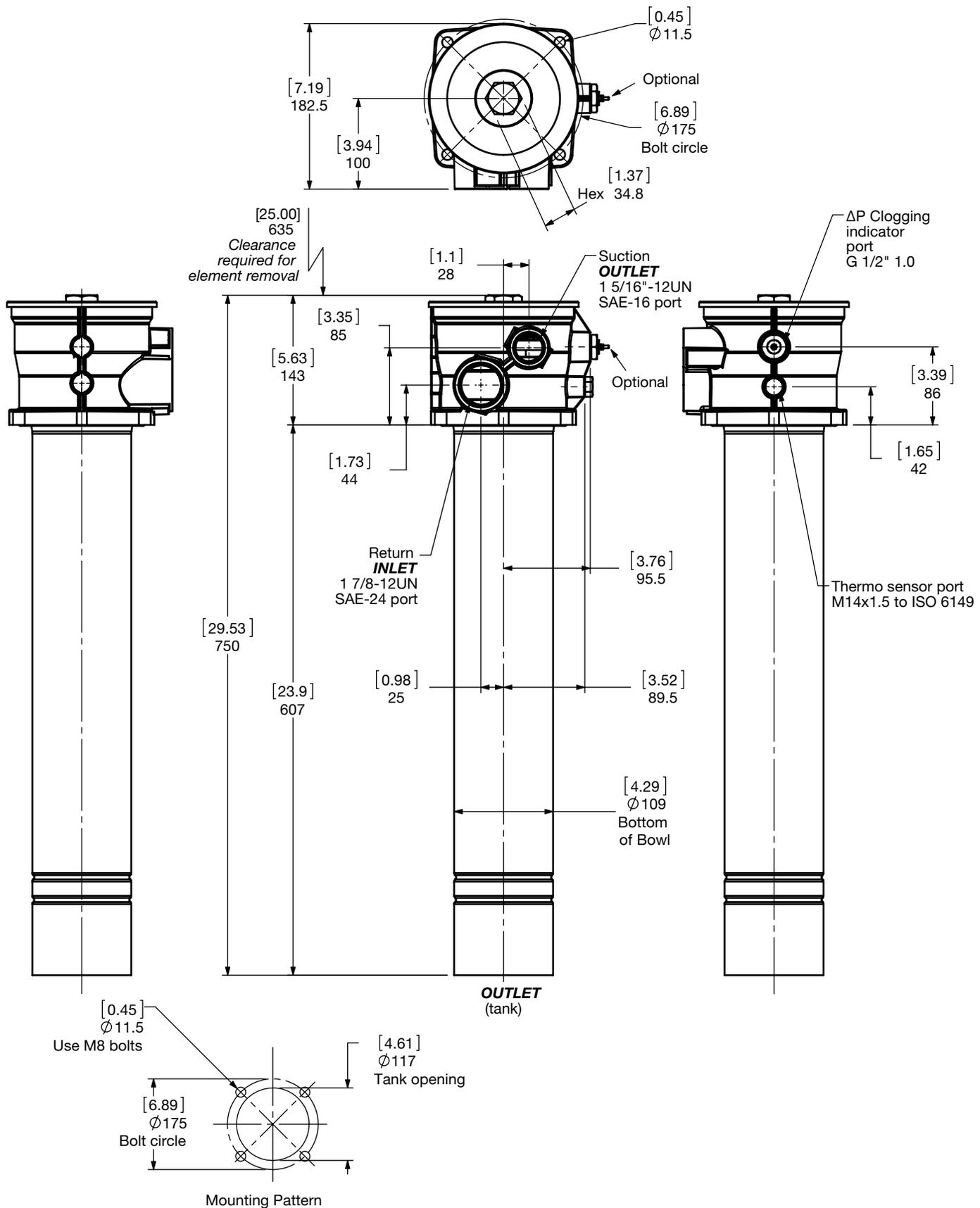


Size	300
Weight (lbs.)	10.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions RKM 350



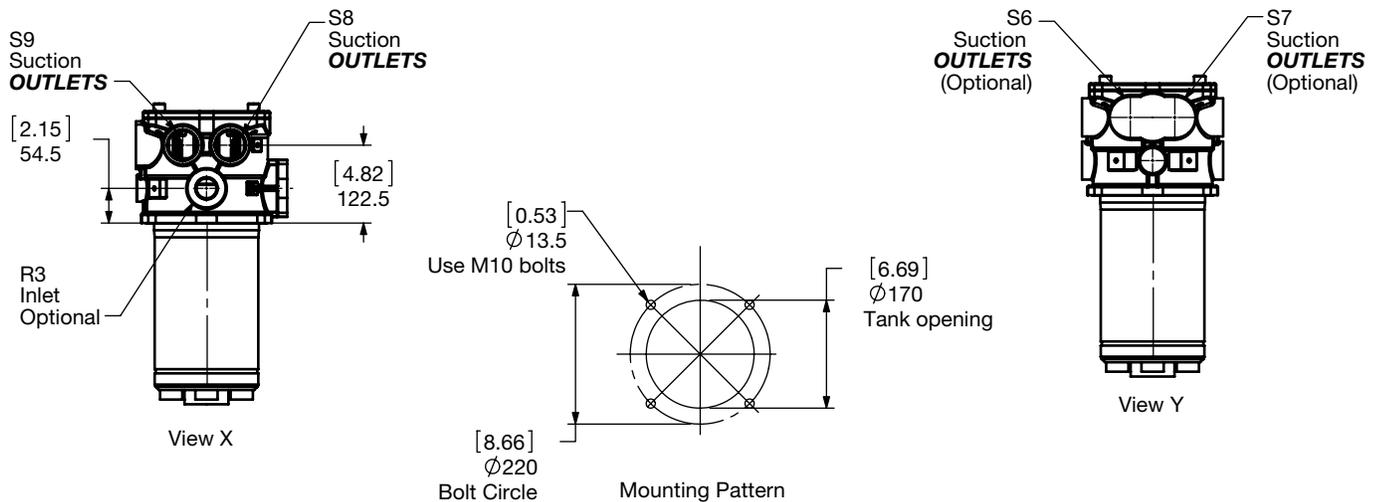
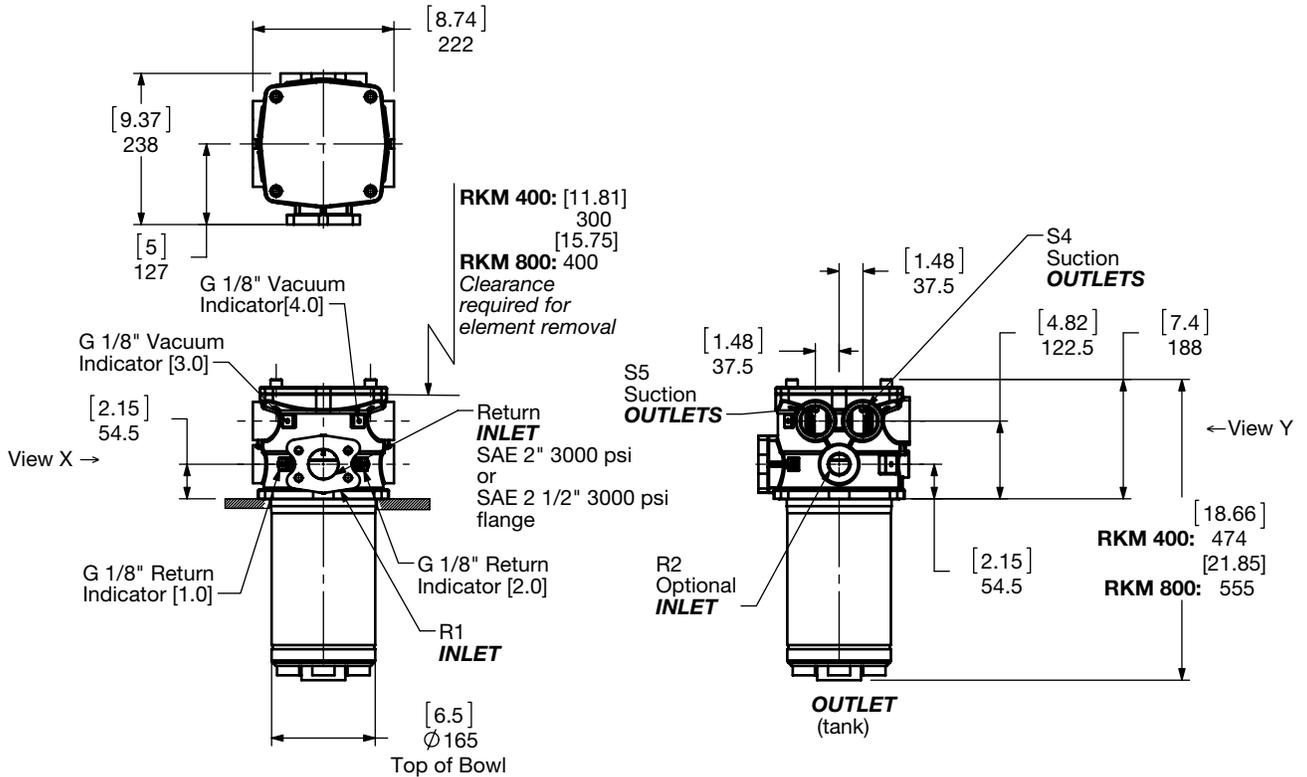
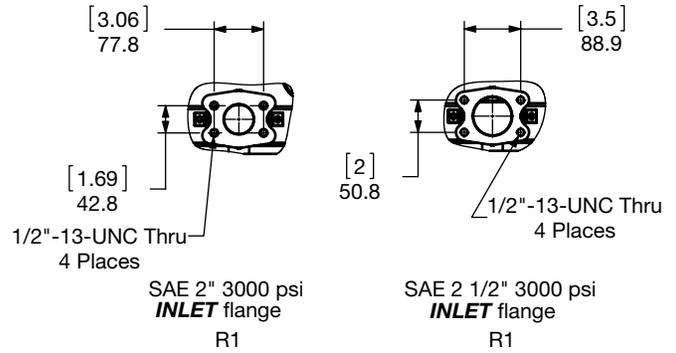
Size	350
Weight (lbs.)	13.9

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RKM 400 / 800

Port Configuration RKM 400 / 800

Position in code	1	2	3	4	5	6	7	8	9
Connection	R1	R2	R3	S4	S5	S6	S7	S8	S9
SAE 2" FLG	①								
SAE 2 1/2" FLG	2								
SAE-16		1	1	A	A	1	1	A	A
SAE-20		2	②	B	B	②	②	B	B
SAE-24		3	3	③	③	3	3	C	C
Port plugged		④	0	0	0	0	0	⑤	⑥
Special port		Z	Z	Z	Z	Z	Z	Z	Z



Size	400	800
Weight (lbs.)	14.4	16.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

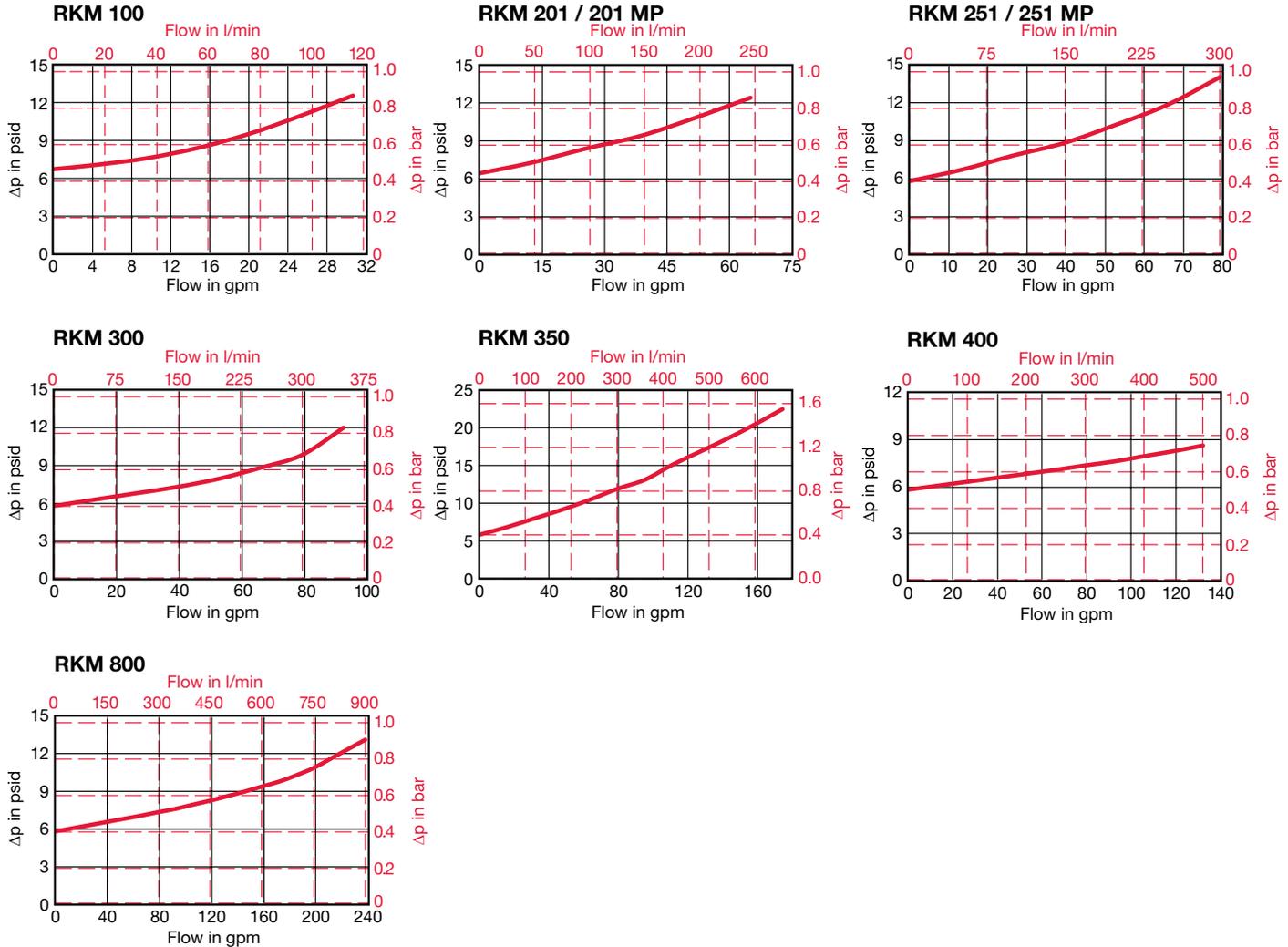
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Mobilemicron RK	...RK...MM		
	8 μm	10 μm	15 μm
0100 RK XXX MM	0.095	0.095	0.061
0201 RK XXX MM	0.041	0.041	0.026
0251 RK XXX MM	0.032	0.032	0.020
0300 RK XXX MM	0.034	0.034	0.021
0350 RK XXX MM	0.016	0.016	0.011
0400 RK XXX MM	0.031	0.031	0.019
0800 RK XXX MM	0.024	0.024	0.015

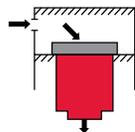
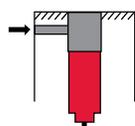
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

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
Tank Cutaway

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.

Note: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Applications



Agricultural

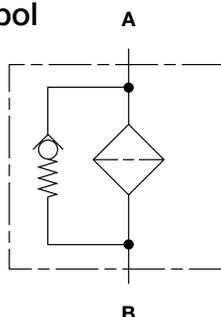


Automotive



Construction

Hydraulic Symbol



Installation

RFM...SET: Inside Tank Filters are installed into a separate chamber (see *tank cutaway*) built into the reservoir tank via the filter ring and four 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, contact HYDAC.

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*). 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, contact HYDAC.

Technical Specifications

Mounting Method	See Installation at left
Port Connection	Outlet
75/165	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 RFM-S	20 gpm (75 lpm)
165 RFM-S	43 gpm (165 lpm)
330 RFM-Set	87 gpm (330 lpm)
500 RFM-Set	132 gpm (500 lpm)
Housing Pressure Rating	
Max. Allowable Working Pressure:	145 psi (10 bar)
Fatigue Pressure	145 psi (10 bar)
Burst Pressure	> 580 psi (40 bar)
Element Collapse Pressure Rating	
ON, W/HC, MM,	290 psid (20 bar)
BN4AM, ECON2, AM, P/HC,	145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)
Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Bypass Valve Cracking Pressure	
$\Delta P = 43$ psid (3 bar) +10%	
$\Delta P = 87$ psid (6 bar) +10%	

Model Code

RFM ON 75 S 3 W 1.0 / V

Series

RFM = In-Tank Return Line Filter

Element Media

ON = Optimicron®
 ECON2 = ECOmicron®
 W/HC = Wire Mesh
 MM = Mobilemicron® (Low Collapse)

BN/AM = Betamicron®/Aquamicron®
 AM = Aquamicron®
 P/HC = Polyester

Size

75
 165 } Not available in the SET Style
 330
 500 } Not available in the S Style

Type of Mounting Connection

S = Inside Tank with shroud for welding and spring for element hold-down (sizes 75 & 165 only)
 SET = Inside Tank with Ring for bolt mounting and clip for element hold-down (sizes 330 & 500 only)

Filtration Rating (micron)

1, 3, 5, 10, 15, 20 = ON
 3, 10 = BN/AM
 3, 5, 10, 20 = ECON2
 40 = AM
 25, 74, 149 = W/HC
 10, 20 = P/HC
 10, 15 = MM

Clogging Indicator

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

Modification Number (latest version always supplied)

Seals

(omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve

(omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system)] not available with ECON2

Supplementary Details

SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0330 R 003 ON / V

Size

0075, 0165, 0330, 0500

Filtration Rating (micron)

1, 3, 5, 10, 15, 20 = ON
 3, 5, 10, 20 = ECON2
 25, 74, 149 = W/HC
 10, 15 = MM

3, 10 = BN4AM
 40 = AM
 10, 20 = P/HC

Element Media

ON, BN4AM, ECON2, AM, W/HC, P/HC, MM

Seals

(omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve

(omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system)] not available with ECON2

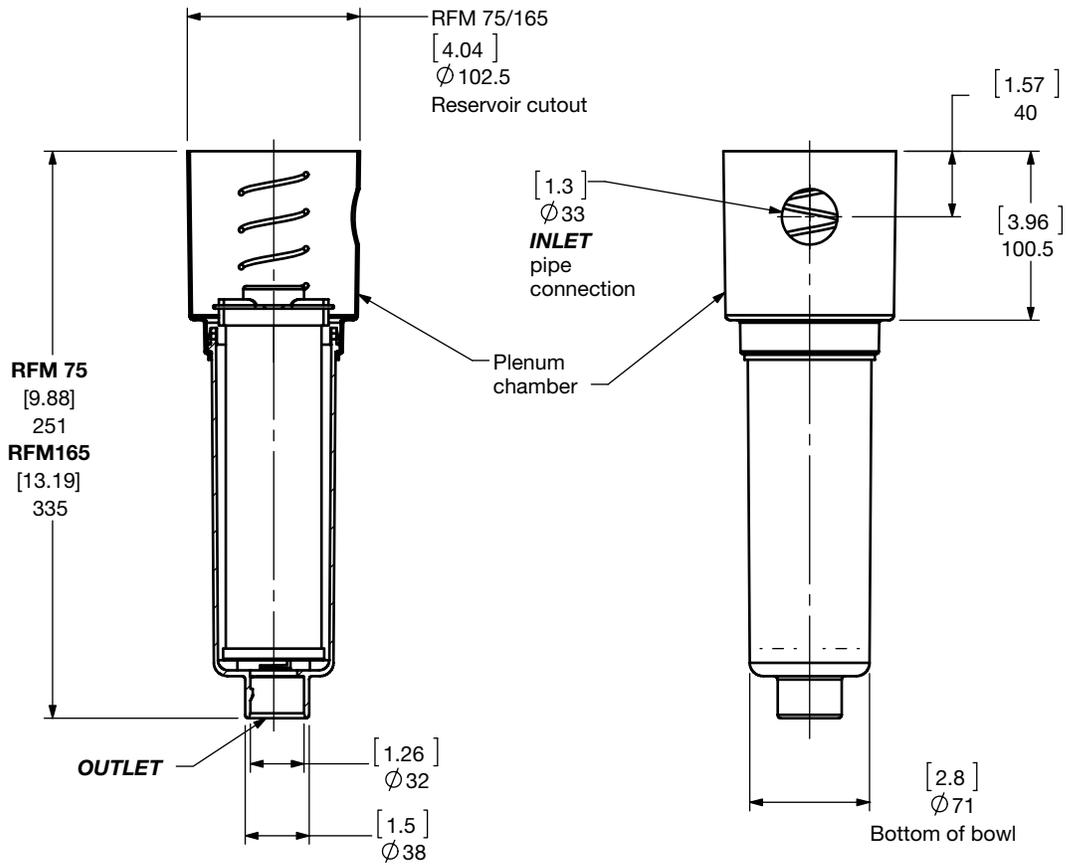
Supplementary Details

SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 SFREE = Element specially designed to minimize electrostatic charge generation

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

LOW PRESSURE FILTERS

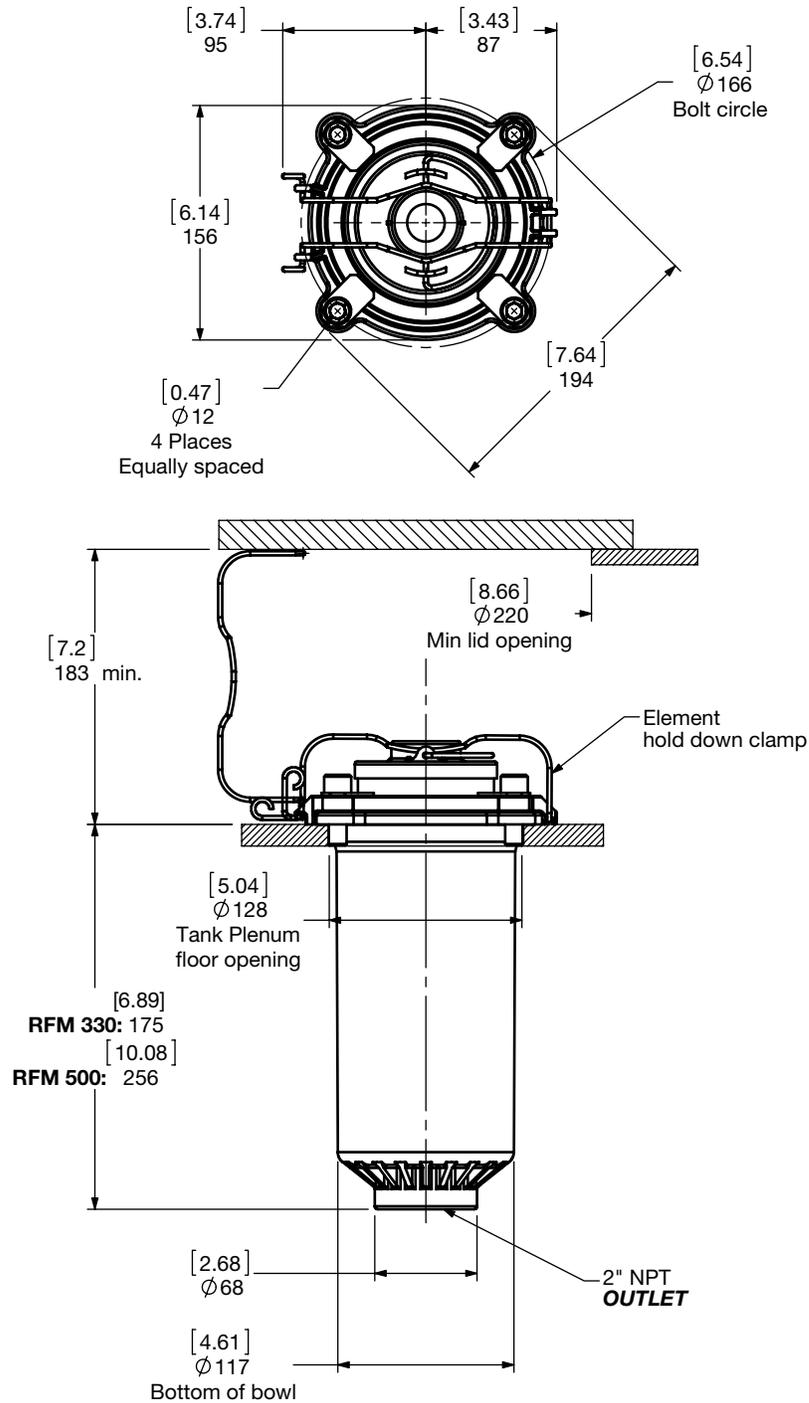
Dimensions
RFM...S



Size	75	165
Weight (lbs.)	2.1	2.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFM...Set



Size	330	500
Weight (lbs.)	5.2	6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P = \emptyset \text{ (no housing)} + \text{Element } \Delta P = \text{Element } \Delta P$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

Element K Factors

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

(From Tables Below)

Optimicron Size	...R...ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0075 R XXX ON	1.405	1.065	0.735	0.401	0.263	0.241
0165 R XXX ON	0.774	0.518	0.404	0.221	0.123	0.133
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056
0500 R XXX ON	0.289	0.143	0.104	0.06	0.046	0.038

ECOMICRON Size	...R...ECON2			
	3 µm	5 µm	10 µm	20 µm
0165 R XXX ECON2	0.615	0.428	0.247	0.132
0330 R XXX ECON2	0.230	0.148	0.093	0.066
0500 R XXX ECON2	0.165	0.104	0.071	0.044

Betamicron/Aquamicron Size	...R...BN4AM	
	3 µm	10 µm
0330 R XXX BN4AM	0.477	0.165
0500 R XXX BN4AM	0.313	0.11

Aquamicron Size	...R...AM
	40 µm
0330 R 040 AM	0.115
0500 R 040 AM	0.076

Wire Mesh Size	...R...W/HC
	25, 50, 74, 100, 149, 200 µm
0075 R XXX W/HC	0.020
0165 R XXX W/HC	0.011
0330 R XXX W/HC	0.011
0500 R XXX W/HC	0.007

Polyester Size	...R...P/HC	
	10 µm	20 µm
0075 R XXX P/HC	0.071	0.036
0165 R XXX P/HC	0.033	0.016
0330 R XXX P/HC	0.016	0.008
0500 R XXX P/HC	0.011	0.005

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

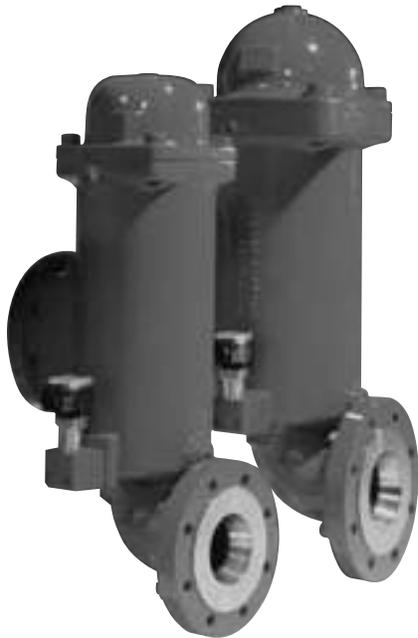
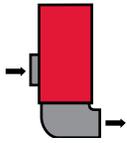
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

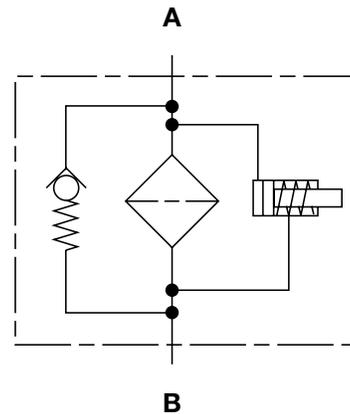
RFL Cast Series

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.

Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Technical Specifications

Mounting Method	Support by means of pipe clamps
Port Connection	851 3" SAE DN 80 Flange 1301 4" SAE DN 100 Flange
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. Allowable Working Pressure 360 psi (25 bar) Fatigue Pressure 360 psi (25 bar) Burst Pressure > 1440 psi (100 bar)
Element Collapse Pressure Rating	ON, W/HC 290 psid (20 bar) BN4AM, ECON2, AM, P/HC 145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% $\Delta P = 72$ psid (5 bar) -10%
Bypass Valve Cracking Pressure	$\Delta P = 43$ psid (3 bar) +10% $\Delta P = 87$ psid (6 bar) +10%

Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Model Code

RFL ON 851 D P 3 A 1 . X / V

Filter Type _____
 RFL = Inline Filter

Element Media _____
 ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 W/HC = Wire Screen P/HC = Polyester

Size _____
 851
 1301

Operating Pressure _____
 D = 363 psi (25 bar)

Type of Connection _____
 N = SAE DN 80 3" (size 851)
 P = SAE DN 100 4" (size 1301)] with metric threads

Filtration Rating (microns) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149 = W/HC 10, 20 = P/HC

Type of ΔP Clogging Indicator _____
 A, B, BM, C, D (Others available upon request)

Type Code _____
 1

Modification Number (latest version always supplied) _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)] not available with ECON2
 KB = no bypass (flushing systems)

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 cRUus = Electrical Indicator with underwriter's approval
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0850 R 010 ON / V B6

Size _____
 0850, 1300

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149, = W/HC 10, 20 = P/HC

Element Media _____
 ON, BN4AM, ECON2, AM, W/HC, P/HC

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar)
 KB = No Bypass

Supplementary Details _____
 SO263 = (same as above) SFREE = (same as above)

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 = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = electric switch - SPDT
 D = electric switch & LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

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

Thermal Lockout (VM type C, D, J, J4 only) _____
 T100 = Lockout below 100°F

Underwriter's Approval (VM type C, D, J, J4 only) _____
 cRUus = Electrical Indicator with underwriter's approval

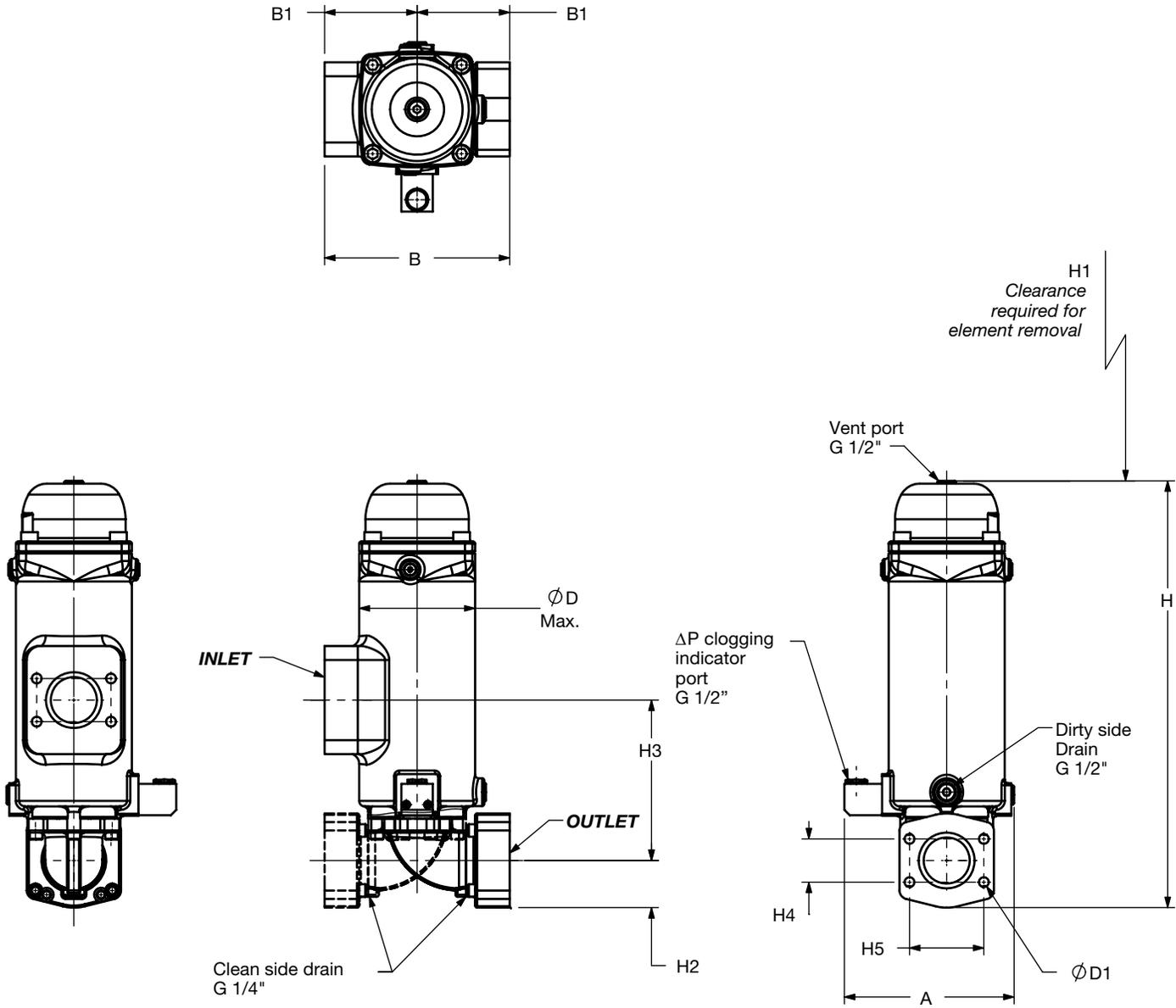
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

RFL Cast 851-1301



Size	A	B	B1	H	H1	H2	H3	H4	H5	D	D1	Weight (lbs)
RFL 851	[7.56] 192	[8.78] 266	[5.23] 133	[24.09] 612	[16.54] 420	[2.66] 67.5	[9.05] 230	[2.44] 61.9	[4.19] 106.4	[6.77] 172	M16	84.9
RFL 1301	[8.78] 223	[11.26] 286	[5.63] 143	[27.99] 711	[19.69] 500	[3.05] 77.5	[9.84] 250	[3.06] 77.8	[5.13] 130.2	[8.66] 220	M16	122.4

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

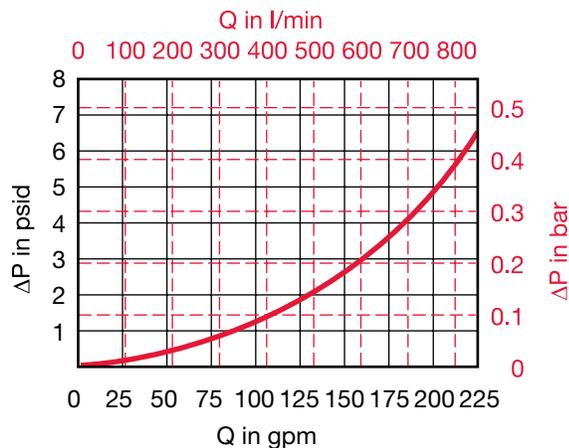
Housing Curve:

Pressure loss through housing is as follows:

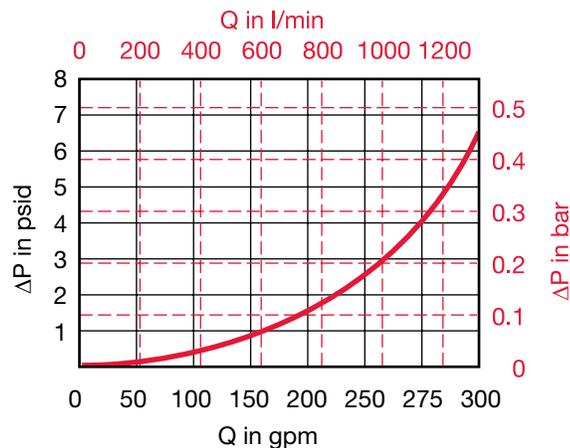
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

RFL 851 HOUSING



RFL 1301 HOUSING



Element K Factors

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

(From Tables Below)

Optimicron	...R...ON					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.02
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012

ECOMICRON	...R...ECON2			
Size	3 μm	5 μm	10 μm	20 μm
0850 R XXX ECON2	0.082	0.055	0.038	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016

Betamicron/Aquamicon	...R...BN4AM	
Size	3 μm	10 μm
0850 R XXX BN4AM	0.154	0.049
1300 R XXX BN4AM	0.088	0.033

Aquamicon	...R...AM
Size	40 μm
0850 R 040 AM	0.040
1300 R 040 AM	0.026

Wire Screen	...R...W/HC
Size	25, 50, 74, 100, 149, 200 μm
0850 R XXX W/HC	0.003
1300 R XXX W/HC	0.002

Polyester	...R...P/HC	
Size	10 μm	20 μm
0850 R XXX P/HC	0.007	0.003
1300 R XXX P/HC	0.004	0.002

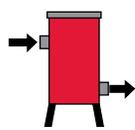
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

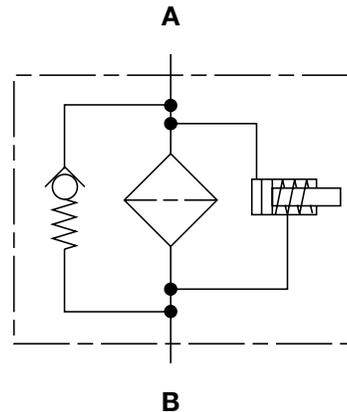
RFL Welded Series

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.

Notes: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Most states and local jurisdictions in the United States require pressure vessels to be ASME stamped. It is the responsibility of the end customer to research and fully understand the ASME code requirements of the jurisdiction this filter will ultimately be installed in, and to fully communicate these requirements to HYDAC.

Applications



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

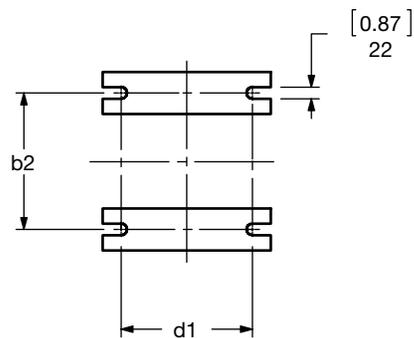
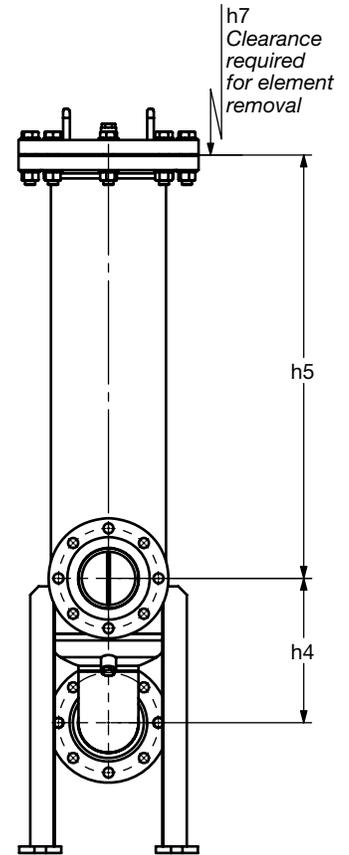
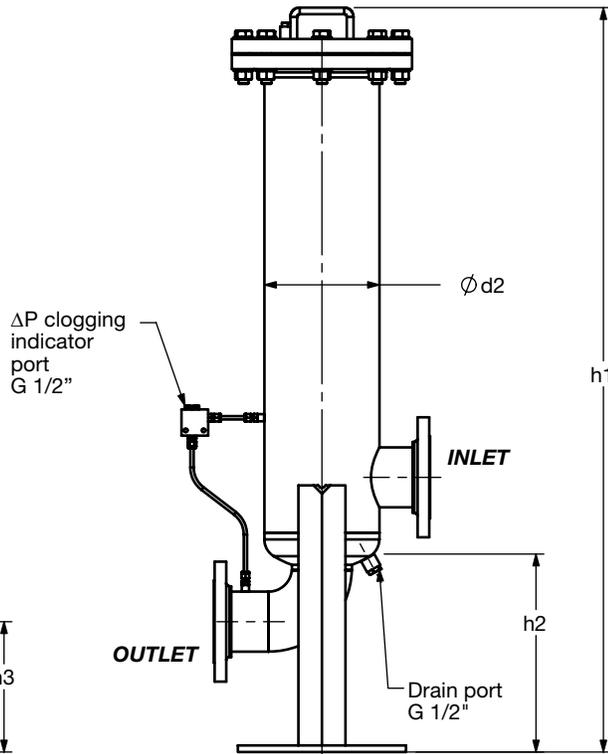
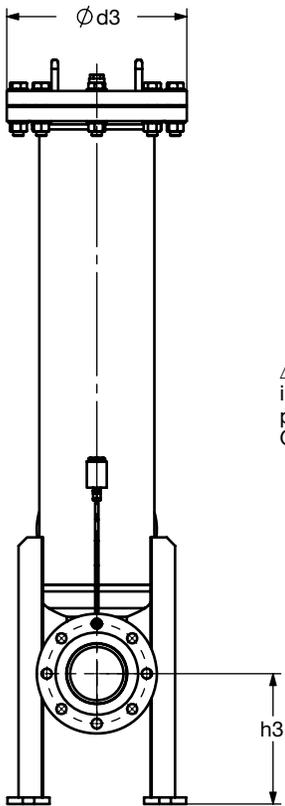
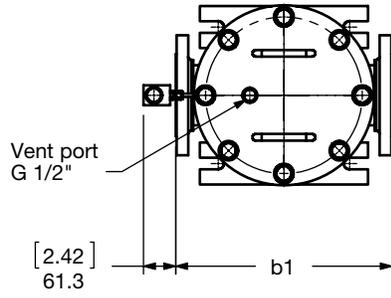
Technical Specifications

Mounting Method	Floor mounted legs
Port Connection	Typical Connections
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	Steel
Housing, Lid	Steel
Note: Please contact HYDAC 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. Allowable Working Pressure	150 psi (10 bar) (standard)
	232 psi (16 bar) (optional)
Fatigue Pressure	Contact HYDAC
Burst Pressure	Contact HYDAC
Element Collapse Pressure Rating	
ON, W/HC	290 psid (20 bar)
ECON2, BN4AM, AM, P/HC	145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)
Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	
$\Delta P = 29$ psid (2 bar) -10% (standard)	
$\Delta P = 72$ psid (5 bar) -10% (optional)	
Bypass Valve Cracking Pressure	
$\Delta P = 43$ psid (3 bar) +10% (standard)	
$\Delta P = 87$ psid (6 bar) +10% (optional)	

LOW PRESSURE FILTERS

Dimensions

RFL 1300 - 2520



Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFL 1300 - 2520

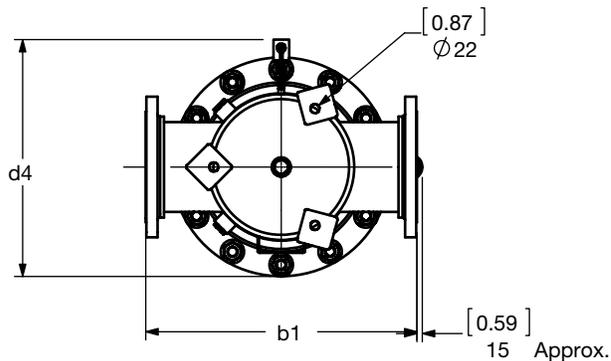
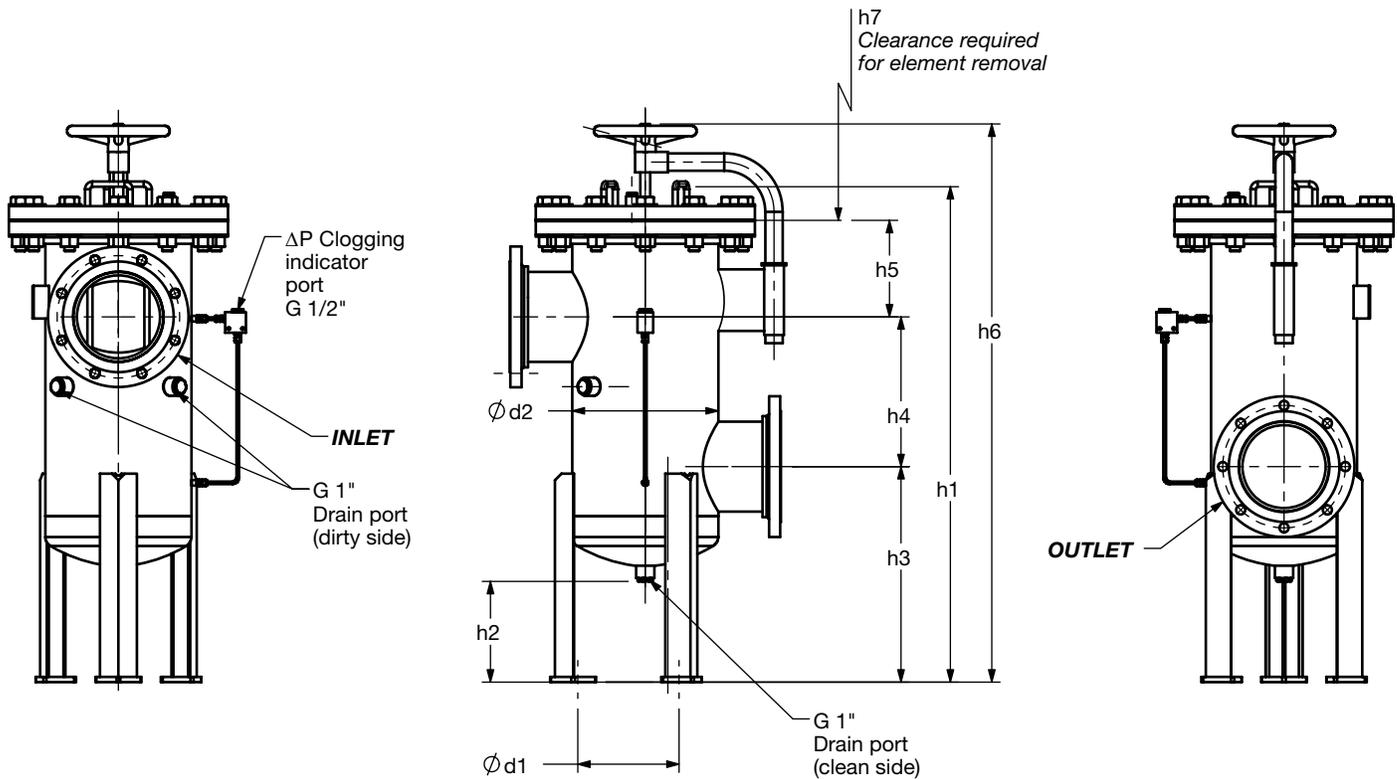
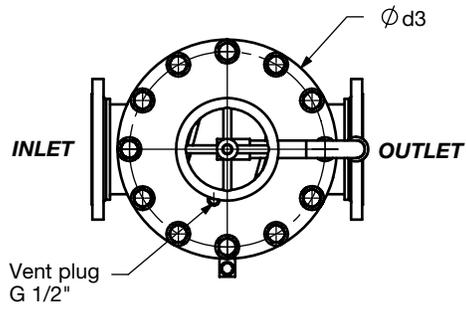
Size	Flange Port	b1	b2	d1	d2	d3	h1	h2	h3	h4	h5	h7	Wt. (lbs)	Use Bolt
RFL 1300	2" ANSI 150 lb RF	[16.22] 412	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[38.72] 972	[14.57] 370	[10.47] 266	[9.45] 240	[15.12] 384	[19.69] 500	141/172	5/8"-11 UNC HEAVY HEX
	DIN DN 50	[16.22] 412	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[38.72] 972	[14.57] 370	[10.47] 266	[9.45] 240	[15.12] 384	[19.69] 500	141/172	M16X2
RFL 1300/1320	3" ANSI 150 lb RF	[16.22] 412	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[38.72] 972 [55.75] 1416	[14.57] 370	[10.47] 266	[9.45] 240	[15.12] 384 [32.44] 824	[19.69] 500 [37.01] 940	148/178	5/8"-11 UNC HEAVY HEX
	DIN DN 80	[16.22] 412	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[38.72] 972 [55.75] 1416	[14.57] 370	[10.47] 266	[9.45] 240	[15.12] 384 [32.44] 824	[19.69] 500 [37.01] 940	148/178	M16X2
	4" ANSI 150 lb RF	[16.22] 412	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[38.72] 972 [55.75] 1416	[14.57] 370	[9.96] 253	[10.83] 275	[14.25] 362 [31.57] 802	[19.69] 500 [37.01] 940	152/183	5/8"-11 UNC HEAVY HEX
	DIN DN 100	[16.22] 412	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[38.72] 972 [55.75] 1416	[14.57] 370	[9.96] 253	[10.83] 275	[14.25] 362 [31.57] 802	[19.69] 500 [37.01] 940	152/183	M16X2
RFL 1320	DIN DN 125	[18.90] 480	[10.24] 260	[9.84] 250	[8.63] 219.1	[13.39] 340	[55.75] 1416	[14.57] 370	[8.46] 215	[11.46] 291	[32.44] 824	[37.01] 940	192	M16X2
RFL 2500/2520	3" ANSI 150 lb RF	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[38.98] 990 [54.33] 1380	[8.66] 220	[15.28] 388	[16.14] 410	[4.72] 120 [20.08] 510	[16.54] 420 [31.89] 810	160/192	5/8"-11 UNC HEAVY HEX
	DIN DN 80	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[38.98] 990 [54.33] 1380	[8.66] 220	[15.28] 388	[16.14] 410	[4.72] 120 [20.08] 510	[16.54] 420 [31.89] 810	160/192	M16X2
	4" ANSI 150 lb RF	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[41.34] 1050 [56.69] 1440	[8.66] 220	[17.24] 438	[11.97] 304	[9.29] 236 [24.65] 626	[16.54] 420 [31.89] 810	167/199	5/8"-11 UNC HEAVY HEX
	DIN DN 100	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[41.34] 1050 [56.69] 1440	[8.66] 220	[17.24] 438	[11.97] 304	[9.29] 236 [24.65] 626	[16.54] 420 [31.89] 810	167/199	M16X2
	DIN DN 125	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[41.34] 1050 [56.69] 1440	[8.66] 220	[17.24] 438	[14.96] 380	[6.30] 160 [21.65] 550	[16.54] 420 [31.89] 810	176/208	M16X2
	6" ANSI 150 lb RF	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[41.34] 1050 [56.69] 1440	[8.66] 220	[17.24] 438	[14.37] 365	[6.89] 175 [22.24] 565	[16.54] 420 [31.89] 810	185/217	3/4"-10 UNC HEAVY HEX
	DIN DN 150	[18.35] 466	[12.28] 312	[9.84] 250	[10.50] 273	[14.17] 360	[41.34] 1050 [56.69] 1440	[8.66] 220	[17.24] 438	[14.37] 365	[6.89] 175 [22.24] 565	[16.54] 420 [31.89] 810	185/217	M20X2.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print..

LOW PRESSURE FILTERS

Dimensions

RFL 4000 - 15020



Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFL 4000 - 15020

Size	Flange Port	b1	d1	d2	d3	d4	h1	h2	h3	h4	h5	h6	h7	Wt. (lbs.)	Use Bolt
RFL 4000/4020	DIN DN 100	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.40] 543	[42.48] 1079 [57.83] 1469	[10.47] 266	[18.7] 475	[11.97] 304	[8.70] 221 [26.02] 661	[48.03] 1220 [65.35] 1660	[16.54] 420 [31.89] 810	267 /323	M16X2
	4" ANSI 150 LB RF	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.37] 543	[42.48] 1079 [57.83] 1469	[10.47] 266	[18.7] 475	[11.97] 304	[8.70] 221 [26.02] 661	[48.03] 1220 [65.35] 1660	[16.54] 420 [31.89] 810	267 /323	5/8"-11 UNC HEAVY HEX
	DIN DN 125	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.37] 543	[46.02] 1169 [57.44] 1459	[10.47] 266	[20.67] 525	[14.96] 380	[7.28] 185 [22.64] 575	[51.57] 1310 [66.93] 1700	[16.54] 420 [31.89] 810	281 /337	M16X2
	6" ANSI 150 LB RF	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.37] 543	[46.02] 1169 [61.38] 1559	[10.47] 266	[20.67] 525	[14.96] 380	[7.87] 200 [23.23] 590	[52.17] 1325 [67.52] 1715	[16.54] 420 [31.89] 810	294 /350	3/4"-10 UNC HEAVY HEX
	DIN DN 150	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.37] 543	[46.02] 1169 [61.38] 1559	[10.47] 266	[20.67] 525	[14.96] 380	[7.87] 200 [23.23] 590	[52.17] 1325 [67.52] 1715	[16.54] 420 [31.89] 810	294 /350	M20X2.5
	8" ANSI 150 LB RF	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.37] 543	[47.4] 1204 [62.76] 1594	[10.47] 266	[20.67] 525	[14.37] 365	[9.25] 235 [24.61] 625	[52.95] 1345 [68.31] 1735	[16.54] 420 [31.89] 810	309 /365	3/4"-10 UNC HEAVY HEX
	DIN DN 200	[23.62] 600	[12.99] 330	[14.00] 355.6	[18.11] 460	[21.37] 543	[47.4] 1204 [62.76] 1594	[10.47] 266	[20.67] 525	[14.37] 365	[9.25] 235 [24.61] 625	[52.95] 1345 [68.31] 1735	[16.54] 420 [31.89] 810	309 /365	M20X2.5
RFL 5200/5220	DIN DN 100	[23.62] 600	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[45.04] 1144 [62.36] 1584	[9.61] 244	[18.31] 465	[11.97] 304	[11.69] 297 [29.02] 737	[50.63] 1286 [67.95] 1726	[19.69] 500 [37.01] 940	353 /450	M16X2
	4" ANSI 150 LB RF	[23.62] 600	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[45.04] 1144 [62.36] 1584	[9.61] 244	[18.31] 465	[11.97] 304	[11.69] 297 [29.02] 737	[50.63] 1286 [67.95] 1726	[19.69] 500 [37.01] 940	353 /450	5/8"-11 UNC HEAVY HEX
	DIN DN 125	[23.62] 600	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[49.45] 1256 [66.77] 1696	[9.61] 244	[20.67] 525	[14.96] 380	[10.67] 271 [27.99] 711	[54.96] 1396 [72.28] 1836	[19.69] 500 [37.01] 940	375 /472	M16X2
	DIN DN 150	[23.62] 600	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[49.45] 1256 [66.77] 1696	[9.61] 244	[20.67] 525	[14.37] 365	[11.26] 286 [28.58] 726	[54.96] 1396 [72.28] 1836	[19.69] 500 [37.01] 940	386 /483	M20X2.5
	6" ANSI 150 LB RF	[23.62] 600	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[49.45] 1256 [66.77] 1696	[9.61] 244	[20.67] 525	[14.37] 365	[11.26] 286 [28.58] 726	[54.96] 1396 [72.28] 1836	[19.69] 500 [37.01] 940	386 /483	3/4"-10 UNC HEAVY HEX
	DIN DN 200	(25.20) 640	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[49.45] 1256 [66.77] 1696	[9.61] 244	[20.67] 525	[14.37] 365	[11.26] 286 [28.58] 726	[54.96] 1396 [72.28] 1836	[19.69] 500 [37.01] 940	395 /492	M20X2.5
	8" ANSI 150 LB RF	(25.20) 640	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[49.45] 1256 [66.77] 1696	[9.61] 244	[20.67] 525	[14.37] 365	[11.26] 286 [28.58] 726	[54.96] 1396 [72.28] 1836	[19.69] 500 [37.01] 940	395 /492	3/4"-10 UNC HEAVY HEX
	DIN DN 250	(25.98) 660	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[52.13] 1324 [69.45] 1764	[9.61] 244	[22.05] 560	[17.72] 450	[9.29] 236 [26.61] 676	[57.72] 1466 [75.04] 1906	[19.69] 500 [37.01] 940	428 /525	M24X3
	10" ANSI 150 LB RF	(25.98) 660	[14.90] 380	[16.00] 406.4	[20.08] 510	[23.35] 593	[52.13] 1324 [69.45] 1764	[9.61] 244	[22.05] 560	[17.72] 450	[9.29] 236 [26.61] 676	[57.72] 1466 [75.04] 1906	[19.69] 500 [37.01] 940	428 /525	7/8"-9UNC HEAVY HEX

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print..

See next pages for other sizes of dimensions.

LOW PRESSURE FILTERS

Dimensions

RFL 4000 - 15020

Size	Flange Port	b1	d1	d2	d3	d4	h1	h2	h3	h4	h5	h6	h7	Wt. (lbs.)	Use Bolt
RFL 6500/6520	DIN DN 100	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[11.97] 304	[13.23] 336 [30.55] 776	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	487/604	M16X2
	4" ANSI 150 LB RF	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[11.97] 304	[13.23] 336 [30.55] 776	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	487/604	5/8"-11UNC HEAVY HEX
	DIN DN 125	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[14.96] 380	[10.24] 260 [27.56] 700	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	496/613	M16X2
	DIN DN 150	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[14.37] 365	[10.83] 275 [28.15] 715	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	507/624	M20X2.5
	6" ANSI 150 LB RF	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[14.37] 365	[10.83] 275 [28.15] 715	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	507/ 624	3/4"-10UNC HEAVY HEX
	DIN DN 200	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[18.11] 460	[9.45] 240 [26.77] 680	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	540/657	M20X2.5
	8" ANSI 150 LB RF	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[18.11] 460	[9.45] 240 [26.77] 680	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	540/657	3/4"-10UNC HEAVY HEX
	DIN DN 250	[30.71] 780	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[17.72] 450	[9.84] 250 [27.17] 690	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	562/679	M24X3
	10" ANSI 150 LB RF	[30.71] 780	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[17.72] 450	[9.84] 250 [27.17] 690	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	562/679	7/8"-9UNC HEAVY HEX
RFL 7800/7820	DIN DN 100	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[11.97] 304	[13.23] 336 [30.55] 776	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	496/622	M16X2
	4" ANSI 150 LB RF	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[11.97] 304	[13.23] 336 [30.55] 776	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	496/622	5/8"-11UNC HEAVY HEX
	DIN DN 125	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[14.96] 380	[10.24] 260 [27.56] 700	[55.31] 1405 [72.64] 1845	[19.69] 500 [37.01] 940	505/631	M16X2
	6" ANSI 150 LB RF	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[14.37] 365	[10.24] 260 [27.56] 700	[54.72] 1390 [72.05] 1830	[19.69] 500 [37.01] 940	505/631	5/8"-11UNC HEAVY HEX
	DIN DN 150	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[49.61] 1260 [66.93] 1700	[10.04] 255	[21.26] 540	[14.37] 365	[10.83] 275 [28.15] 715	[54.72] 1390 [72.05] 1830	[19.69] 500 [37.01] 940	516/642	M20X2.5
	DIN DN 200	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[18.11] 460	[9.45] 240 [26.77] 680	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	549/675	M20X2.5
	8" ANSI 150 LB RF	[29.13] 740	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[18.11] 460	[9.45] 240 [26.77] 680	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	549/675	3/4"-10UNC HEAVY HEX
	DIN DN 250	[30.71] 780	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[17.72] 450	[9.84] 250 [27.17] 690	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	571/697	M24X3
	10" ANSI 150 LB RF	[30.71] 780	[18.90] 480	[20.00] 508	[24.41] 620	[27.51] 699	[54.33] 1380 [71.65] 1820	[10.04] 255	[23.62] 600	[17.72] 450	[9.84] 250 [27.17] 690	[60.04] 1525 [77.36] 1965	[19.69] 500 [37.01] 940	571/697	7/8"-9UNC HEAVY HEX

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.

For complete dimensions please contact HYDAC to request a certified print..

Dimensions RFL 4000 - 15020

Size	Flange Port	b1	d1	d2	d3	d4	h1	h2	h3	h4	h5	h6	h7	Wt. (lbs.)	Use Bolt
RFL 15000/ 15020	DIN DN 200	[39.37] 1000	[27.17] 690	[27.99] 711	[32.68] 830	[35.66] 906	[56.1] 1425 [73.43] 1865	[10.35] 263	[25.79] 655	[14.37] 365	[12.99] 330 [30.31] 770	[64.17] 1630 [81.50] 2070	[19.69] 500 [37.01] 940	1047/1254	M20X2.5
	8" ANSI 150 LB RF	[39.37] 1000	[27.17] 690	[27.99] 711	[32.68] 830	[35.66] 906	[56.1] 1425 [73.43] 1865	[10.35] 263	[25.79] 655	[14.37] 365	[12.99] 330 [30.31] 770	[63.98] 1625 [81.50] 2070	[19.69] 500 [37.01] 940	1047/1254	3/4"- 10UNC HEAVY HEX
	DIN DN 250	[39.37] 1000	[27.17] 690	[27.99] 711	[32.68] 830	[35.66] 906	[56.1] 1425 [73.43] 1865	[10.35] 263	[25.79] 655	[17.72] 450	[9.65] 245 [26.97] 685	[63.98] 1625 [81.50] 2070	[19.69] 500 [37.01] 940	1074/1280	M24X3
	10" ANSI 150 LB RF	[39.37] 1000	[27.17] 690	[27.99] 711	[32.68] 830	[35.66] 906	[56.1] 1425 [73.43] 1865	[10.35] 263	[25.79] 655	[17.72] 450	[9.65] 245 [26.97] 685	[63.98] 1625 [81.50] 2070	[19.69] 500 [37.01] 940	1074/1280	7/8"- 9UNC HEAVY HEX
	DIN DN 300	[39.37] 1000	[27.17] 690	[27.99] 711	[32.68] 830	[35.66] 906	[58.86] 1495 [76.18] 1935	[10.35] 263	[26.38] 670	[20.28] 515	[9.25] 235 [26.57] 675	[66.93] 1700 [84.25] 2140	[19.69] 500 [37.01] 940	1129/1335	M24X3
	12" ANSI 150 LB RF	[39.37] 1000	[27.17] 690	[27.99] 711	[32.68] 830	[35.66] 906	[58.86] 1495 [76.18] 1935	[10.35] 263	[26.38] 670	[20.28] 515	[9.25] 235 [26.57] 675	[66.93] 1700 [84.25] 2140	[19.69] 500 [37.01] 940	1129/1335	7/8"- 9UNC HEAVY HEX

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print..

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

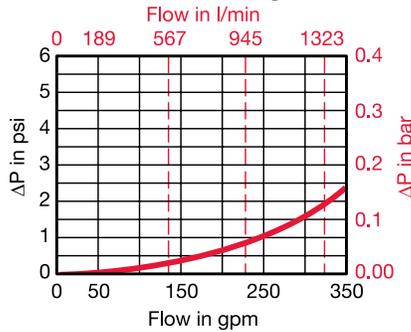
Housing Curve:

Pressure loss through housing is as follows:

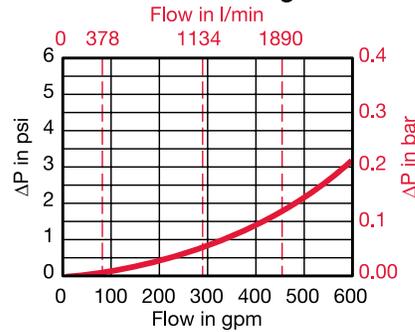
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

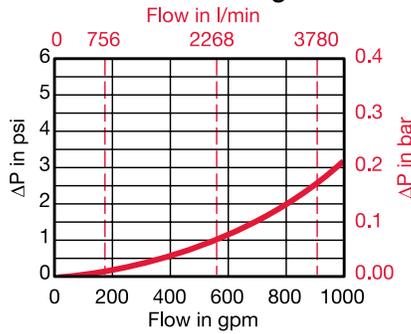
**RFL 1300/1320 Housing
w/ ANSI 4" Flange**



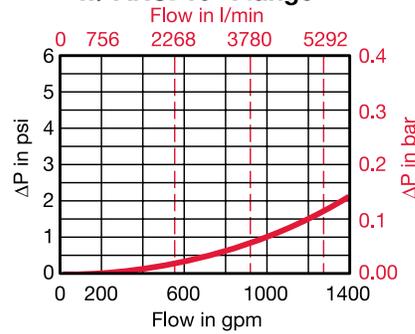
**RFL 2500/2520 Housing
w/ ANSI 6" Flange**



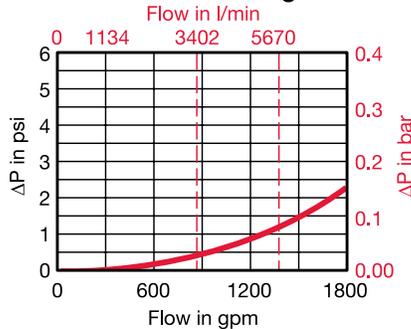
**RFL 4000/4020 Housing
w/ ANSI 8" Flange**



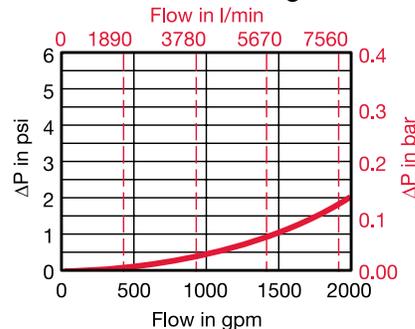
**RFL 5200/5220 Housing
w/ ANSI 10" Flange**



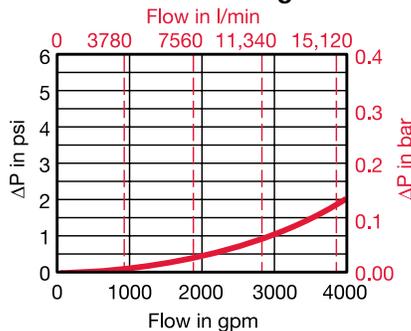
**RFL 6500/6520 Housing
w/ ANSI 10" Flange**



**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

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

(From Tables Below)

Optimicron Size	...R...ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.02
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
1700 R XXX ON	0.074	0.035	0.029	0.015	0.014	0.01
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECOMICRON Size	...R...ECON2			
	3 µm	5 µm	10 µm	20 µm
0850 R XXX ECON2	0.082	0.055	0.038	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016
1700 R XXX ECON2	0.038	0.027	0.016	0.011
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicron Size	...R...BN4AM	
	3 µm	10 µm
0850 R XXX BN4AM	0.154	0.049
1300 R XXX BN4AM	0.088	0.033
1700 R XXX BN4AM	0.071	0.027
2600 R XXX BN4AM	0.055	0.016

Aquamicron Size	...R...AM
	40 µm
0850 R 040 AM	0.040
1300 R 040 AM	0.026
1700 R 040 AM	0.020
2600 R 040 AM	0.013

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

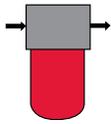
Polyester Size	...R...P/HC	
	10 µm	20 µm
0850 R XXX P/HC	0.007	0.003
1300 R XXX P/HC	0.004	0.002
1700 R XXX P/HC	0.003	0.002
2600 R XXX P/HC	0.002	0.001

All Element K Factors in psi / gpm.

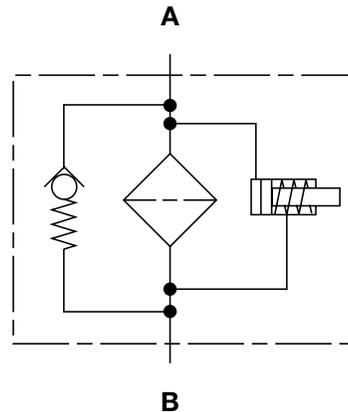
LOW PRESSURE FILTERS

FLN Series

Inline Filters — to DIN 24550
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 axial 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.
- This filter meets the requirements of DIN 24550 as follows:
 - Filter size 0160 with G 1-1/4" port selection
 - Filter size 0250 with G 1-1/2" port selection
 - Filter size 0400 with SAE-DN 38 1-1/2" Flange
- Bypass versions of FLN filters have the bypass valve located in the filter head.

Technical Specifications

Mounting Method	2 mounting holes in the filter head
Port Connection	Inlet / Outlet 1-1/4" Threaded – SAE 20, 1-1/4" BSPP 1-1/2" Threaded – SAE 24, 1-1/2" BSPP 1-1/2" Flange-SAE-DN 38
Flow Direction	Inlet: Side Outlet: Opposite 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. Allowable Working Pressure:	360 psi (25 bar)
Fatigue Pressure	360 psi (25 bar)
Burst Pressure	1450 psi (100 bar)
Element Collapse Pressure Rating	
BN4HC, W/H-C	290 psid (20 bar)
BH4HC	3045 psid (210 bar)
Fluid Temperature Range -22°F to 212°F (-30°C to 100°C) Consult HYDAC for applications below -22°F (-30°C)	
Fluid Compatibility Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	
$\Delta P = 36.25$ psid (2.5 bar) -10% (standard)	
$\Delta P = 72$ psid (5 bar) -10%	
$\Delta P = 116$ psid (8 bar) -10%	
Bypass Valve Cracking Pressure	
$\Delta P = 50.75$ psid (3.5 bar) +10% (standard)	
$\Delta P = 102$ psid (7 bar) +10%	

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial

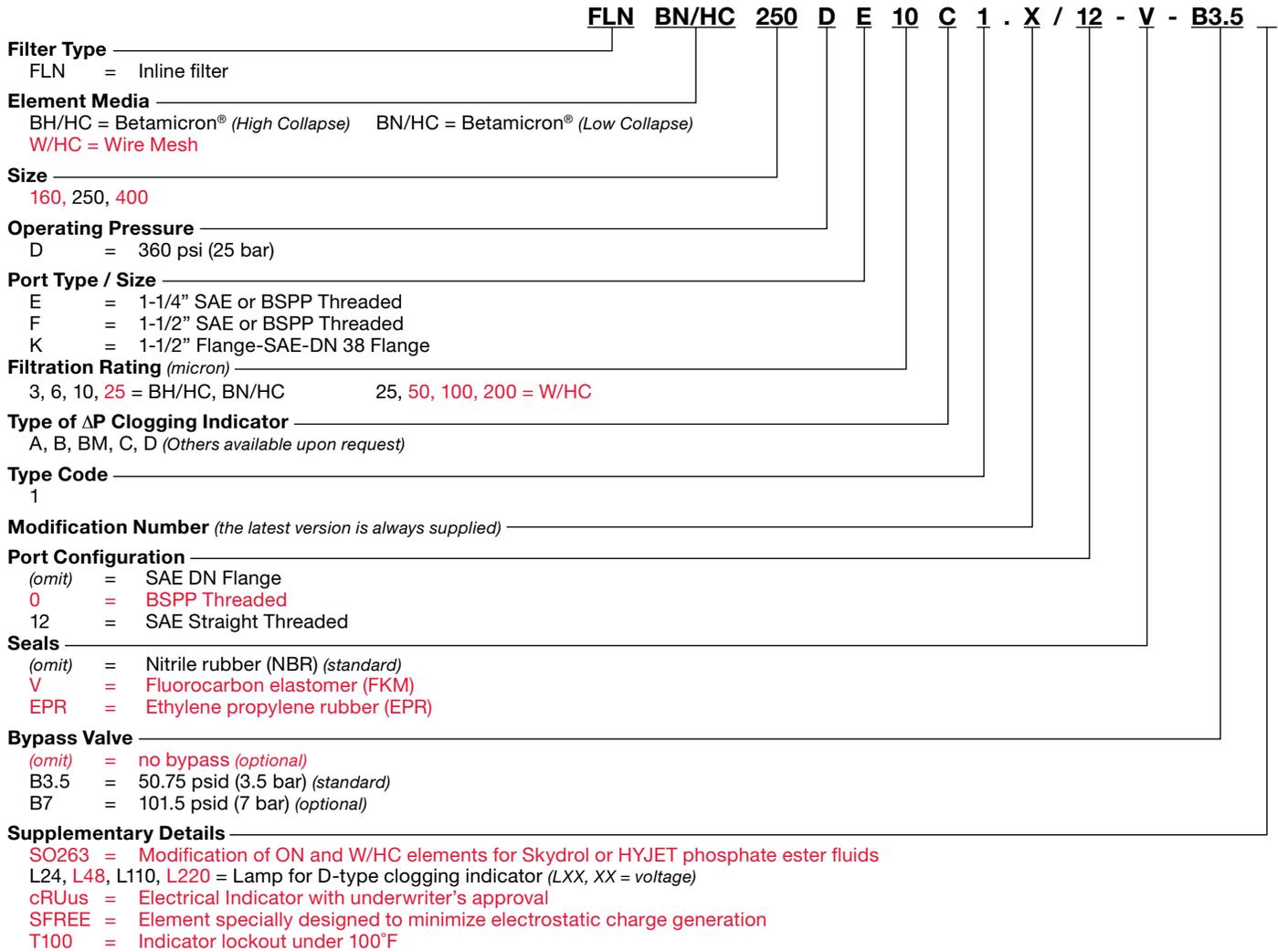


Power Generation

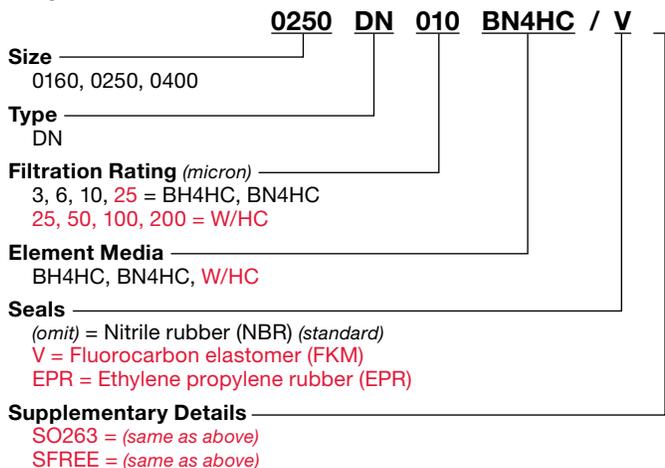


Pulp & Paper

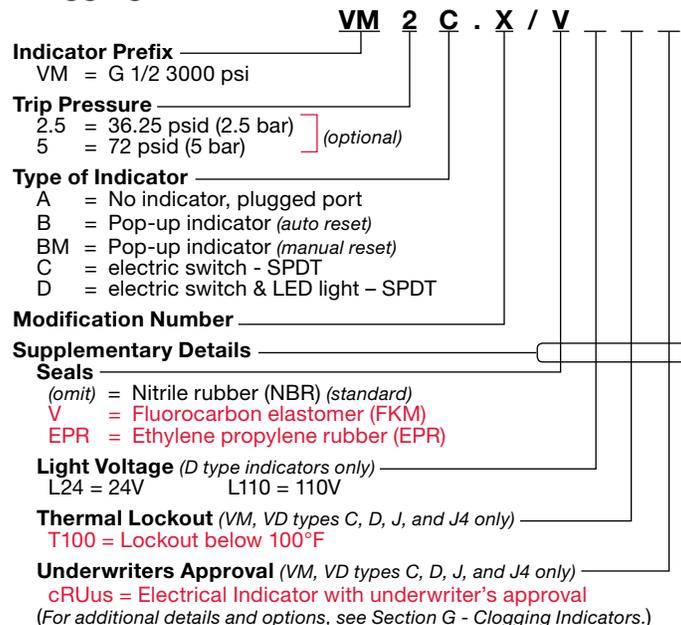
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

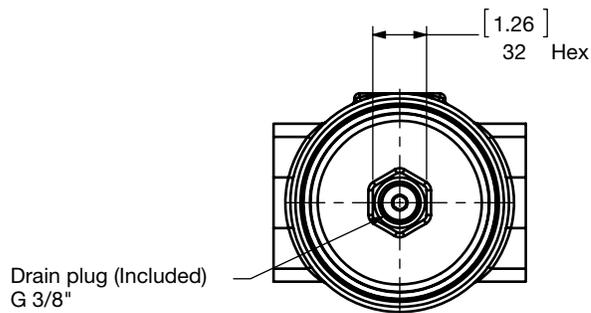
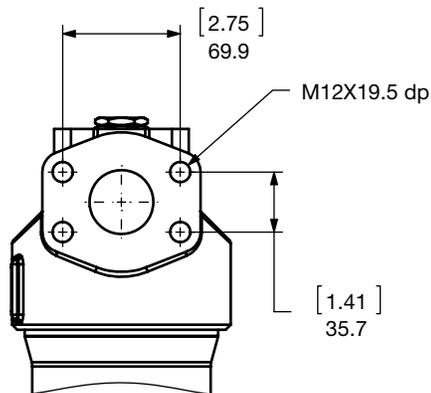
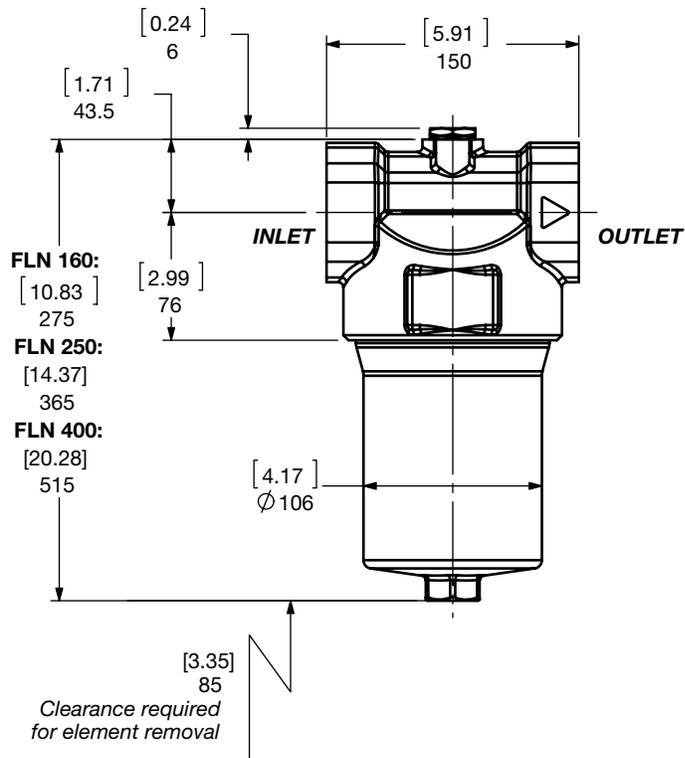
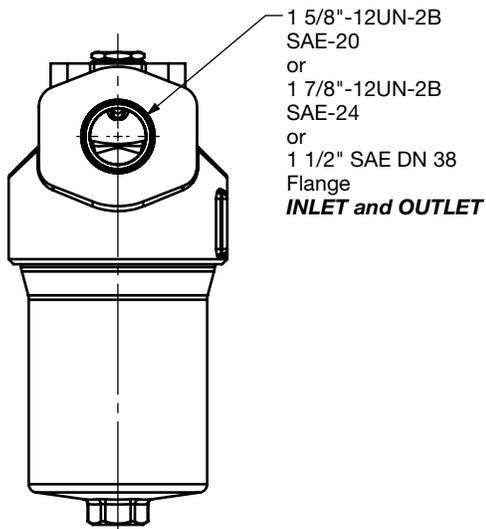
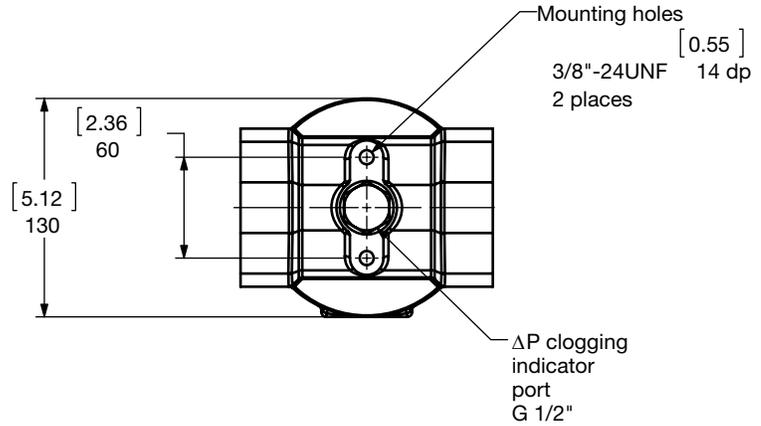


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

LOW PRESSURE FILTERS

Dimensions

FLN 160 / 250 / 400



1 1/2" SAE DN 38 Flange

Size	160	250	400
Weight (lbs.)	9.5	10.9	13.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

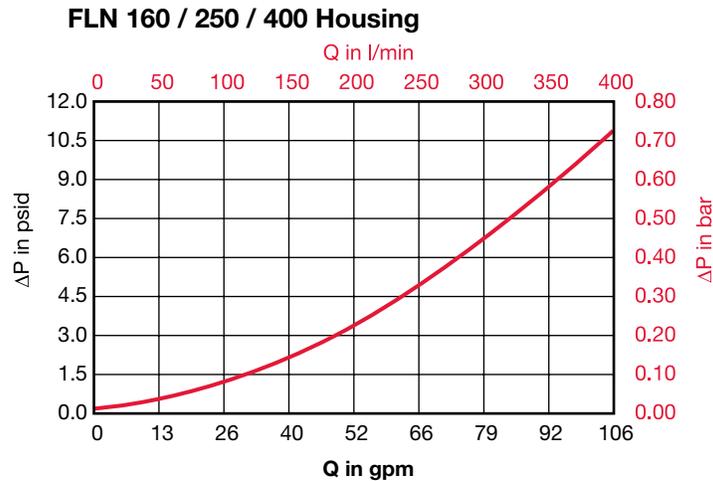
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

BN4HC	...DN...BN4HC (Betamicron Low Collapse)			
Size	3 μm	6 μm	10 μm	25 μm
0160 DN XXX BN4HC	0.434	0.280	0.187	0.143
0250 DN XXX BN4HC	0.280	0.176	0.115	0.099
0400 DN XXX BN4HC	0.176	0.110	0.071	0.055

BH4HC	...DN...BH/HC (Betamicron High Collapse)			
Size	3 μm	6 μm	10 μm	25 μm
0160 DN XXX BH4HC	0.439	0.280	0.209	0.137
0250 DN XXX BH4HC	0.296	0.187	0.154	0.104
0400 DN XXX BH4HC	0.187	0.115	0.093	0.060

W/HC	...DN...W/HC (Betamicron Low Collapse)			
Size	25 μm	50 μm	100 μm	200 μm
0160 DN XXX W/HC	0.009	0.009	0.009	0.009
0250 DN XXX W/HC	0.006	0.006	0.006	0.006
0400 DN XXX W/HC	0.004	0.004	0.004	0.004

All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

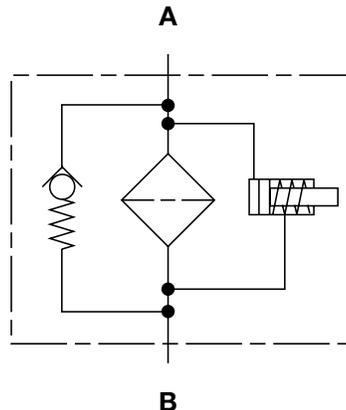
NFH Series

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 (right side of Inlet Port) SAE 12 (3/4")
- Clogging Indicator for local and/or remote signals
- Easily banked in parallel (manifolded) for high viscosity applications.

Notes: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Technical Specifications

Mounting Method	
NFH	2 mounting holes - filter head
NFH Manifold	Floor mounting brackets
Port Connection	
	SAE-64 Flange Code 61 (<i>single tower</i>)
	DIN100 (<i>multi-tower</i>)
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)
	(Flow limited by 4" pipe size)
Housing Pressure Rating	
Max. Allowable Working Pressure	500 psi (34.5 bar)
Fatigue Pressure	500 psi (34.5 bar)
Burst Pressure	> 1440 psi (100 bar)
Element Collapse Pressure Rating	
ON, W/HC	290 psid (20 bar)
ECON2, BN4AM, AM, P/HC	145 psid (10 bar)
Fluid Temperature Range	
	14°F to 212°F (-10°C to 100°C)
Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	
	$\Delta P = 29$ psid (2 bar) -10% (<i>standard</i>)
	$\Delta P = 72$ psid (5 bar) -10% (<i>optional</i>)
Bypass Valve Cracking Pressure	
	$\Delta P = 43$ psid (3 bar) +10%
	$\Delta P = 87$ psid (6 bar) +10%

Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Model Code

NFH ON 5200 E P 5 C 1 . 1 / 16 A V T100

Filter Type _____
 NFH = In-line Return Line Filter

Element Media _____
 ON = Optimicron® BN/AM = Betamicron® Aquamicron®
 ECON2 = ECOMicron® AM = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester

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

Operating Pressure _____
 E = 500 psi (34 bar)

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

Filtration Rating (microns) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = ECON2
 40 = AM 25, 74, 149 = W/HC 10, 20 = P/HC

Type of ΔP Clogging Indicator _____
 A, 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 C = Left inlet, Right outlet
 A = Left inlet, Left outlet D = Right inlet, Left outlet (sizes 5200 - 10400 only)
 B = Right inlet, Right outlet (sizes 5200 - 10400 only)

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system)] not available with ECON2

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 T100 = Indicator Thermal Lockout, 100°F (C and D only)
 SFREE = Element specially designed to minimize electrostatic charge generation
 cRUus = Electrical Indicator with underwriter's recognition

Replacement Element Model Code

2600 R 005 ON / V

Size _____
 1300, 2600

Type _____
 R

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149 = W/HC
 10, 20 = P/HC

Element Media _____
 ON, BN4AM, ECON2, AM, W/HC, P/HC

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details _____
 SO263 = (same as above) SFREE = (same as above)

Clogging Indicator Model Code

VM 2 C . X / V

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
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene Propylene rubber (EPR)

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

Underwriters Approval (VM, VD types C, D, J, and J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition

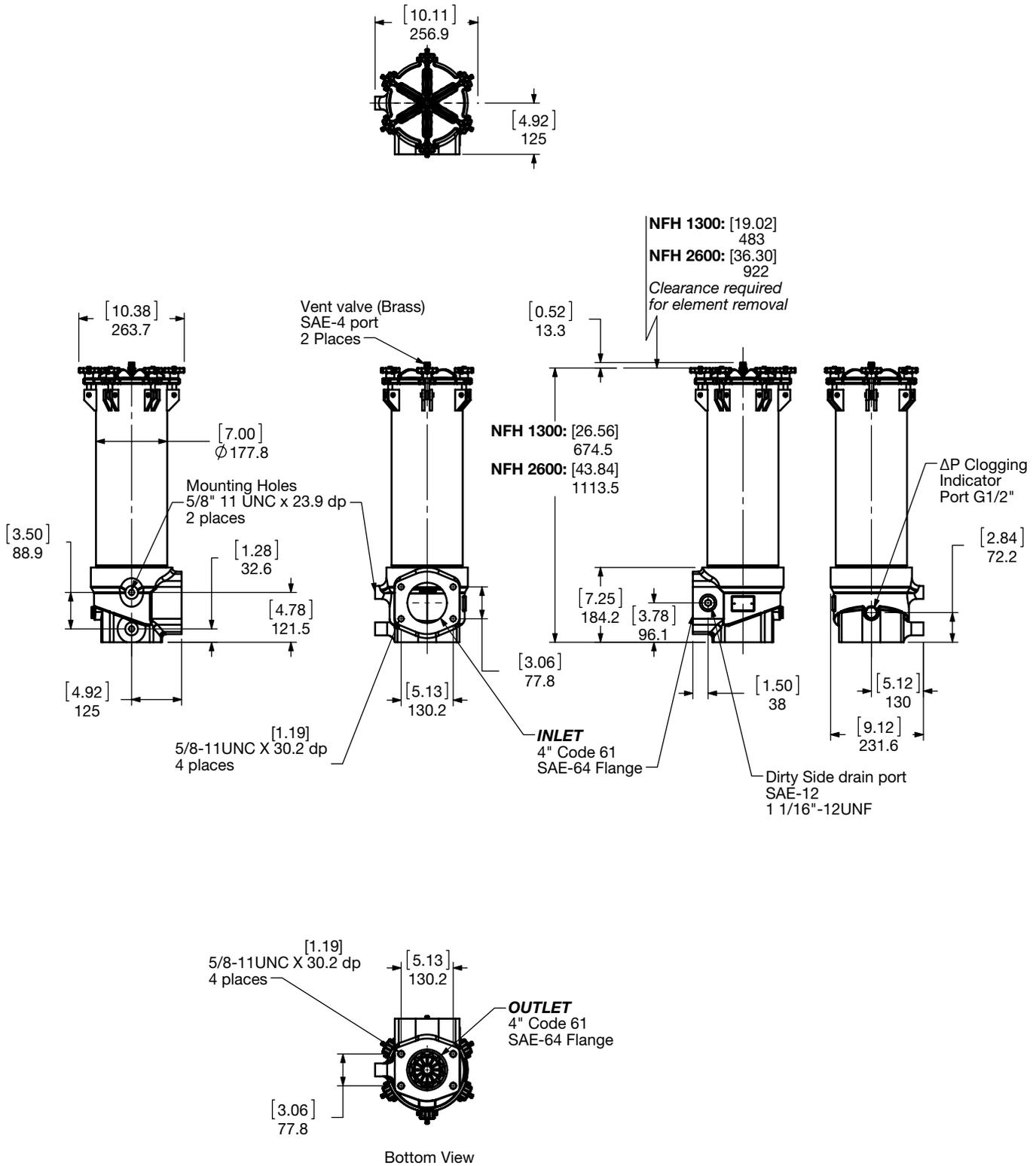
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

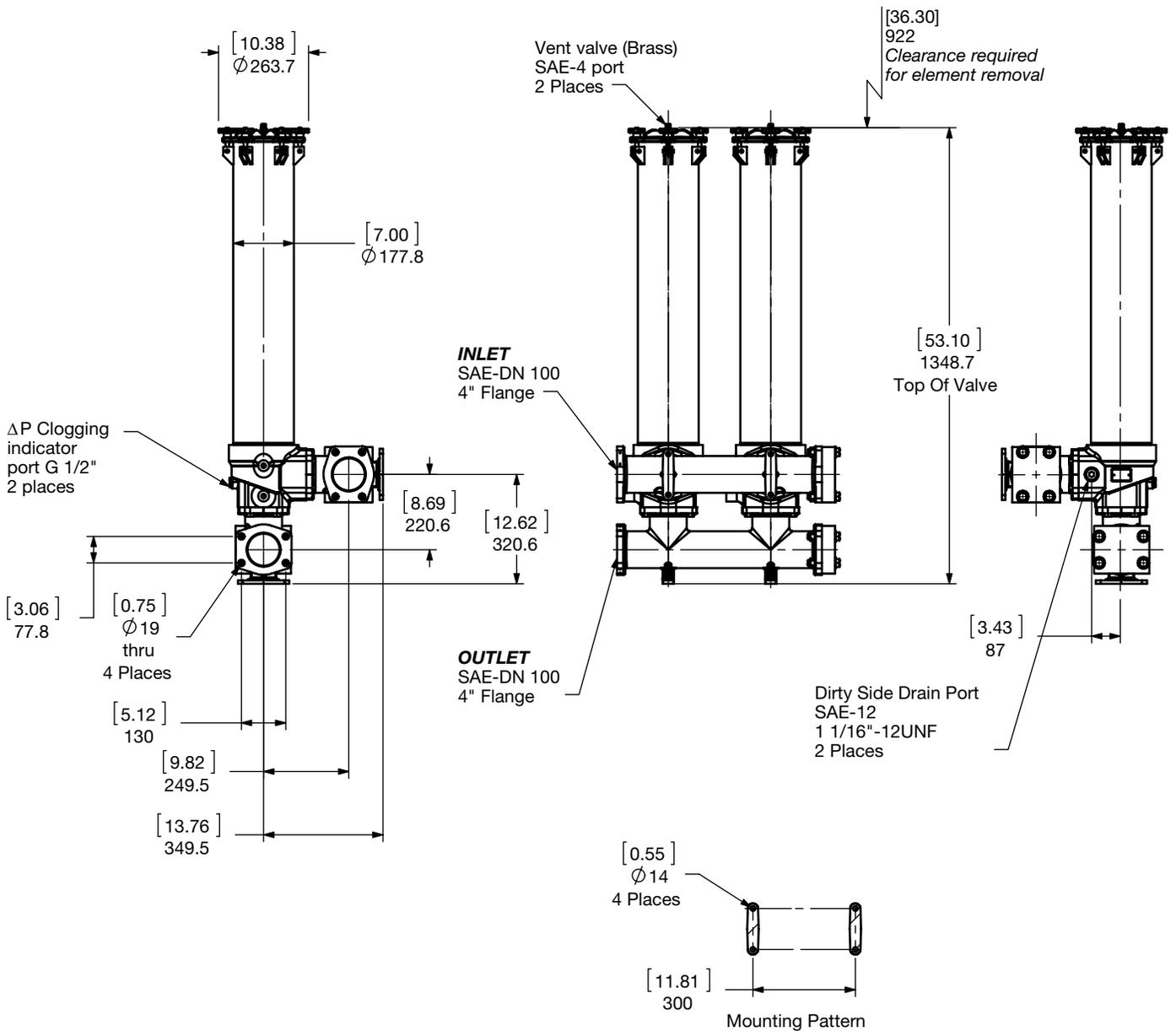
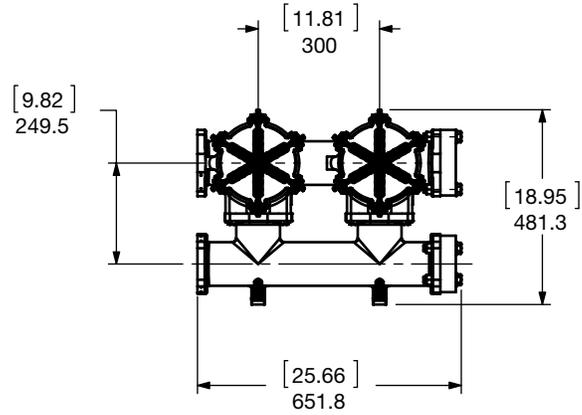
NFH 1300 / 2600



Size	1300	2600
Weight (lbs.)	87.1	115.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions NFH 5200

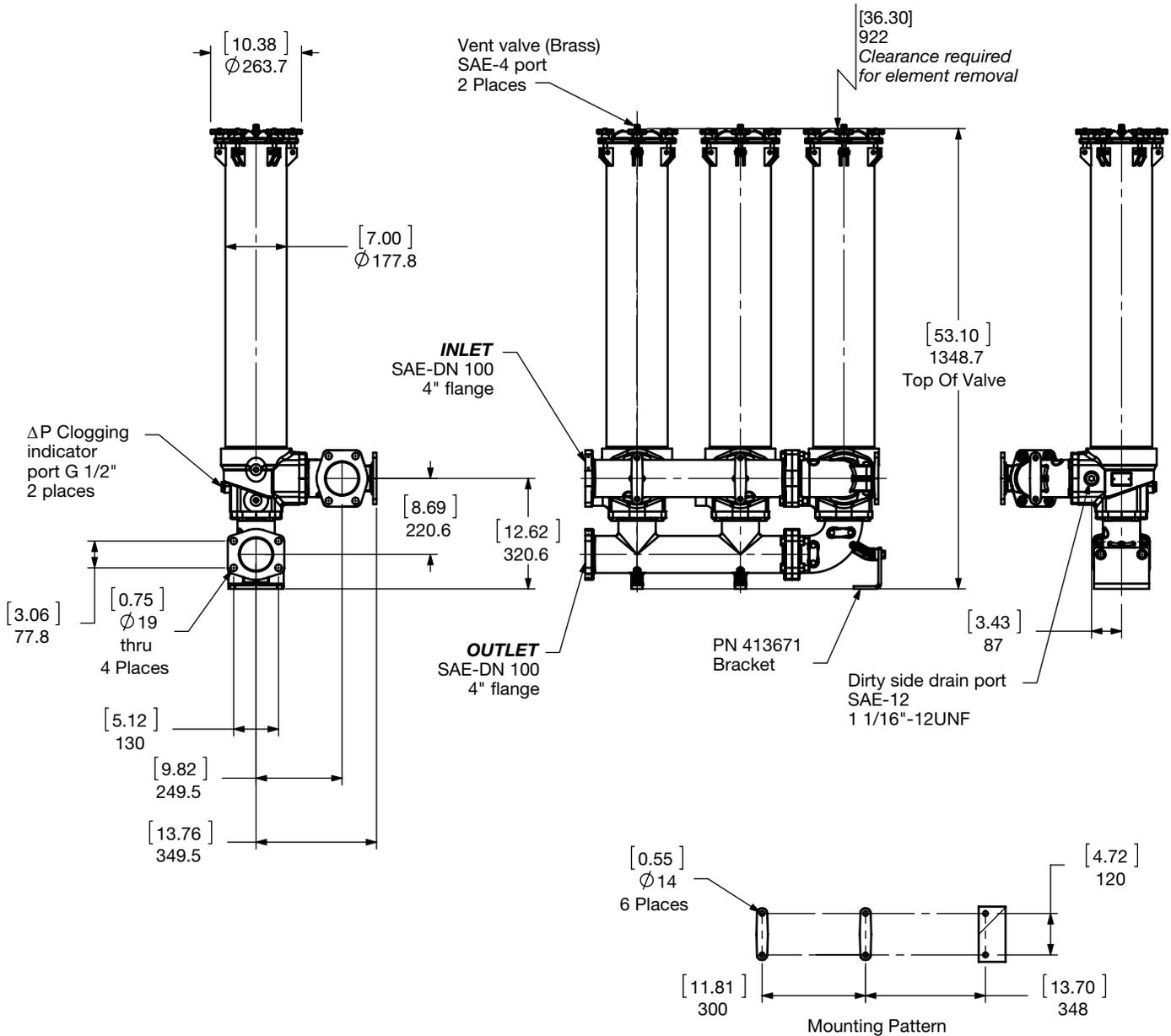
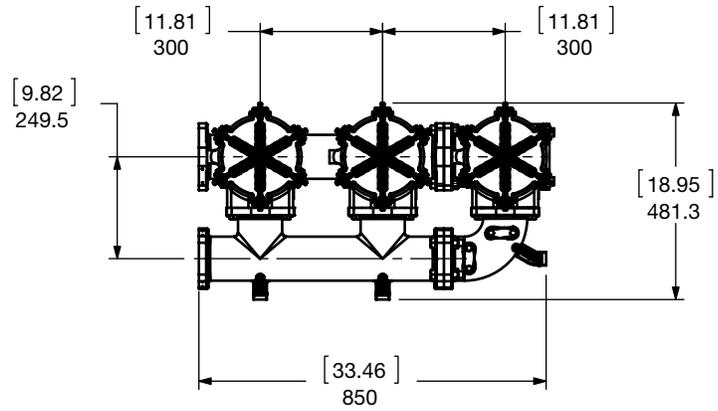


Size	5200
Weight (lbs.)	356

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

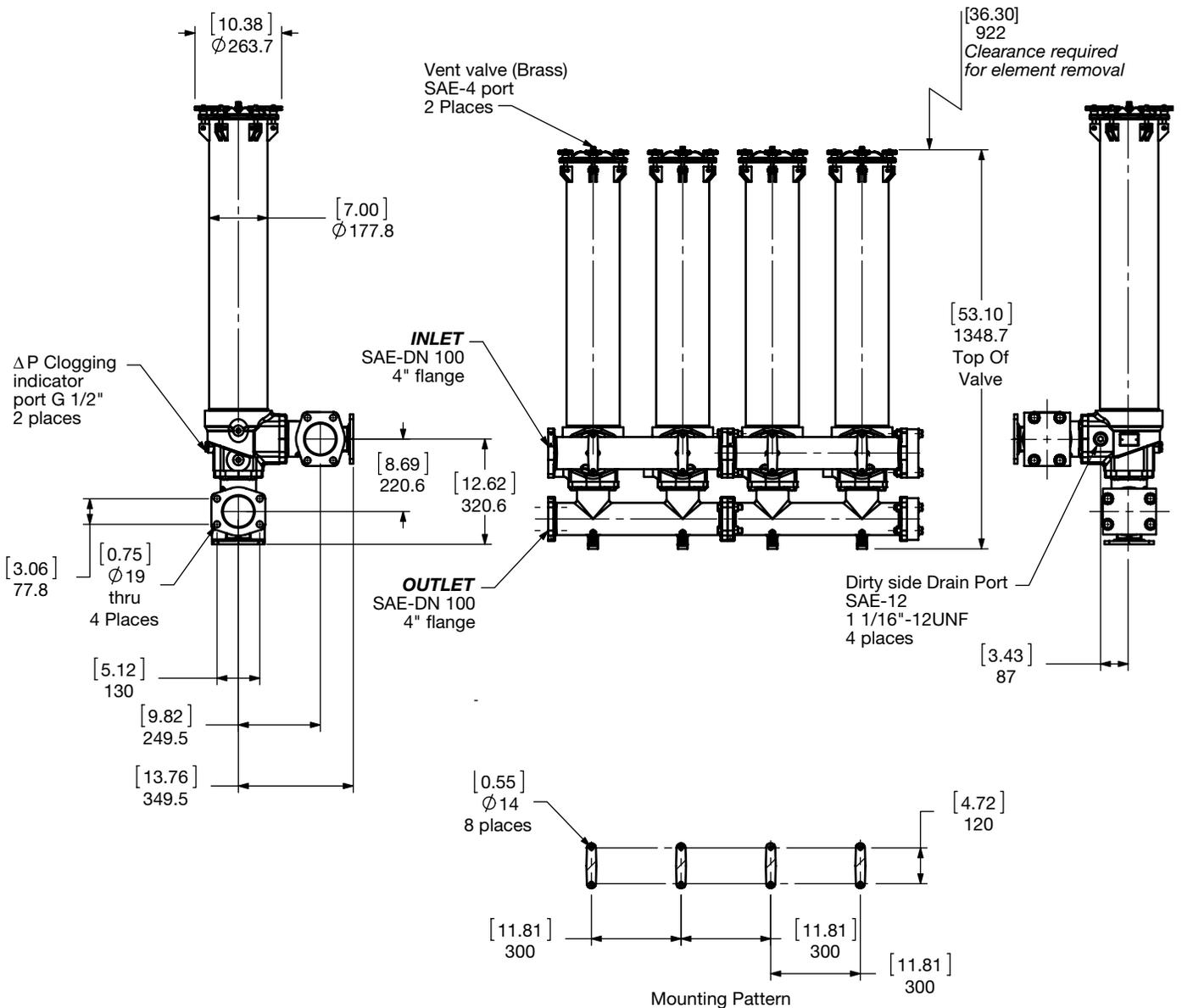
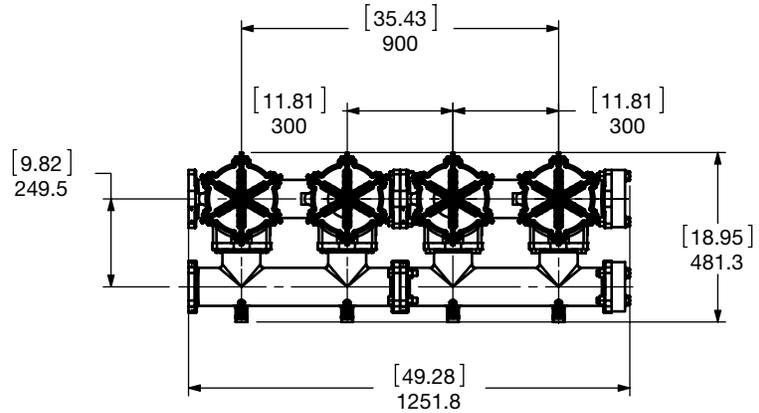
Dimensions NFH 7800



Size	7800
Weight (lbs.)	477.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions NFH 10400



Size	10400
Weight (lbs.)	684

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

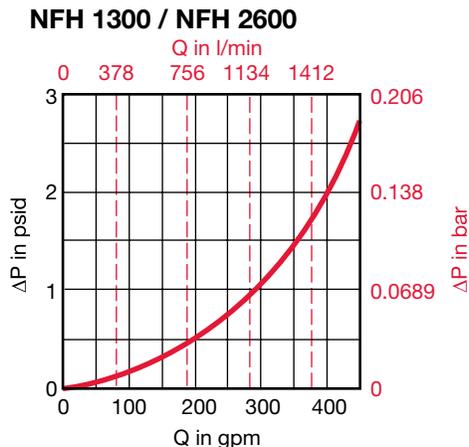
Housing Curve:

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 housing ΔP for manifolds with multiple housings, multiply the clean ΔP curve value by the percentage values in the table.

ΔP Housing



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 <small>Piping & Housing</small>
ΔP Total System = 1.5 psid + ΔP Element

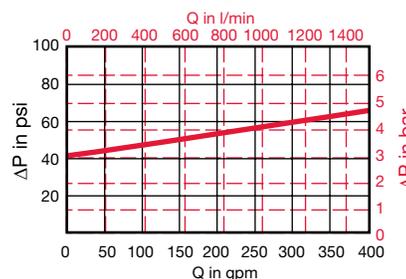
Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

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 appropriate sized single element (K) factor and multiply (total assembly flow rate divided by the number of housings in the manifold), then correct for viscosity.

Example 1: Lube System

Conditions
Viscosity = 500 SUS @ 120°F
Specific gravity = 0.86
Flow = 75 gpm
Low pressure drop essential
K Factor = 10 μ m Optimicron® filter element
Selection - NFH 2600 Filter
An NFH 2600 filter gives an Adjusted Clean Element ΔP as follows:
Clean ΔP = 75 gpm x 0.01 = 0.75 psid
Clean $\Delta P_{adj.} = 0.75 \times \frac{500}{141} \times \frac{0.86}{0.86} = 2.7$ psid
Housing ΔP = "0" (negligible)

Example 2: System Return Filter

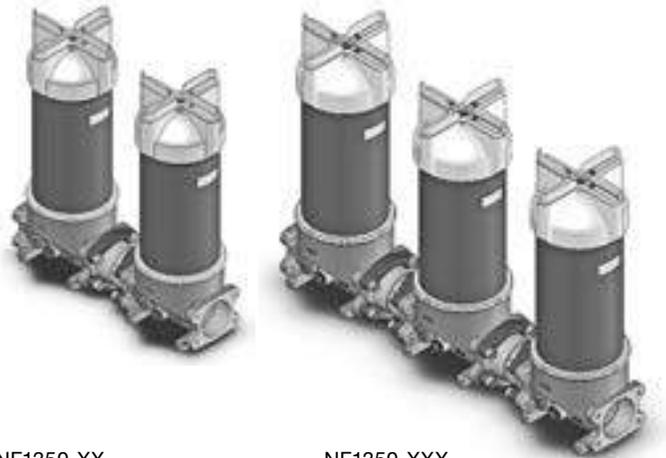
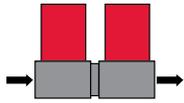
Conditions
Viscosity = ISO 68 Fluid 220 SUS @ 120°F
Specific gravity = 0.86
Flow = 350 gpm
3 μ m Filtration (depth) β (beta) = 1000
K Factor = 3 μ m Optimicron® filter element = 0.04
Selection - NFH 7800 Filter
Element ΔP = (350 \div 3 housings) x 0.04 x $\frac{220}{141}$ x $\frac{0.86}{0.86}$ = 7.28 psid
Housing ΔP = 1.05 (curve) x 0.61 x $\frac{0.86}{0.86}$ x 0.64 psid
Assembly ΔP = 7.28 psid + 0.64 psid = 7.92 psid

LOW PRESSURE FILTERS

NF UHE Series

Ultra High Efficiency Inline Simplex Filters

360 psi • up to 450 gpm

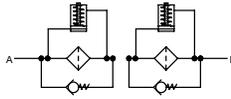


NF1350-XX

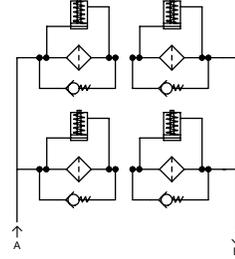
NF1350-XXX

Hydraulic Symbol

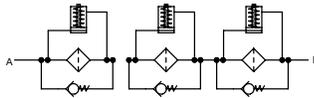
NF 1350/2650 UHE 2 Stage



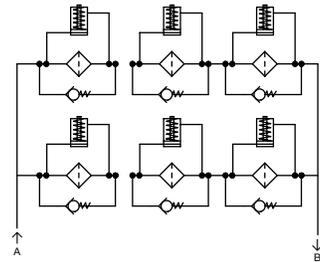
NF 5250 UHE 2 Stage



NF 1350/2650 UHE 3 Stage



NF 5250 UHE 3 Stage



Features

- Multi-pass filtration in a single pass!
- Beta efficiency values > 5000 single pass possible
- Conventional NF housings are piped in series to achieve multi-levels of filtration in one pass.

Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Configurations

NF Size 1350, 2650, 5250 - Two Stage

- Fine-Fine Filtration Arrangement
- Coarse-Fine Filtration Arrangement
- Medium-Fine Filtration Arrangement
- Fine Filtration with Water Removal Arrangement
- Customer Defined Arrangement

NF Size 1350, 2650, 5250 - Three Stage

- Fine-Fine Fine Filtration Arrangement
- Coarse-Fine Fine Filtration Arrangement
- Coarse-Medium Fine Filtration Arrangement
- Coarse-Fine with Water Removal Arrangement
- Medium-Fine Fine Filtration Arrangement
- Customer Defined Arrangement

Applications



Agricultural



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Technical Specifications

Mounting Method	See drawings	
Port Connection	4" SAE-DN 100 Flange <i>(with M16 flange connection bolts included)</i>	
Flow Direction	1350 / 2650 / 5250	Inlet: Side Outlet: Side (<i>opp.</i>)
Construction Materials	Head, Housing, Lid	Aluminum
	Filter Stage Connectors	Carbon Steel
	Elbows, Manifolds	Ductile Iron
Flow Capacity	1350	343 gpm (1300 lpm)
	2650, 5250	450 gpm (1700 lpm) (<i>4" pipe limit</i>)
Housing Pressure Rating	Max. Allowable Working Pressure	360 psi (25 bar)
	Fatigue Pressure	360 psi (25 bar)
	Burst Pressure	Contact HYDAC
Element Collapse Pressure Rating	ON	290 psid (20 bar)
	ECON2, BN4AM, AM	145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	$\Delta P = 29 \text{ psid (2 bar) } -10\%$	$\Delta P = 72 \text{ psid (5 bar) } -10\%$
Bypass Valve Cracking Pressure	$\Delta P = 15 \text{ psid (1 bar) } +10\%$	$\Delta P = 87 \text{ psid (6 bar) } +10\%$
	$\Delta P = 43 \text{ psid (3 bar) } +10\%$	

*Note: All NF...1.0 Filters MAWP reduce to 7 bar (101.5 psi) when using the following "VR" indicators: B, BM, E, ES, GC, LE, LZ.

Model Code

NF ON-ON-AM 1350 D P 5-3-40 BM 2.0 / KB

Filter Type _____
 NF = Return Line Filter Simplex

Element Media _____
 ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 Note: Include filtration media from inlet stage sequence to outlet port.

Size _____
 1350, 2650, 5250

Operating Pressure _____
 D = 360 psi (25 bar)

Type of Connection _____
 P = SAE DN 100 (4") Flange (standard port size)
 L = SAE DN 50 (2") Flange
 M = SAE DN 65 (2 1/2") Flange
 N = SAE DN 80 (3") Flange

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2 3, 10 = BN/AM 40 = AM
 Note: Include filtration rating from each stage, inlet to output.

Type of ΔP Clogging Indicator _____
 A = No Indicator (plugged) BM, C, D, LE (Others available upon request)

Type Number / Modification Number _____
 2.0 = Inline Filter - ΔP indicator

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene Propylene (EPDM)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system) } not available with ECON2

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 cRUus = Electrical indicator with underwriter's recognition
 SFREE = Element specially designed to minimize electrostatic charge generation

Number of Filtration Stages _____
 2 = Two Stages (2 in a series)
 3 = Three Stages (3 in a series)

Replacement Element Model Code

1300 R 003 ON /

Size _____
 1300 - for housings: 1350
 2600 - for housings: 2650, 5210

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM

Element Media _____
 ON, BN4AM, ECON2, AM

Seals _____
 (omit) = standard - Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details _____
 SO263 = (See above)
 SFREE = (See above)

Clogging Indicator Model Code

VM 5 BM . X /

Indicator Prefix _____
 VM = ΔP, G 1/2" 3000 psi
 VD = ΔP G 1/2" 6000 psi
 (2.0 ver. - LE Indicators only)

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

Type of Indicator _____
 A = No indicator, plugged port
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT
 LE = Electric switch and pop-up

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Light Voltage (D type indicators only) _____
 L24 = 24V L48 = 48V L110 = 110V L220 = 220V

Thermal Lockout (VM type C, D, J, J4 only) _____
 T100 = Lockout below 100°F

Underwriter's Recognition (VM type C, D, J, J4 only) _____
 cRUus = Electrical indicator with underwriter's recognition

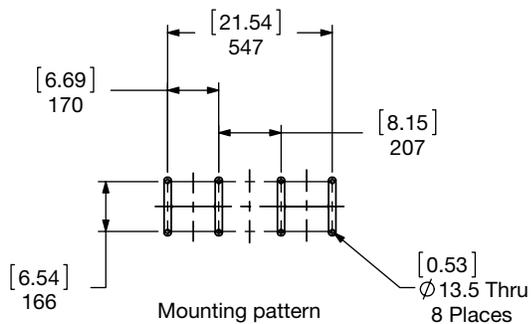
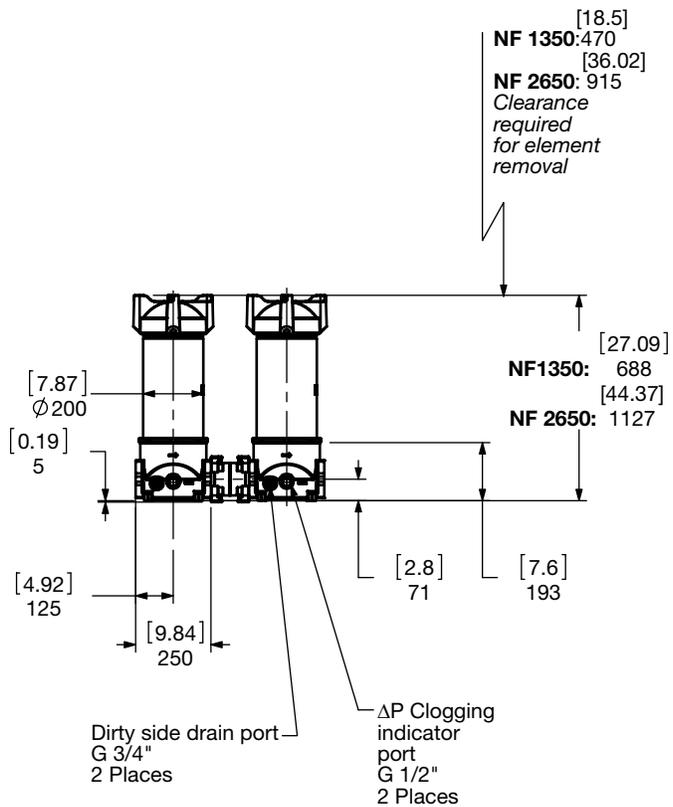
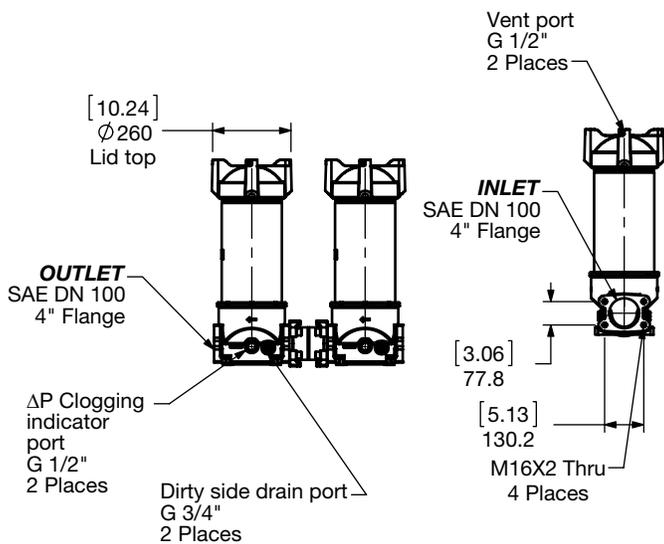
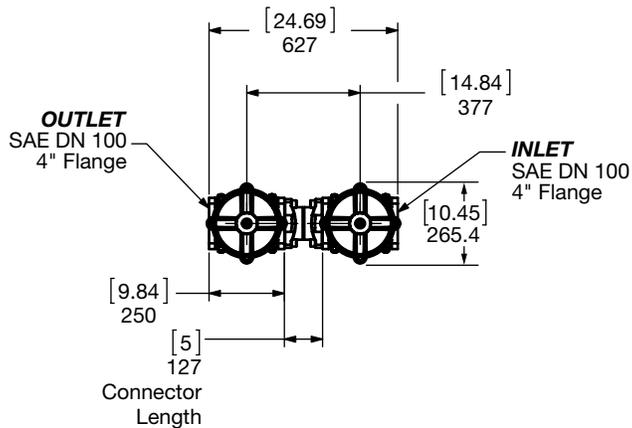
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

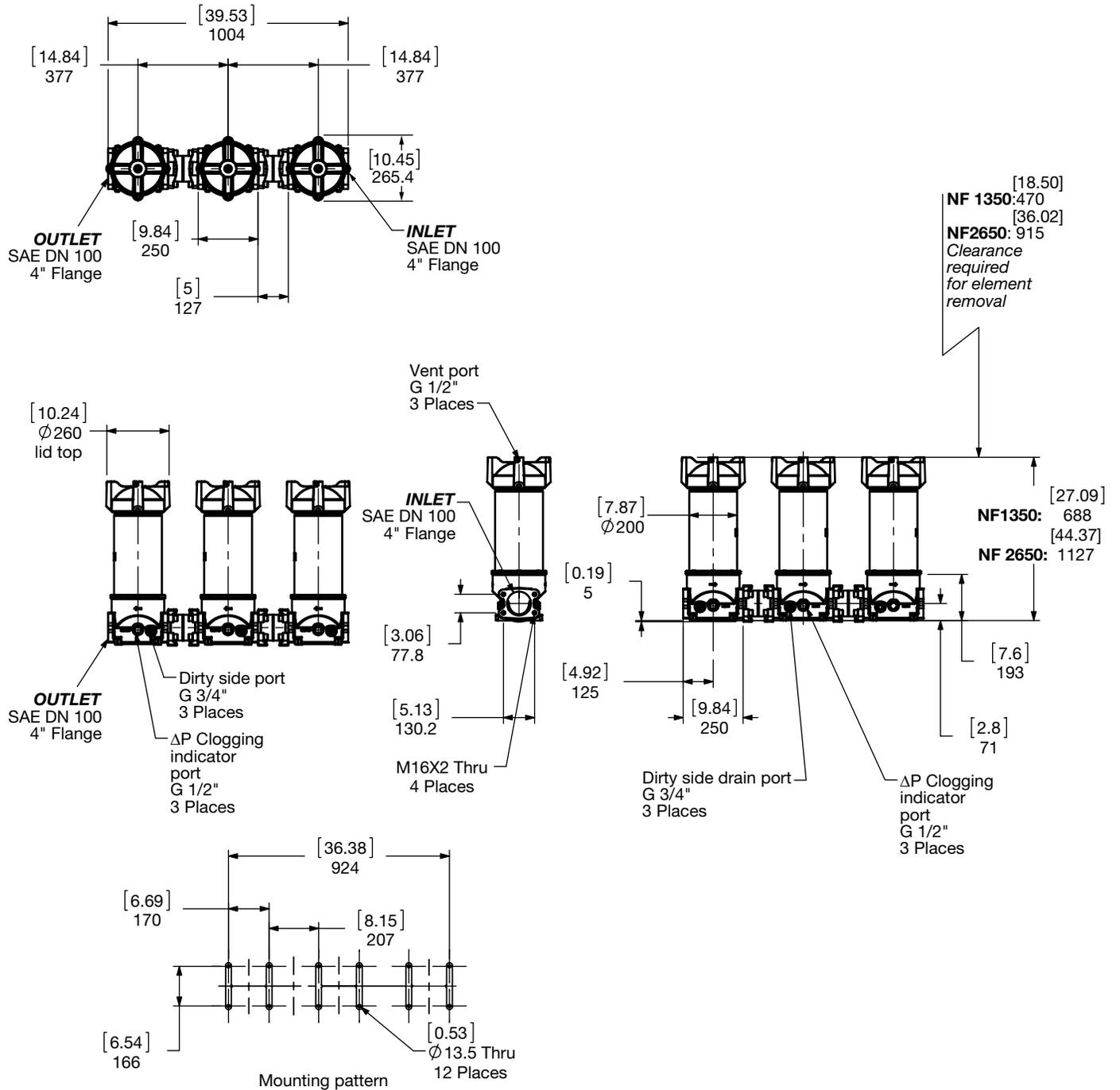
NF 1350 / 2650 - 2 Stage UHE



Size	1350 2 Stage	2650 2 Stage
Weight (lbs.)	90.6	121.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 1350 / 2650 - 3 Stage UHE

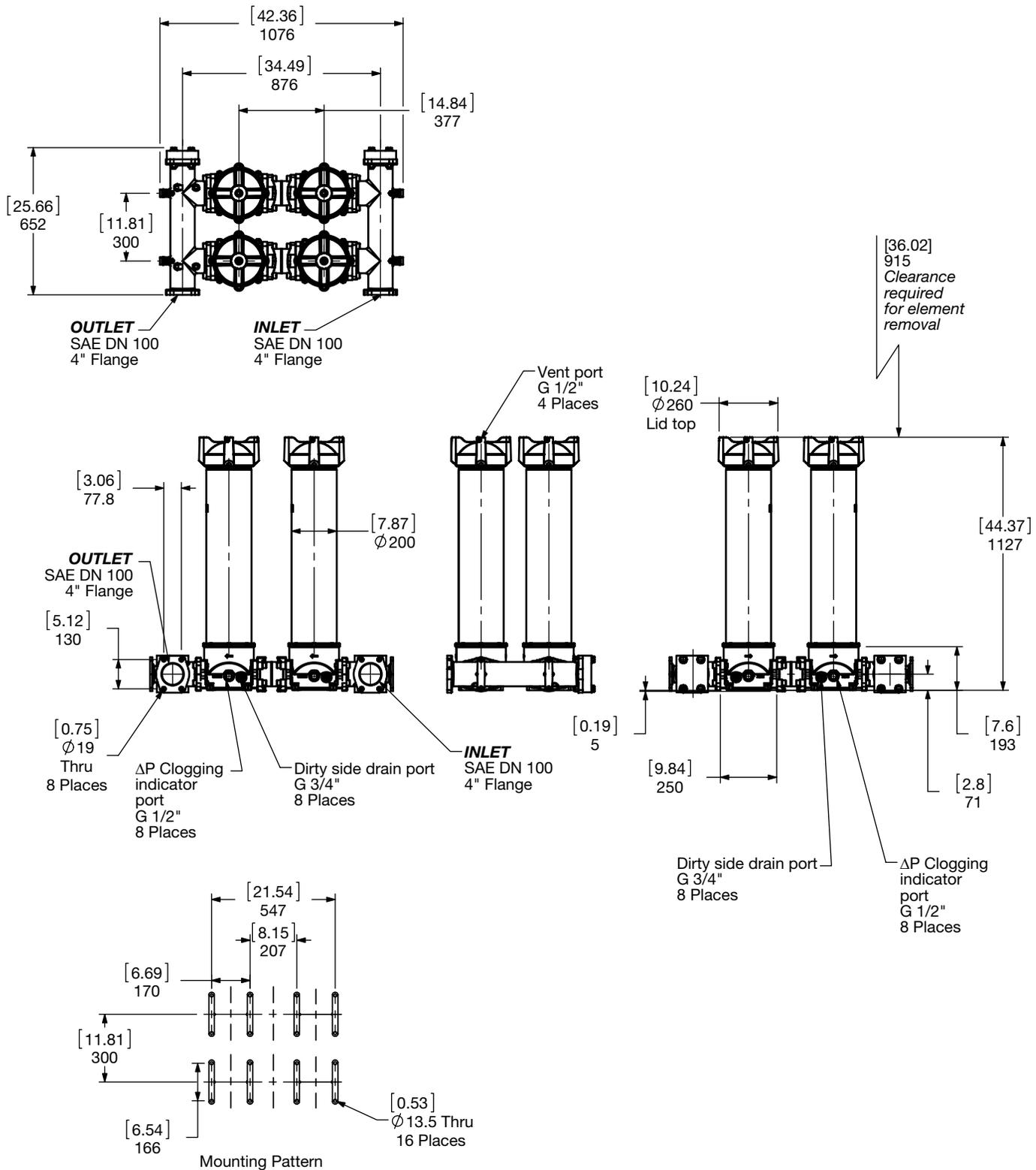


Size	1350 3 Stage	2650 3 Stage
Weight (lbs.)	139.3	185.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

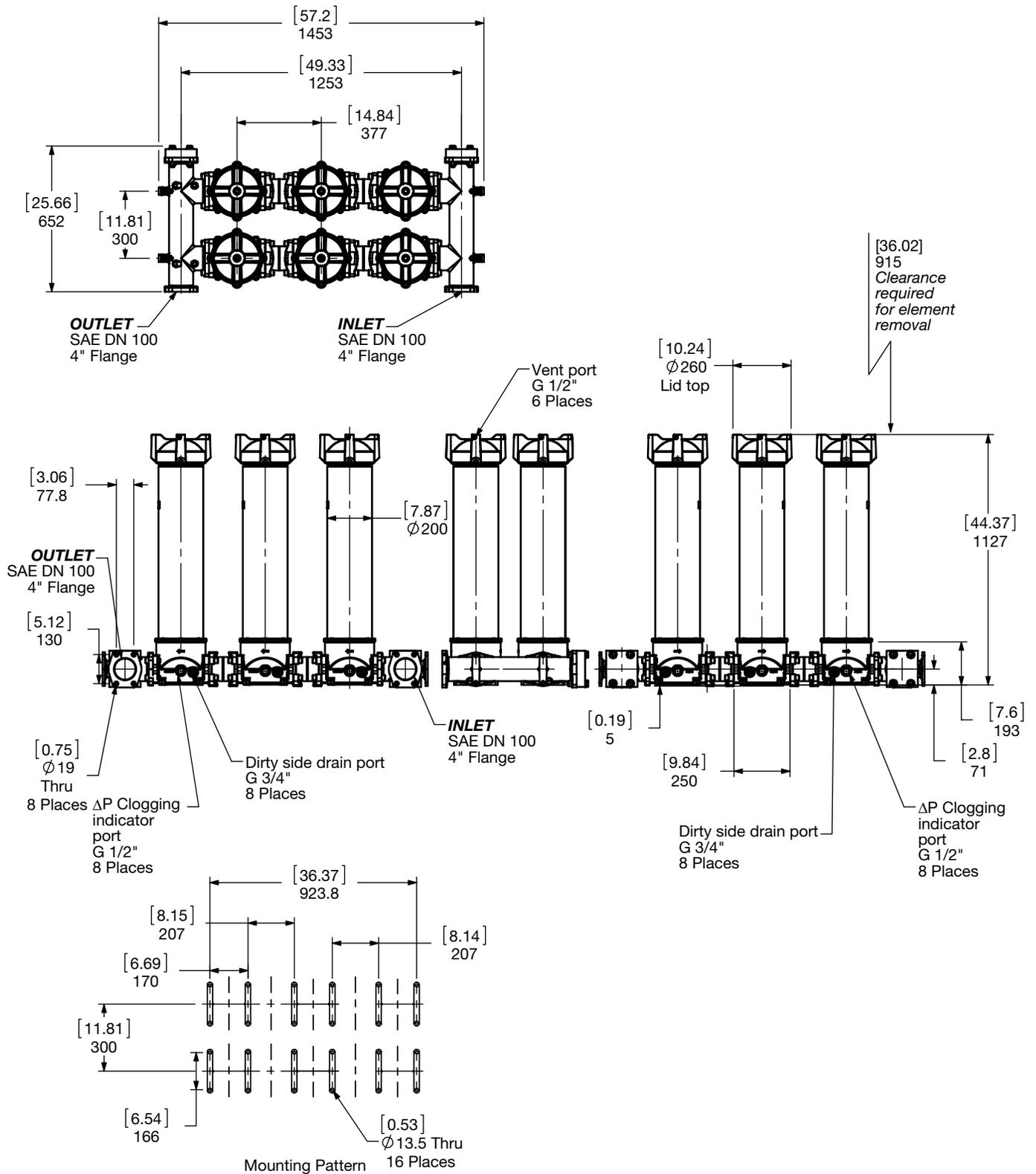
Dimensions:
NF 5250 - 2 Stage UHE



Size	5250 2 Stage
Weight (lbs.)	329

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 5250 - 3 Stage UHE



Size	5250 3 Stage
Weight (lbs.)	459.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include elements. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

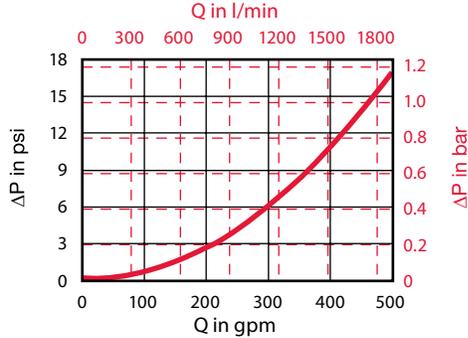
Housing Curve:

Pressure loss through housing is as follows:

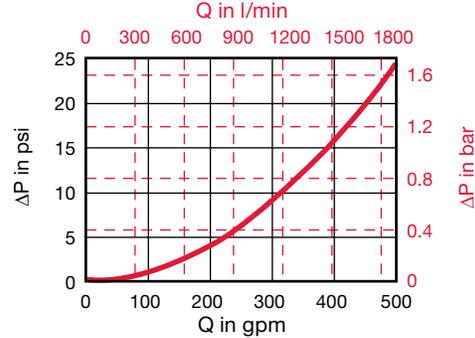
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

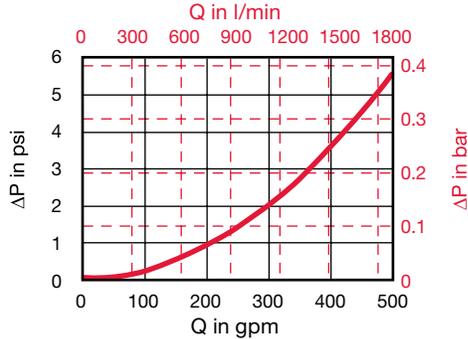
NF 1350-2650 UHE - 2 STAGE HOUSING



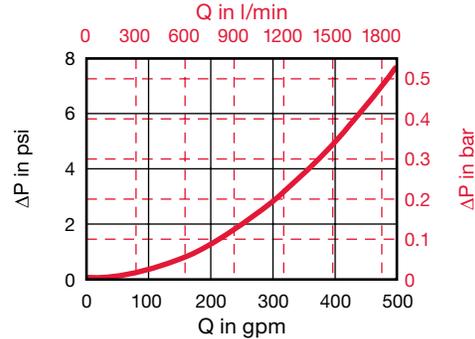
NF 1350-2650 UHE - 3 STAGE HOUSING



NF 5250 UHE - 2 STAGE HOUSING



NF 5250 UHE - 3 STAGE HOUSING



Element K Factors

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

(From Tables Below)

Optimicon	...R...ON					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECOMICRON	...R...ECON2			
Size	3 μm	5 μm	10 μm	20 μm
1300 R XXX ECON2	0.044	0.033	0.022	0.016
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicon	...R...BN4AM	
Size	3 μm	10 μm
1300 R XXX BN4AM	0.088	0.033
2600 R XXX BN4AM	0.055	0.016

Aquamicon	...R...AM
Size	40 μm
1300 R 040 AM	0.026
2600 R 040 AM	0.013

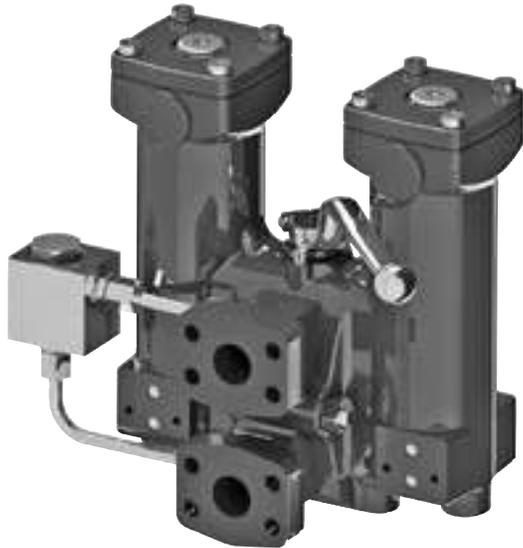
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

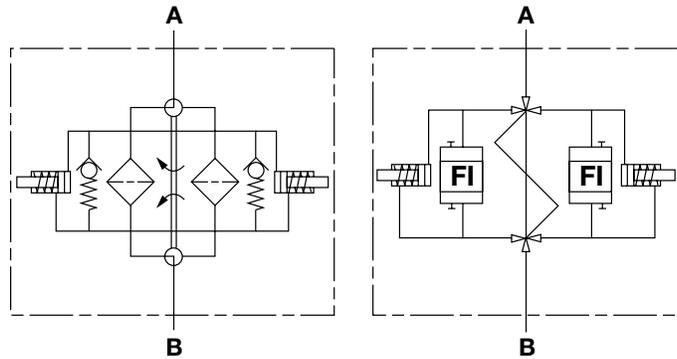
RFLD Cast Series

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.
- Transfer valve and pressure equalization line allows easy changeover between filter housings without costly system shutdown. (*standard with 851, 951 & 1301*)
- Clogging indicators have no external dynamic seal. High reliability is achieved and magnetic actuation eliminates a leak point.

Note: This filter is configured with anR.... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Technical Specifications

Mounting Method	Mounting holes on opposite side from Inlet/Outlet port faces	
Port Connection	Flange ports with metric threads	
111	1 1/2" SAE DN 25	
241	1 1/2" SAE DN 40	
331	1 1/2" SAE DN 40, 2" SAE DN 50	
501	1 1/2" SAE DN 40, 2" SAE DN 50	
661	2" SAE DN 50, 2 1/2" SAE DN 65, 3" SAE/DIN DN 80	
851	2" SAE DN 50, 2 1/2" SAE DN 65, 3" SAE/DIN DN 80	
951	3" SAE/DIN DN 80, 4" SAE/DIN DN 100	
1301	3" SAE/DIN DN 80, 4" SAE/DIN DN 100	
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)	
331	87 gpm (330 lpm)	
501	132 gpm (500 lpm)	
661	174 gpm (660 lpm)	
851	225 gpm (850 lpm)	
951	251 gpm (950 lpm)	
1301	343 gpm (1300 lpm)	
Housing Press. Rating	111 - 241	501 - 1301
Max. Allowable Working Pressure	580 psi (40 bar)	360 psi (25 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		
ON, W/HC	290 psid (20 bar)	
ECON2, BN4AM, AM, P/HC	145 psid (10 bar)	
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C)	
Consult HYDAC for applications below 14°F (-10°C)		
Fluid Compatibility		
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.		
Indicator Trip Pressure		
$\Delta P = 29$ psid (2 bar) -10% (<i>standard</i>)		
$\Delta P = 72$ psid (5 bar) -10%		
Bypass Valve Cracking Pressure		
$\Delta P = 43$ psid (3 bar) +10% (<i>standard</i>)		
$\Delta P = 87$ psid (6 bar) +10%		

Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



Railways



Shipbuilding



Steel / Heavy Industry

Model Code

RFLD ON 1301 D A T 10 D 1 . X / V

Filter Type _____
 RFLD = Duplex Inline Filter

Element Media _____
 ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester

Sizes _____
 111, 241, 331, 501, 661, 851, 951, 1301

Operating Pressure _____
 D = 25 bar (sizes 331, 501, 661, 851, 951, 1301)
 E = 40 bar (sizes 111, 241)

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

Type of Connection / Connection Sizes _____
 I = 1" SAE DN 25 (size 111 only) M = 2 1/2" SAE DN 65 (sizes 661, 851)
 K = 1 1/2" SAE DN 40 (sizes 241, 331, 501) S = 3" SAE/DIN DN 80 (sizes 661, 851, 951, 1301)
 L = 2" SAE DN 50 (sizes 331, 501, 661, 851) T = 4" SAE/DIN DN 100 (sizes 951, 1301)

Filtration Rating (microns) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = ECON2
 40 = AM 25, 74, 149 = W/HC 10, 20 = P/HC

Type of ΔP Clogging Indicator _____
 A, B, BM, C, D (Others available upon request)

Type Code _____
 1

Modification Number (latest version always supplied) _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing systems)] not available with ECON2

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 cRUus = Electrical Indicator with underwriter's approval
 DE = Dual Indicator Option (one indicator per duplex side)
 SB = Pressure equalization line (sizes 111 - 661; included standard on larger sizes)
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0110 R 010 ON / V B6

Size _____
 0110, 0240, 0330, 0500,
 0660, 0850, 0950, 1300

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149 = W/HC 10, 20 = P/HC

Element Media _____
 ON, BN4AM, ECON2, AM, W/HC, P/HC

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar)
 KB = No Bypass

Supplementary Details _____
 SO263 = (same as above) SFREE = (same as above)

Clogging Indicator Model Code

VM 2 B . X / V

Indicator Prefix _____
 VM = G 1/2 3000 psi

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

Type of Indicator _____
 A = No indicator, plugged port
 B = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = electric switch - SPDT
 D = electric switch & LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

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

Thermal Lockout (VM type C, D, J, J4 only) _____
 T100 = Lockout below 100°F

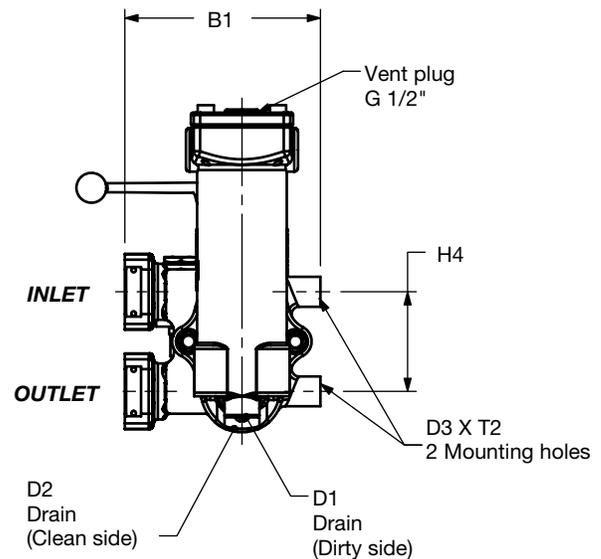
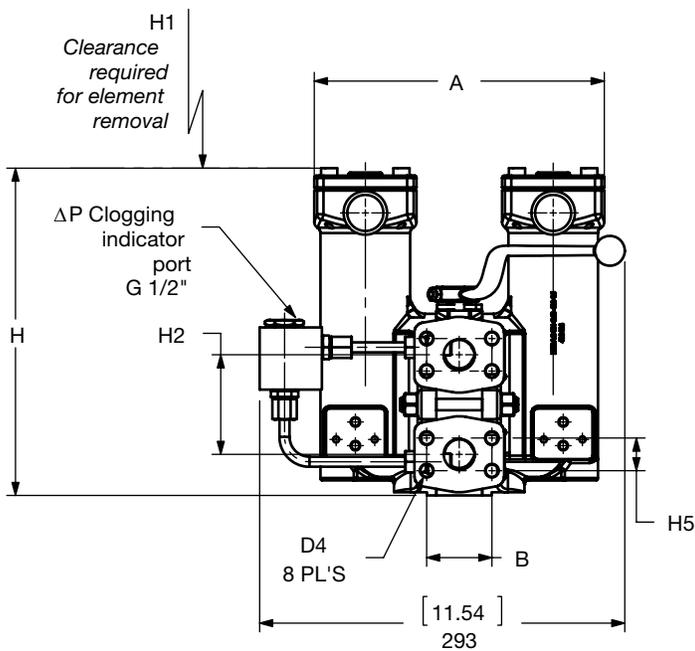
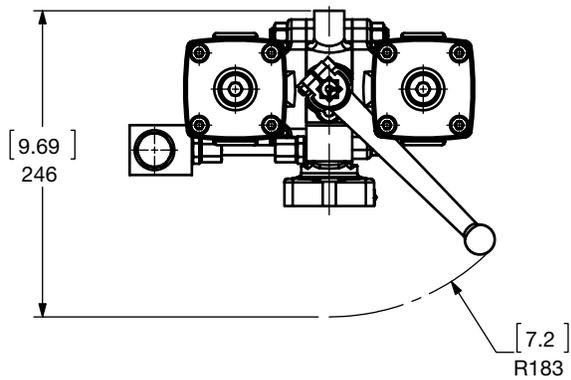
Underwriter's Approval (VM type C, D, J, J4 only) _____
 cRUus = Electrical Indicator with underwriter's approval
 (For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

RFLD 111 - 1301



Size	A	B	B1	H	H1	H2	H4	H5	D1	D2	D3	D4	T2	Wt. (lbs)
RFLD 111 EAI (DN 25)	[9.17] 233	[2.06] 52.4	[6.18] 157	[10.35] 263	[6.89] 175	[3.15] 80	[3.15] 80	[1.03] 26.2	G 1/4	G 1/4	M12	M10	[0.98] 25	37.4
RFLD 241 EAK (DN 40)	[11.89] 302	[2.75] 69.8	[6.57] 167	[12.28] 312	[8.27] 210	[3.74] 95	[5.51] 140	[1.41] 35.7	G 1/4	G 1/4	M12	M12	[0.71] 18	59.4
RFLD 331 DAL (DN 50)	[14.96] 380	[3.06] 77.8	[7.36] 187	[12.72] 323	[7.87] 200	[4.33] 110	[6.50] 165	[1.69] 42.9	G 1/2	G 1/4	M12	M12	[0.71] 18	81.4
RFLD 501 DAL (DN 50)	[14.96] 380	[3.06] 77.8	[7.36] 187	[15.75] 400	[11.02] 280	[4.33] 110	[6.50] 165	[1.69] 42.9	G 1/2	G 1/4	M12	M12	[0.71] 18	85.8
RFLD 661 DAM (DN 65)	[19.52] 496	[3.50] 88.9	[9.92] 252	[18.58] 472	[13.39] 340	[4.33] 110	[6.50] 165	[2.00] 50.8	G 1/2	G 1/4	M12	M12	[0.71] 18	162.8
RFLD 851 DAS (DN 80)	[19.52] 496	[4.19] 106.4	[8.74] 222	[25.59] 650	[16.54] 420	[9.06] 230	[9.06] 230	[2.44] 61.9	G 1/2	G 1/4	M12	M16	[0.91] 23	193.6
RFLD 951 DAS (DN 80)	[21.57] 548	[4.19] 106.4	[8.74] 222	[23.43] 595	[14.57] 370	[9.06] 230	[9.06] 230	[2.44] 61.9	G 1/2	G 1/4	M12	M16	[0.91] 23	231
RFLD 1301 DAT (DN 100)	[21.85] 555	[5.13] 130.2	[9.76] 248	[29.37] 746	[19.29] 490	[9.84] 250	[9.84] 250	[3.06] 77.8	G 1/2	G 1/4	M16	M16	[0.91] 23	275

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

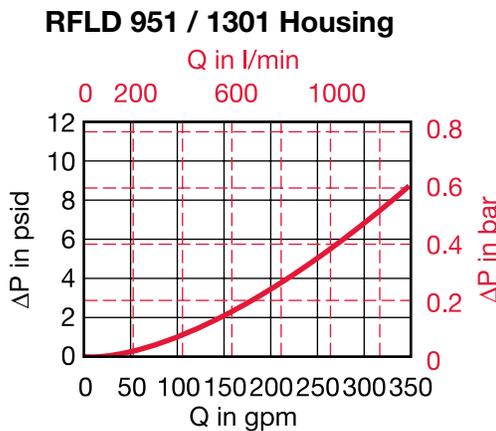
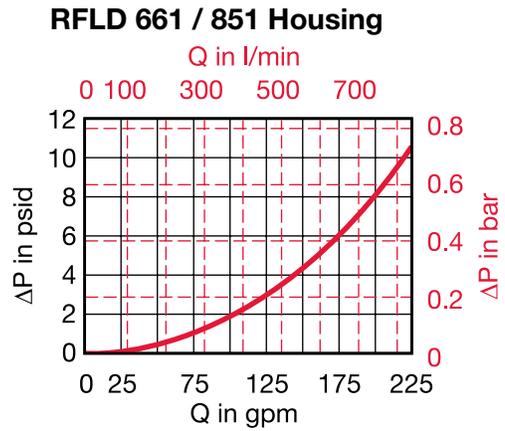
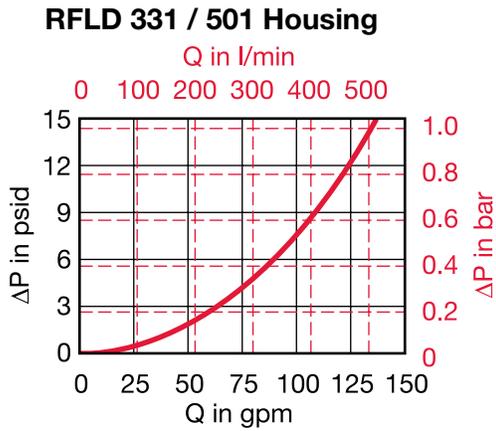
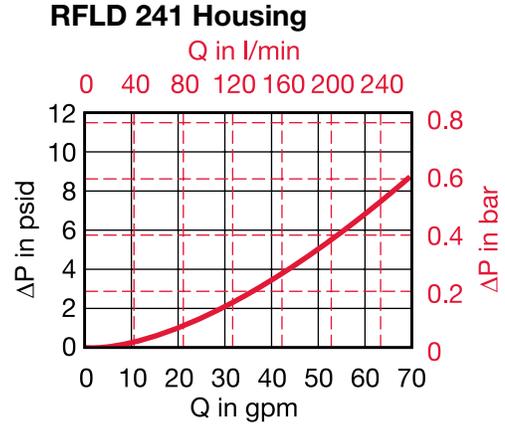
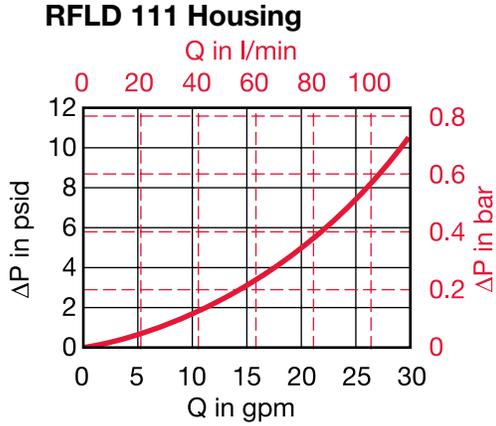
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



LOW PRESSURE FILTERS

Required Element Per Housing

Housing Size	Element Size	Elements per Side
111	0110	1
241	0240	1
331	0330	1
501	0500	1
661	0660	1
851	0850	1
951	0950	1
1301	1300	1

Element K Factors

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

(From Tables Below)

Optimicron Size	...R...ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0110 R XXX ON	1.224	0.719	0.487	0.296	0.234	0.178
0240 R XXX ON	0.571	0.284	0.201	0.125	0.101	0.077
0330 R XXX ON	0.444	0.204	0.15	0.081	0.07	0.056
0500 R XXX ON	0.289	0.143	0.104	0.06	0.046	0.038
0660 R XXX ON	0.196	0.093	0.066	0.037	0.031	0.025
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.02
0950 R XXX ON	0.131	0.057	0.043	0.026	0.021	0.017
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012

ECOMICRON Size	...R...ECON2			
	3 µm	5 µm	10 µm	20 µm
0240 R XXX ECON2	0.340	0.209	0.143	0.099
0330 R XXX ECON2	0.230	0.148	0.093	0.066
0500 R XXX ECON2	0.165	0.104	0.071	0.044
0660 R XXX ECON2	0.104	0.066	0.044	0.027
0850 R XXX ECON2	0.082	0.055	0.038	0.022
0950 R XXX ECON2	0.066	0.044	0.027	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016

Betamicron/Aquamicron Size	...R...BN4AM	
	3 µm	10 µm
0330 R XXX BN4AM	0.477	0.165
0500 R XXX BN4AM	0.313	0.11
0660 R XXX BN4AM	0.192	0.066
0850 R XXX BN4AM	0.154	0.049
0950 R XXX BN4AM	0.132	0.044
1300 R XXX BN4AM	0.088	0.033

Aquamicron Size	...R...AM
	40 µm
0330 R 040 AM	0.115
0500 R 040 AM	0.076
0660 R 040 AM	0.051
0850 R 040 AM	0.040
0950 R 040 AM	0.036
1300 R 040 AM	0.026

Wire Screen Size	...R...W/HC
	25, 50, 74, 100, 149, 200 µm
0110 R XXX W/HC	0.016
0240 R XXX W/HC	0.007
0330 R XXX W/HC	0.011
0500 R XXX W/HC	0.007
0660 R XXX W/HC	0.004
0850 R XXX W/HC	0.003
0950 R XXX W/HC	0.003
1300 R XXX W/HC	0.002

Polyester Size	...R...P/HC	
	10 µm	20 µm
0110 R XXX P/HC	0.050	0.025
0240 R XXX P/HC	0.023	0.012
0330 R XXX P/HC	0.016	0.008
0500 R XXX P/HC	0.011	0.005
0660 R XXX P/HC	0.008	0.004
0850 R XXX P/HC	0.007	0.003
0950 R XXX P/HC	0.006	0.003
1300 R XXX P/HC	0.004	0.002

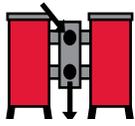
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

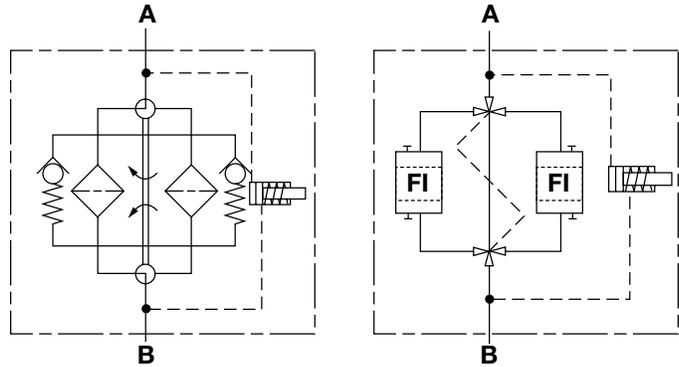
RFLD Welded Series

Inline Duplex Filters

230 psi • up to 3900 gpm



Hydraulic Symbol



Features

- Models 1300 to 15020 are made of 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 15020 use the same filter element size (1300 R) allowing maximum standardization in multiple filter element housings.
- Clogging indicators have no external dynamic seal. High reliability is achieved and magnetic actuation eliminates a leak point.

Notes: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Most states and local jurisdictions in the United States require pressure vessels to be ASME stamped. It is the responsibility of the end customer to research and fully understand the ASME code requirements of the jurisdiction this filter will ultimately be installed in, and to fully communicate these requirements to HYDAC.

Technical Specifications

Mounting Method	Floor mounted legs <i>(Filters must not be used as pipe support)</i>
Port Connection	Inlet / Outlet - Transfer Valves <i>See chart below for details</i>
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. Allowable Working Pressure	150 psi (10 bar) <i>(standard)</i> 232 psi (16 bar) <i>(optional)</i>
Fatigue Pressure	Contact HYDAC
Burst Pressure	Contact HYDAC
Element Collapse Pressure Rating	
ON, W/HC	290 psid (20 bar)
ECON2, BN4AM, AM, P/HC	145 psid (10 bar)
Fluid Temperature Range 14°F to 212°F (-10°C to 100°C)	
Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	
$\Delta P = 29$ psid (2 bar) -10% <i>(standard)</i>	
$\Delta P = 72$ psid (5 bar) -10% <i>(standard)</i>	
Bypass Valve Cracking Pressure	
$\Delta P = 43$ psid (3 bar) +10%	
$\Delta P = 87$ psid (6 bar) +10%	

Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Port Connections

Filter	Ball Valve				Segment / Butterfly Valve
	ANSI	SAE DN	DIN DN	SAE/DIN DN	
Size					DN
1300	2"	50	-	-	-
1320	3", 4"	-	125	80, 100	-
2500	3", 4"	-	125, 150	80, 100	150
2520	5", 6"	-	125, 150, 200	80, 100	150
4000/4020	4", 6", 8"	-	125, 150, 200	100	150, 200
5200/5220	4", 6", 8"	-	125, 150, 200	100	150, 200, 250
6500/6520	4", 6", 8"	-	125, 150, 200	100	150, 200, 250
7800/7820	4", 6", 8"	-	125, 150, 200	100	150, 200, 250
15000/15020	-	-	-	-	150, 200, 250

Model Code

RFLD ON 1300 C A T 3 A 1 . X / ZU 150 V DH

Filter Type _____

Element Media _____

ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOmicron® AM = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester

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 (one pc.)— ANSI 2", 3", 4", 6", 8" / DN 50, 80, 100, 125, 150, 200 (sz. 1300 - 2520)
 B = Segment Valve – ANSI 6", 8", 10", 12" / DN 150, 200, 250, 300 (sizes 2500 - 15020)
 C = Butterfly – ANSI (same as Segment sizes) / DN (same as Segment sizes) (sizes 2500 - 15020)
 E = Ball Valve (two pc.)— ANSI 8" / DN 200 (sizes 4000 - 15020)

Type of Connection _____

ANSI Flange Ports	DIN DN Ports
2 = 2" ANSI Flange (sizes 1300)	L = DN 50 (size 1300)
4 = 3" ANSI Flange (sizes 1300/2500)	S = SAE/DIN DN 80 (sizes 1300 - 2500)
5 = 4" ANSI Flange (sizes 1320 & 2500)	T = SAE/DIN DN 100 (sizes 1300 - 7820)
7 = 6" ANSI Flange (sizes 2520 - 7820)	U = DIN DN 125 (sizes 1320 - 7820)
8 = 8" ANSI Flange (sizes 2520 - 7820)	V = DIN DN 150 (sizes 2500 - 7820)
9 = 10" ANSI Flange (Consult HYDAC)	W = DIN DN 200 (sizes 4000 - 15020)
10 = 12" ANSI Flange (Consult HYDAC)	X = DIN DN 250 (sizes 5200 - 15020)
	Y = DIN DN 300 (sizes 5200 - 15020)

Filtration Rating (microns) _____

1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM 3, 5, 10, 20 = ECON2
 40 = AM 25, 74, 149 = W/HC 10, 20 = P/HC

Type of ΔP Clogging Indicator _____

A, B, BM, C, D (Others available upon request)

Type Code _____

1

Modification Number (latest version always supplied) _____

Country of Installation _____

(omit) = standard (non coded) ZU = ASME Coded with "ASME" Stamp

Flange _____

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

Seals _____

(omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM)

Bypass Valve _____

(omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar) (lubrication or coolant applications)
 B6 = 87 psid (6 bar) (return line extended life) } not available with ECON2
 KB = No Bypass (flushing system)

Supplementary Details _____

(omit) = Cover Lifting Device (Handle only)
 DH = Cover Lifting Device (Davit lifting mechanism for sizes 4000 and larger, style may vary)
 W = Indicator with brass piston (for water base fluids)
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 cRUus = Electrical Indicator with underwriter's recognition
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0850 R 010 ON / V B6

Size _____

0850, 1300, 1700, 2600

Filtration Rating (micron) _____

1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149, = W/HC 10, 20 = P/HC

Element Media _____

ON, BN4AM, ECON2, AM, W/HC, P/HC

Seals _____

(omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

Bypass Valve _____

(omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar)
 KB = No Bypass

Supplementary Details _____

W = (same as above)
 SO263 = (same as above)
 SFREE = (same as above)

Clogging Indicator Model Code

VM 2 B . X /

Indicator Prefix _____

VM = G 1/2 3000 psi

Trip Pressure _____

2 = 29 psid (2 bar) (standard)
 5 = 72 psid (5 bar) (optional)

Type of Indicator _____

A = No indicator, plugged port
 B = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = electric switch - SPDT
 D = electric switch & LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____

(omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

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

Underwriters Approval (VM, VD types C, D, J, and J4 only) _____

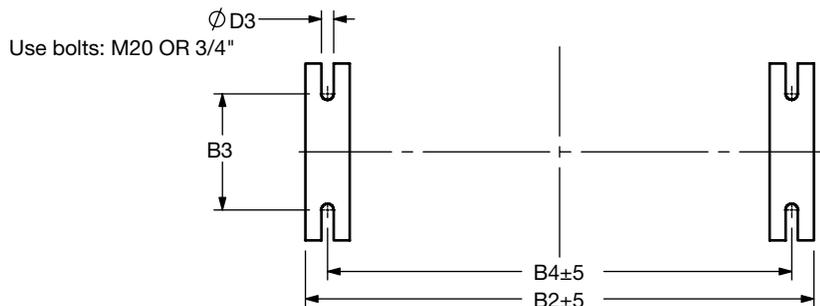
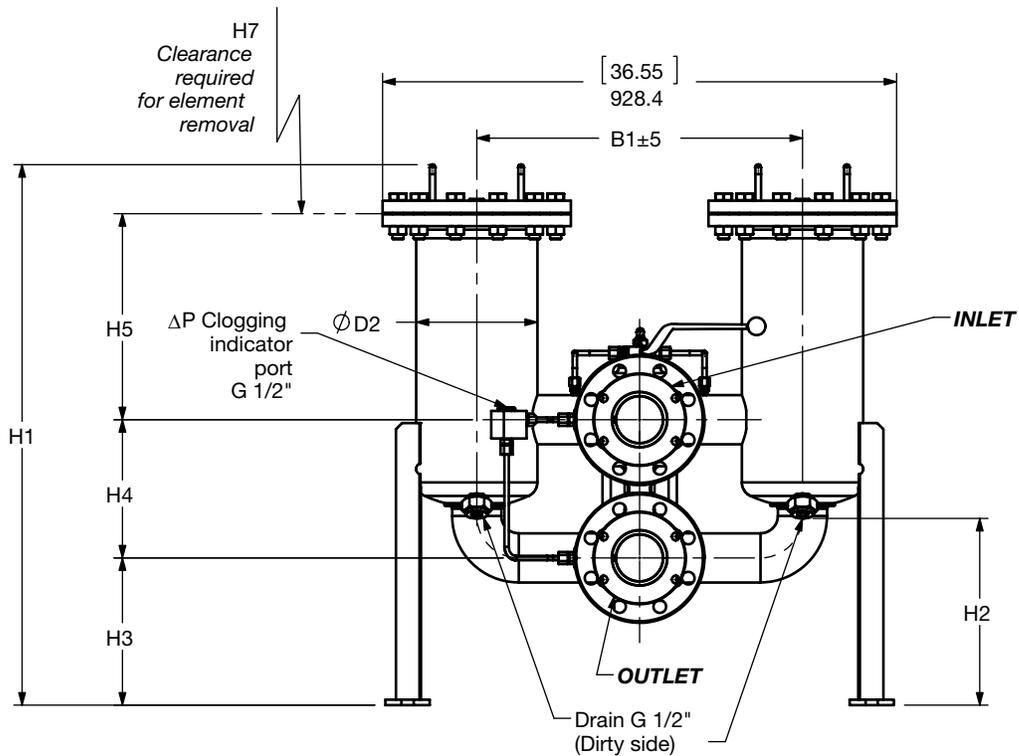
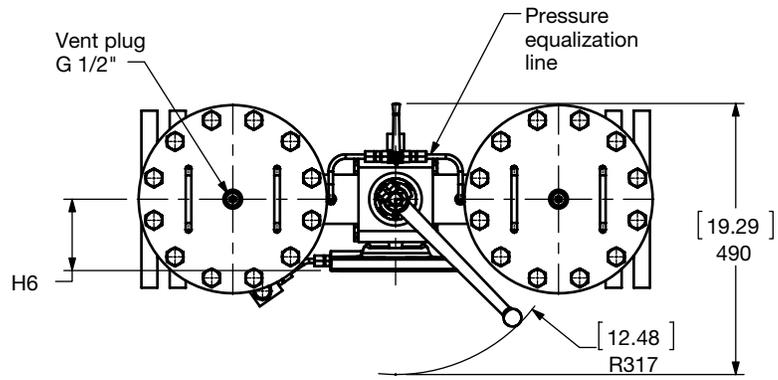
cRUus = Electrical Indicator with underwriter's recognition
 (For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

RFLD 1300 / 1320



Foot Pattern

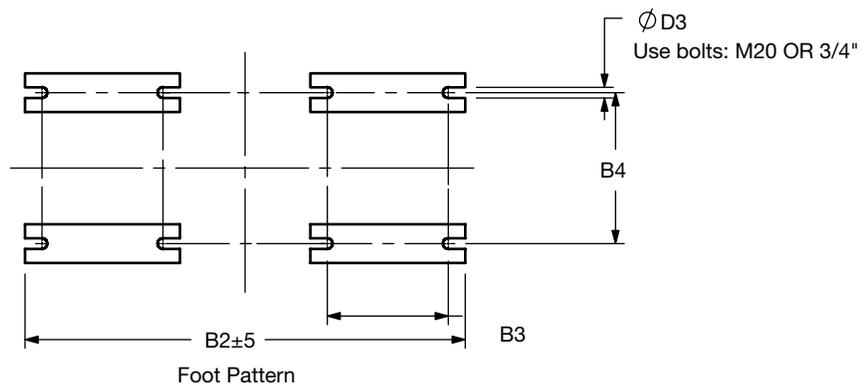
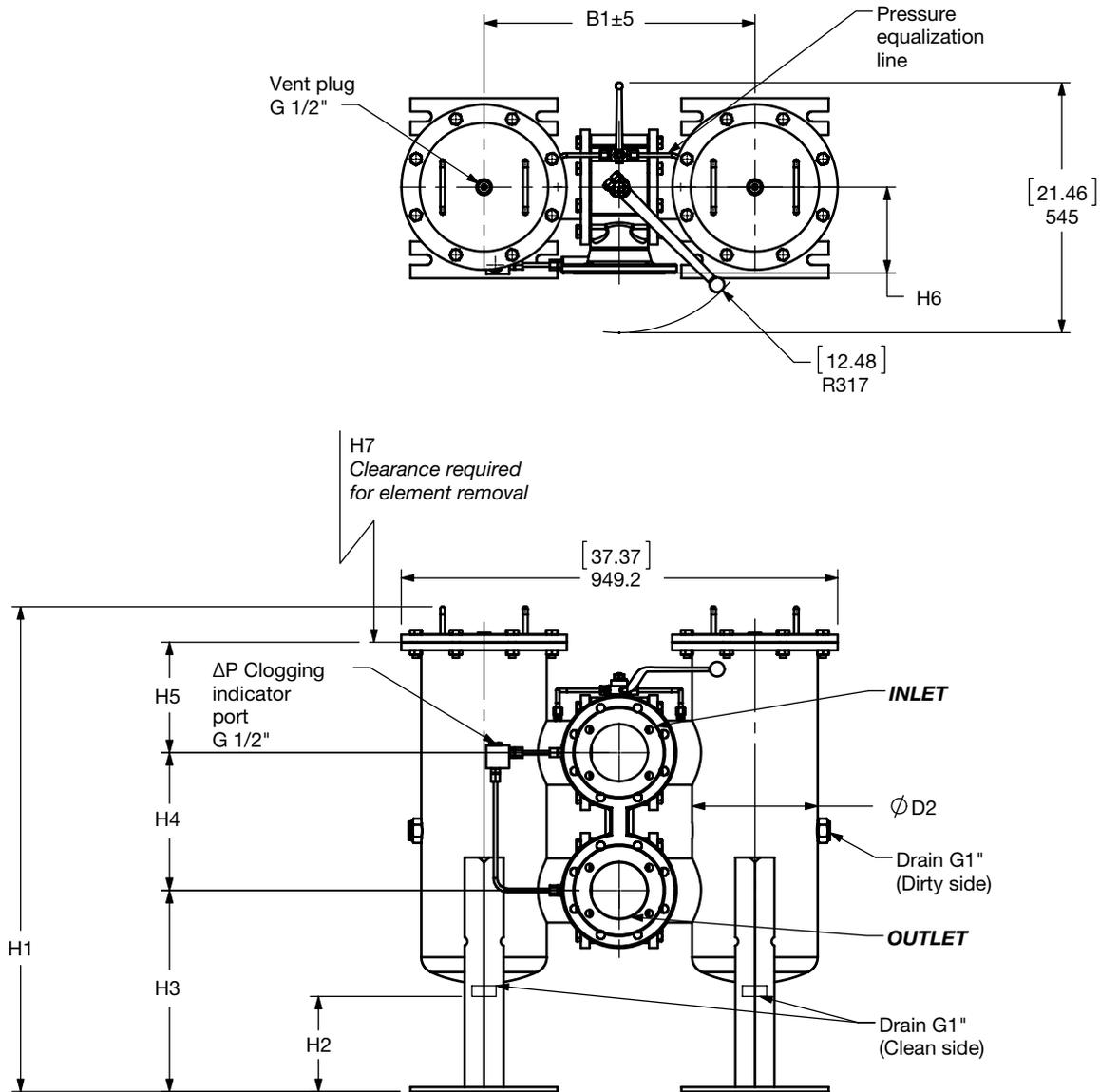
Size	1300	1320
Weight (lbs.)	330.7	460.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

RFLD 2500 / 2520



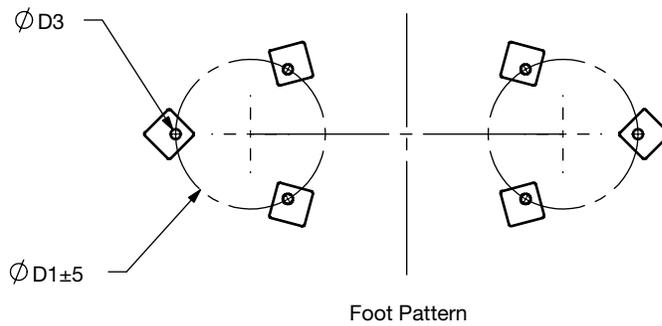
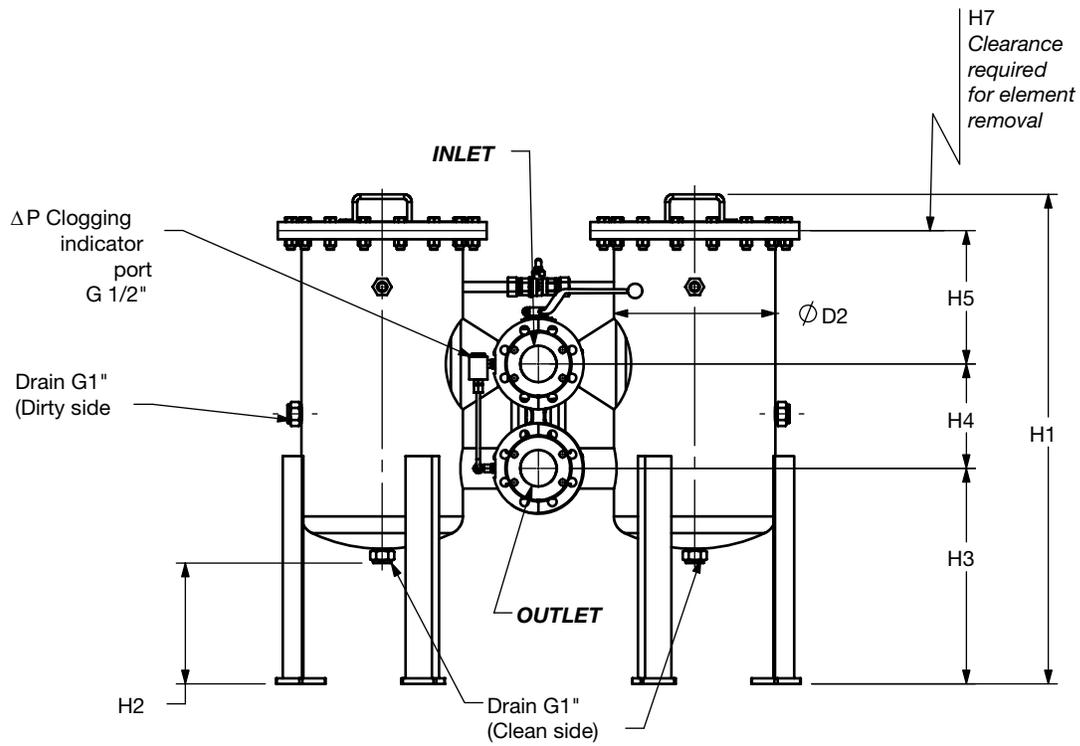
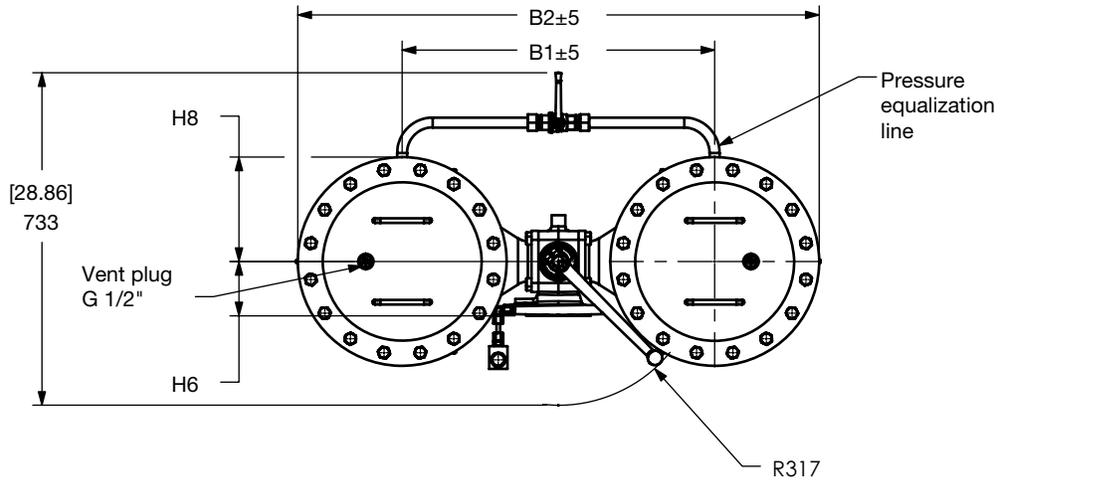
Size	2500	2520
Weight (lbs.)	632.8	721

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

RFLD 4000 - 7820



Size	4000	4020	5200	5220	6500	6520	7800	7820
Weight (lbs.)	866.5	1111.2	2107.7	2464.8	2471.4	2826.4	2489.1	2861.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

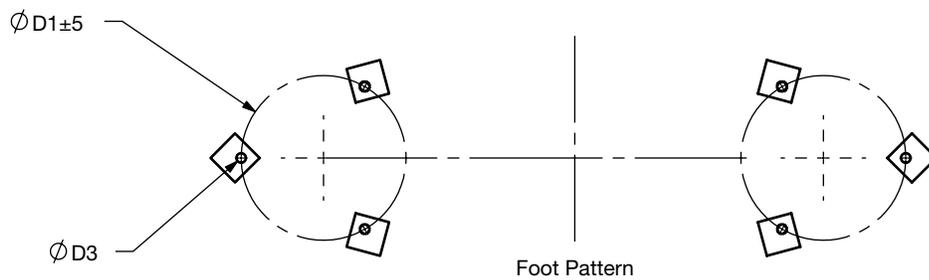
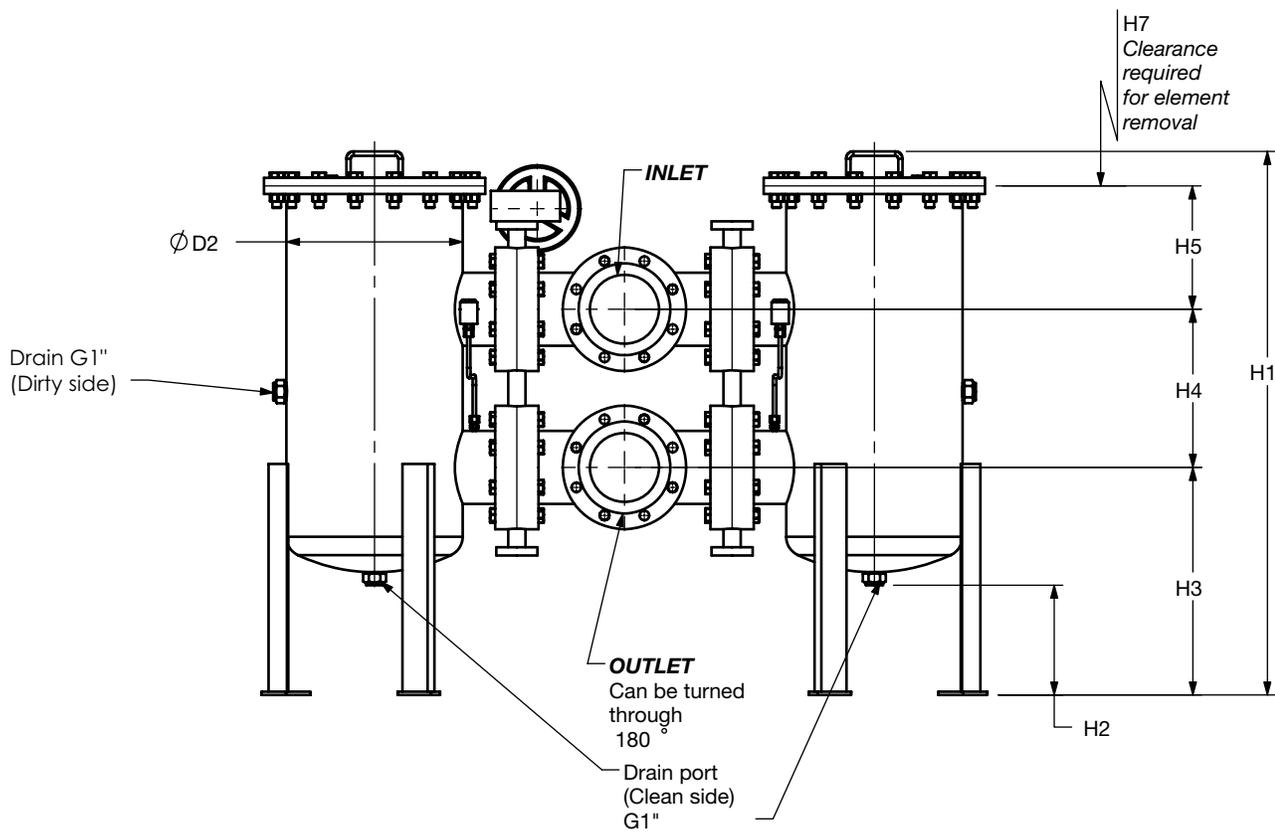
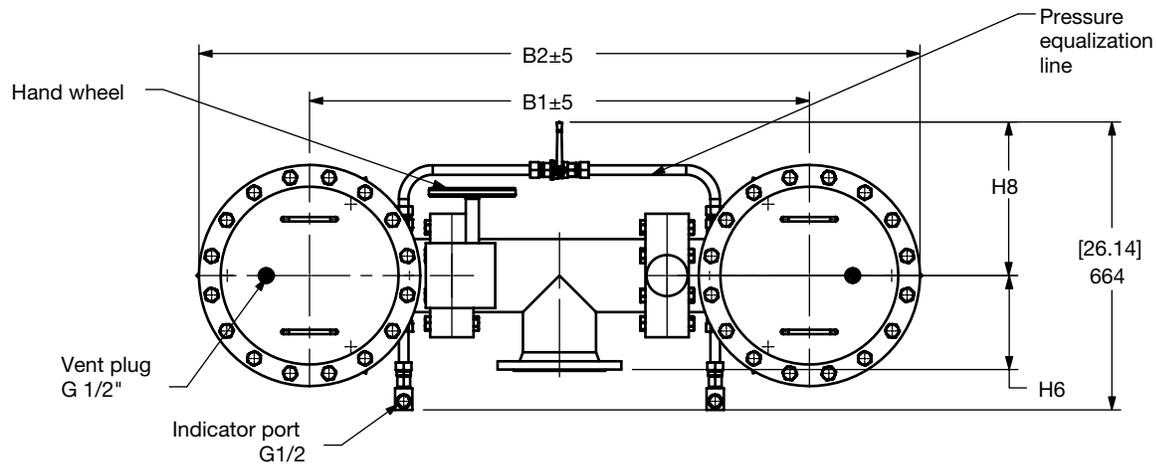
LOW PRESSURE FILTERS

Size	Flange Port	B1	B2	D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8	Use Bolts
RFLD 4000 / 4020	4" ANSI 150 LB	[27.72]	[45.83]	[12.99]	[14.02]	[0.87]	[42.52] 1080	[10.24]	[18.70]	[9.84]	[11.61] 295	[5.12]	[16.54] 420	[9.06]	5/8"-11 UNC Heavy Hex
	SAE / DIN DN 100	704	1164	330	356	22	[57.87] 1470	260	475	250	[26.97] 685	130	[31.89] 810	230	M16 - 4 Bolt Flange / M20 - Din Flange
	DIN DN 125	[28.46] 723	[46.57] 1183	[12.99] 330	[14.02] 356	[0.87] 22	[46.06] 1170 [61.42] 1560	[10.24] 260	[20.67] 525	[11.81] 300	[10.43] 265 [25.79] 655	[7.40] 188	[16.54] 420 [31.89] 810	[9.06] 230	M16
	DIN DN 150	[30.51]	[48.82]	[12.99]	[14.02]	[0.87]	[46.06] 1170	[10.24]	[20.67]	[11.81]	[10.43] 265	[7.48]	[16.54] 420	[9.06]	M20
	6" ANSI 150 LB	775	1240	330	356	22	[61.42] 1560	260	525	300	[25.79] 655	190	[31.89] 810	230	3/4"-10 UNC Heavy HEX
	DIN DN 200	[34.80]	[53.11]	[12.99]	[14.02]	[0.87]	[46.06] 1170	[10.24]	[20.67]	[19.69]	[2.56] 65	[10.63]	[16.54] 420	[9.06]	M20
	8" ANSI 150 LB	884	1349	330	356	22	[61.42] 1560	260	525	500	[13.98] 355	270	[31.89] 810	230	3/4"-10 UNC Heavy HEX
RFLD 5200 / 5220	4" ANSI 150 LB	[29.29]	[49.61]	[14.96]	[15.98]	[0.87]	[45.04] 1144	[9.84]	[18.31]	[9.84]	[13.82] 351	[5.12]	[19.69] 500	[10.04]	5/8"-11UNC HEAVY HEX
	SAE / DIN DN 100	744	1260	380	406	22	[62.36] 1584	250	465	250	[31.14] 791	130	[37.01] 940	255	M16 - 4 Bolt Flange / M20 - DIN Flange
	DIN DN 125	[30.04] 763	[50.19] 1275	[14.96] 380	[15.98] 406	[0.87] 22	[49.45] 1256 [66.77] 1696	[9.84] 250	[20.67] 525	[11.81] 300	[13.82] 351 [31.14] 791	[7.40] 188	[19.69] 500 [37.01] 940	[10.04] 255	M16
	DIN DN 150	[32.09]	[52.36]	[14.96]	[15.98]	[0.87]	[49.45] 1256	[9.84]	[20.67]	[11.81]	[13.82] 351	[7.48]	[19.69] 500	[10.04]	M20
	6" ANSI 150 LB	815	1330	380	406	22	[66.77] 1696	250	525	300	[31.14] 791	190	[37.01] 940	255	3/4"-10 UNC Heavy HEX
	DIN DN 200	[36.38]	[56.61]	[14.96]	[15.98]	[0.87]	[55.63] 1413	[9.84]	[20.67]	[19.69]	[5.94] 151	[10.63]	[19.69] 500	[10.04]	M20
	8" ANSI 150 LB	924	1438	380	406	22	[72.95] 1853	250	525	500	[23.27] 591	270	[37.01] 940	255	3/4"-10 UNC Heavy HEX
RFLD 6500 / 6520	4" ANSI 150 LB	[40.31]	[64.72]	[18.89]	[20.00]	[0.87]	[49.61] 1260	[10.24]	[21.26]	[9.84]	[15.35] 390	[5.12]	[19.69] 500	[12.20]	5/8"-11 UNC Heavy HEX
	SAE / DIN DN 100	1024	1644	480	508	22	[66.93] 1700	260	540	250	[32.68] 830	130	[37.01] 940	310	M16 - 4 Bolt Flange / M20 - DIN Flange
	DIN DN 125	[33.98] 863	[58.39] 1483	[18.89] 480	[20.00] 508	[0.87] 22	[49.61] 1260 [66.93] 1700	[10.24] 260	[21.26] 540	[11.81] 300	[13.39] 340 [30.71] 780	[7.40] 188	[19.69] 500 [37.01] 940	[12.20] 310	M16
	DIN DN 150	[36.02]	[60.43]	[18.89]	[20.00]	[0.87]	[49.61] 1260	[10.24]	[21.26]	[11.81]	[13.39] 340	[7.48]	[19.69] 500	[12.20]	M20
	6" ANSI 150 LB	915	1535	480	508	22	[66.93] 1700	260	540	300	[30.71] 780	190	[37.01] 940	310	3/4"-10 UNC Heavy HEX
	DIN DN 200	[40.31]	[64.72]	[18.89]	[20.00]	[0.87]	[55.63] 1413	[10.43]	[23.62]	[19.69]	[9.06] 230	[10.63]	[19.69] 500	[12.20]	M20
	8" ANSI 150 LB	1024	1644	480	508	22	[72.95] 1853	265	600	500	[26.38] 670	270	[37.01] 940	310	3/4"-10 UNC Heavy HEX
RFLD 7800 / 7820	4" ANSI 150 LB	[40.31]	[64.72]	[18.89]	[20.00]	[0.87]	[49.61] 1260	[10.24]	[21.26]	[9.84]	[15.35] 390	[5.12]	[19.69] 500	[12.20]	3/4"-10 UNC Heavy HEX
	SAE / DIN DN 100	1024	1644	480	508	22	[66.93] 1700	260	540	250	[32.68] 830	130	[37.01] 940	310	M16 - 4 Bolt Flange / M20 - DIN Flange
	DIN DN 125	[33.98] 863	[58.39] 1483	[18.89] 480	[20.00] 508	[0.87] 22	[49.61] 1260 [66.93] 1700	[10.24] 260	[21.26] 540	[11.81] 300	[13.39] 340 [30.71] 780	[7.40] 188	[19.69] 500 [37.01] 940	[12.20] 310	M16
	DIN DN 150	[36.02]	[60.43]	[18.89]	[20.00]	[0.87]	[49.61] 1260	[10.24]	[21.26]	[11.81]	[13.39] 340	[7.48]	[19.69] 500	[12.20]	M20
	6" ANSI 150 LB	915	1535	480	508	22	[66.93] 1700	260	540	300	[30.71] 780	190	[37.01] 940	310	5/8"-11 UNC Heavy HEX
	DIN DN 200	[40.31]	[64.72]	[18.89]	[19.69]	[0.87]	[55.63] 1413	[10.43]	[23.62]	[19.69]	[13.39] 340	[10.63]	[19.69] 500	[12.20]	M20
	8" ANSI 150 LB	1024	1644	480	500	22	[72.95] 1853	265	600	500	[30.71] 780	270	[37.01] 940	310	3/4"-10 UNC Heavy HEX

LOW PRESSURE FILTERS

Dimensions

RFLD 250X - 1502X Butterfly Version



Size	2500	2520	4000	4020	5200	5220	6500	6520	7800	7820	15000	15020
Weight (lbs.)	632.8	721	866.5	1111.2	2107.7	2464.8	2471.4	2826.4	2489.1	2861.6	3278.3	3578.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

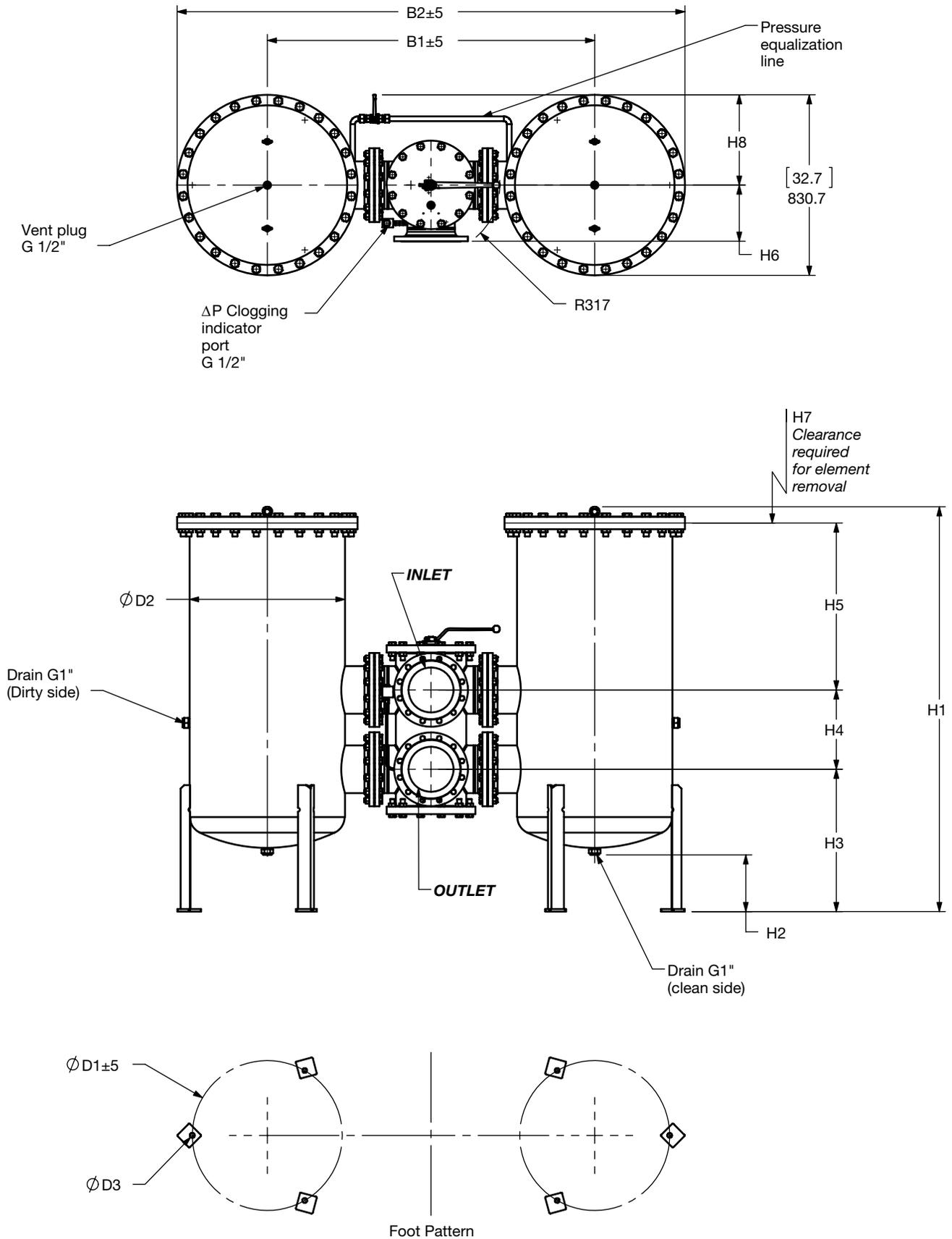
LOW PRESSURE FILTERS

Size	Flange Port	B1	B2	D1	D2	D3	H1	H2	H3	H4	H5	H6	H7	H8
RFLD 2500 / 2520	DN 150	[40.08] 1018	[54.25] 1378	[12.99] 330	[10.75] 273	[0.87] 22	[43.62] 1108 [58.98] 1498	[8.66] 220	[18.11] 460	[14.37] 365	[8.31] 211 [23.66] 601	[8.66] 220	[16.54] 420 [31.89] 810	[12.99] 330
RFLD 4000 / 4020	DN 150	[45.35] 1152	[63.62] 1616	[12.99] 330	[14.02] 356	[0.87] 22	[46.06] 1170 [61.42] 1560	[10.24] 260	[20.67] 525	[14.37] 365	[7.87] 200 [23.23] 590	[8.66] 220	[16.54] 420 [31.89] 810	[13.78] 350
	DN 200	[48.82] 1240	[67.87] 1724	[12.99] 330	[14.02] 356	[0.87] 22	[47.44] 1205 [62.79] 1595	[9.84] 250	[20.67] 525	[14.37] 365	[9.25] 235 [24.61] 625	[10.24] 260	[19.69] 500 [37.01] 940	[14.57] 370
RFLD 5200 / 5200	DN 150	[45.35] 1152	[65.59] 1666	[14.96] 380	[15.98] 406	[0.87] 22	[6.14] 156 [66.77] 1696	[9.84] 250	[20.67] 525	[14.37] 365	[11.26] 286 [28.58] 726	[8.66] 220	[19.69] 500 [37.01] 940	[13.78] 350
	DN 200	[50.39] 1280	[70.63] 1794	[14.96] 380	[15.98] 406	[0.87] 22	[49.45] 1256 [66.77] 1696	[9.84] 250	[20.67] 525	[14.37] 365	[11.26] 286 [28.58] 726	[10.24] 260	[19.69] 500 [37.01] 940	[14.57] 370
	DN 250	[58.89] 1496	[79.13] 2010	[14.96] 380	[15.98] 406	[0.87] 22	[52.20] 1326 [69.53] 1766	[10.24] 260	[22.05] 560	[17.72] 450	[9.29] 236 [26.61] 676	[13.78] 350	[19.69] 500 [37.01] 940	[15.75] 400
RFLD 6500 / 6520	DN 150	[50.87] 1292	[75.43] 1916	[18.89] 480	[20.00] 508	[0.87] 22	[49.61] 1260 [66.93] 1700	[10.24] 260	[21.26] 540	[14.37] 365	[10.83] 275 [28.15] 715	[8.66] 220	[19.69] 500 [37.01] 940	[13.78] 350
	DN 200	[54.33] 1380	[78.89] 2004	[18.89] 480	[20.00] 508	[0.87] 22	[54.33] 1380 [71.65] 1820	[10.24] 260	[23.62] 600	[14.37] 365	[13.19] 335 [30.51] 775	[10.24] 260	[19.69] 500 [37.01] 940	[14.57] 370
	DN 250	[62.44] 1586	[87.01] 2210	[18.89] 480	[20.00] 508	[0.87] 22	[54.33] 1380 [71.65] 1820	[10.24] 260	[23.62] 600	[17.72] 450	[9.84] 250 [27.17] 690	[13.78] 350	[19.69] 500 [37.01] 940	[15.75] 400
RFLD 7800 / 7820	DN 150	[50.87] 1292	[75.43] 1916	[18.89] 480	[20.00] 508	[0.87] 22	[49.61] 1260 [66.93] 1700	[10.24] 260	[21.26] 540	[14.37] 365	[10.83] 275 [28.15] 715	[8.66] 220	[19.69] 500 [37.01] 940	[13.78] 350
	DN 200	[54.33] 1380	[78.89] 2004	[18.89] 480	[20.00] 508	[0.87] 22	[54.33] 1380 [71.65] 1820	[10.24] 260	[23.62] 600	[14.37] 365	[13.19] 335 [30.51] 775	[10.24] 260	[19.69] 500 [37.01] 940	[14.57] 370
	DN 250	[62.44] 1586	[87.01] 2210	[18.89] 480	[20.00] 508	[0.87] 22	[54.33] 1380 [71.65] 1820	[10.24] 260	[23.62] 600	[17.72] 450	[9.84] 250 [27.17] 690	[13.78] 350	[19.69] 500 [37.01] 940	[15.75] 400
RFLD 15000 / 15020	DN 200	[63.78] 1620	[96.46] 2450	[27.17] 690	[27.99] 711	[0.87] 22	[56.10] 1425 [73.43] 1865	[10.24] 260	[25.79] 655	[14.37] 365	[12.99] 330 [30.31] 770	[10.24] 260	[19.69] 500 [37.01] 940	[14.57] 370
	DN 250	[71.50] 1816	[104.17]] 2646	[27.17] 690	[27.99] 711	[0.87] 22	[56.10] 1425 [73.43] 1865	[10.24] 260	[25.79] 655	[17.72] 450	[9.84] 250 [27.17] 690	[13.78] 350	[19.69] 500 [37.01] 940	[15.75] 400
	DN 300	[77.01] 1956	[109.69]] 2786	[27.17] 690	[27.99] 711	[0.87] 22	[59.06] 1500 [76.38] 1940	[10.24] 260	[26.38] 670	[20.28] 515	[9.25] 235 [26.57] 675	[15.75] 400	[19.69] 500 [37.01] 940	[16.93] 430

LOW PRESSURE FILTERS

Dimensions

RFLD 4000 - 15020 Segment Version



Size	4000	4020	5200	5220	6500	6520	7800	7820	15000	15020
Weight (lbs.)	866.5	1111.2	2107.7	2464.8	2471.4	2826.4	2489.1	2861.6	3278.3	3578.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

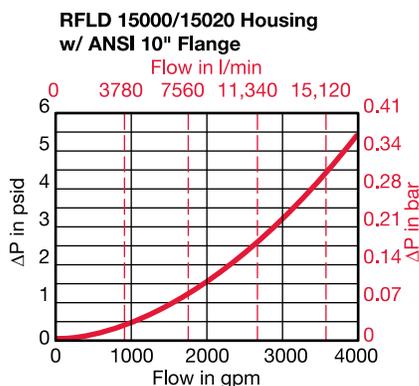
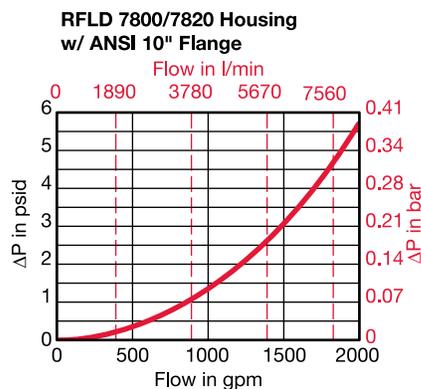
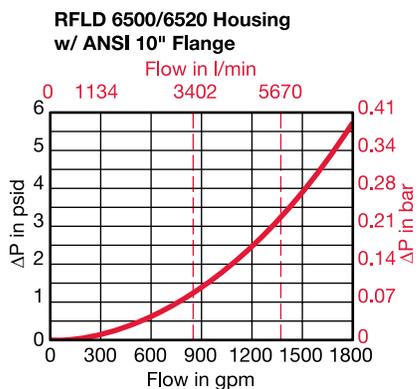
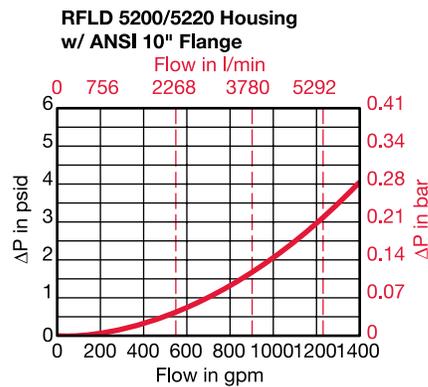
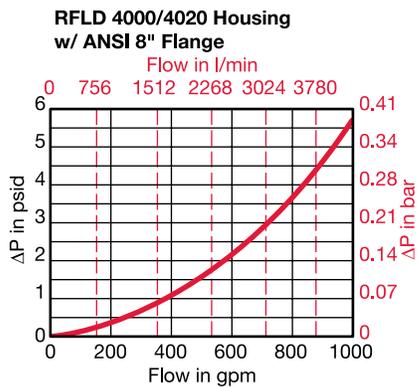
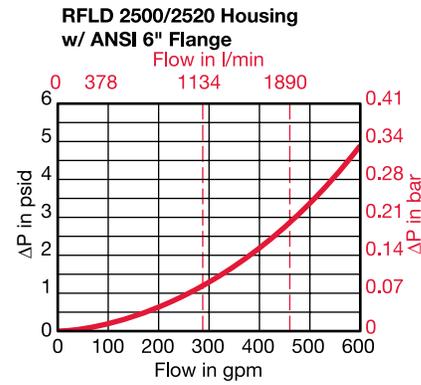
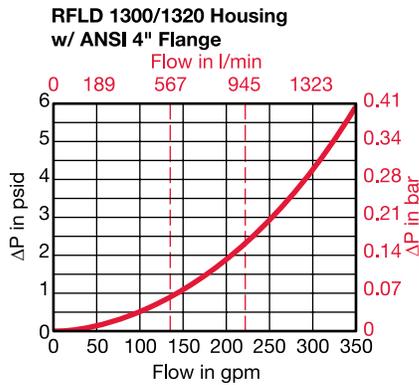
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



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

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

(From Tables Below)

Optimicron Size	...R...ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.02
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
1700 R XXX ON	0.074	0.035	0.029	0.015	0.014	0.01
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECOMICRON Size	...R...ECON2			
	3 µm	5 µm	10 µm	20 µm
0850 R XXX ECON2	0.082	0.055	0.038	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016
1700 R XXX ECON2	0.038	0.027	0.016	0.011
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicron Size	...R...BN4AM	
	3 µm	10 µm
0850 R XXX BN4AM	0.154	0.049
1300 R XXX BN4AM	0.088	0.033
1700 R XXX BN4AM	0.071	0.027
2600 R XXX BN4AM	0.055	0.016

Aquamicron Size	...R...AM
	40 µm
0850 R 040 AM	0.040
1300 R 040 AM	0.026
1700 R 040 AM	0.020
2600 R 040 AM	0.013

Wire Mesh Size	...R...W/HC
	25, 50, 74, 100, 149, 200 µm
0850 R XXX W/HC	0.003
1300 R XXX W/HC	0.002
1700 R XXX W/HC	0.001
2600 R XXX W/HC	0.001

Polyester Size	...R...P/HC	
	10 µm	20 µm
0850 R XXX P/HC	0.007	0.003
1300 R XXX P/HC	0.004	0.002
1700 R XXX P/HC	0.003	0.002
2600 R XXX P/HC	0.002	0.001

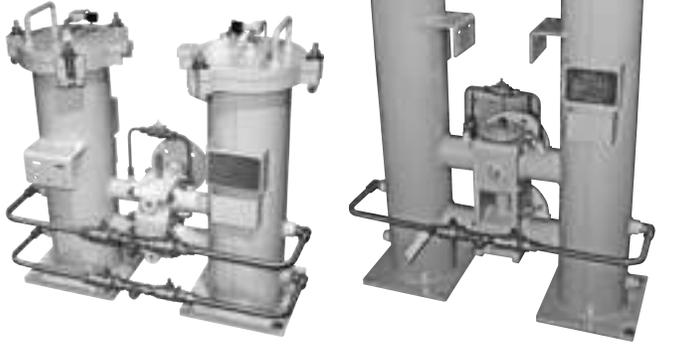
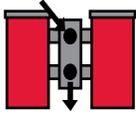
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

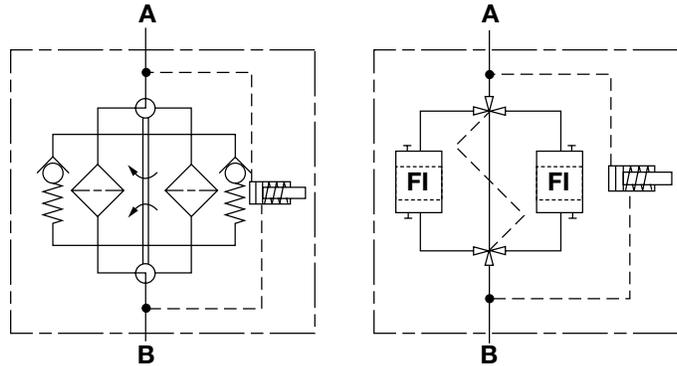
RFLDH Welded Series

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 achieved and magnetic actuation eliminates a leak point.
- Stainless drain piping with ball valves available.
- Air bleed line available
- ASME stamp available
- Australian AS1210 approval available
- Canadian registration approval available

Notes: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Most states and local jurisdictions in the United States require pressure vessels to be ASME stamped. It is the responsibility of the end customer to research and fully understand the ASME code requirements of the jurisdiction this filter will ultimately be installed in, and to fully communicate these requirements to HYDAC.

Technical Specifications

Mounting Method	Floor mounted legs <i>(Filters must not be used as pipe support)</i>
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. Allowable Working Pressure 150 psi (10 bar) standard Proof Pressure (ASME) 195 psi (13.4 bar)
Element Collapse Pressure Rating	ON, W/HC 290 psid (20 bar) ECON2, BN4AM, AM, P/HC 145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% $\Delta P = 72$ psid (5 bar) -10%
Bypass Valve Cracking Pressure	$\Delta P = 43$ psid (3 bar) +10% $\Delta P = 87$ psid (6 bar) +10%

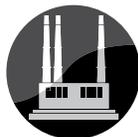
Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Model Code

RFLDH ON 1300 B A 3 10 C 1 . X / ZU 150 V DH

Filter Type _____

Element Media _____

ON = Optimicron® BN/AM = Betamicron®/Aquamicron®
 ECON2 = ECOMicron® AM = Aquamicron®
 W/HC = Wire Mesh P/HC = Polyester

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) 5 = 4" ANSI Flange (sizes 1320/1323 & 2520/2523)
 4 = 3" ANSI Flange (sizes 2500/2503) 7 = 6" ANSI Flange (sizes 4020/4023)

Filtration Rating (microns) _____

1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = ECON2
 40 = 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 _____

ZU = ASME Coded with "ASME" Stamp

Flange _____

150 = 150 lbs ANSI Flange

Seals _____

(omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM)

Bypass Valve _____

(omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lubrication or coolant applications)
 B6 = 87 psid (6 bar) (return line extended life) not available with ECON2
 KB = No Bypass (flushing system)

Supplementary Details _____

(omit) = Cover Lifting Device (Handle only)
 DH = Cover Lifting Device (Davit lifting mechanism for sizes 4000 and larger, style may vary)
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 cRUus = Electrical indicator with underwriter's recognition
 SFREE = Element specially designed to minimize electrostatic charge generation
 VKD = Drain piping
 EM = Air bleed valves
 W = Indicator with brass piston (for water based fluids)

Replacement Element Model Code

1300 R 010 ON / V B6

Size _____

0850, 1300, 1700, 2600

Filtration Rating (micron) _____

1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149, = W/HC 10, 20 = P/HC

Element Media _____

ON, BN4AM, ECON2, AM, W/HC, P/HC

Seals _____

(omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

Bypass Valve _____

(omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar)
 KB = No Bypass

Supplementary Details _____

W = (same as above)
 SO263 = (same as above)
 SFREE = (same as above)

Clogging Indicator Model Code

VM 2 C . X /

Indicator Prefix _____

VM = G 1/2 3000 psi

Trip Pressure _____

2 = 29 psid (2 bar) (standard)
 5 = 72 psid (5 bar) (optional)

Type of Indicator _____

A = No indicator, plugged port
 B = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = electric switch - SPDT
 D = electric switch & LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____

(omit) = Nitrile (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

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

Underwriters Recognition (VM, VD types C, D, J, and J4 only) _____

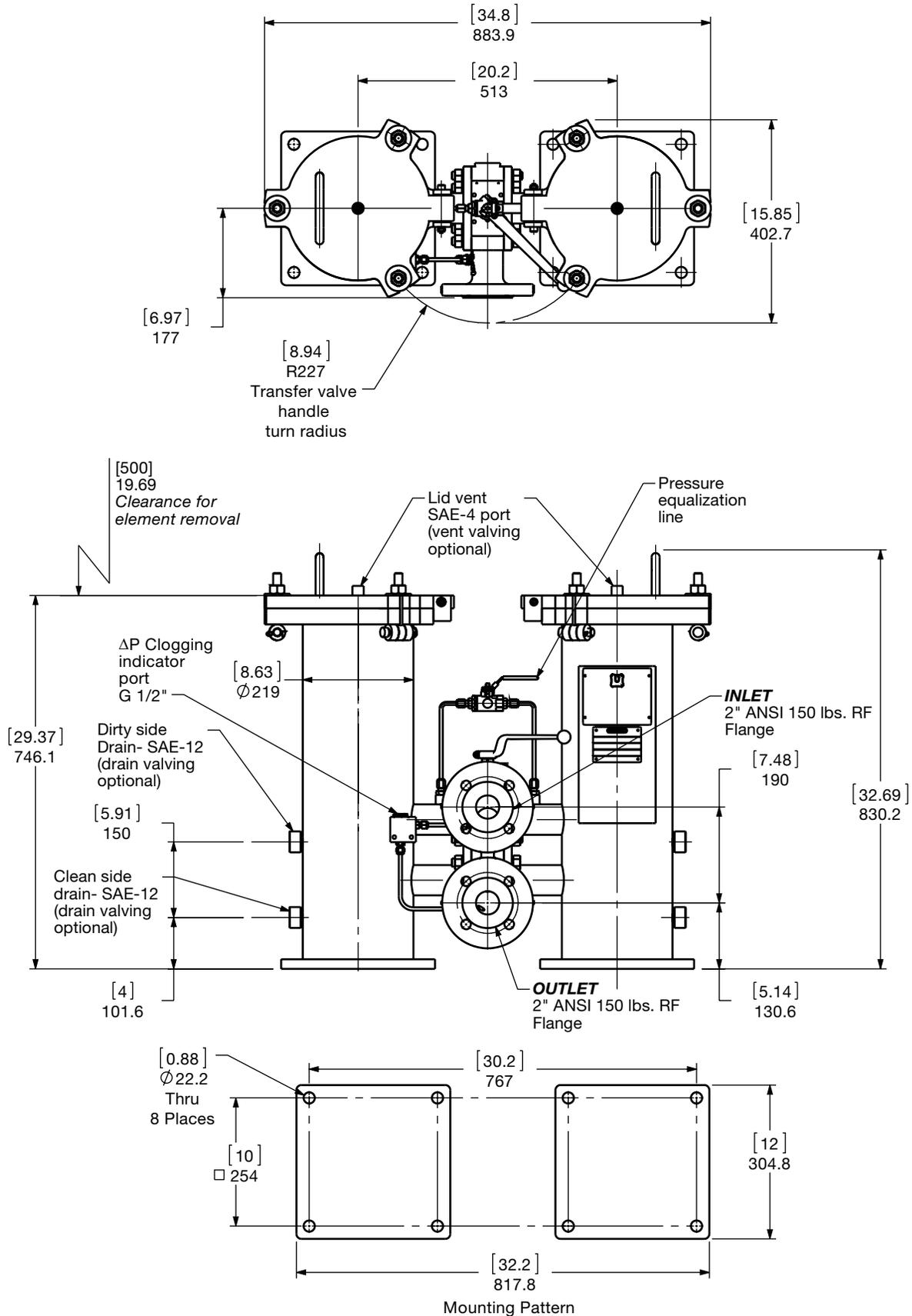
cRUus = Electrical indicator with underwriter's recognition
 (For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

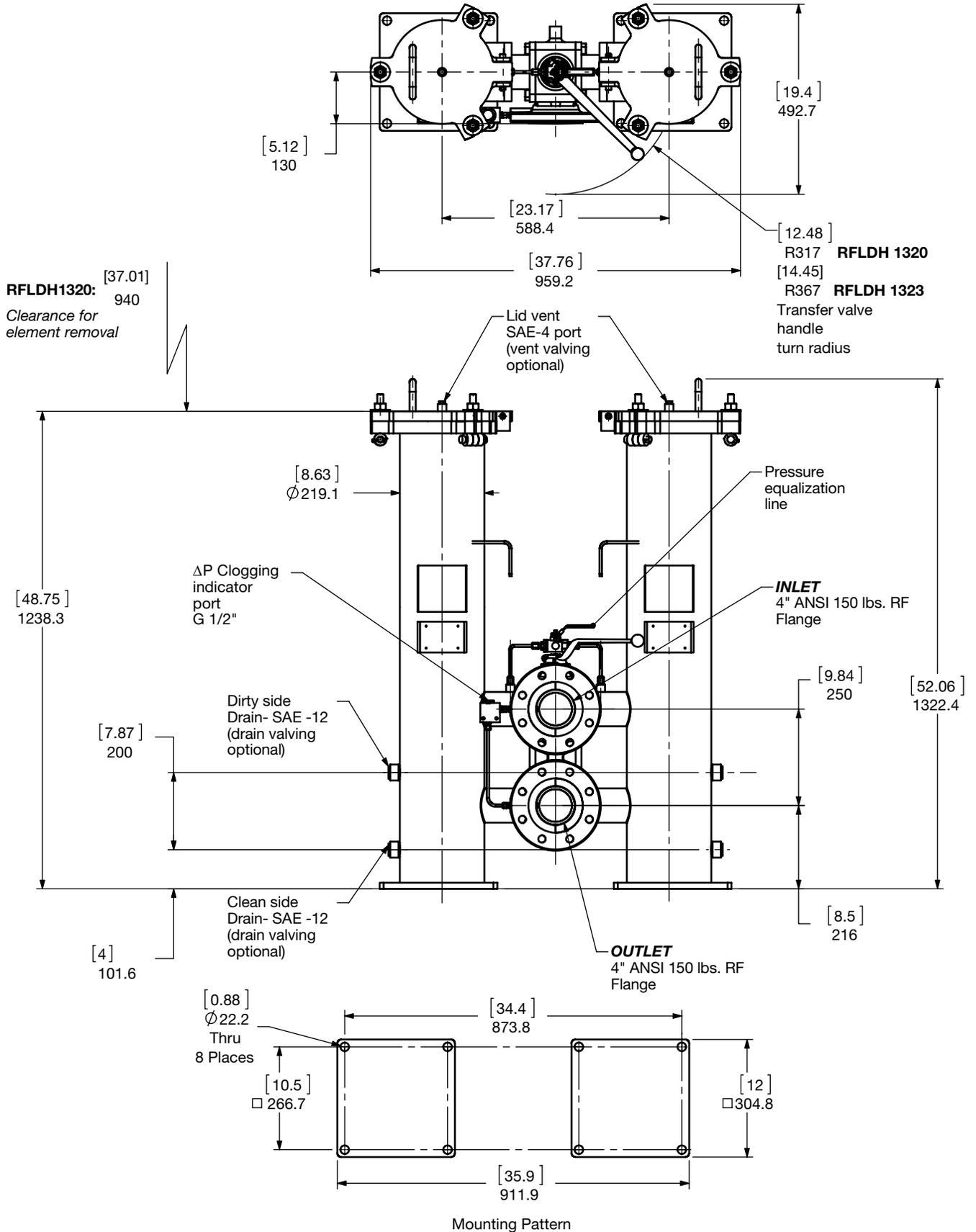
RFLDH 1300 / 1303



Size	1300	1303
Weight (lbs.)	475	475

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFLDH 1320 / 1323



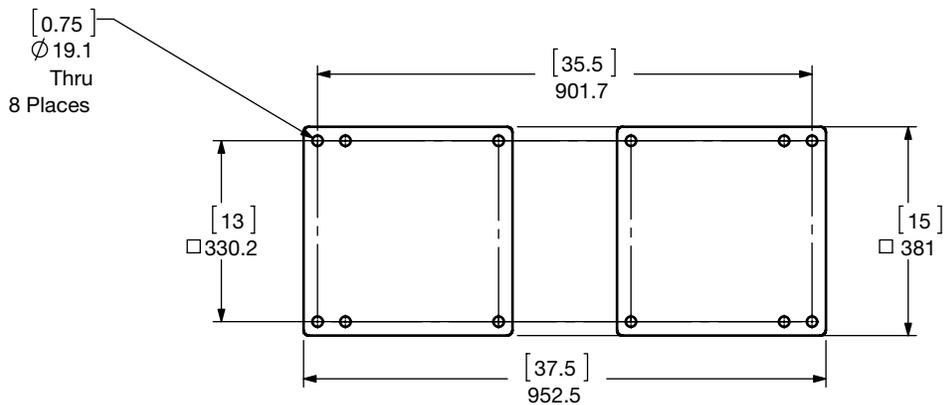
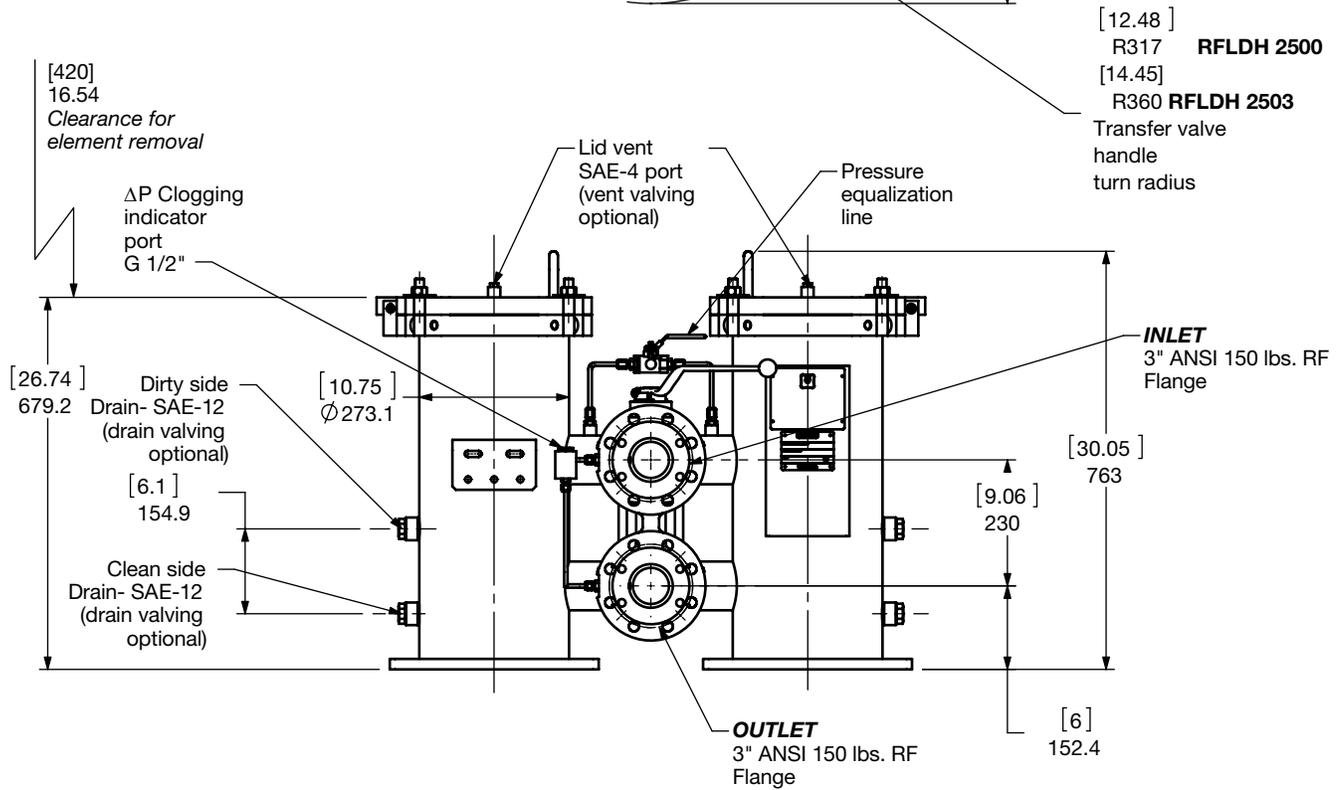
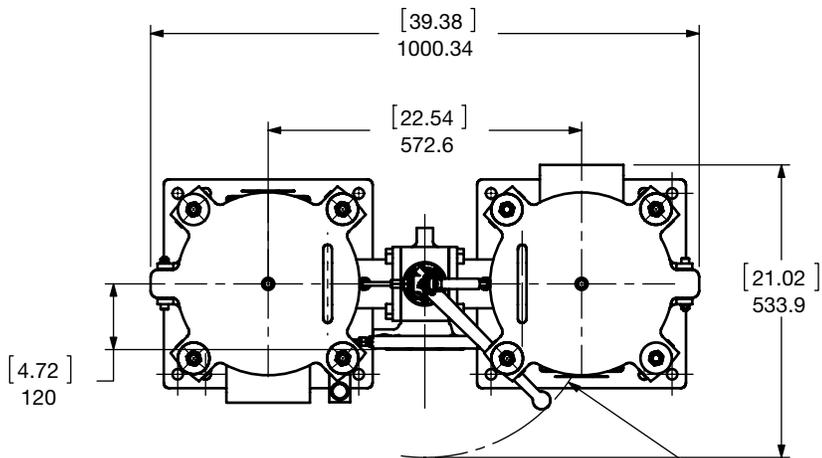
Size	1320	1323
Weight (lbs.)	575	575

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

RFLDH 2500 / 2503

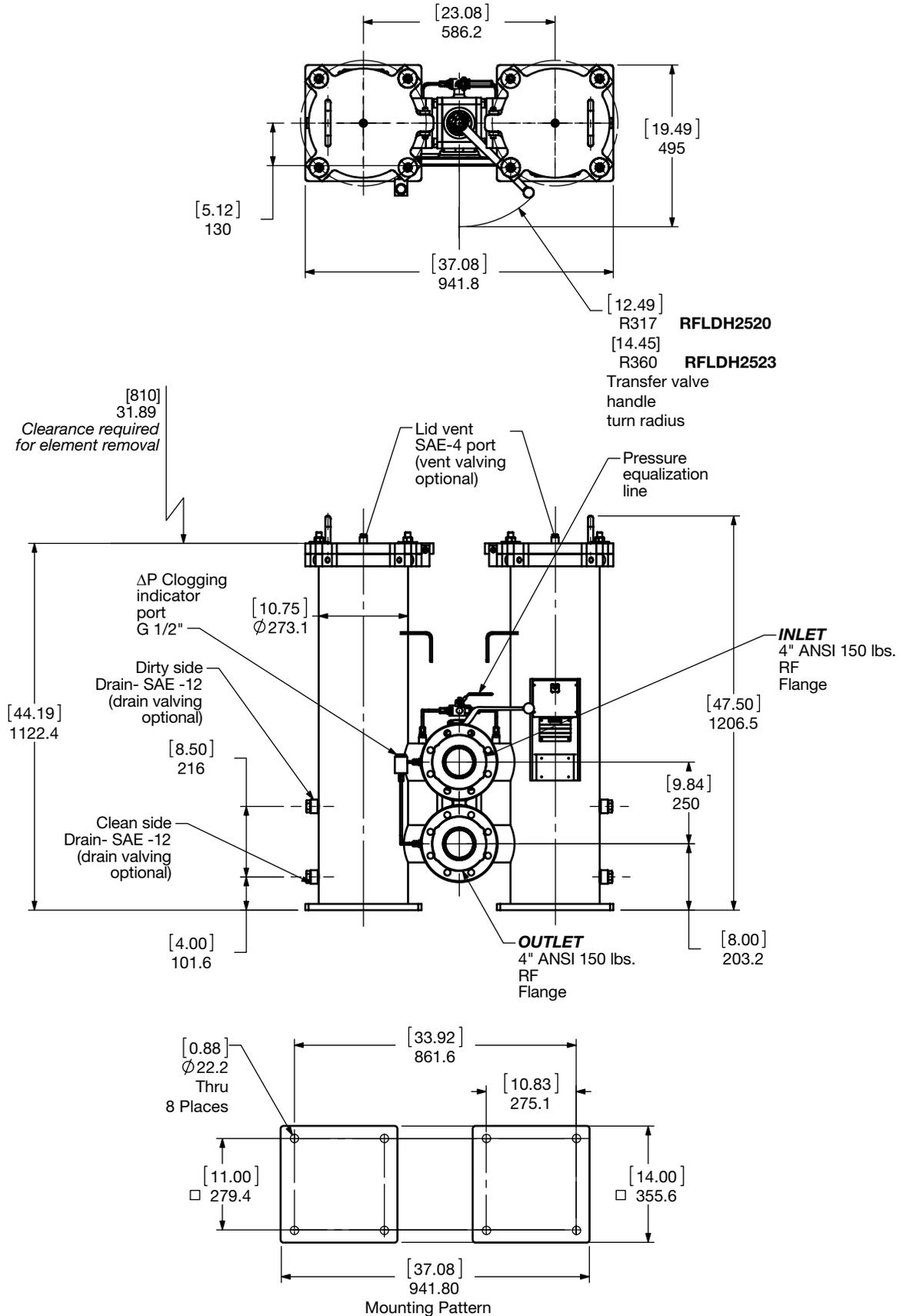


Mounting Pattern

Size	2500	2503
Weight (lbs.)	270	270

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions RFLDH 2520 / 2523

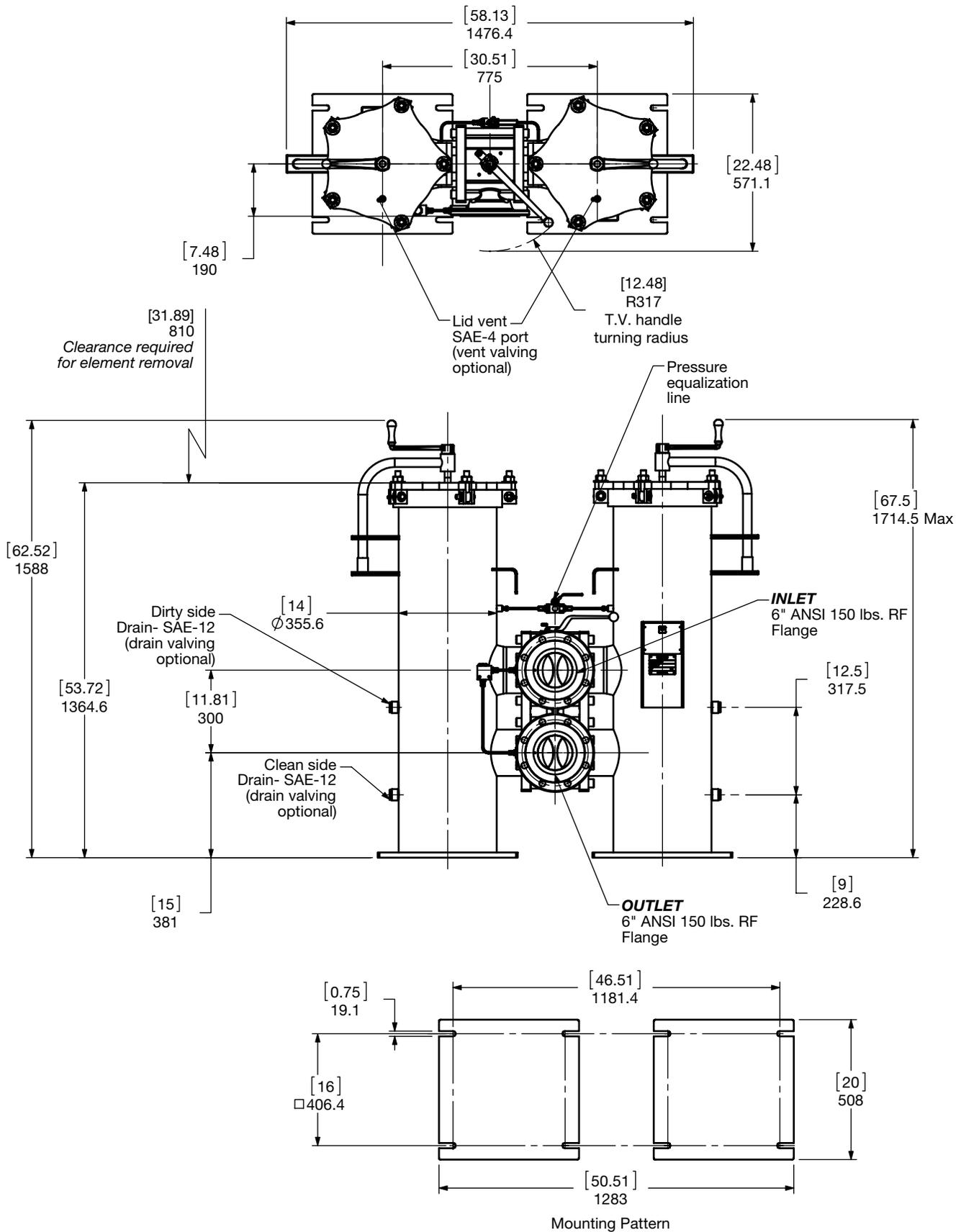


Size	2520	2523
Weight (lbs.)	700	700

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions
RFLDH 4020



Size	4020
Weight (lbs.)	1500

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

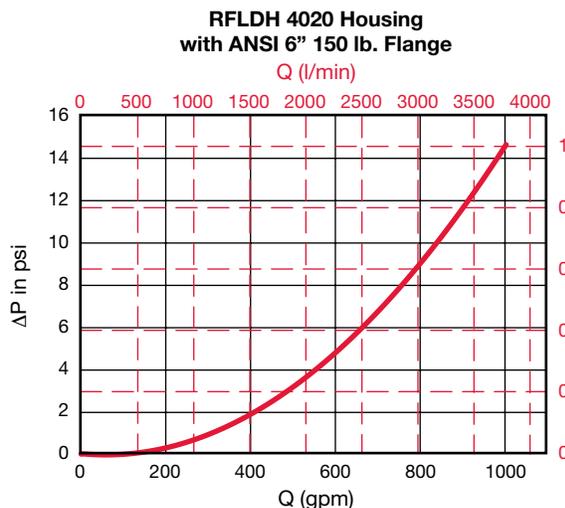
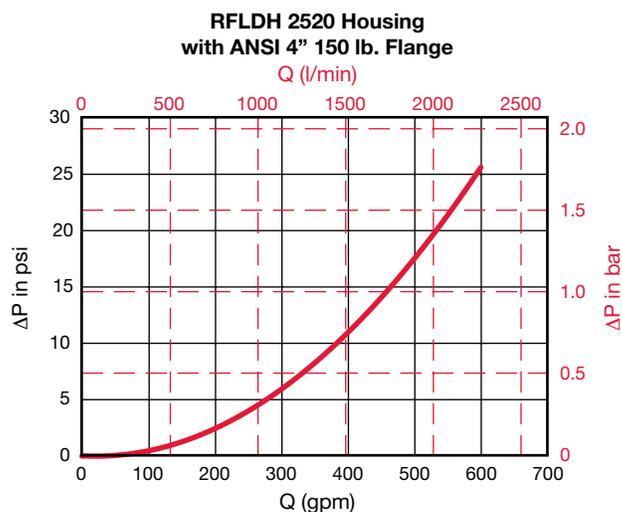
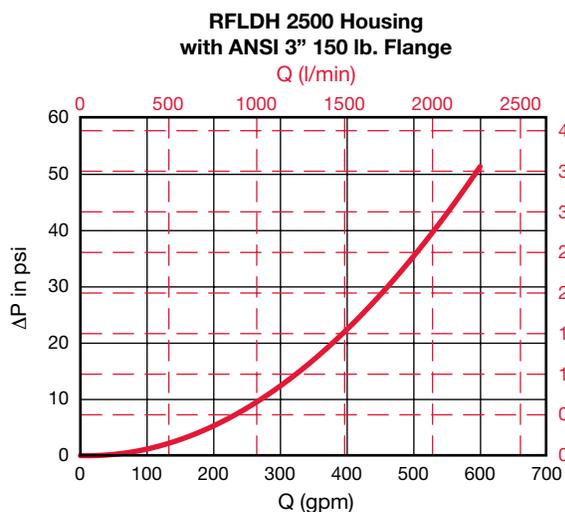
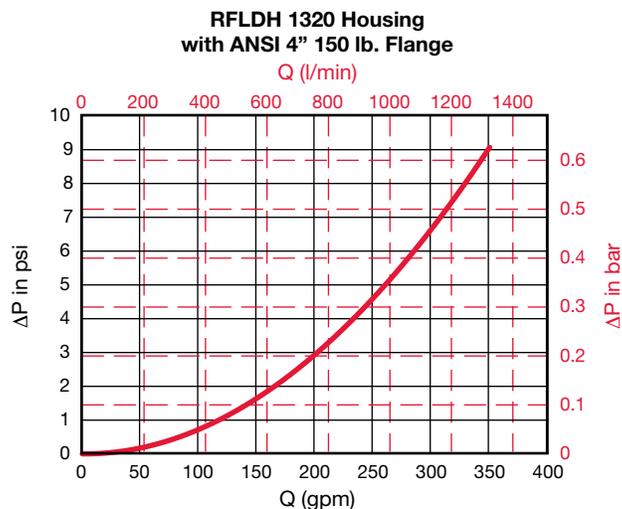
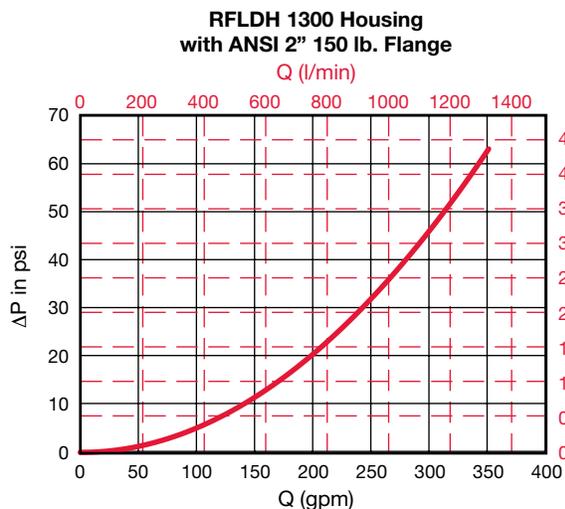
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



LOW PRESSURE FILTERS

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

Element K Factors

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

(From Tables Below)

Optimicron Size	...R...ON					
	1 µm	3 µm	5 µm	10 µm	15 µm	20 µm
0850 R XXX ON	0.152	0.072	0.055	0.032	0.024	0.02
1300 R XXX ON	0.094	0.04	0.032	0.019	0.018	0.012
1700 R XXX ON	0.074	0.035	0.029	0.015	0.014	0.01
2600 R XXX ON	0.046	0.02	0.016	0.01	0.009	0.006

ECONmicron Size	...R...ECON2			
	3 µm	5 µm	10 µm	20 µm
0850 R XXX ECON2	0.082	0.055	0.038	0.022
1300 R XXX ECON2	0.044	0.033	0.022	0.016
1700 R XXX ECON2	0.038	0.027	0.016	0.011
2600 R XXX ECON2	0.022	0.016	0.011	0.005

Betamicron/Aquamicron Size	...R...BN4AM	
	3 µm	10 µm
0850 R XXX BN4AM	0.154	0.049
1300 R XXX BN4AM	0.088	0.033
1700 R XXX BN4AM	0.071	0.027
2600 R XXX BN4AM	0.055	0.016

Aquamicron Size	...R...AM
	40 µm
0850 R 040 AM	0.040
1300 R 040 AM	0.026
1700 R 040 AM	0.020
2600 R 040 AM	0.013

Wire Mesh Size	...R...W/HC
	25, 50, 74, 100, 149, 200 µm
0850 R XXX W/HC	0.003
1300 R XXX W/HC	0.002
1700 R XXX W/HC	0.001
2600 R XXX W/HC	0.001

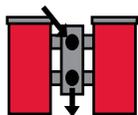
Polyester Size	...R...P/HC	
	10 µm	20 µm
0850 R XXX P/HC	0.007	0.003
1300 R XXX P/HC	0.004	0.002
1700 R XXX P/HC	0.003	0.002
2600 R XXX P/HC	0.002	0.001

All Element K Factors in psi / gpm.

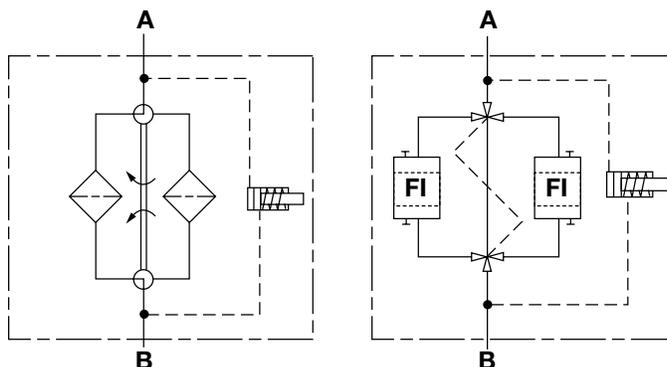
LOW PRESSURE FILTERS

AFLD API 614 Series

Inline Duplex Filters
232 psi • up to 630 gpm



Hydraulic Symbol



Features

- Filter series designed to meet the requirements of API 614 for lube oil and other applications.
- Models are available in carbon and stainless steel versions.
- Transfer valve internal components of stainless steel.
- ANSI flange connections standard
- 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.
- Air bleed line and drain line available.
- ASME coded with ASME-stamp
- CRN available
- AS1210 available
- GOST available
- 3.1 material certificate standard
- API 614 requires compliant filters to be non-bypass

Notes: Most states and local jurisdictions in the United States require pressure vessels to be ASME stamped. It is the responsibility of the end customer to research and fully understand the ASME code requirements of the jurisdiction this filter will ultimately be installed in, and to fully communicate these requirements to HYDAC.

Applications



Off Shore



Power Generation



Industrial

Technical Specifications

Mounting Method	Floor mounted legs <i>(Filters must not be used as pipe support)</i>	
Port Connection		
122/123	1"	ANSI 150# Flanges*
232/233	1.5"	ANSI 150# Flanges*
332/333	2"	ANSI 150# Flanges*
502/503	2"	ANSI 150# Flanges*
542/543	2"	ANSI 150# Flanges*
882/883	3"	ANSI 150# Flanges*
1402/1403	4"	ANSI 150# Flanges*
2702/2703	6"	ANSI 150# Flanges*
Flow Direction	Inlet: Front Top Outlet: Front Bottom	
Construction Materials <i>(Transfer valve balls and spindle, stainless steel)</i>	122, 232, 332, 502, 542, 882, 1402, 2702 - Carbon Steel 123, 233, 333, 503, 543, 883, 1403, 2703 - Stainless Steel	
Flow Capacity @ 32 CSt		
122/123	20 gpm	76 lpm
232/233	45 gpm	171 lpm
332/333	58 gpm	220 lpm
502/503	66 gpm	250 lpm
542/543	79 gpm	300 lpm
882/883	211 gpm	800 lpm
1402/1403	330 gpm	1250 lpm
2702/2703	449 gpm	1700 lpm
Housing Pressure Rating		
Max. Allowable Working Pressure	232 psi (16 bar) standard	
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC*	
<i>*(other pressures available upon request)</i>		
Element Collapse Pressure Rating		
ON/PO	145 psid (10 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)	
Consult HYDAC for applications below 14°F (-10°C)		
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure <i>(optional)</i>		
ΔP = 29 psid (2 bar) -10% <i>(non-bypass per API 614)</i>		

Model Code

AFLD ON/PO 1402 C A 5 10 W 1 . X / Z U 150 V DH

Filter Type _____

Element Media _____
 ON/PO = Optimicron® Power with Stat-Free®

Size _____
 122/123, 232/233, 332/333, 502/503, 542/543, 882/883, 1402/1403, 2702/2703

Operating Pressure _____
 C = 232 psi (16 bar)

Type of Change Over Valve _____
 A = Ball Valve

Type of Connection _____
 1 = 1" ANSI 150# Flange (sizes 122/123)*
 2 = 1.5" ANSI 150# Flange (sizes 232/233)*
 3 = 2" ANSI 150# Flange (sizes 332/333, 502/503, 542/543)*
 4 = 3" ANSI 150# Flange (sizes 882/883)*
 5 = 4" ANSI 150# Flange (sizes 1402/1403)*
 7 = 6" ANSI 150# Flange (sizes 2702/2703)
 *(300# and 600# available upon request)

Filtration Rating (microns) _____
 10 = ON/PO

Type of ΔP Clogging Indicator _____

A	= No indicator	Indicator Model
B	= Pop-up indicator (auto-reset)	VM...B
C	= electric switch	VM...C
D	= electric switch and light	VM...D/L (lamp voltage selected from supplementary section)
W	= no indicator block supplied - D/P ports on vessel plugged (standard)	

(For additional details and options, see Section G - Clogging Indicators.)

Type Code _____
 1

Modification Number (latest version always supplied) _____

Country of Installation _____
 (omit) = (non coded)
 ZU = ASME Coded with "ASME" Stamp (with 3.1 material and pressure test certification)
 Z = 3.1 material and pressure test certification (standard - documentation only)

Flange _____
 150 = 150 lbs ANSI Flange
 300 = 300 lbs ANSI Flange

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) **V = Fluorocarbon elastomer (FKM)**

Bypass Valve _____
 (omit) = No Bypass (API standard)

Supplementary Details _____
 DH = Cover Lifting Device (Davit lifting mechanism for sizes 2702 / 2703 only)
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 VKD = Drain piping
 EM = Air bleed valves

Replacement Element Model Code

0880 A 010 ON/PO / V

Size _____
 0120, 0230, 0330, 0500, 0540,
 0880, 2600, 2700

Filtration Rating (micron) _____
 10 = ON/PO

Element Media _____
 ON/PO

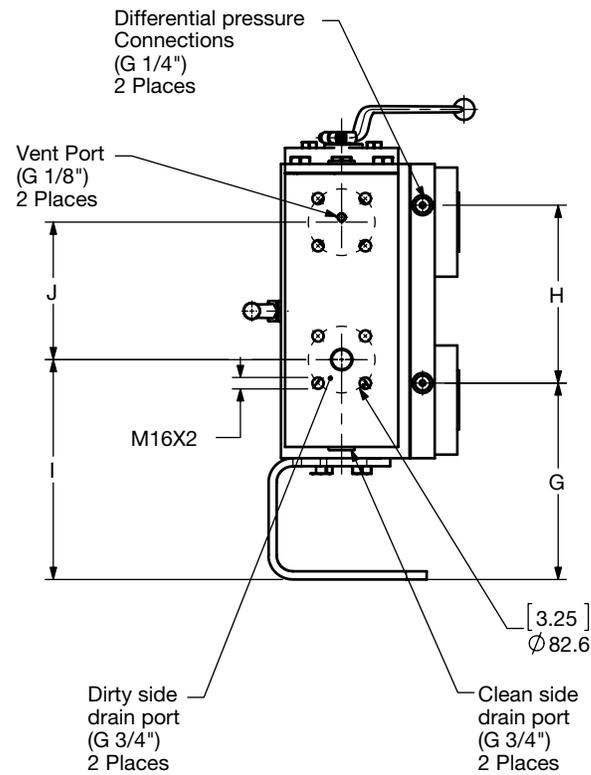
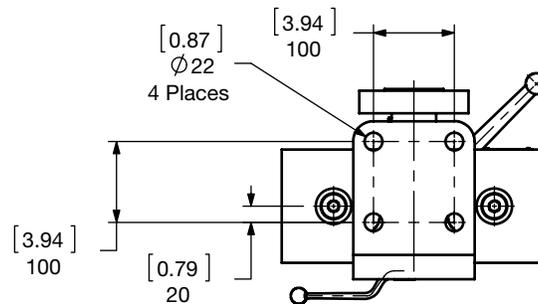
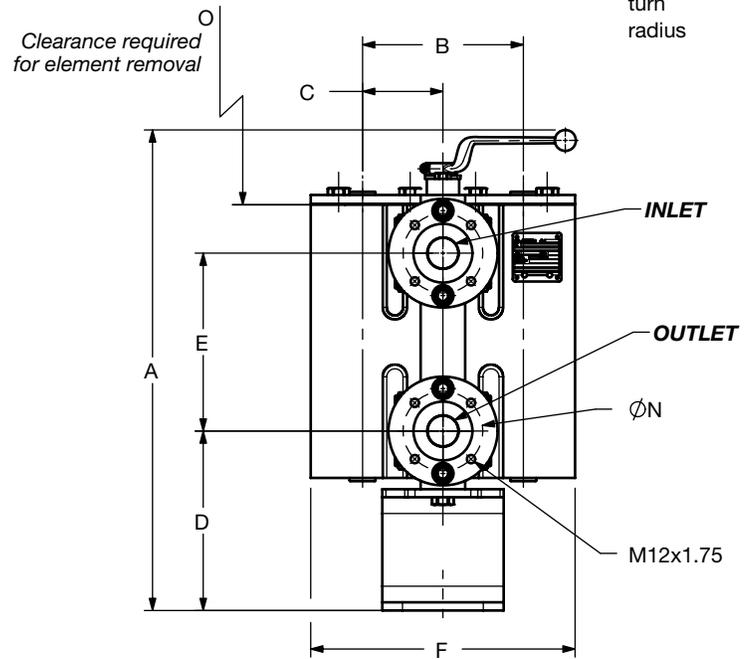
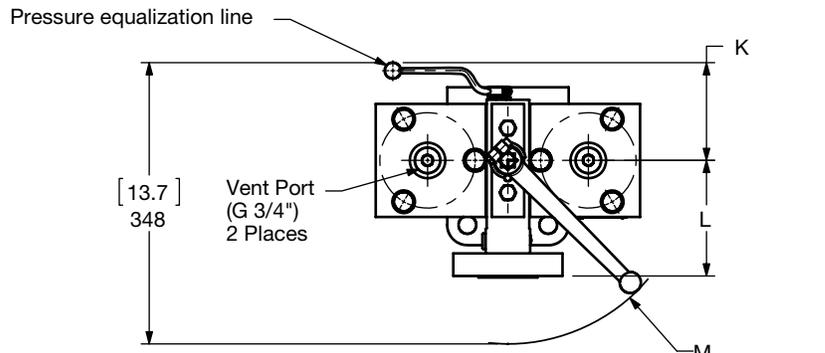
Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)

Note: Elements supplied with no bypass valve per API 614.

LOW PRESSURE FILTERS

Dimensions

AFLD 122 / 123 / 232 / 233



Size	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Connection
AFLD 122/123	[20.24] 514	[4.99] 126.8	[2.49] 63.4	[7.87] 200	[6.10] 155	[9.09] 230.8	[8.50] 216	[6.10] 155	[9.02] 229	[6.04] 153.5	[3.78] 96	[4.25] 108	[7.20] 183	[3.13] 79.4	[7.68] 195	ANSI 150 lb RF 1"
AFLD 232/233	[23.5] 597	[7.04] 178.8	[3.91] 89.4	[8.74] 222	[8.66] 220	[12.87] 326.8	[9.57] 243	[8.66] 220	[10.71] 22	[6.69] 170	[4.79] 121.7	[5.71] 145	[8.94] 227	[3.87] 98.4	[8.07] 205	ANSI 150 lb RF 1.5"

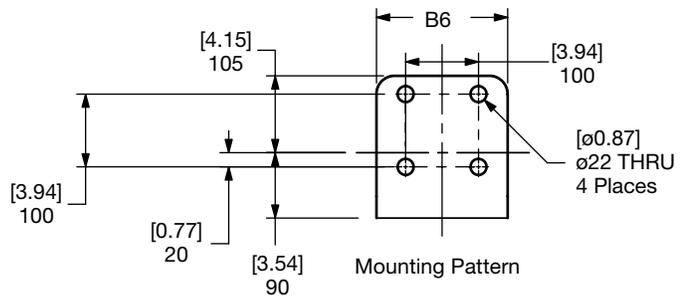
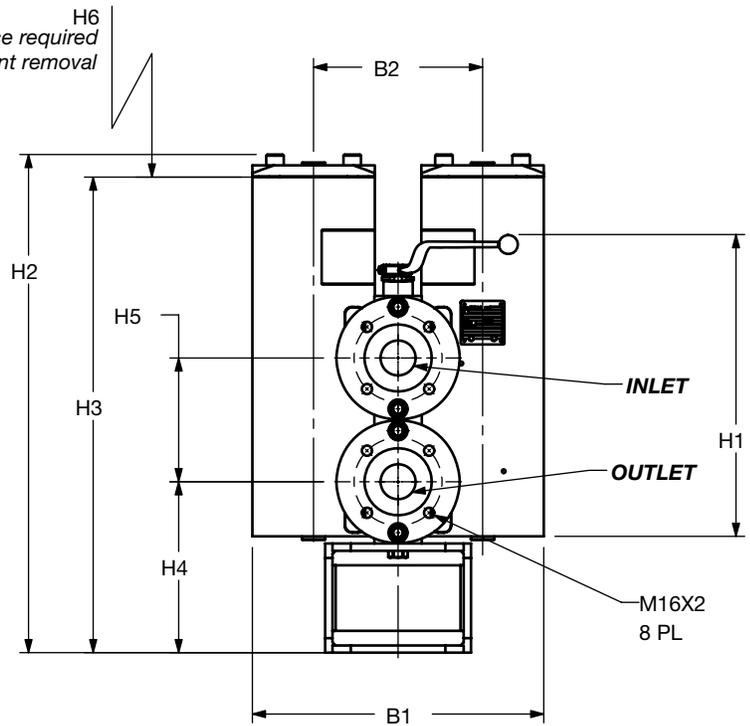
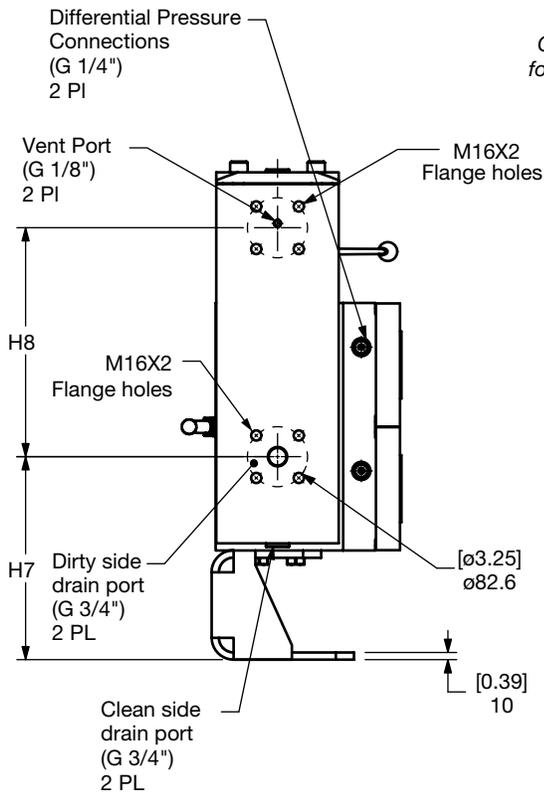
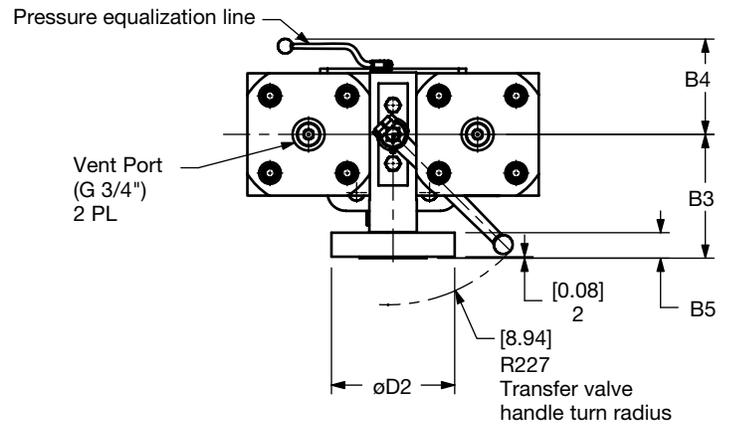
Size	122 / 123	232 / 233
Weight (lbs.)	122.4	269.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

AFLD 332 / 333 / 502 / 503 / 542 / 543



Size	Flange Size	B1	B2	B3	B4	B5	B6	D2	H1	H2	H3	H4	H5	H6	H7	H8
AFLD 332/333	2" 150 lb	[15.75] 400	[9.13] 232	[6.69] 170	[5.16] 131	[1.38] 35	[5.91] 150	[6.65] 169	[22.56] 573	[20.59] 523	[19.65] 499	[9.25] 235	[6.69] 170	[8.07] 205	[11.38] 289	[5.91] 150
AFLD 502/503		[15.75] 400	[9.13] 232	[6.69] 170	[5.16] 131	[1.38] 35	[5.91] 150	[6.65] 169	[25.71] 653	[23.78] 604	[22.83] 580	[9.25] 235	[6.69] 170	[11.81] 300	[11.38] 289	[9.09] 231
AFLD 542/543		[15.75] 400	[9.13] 232	[6.69] 170	[5.16] 131	[1.38] 35	[5.91] 150	[6.65] 169	[22.56] 573	[26.69] 678	[25.71] 653	[9.25] 235	[6.69] 170	[14.57] 370	[12.4] 315	[12.4] 315

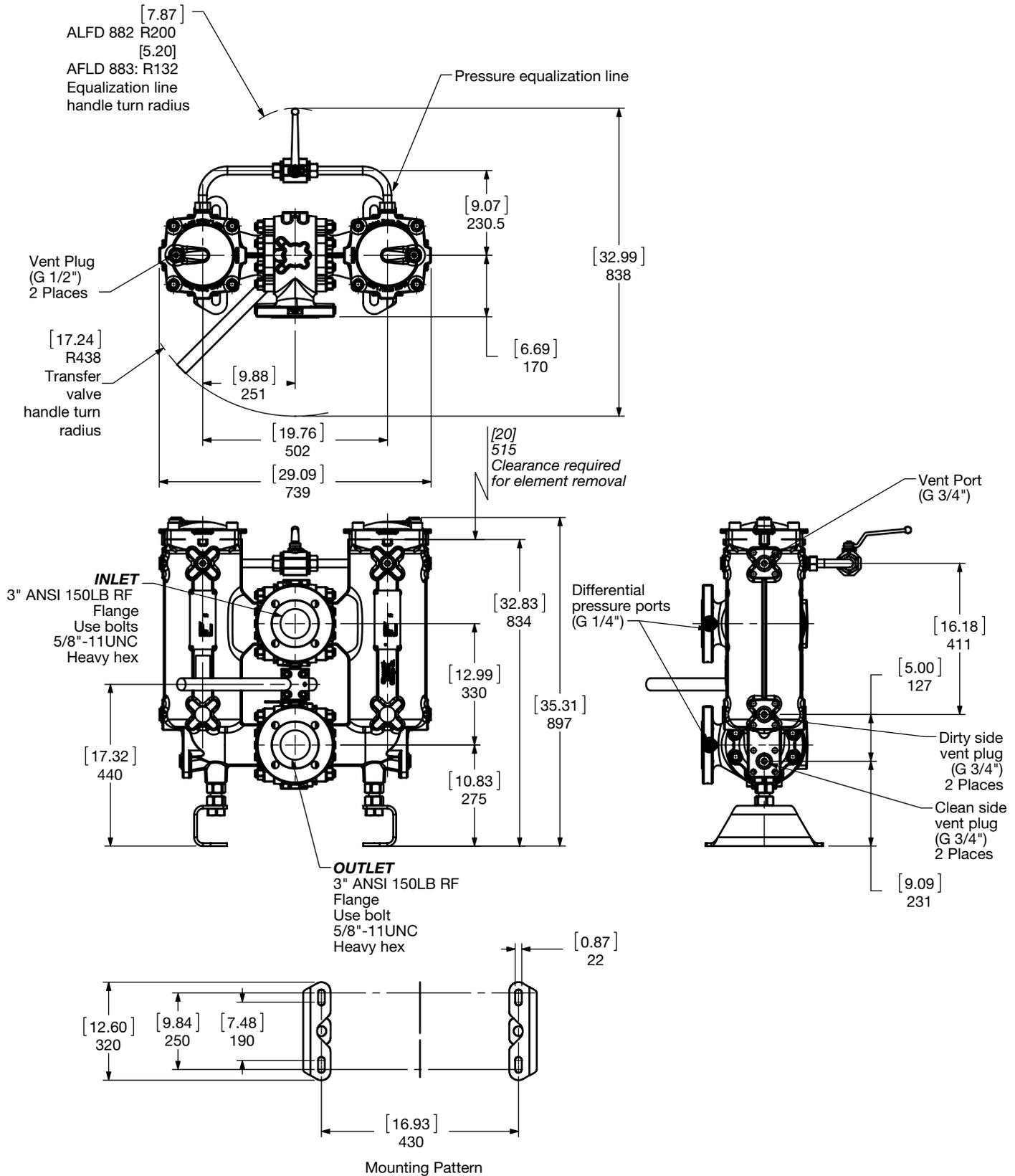
Size	332 / 333	502 / 503	542 / 543
Weight (lbs.)	440.9	496	551.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

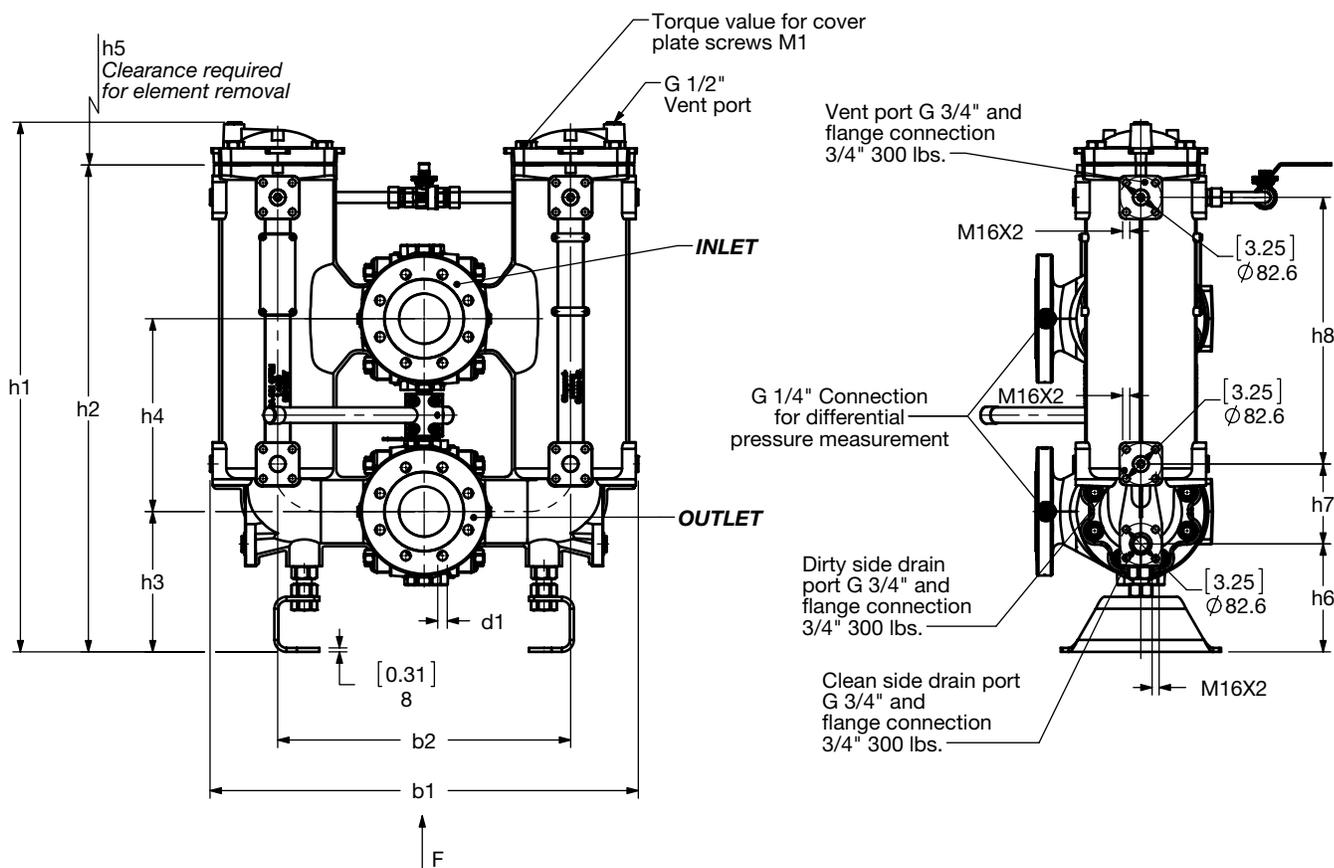
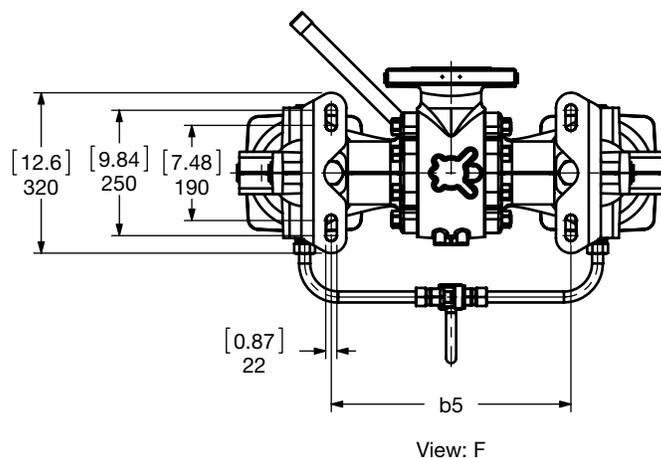
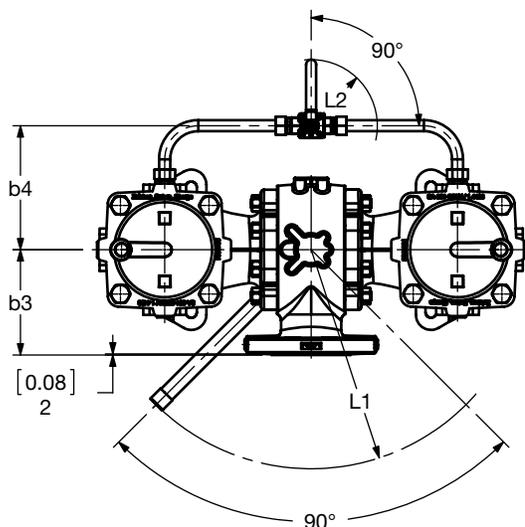
AFLD 882 / 883



Size	882	883
Weight (lbs.)	441	441

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions AFLD 1402 / 1403



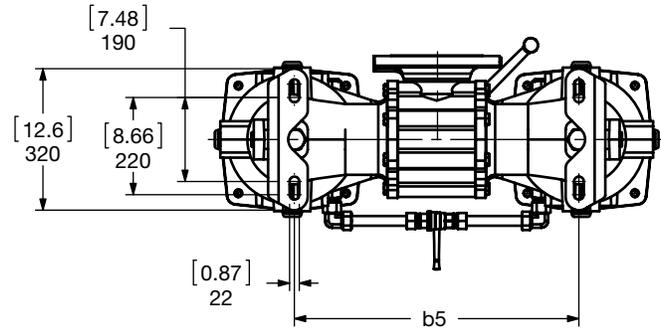
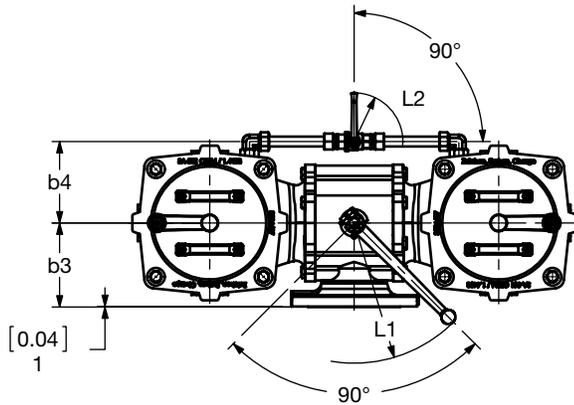
Size	Flange Size	b_1	b_2	b_3	b_4	b_5	d_1	h_1	h_2	h_3	h_4	h_5	h_6	h_7	h_8	L_1	L_2	M1 [N/m]	Vol. of Pressure Vessel, [liters]		
AFLD 1402	4" 150 lbs	$[33.6]$	$[23]$	$[8.3]$	$[6.1]$ over 155	$[18.8]$	$8 \times \text{ø}19$	$[41.6]$	$[38.3]$	$[11]$	$[15.2]$	$[25.6]$	$[8.5]$	$[6.3]$	$[20.9]$	$[17.2]$	$[7.9]$ over 200	170	2 x 24		
AFLD 1403	4" 300 lbs	854	584	210	$[10.5]$ over 266	478	$8 \times \text{ø}23$	1057	972	280	385	650	216	160	532	438	$[5.2]$ over 132	110			
Size		1402						1403													
Weight (lbs.)		639						639													

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

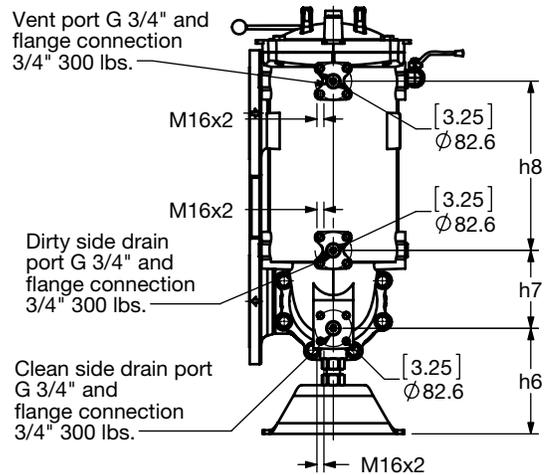
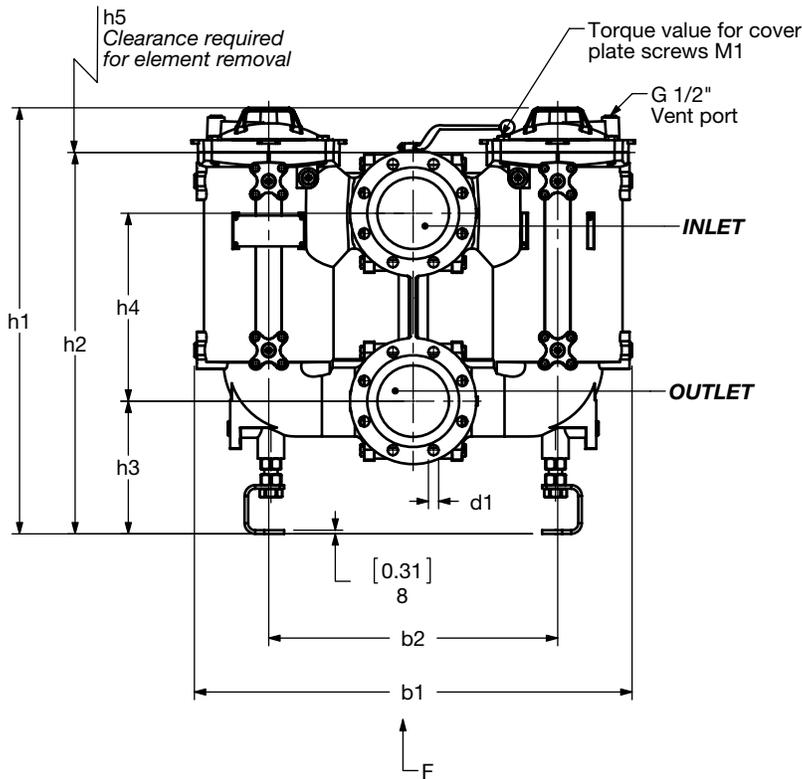
LOW PRESSURE FILTERS

Dimensions

AFLD 2702 / 2703



View: F



Size	Flange Size	b1	b2	b3	b4	b5	d1	h1	h2	h3	h4	h5	h6	h7	h8	L1	L2	M1 [N/m]	Vol. of Pressure Vessel, liters
AFLD 2702	6"	[38.6]	[25.7]	[7.5]	[7.2] 184	[25.4]	8 x ø23	[38]	[34]	[11.8]	[16.7]	[19.7]	[9.4]	[7]	[15.1]	[12.5]	[7.9] 200	110	2 x 37
AFLD 2703	150 lbs	980	653	190	[9.8] 249	645		964	863	300	425	500	239	177	383	317	[5.2] 132		
Size		2702								2703									
Weight (lbs.)		794								794									

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

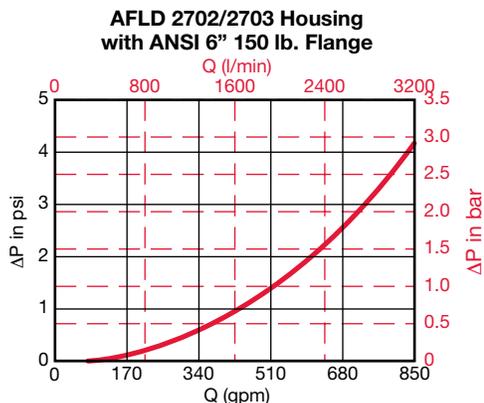
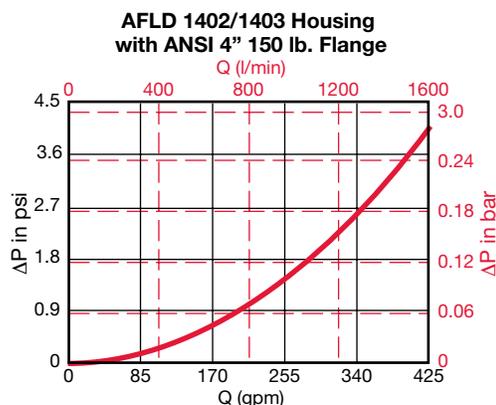
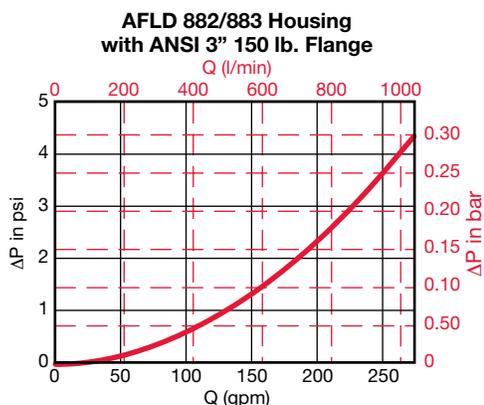
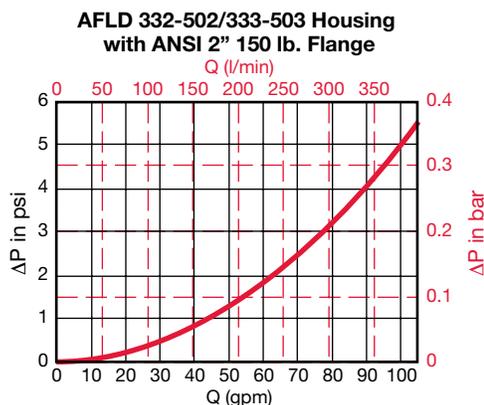
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



LOW PRESSURE FILTERS

Required Element Per Housing

Housing Size	Element Size	Elements per Side
122 / 123	0120	1
232 / 233	0230	1
332 / 333	0330	1
502 / 503	0500	1
542 / 543	0540	1
882 / 883	0880	1
1402 / 1403	2600	1
2702 / 2703	2700	1

Element K Factors

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

(From Tables Below)

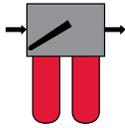
Optimicron Power Size	"ON/PO" API Compliant 10 µm
0120 A XXX ON/PO	0.075
0230 A XXX ON/PO	0.037
0330 A XXX ON/PO	0.037
0500 A XXX ON/PO	0.025
0540 A XXX ON/PO	0.018
0880 A XXX ON/PO	0.008
2600 A XXX ON/PO	0.004
2700 A XXX ON/PO	0.004

LOW PRESSURE FILTERS

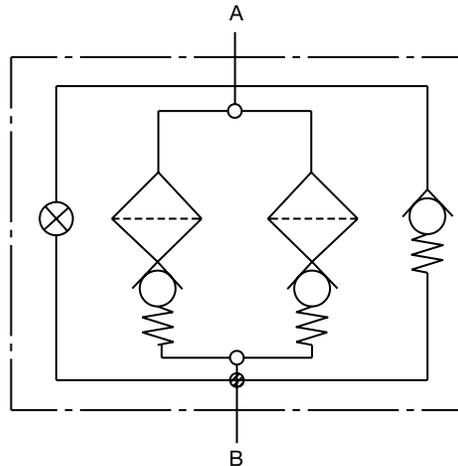
FLND Series

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 are possible.
- 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.
- CRN Approval Available. (*Canadian Registration Number*)
- Bypass versions of FLND filters have the bypass valve located in the filter head.
- This filter meets the requirements of DIN 24550 as follows:
 - Filter size 0160 with G 1-1/4" port selection
 - Filter size 0250 with G 1-1/2" port selection
 - Filter size 0400 with SAE-DN 38 1-1/2" Flange

Technical Specifications

Mounting Method	4 mounting holes - filter head	
Port Connection	Inlet / Outlet 1-1/4" Threaded – SAE 20, 1-1/4" BSPP 1-1/2" Threaded – SAE 24, 1-1/2" BSPP 1-1/2" Flange-SAE-DN 38	
Flow Direction	Inlet: Side	Outlet: Opposite 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)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	1450 psi (100 bar)	
Element Collapse Pressure Rating		
BN4HC, W/HC	290 psid (20 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)	
	Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility		
	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure		
	$\Delta P = 36$ psid (2.5 bar) -10%	
	$\Delta P = 72$ psid (5 bar) -10%	
	$\Delta P = 116$ psid (8 bar) -10% (<i>non-bypass</i>)	
Bypass Valve Cracking Pressure		
	$\Delta P = 50.75$ psid (3.5 bar) +10%	
	$\Delta P = 102$ psid (7 bar) +10%	

Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



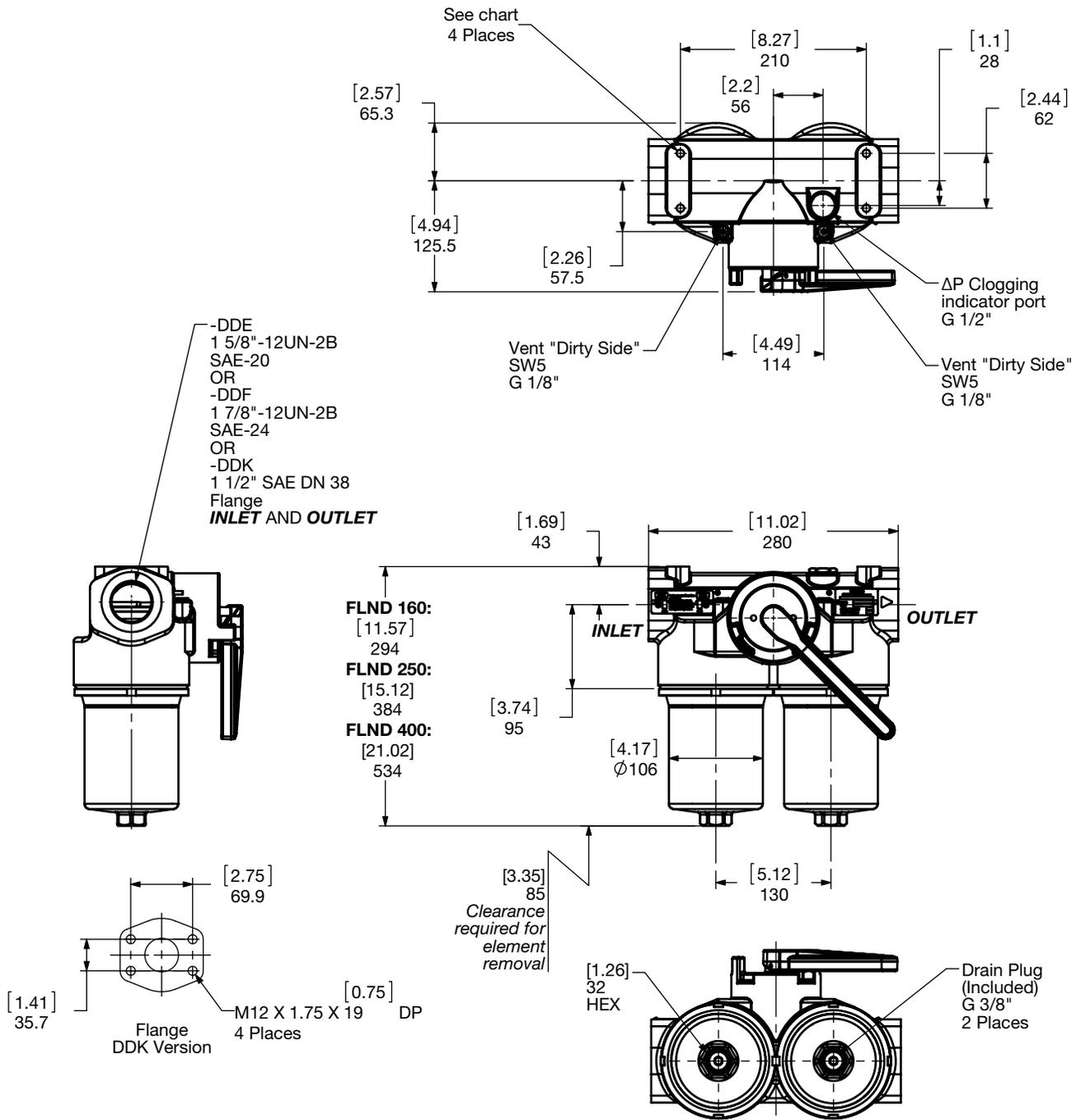
Shipbuilding



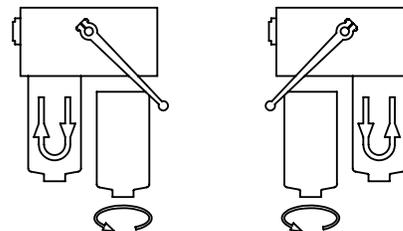
Steel / Heavy Industry

LOW PRESSURE FILTERS

Dimensions FLND



Model	Mounting Hole
FLND160-400DDE	M10-1.5 x 19mm Deep
FLND160-400DDE/12	3/8-24UNF x 14mm Deep
FLND160-400DDF	M10-1.5 x 19mm Deep
FLND160-400DDF/12	3/8-24UNF x 14mm Deep
FLND160-400DDK	M10-1.5 x 19mm Deep



Before changing the element, relieve pressure in the filter housing.

Size	160	250	400
Weight (lbs.)	20.1	21.2	26.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

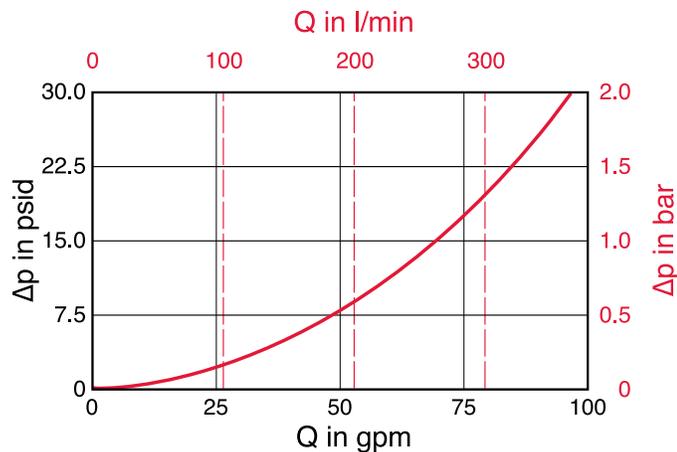
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

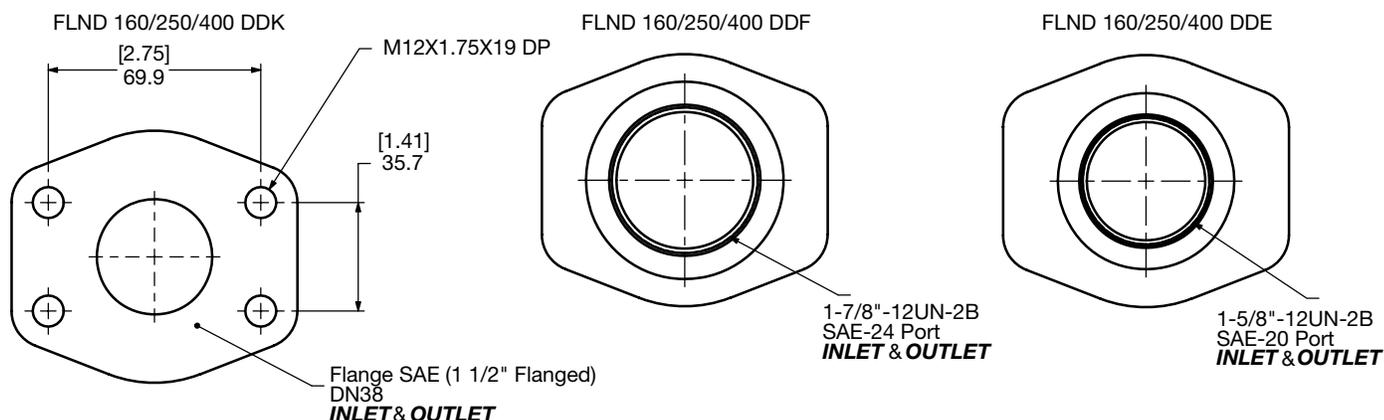
(From Tables Below)

BN4HC	...DN...BN4HC (Betamicon Low Collapse)			
	3 μm	6 μm	10 μm	25 μm
0160 DN XXX BN4HC	0.434	0.280	0.187	0.143
0250 DN XXX BN4HC	0.280	0.176	0.115	0.099
0400 DN XXX BN4HC	0.176	0.110	0.071	0.055

W/HC	...DN...W/HC (Betamicon Low Collapse)			
	25 μm	50 μm	100 μm	200 μm
0160 DN XXX W/HC	0.009	0.009	0.009	0.009
0250 DN XXX W/HC	0.006	0.006	0.006	0.006
0400 DN XXX W/HC	0.004	0.004	0.004	0.004

All Element K Factors in psi / gpm.

FLND 160/250/400 DDK

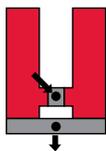


LOW PRESSURE FILTERS

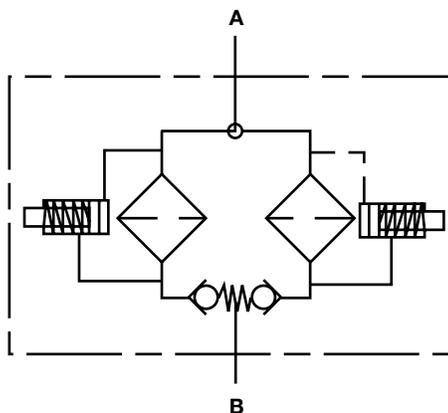
NFHD Series

Modular Inline Duplex Filters

500 psi • up to 450 gpm



Hydraulic Symbol



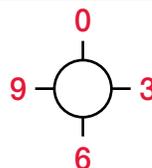
Inlet / Outlet Port Location Configurator

NFHD1300/2600 Inlet/Outlet Available Configurations

	03		09
	33		39
	93		99

NFHD5200/7800/10400 2.X Inlet/Outlet Available Configurations

	00	03		09
	30	33		39
	60			69
		93		99



- 0 = Pointed to Top
- 3 = Pointed to Front
- 6 = Pointed to Bottom
- 9 = Pointed to Back

First Number = Inlet Orientation
Second Number = Outlet Orientation

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 - dirty side (right side of Inlet Port) SAE 12 (3/4")
- Clogging Indicator for local and remote signals
- Easily banked in parallel (manifolded) for high viscosity applications.
- Available with Betterfit elements - consult HYDAC.

Notes: This filter is configured with anR..... type (return/low pressure) element, so if the filter requires a bypass, the bypass is located in the closed end cap of the cartridge element.

Technical Specifications

Mounting Method	Floor mounting brackets
Port Connection	SAE-64 Flange Code 61
Flow Direction (Standard)	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) <i>(Flow limited by 4" pipe size)</i>
Housing Pressure Rating	Max. Allowable Working Pressure: 500 psi (34 bar) Fatigue Pressure: 500 psi (34 bar) Burst Pressure: > 1440 psi (100 bar)
Element Collapse Pressure Rating	ON, W/HC: 290 psid (20 bar) ECON2, BN4AM, AM, P/HC: 145 psid (10 bar)
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% (standard) $\Delta P = 72$ psid (5 bar) -10% (optional)
Bypass Valve Cracking Pressure	$\Delta P = 43$ psid (3 bar) +10% $\Delta P = 87$ psid (6 bar) +10%

Applications



Automotive



Gearboxes



Industrial



Power Generation



Pulp & Paper



Shipbuilding



Steel / Heavy Industry

Model Code

NFHD ON 1300 E A P 3 BMI 1 . X / 16 V

Filter Type _____
 NFHD = In-line Duplex Return Line Filter

Element Media _____
 ON = Optimicron®
 ECON2 = ECOmicron® (Low Collapse)
 W/HC = Wire Mesh
 BN/AM = Betamicron®/Aquamicron®
 AM = Aquamicron®
 P/HC = Polyester

Size _____
 1300, 2600, 5200, 7800, 10400

Operating Pressure _____
 E = 500 psi (34 bar)

Type of Change Over _____
 A = Ball valve

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

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN/AM 3, 5, 10, 20 = BN/HC, ECO/N
 40 = AM 25, 74, 149 = W/HC 10, 20 = P/HC

Type of ΔP Clogging Indicator _____
 A, BM, C, D (Others available upon request)

Type Number _____
 1

Modification Number (latest version always supplied) _____

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

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system)] not available with ECON2

Supplementary Details _____
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage) SB = Equalization valve set
 T100 = Indicator Thermal Lockout, 100°F (C & D indicators only) EM = Manual vent valve set
 cRUus = Electrical Indicator with underwriter's recognition VKD = Drain manifold
 SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids
 SFREE = Element specially designed to minimize electrostatic charge generation

Flow Path _____
 00, 03, 09, 30, 33, 39, 60, 69, 93.99

Note: For Alternate Connection Flow Path (i.e. 39 - Inlet Front / Outlet Back) - See previous page for "Inlet / Outlet Port Configurator."

Replacement Element Model Code

1300 R 003 ON / V

Size _____
 1300 - for housings: 1300
 2600 - for housings: 2600, 5200, 7800, 10400

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 10 = BN4AM
 3, 5, 10, 20 = ECON2 40 = AM
 25, 74, 149 = W/HC 10, 20 = P/HC

Element Media _____
 ON, BN4AM, ECON2, AM, W/HC, P/HC

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details _____
 SO263 = (same as above) SFREE = (same as above)

Clogging Indicator Model Code

VM 2 BM . 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
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

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

Underwriters Approval (VM, VD types C, D, J, and J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition

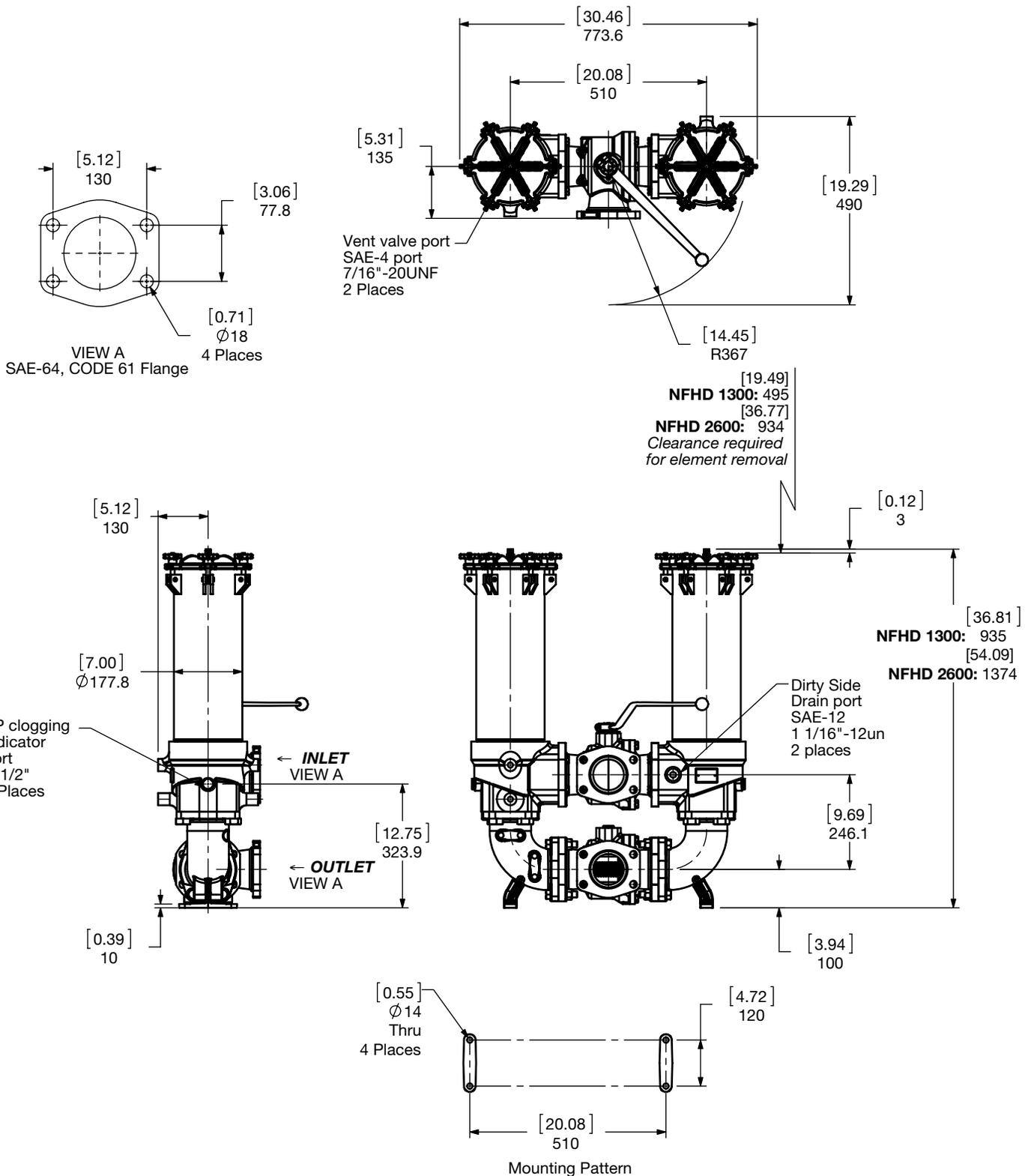
(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

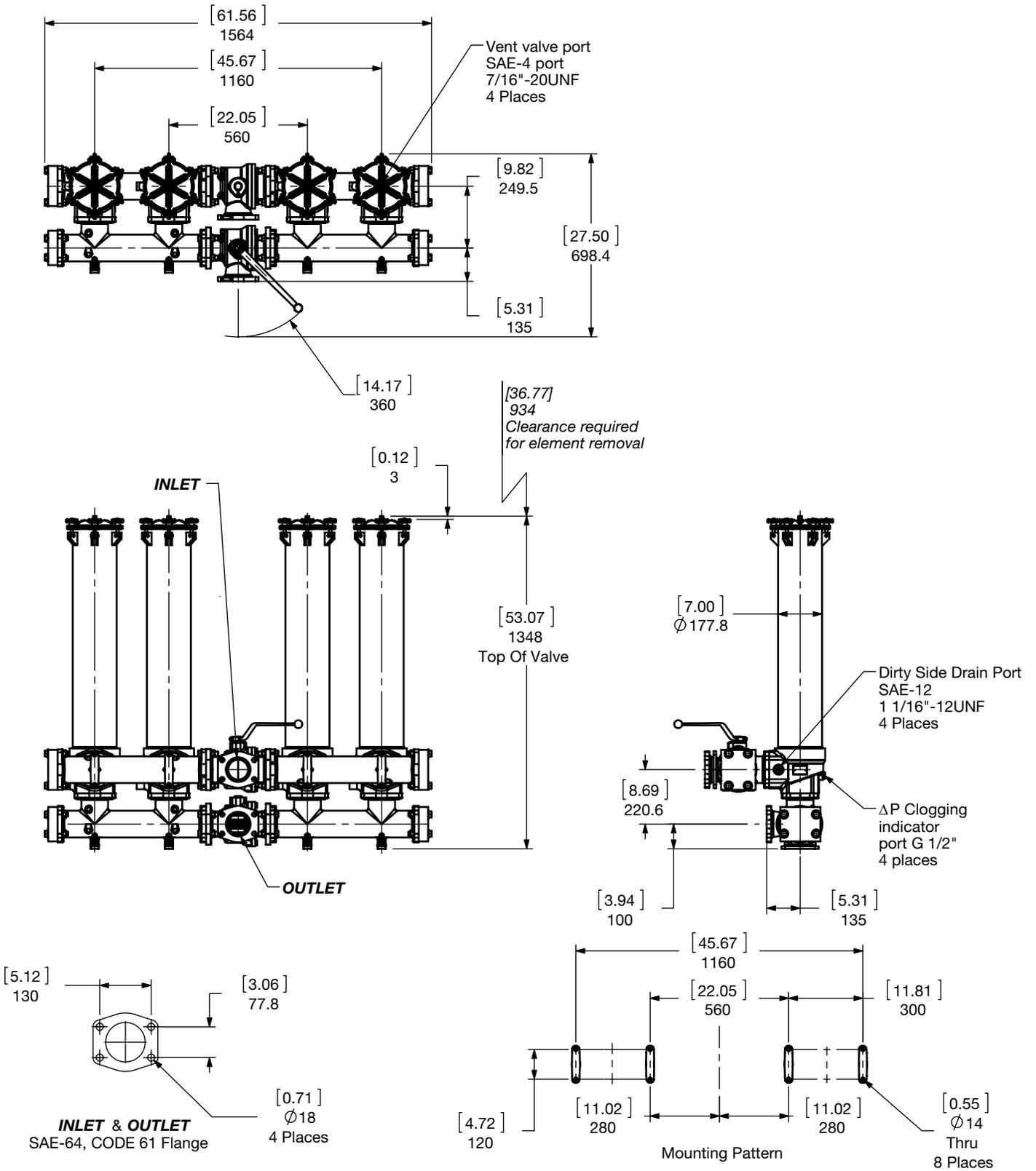
NFHD 1300 / 2600



Size	1300	2600
Weight (lbs.)	302.1	357

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
 For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NFHD 5200

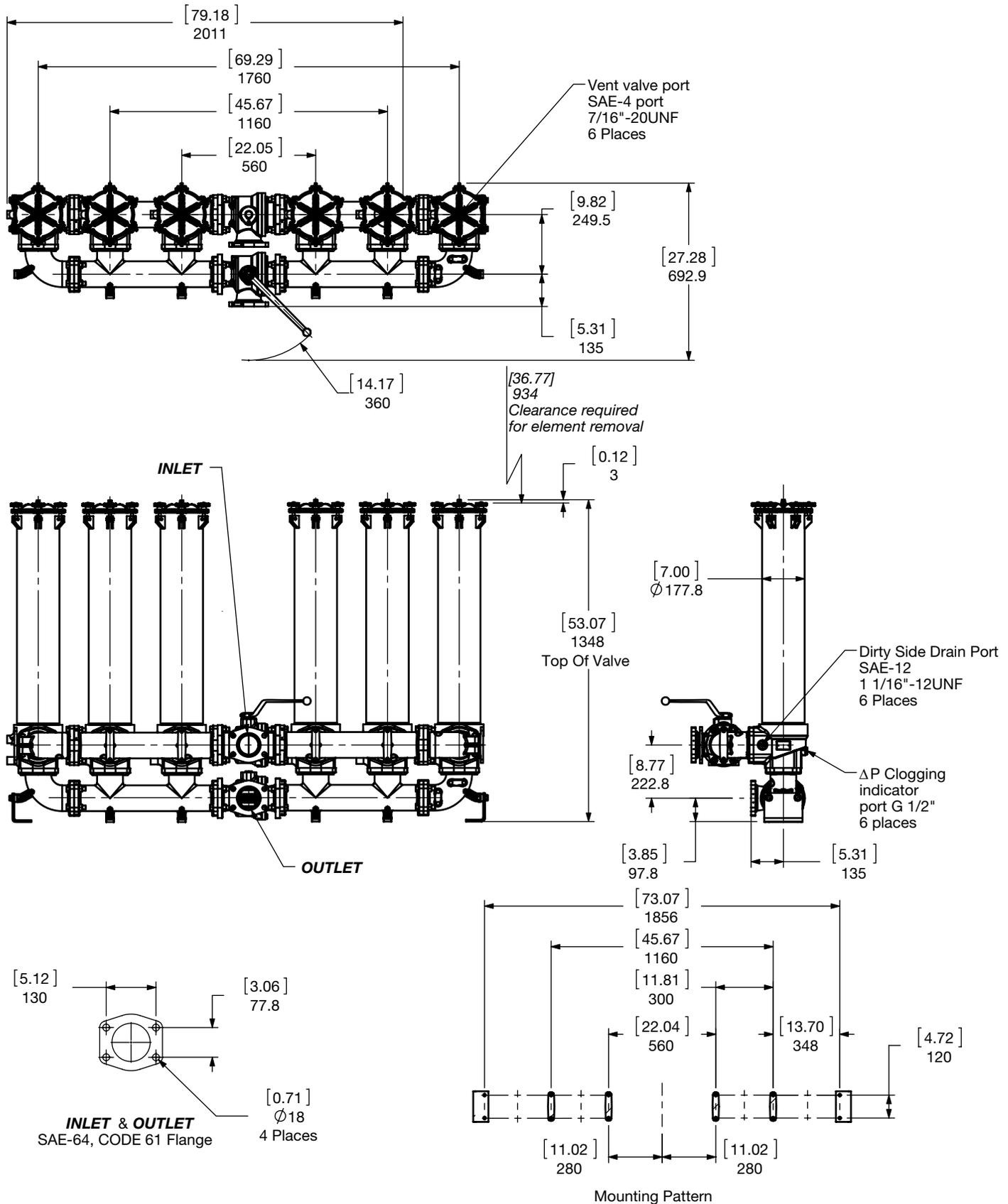


Size	5200
Weight (lbs.)	803

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:
NFHD 7800

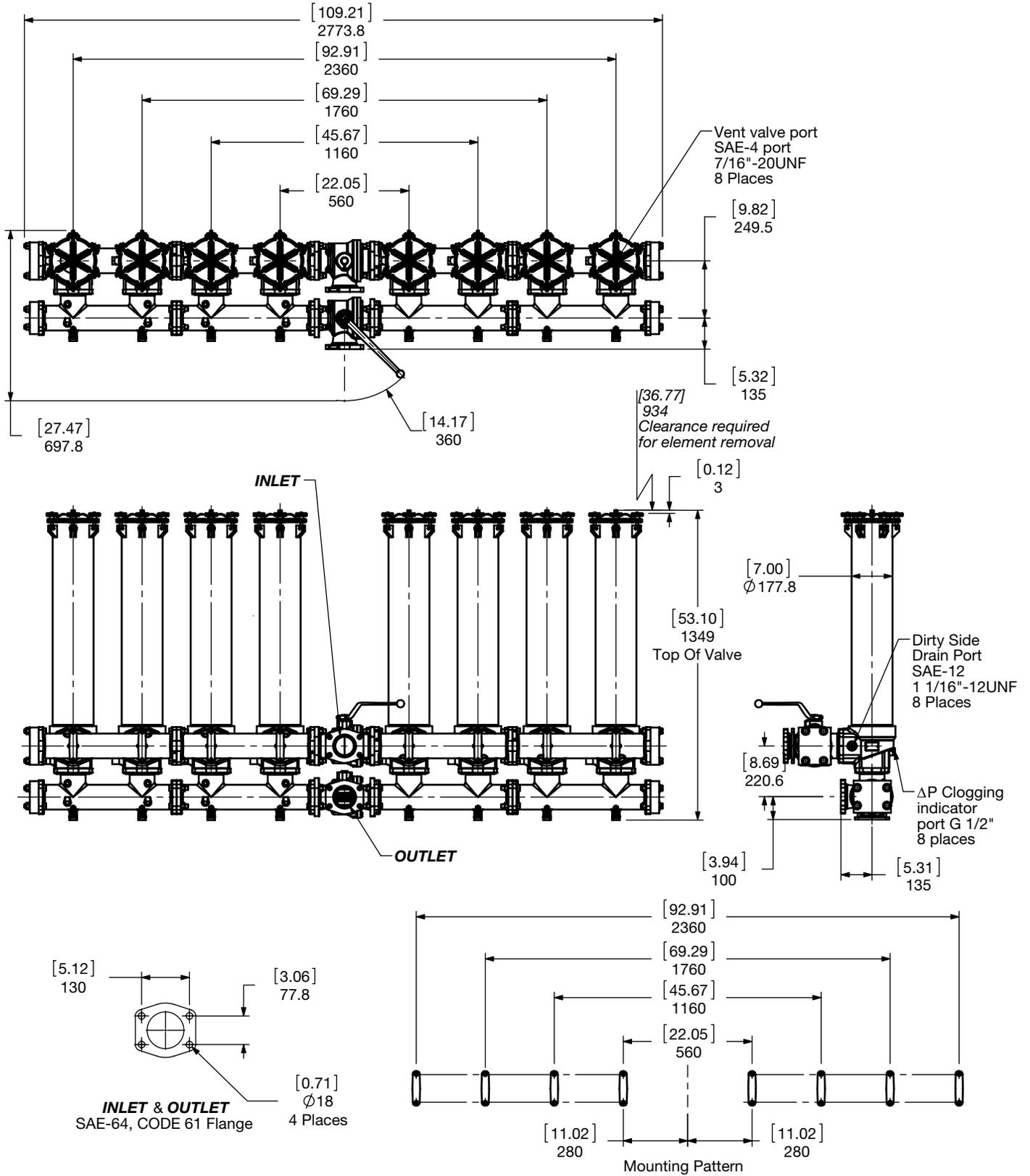


Size	7800
Weight (lbs.)	1008

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions:
NFHD 10400



Size	10400
Weight (lbs.)	1459

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

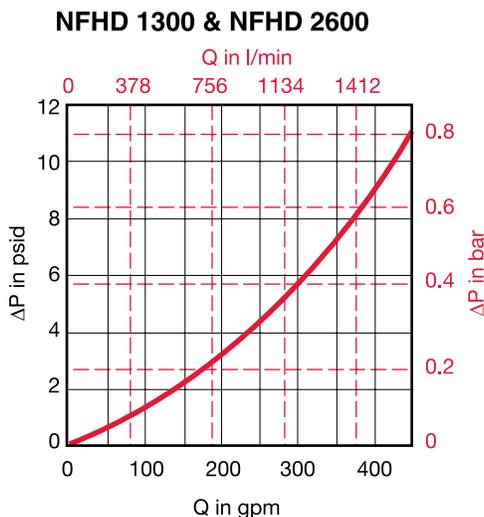
Housing Curve:

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 value in the table.

ΔP Housing



NFHD System	Multiplier
5200	93%
7800	83%
10400	74%

Example

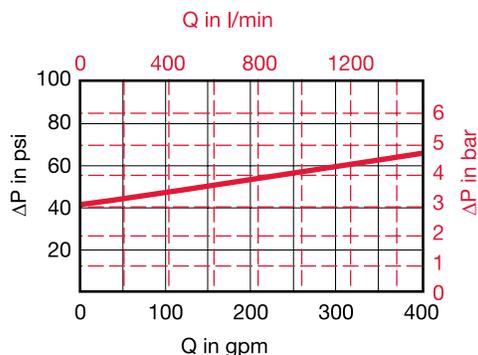
Conditions	
400 gpm flow	
NFHD 10400 manifold	
specified	= 9 psid
ΔP Curve	= 9 psid X 0.74
ΔP 10400	= 6.7 psid
Fluid Specific Gr	= .86 psid <small>Piping & Housing</small>
ΔP Total System = 6.7 psid ΔP Housing + ΔP Element	

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

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 (K) factors below and divide total flow rate by # towers per side.

$$\text{Element } \Delta P = \text{Elements (k) flow Factor} \times \frac{\text{total flow}}{\text{filter towers (on one side)}} \times \frac{\text{Actual Viscosity (SUS)}}{141} \times \frac{\text{Actual Sp Gravity}}{0.86} = 7.09 \text{ psid}$$

Example

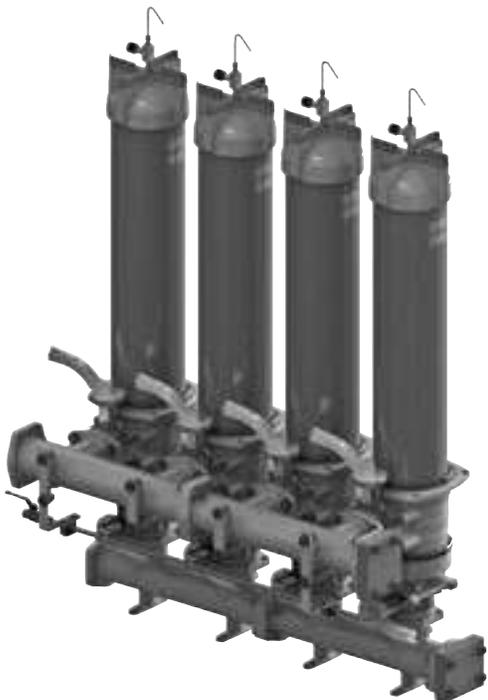
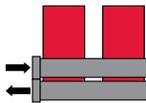
Conditions	Selection - NFDH 10400 Filter
Lube system	An NFHD 10400 filter (<i>with 4 towers</i>) gives an Adjusted Clean element ΔP as follows:
Viscosity of 1,000 SUS	Clean Assembly $\Delta P = \Delta P$ Housing & ΔP Element
Specific gravity 0.86	Clean $\Delta P = 400 \text{ gpm} \times 0.01 = 1.0 \text{ psid}$
400 gpm flow	4 towers
Low pressure drop essential	Clean $\Delta P_{\text{adj.}} = 1.0 \times \frac{1000}{141} \times \frac{0.86}{0.86} = 7.09 \text{ psid}$
10 μm Optimicron [®] filter element	Clean Assembly $\Delta P = 6.7 \text{ psid} + 7.09 \text{ psid} = 13.8 \text{ psid}$
	housing elements

LOW PRESSURE FILTERS

NF MMP Series

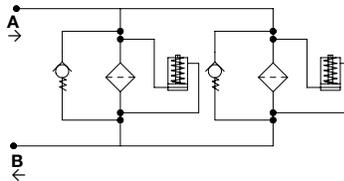
Manifold Modular Parallel Inline Filters - with ECOmicron®-fit option

360 psi • up to 450 gpm (4" header) • up to 1350 gpm (6" header)

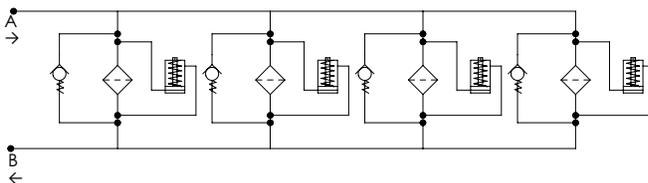


Hydraulic Symbol

NF 52XX Manifold Modular



NF 104XX Manifold Modular



Features

- Less weight/handling - reducing shipping costs
- Towers isolated individually
(versus NFD 5210 and up, duty-standby arrangement)
- Lower Clean ΔP *(less filters, elements, and piping)*
- Significant Cost Reduction *(less components, smaller footprint)*
- Ease of Operation/Maintenance *(less leakage points)*
- Uses NF Series proven housing and element technology
- Replacement Elements - Optimicron®, ECOmicron®-fit, ECOmicron® *(environmentally friendly, incinerable)*

Configurations

NF Optimicron® Size 5210, 7810, 10410

- Bypass located in element endcap

NF ECOmicron®-fit Size 5214, 7814, 10414

- Bypass separate, replaceable component

Applications



Pulp & Paper



Steel / Heavy Industry



Industrial

Technical Specifications

Mounting Method	See drawings	
Port Connection	4" SAE-64 Flange Code 61 <i>(with M16 bolts included)</i>	
Flow Direction	2.0 version	
	Inlet: Side	Outlet: Side
Construction Materials		
Head, Housing, Lid	Aluminum	
6" Piping headers	Carbon Steel	
Elbows, Manifolds	Ductile Iron	
Flow Capacity	DCP... 4" Header Piping	
5210, 5214, 7810, 7814, 10410, 10414	450 gpm (1700 lpm)	
	DC7... 6" Header Piping	
5210, 5214	900 gpm (3406 lpm)	
7810, 7810, 10410, 10414	1350 gpm (5110 lpm)	
Housing Pressure Rating		
Max. Allowable Working Pressure	360 psi (25 bar)	
Fatigue Pressure	360 psi (25 bar)	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
ON,	290 psid (20 bar)	
ECON2, ECO/N	145 psid (10 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)	
Consult HYDAC for applications below 14°F (-10°C)		
Fluid Compatibility		
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.		
Indicator Trip Pressure		
$\Delta P = 29$ psid (2 bar) -10%		
$\Delta P = 72$ psid (5 bar) -10%	2.0 - Differential	
Bypass Valve Cracking Pressure		
$\Delta P = 14.5$ psid (1 bar) +10%		
$\Delta P = 43$ psid (3 bar) +10% <i>(standard)</i>		
$\Delta P = 87$ psid (6 bar) +10%		

Model Code

NF ECO/N 5214 D C P 6 D 2.0 / A V B6 EM - DBV

Filter Type _____
 NF = Inline Filter

Element Media _____
 ON = Optimicron® ECON2 = ECOmicron®
 ECO/N = ECOmicron®-fit

Size _____
 5210, 7810, 10410 = ON, ECON2
 5214, 7814, 10414 = ECO/N

Operating Pressure _____
 D = 360 psi (25 bar)

Type of Isolation Valve _____
 C = Butterfly valves upstream and downstream

Type of Connection _____
 P = SAE DN 100 (4") Flange - Code 61
 7 = 6" ANSI CS 300lb. Flange

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2
 3, 6, 12, 25 = ECO/N

Type of ΔP Clogging Indicator _____
 A = No Indicator (plugged) B, BM, C, D, LE (Others available upon request)

Type Number / Modification Number _____
 2.0 = Inline Filter - ΔP indicator

Flow Path (facing Inlet manifold headers) _____
 A = Left inlet, Left outlet C = Left inlet, Right outlet
 B = Right inlet, Right outlet D = Right inlet, Left outlet

Seals _____
 (omit) = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard)
 B1 = 14.5 psid (1 bar) (lube or coolant)
 B6 = 87 psid (6 bar) (return line extended life)
 KB = no bypass (flushing system) } not available with ECON2

Supplementary Details _____
 SO263 = Modification of ON and W/HC elements for Skydrol or HYJET phosphate ester fluids
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 SFREE = Element specially designed to minimize electrostatic charge generation

EM = Manual vent valve set VKD = Drain manifold
 DBV = Double butterfly valve cRUus = Electrical Indicator with underwriter's recognition

Replacement Element Model Code (ON, ECON2)

2600 R 005 ON / V B6

Size _____
 2600

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = ECON2

Element Media _____
 ON, ECON2

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene Propylene rubber (EPDM)

Bypass Valve _____
 (omit) = 43 psid (3 bar) (standard) B1 = 14.5 psid (1 bar)
 B6 = 87 psid (6 bar) KB = no bypass

Supplementary Details _____
 SO263 = (See above) SFREE = (See above)

Replacement Element Model Code (ECO/N)

1.14.39D 6 ECO/N - V

Size _____
 1.14.39D

Filtration Rating (micron) _____
 3, 6, 12, 25 = ECO/N

Element Media _____
 ECO/N

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

Clogging Indicator Model Code

VM 5 BM . X /

Indicator Prefix _____
 VM = ΔP, G 1/2" 3000 psi
 VD = ΔP G 1/2" 6000 psi
 (2.0 ver. - LE Indicators only)

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

Type of Indicator _____
 A = No indicator, plugged port
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT
 LE = Electric switch and pop-up

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene Propylene rubber (EPDM)

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

Thermal Lockout (VM type C, D, J, J4 only) _____
 T100 = Lockout below 100°F

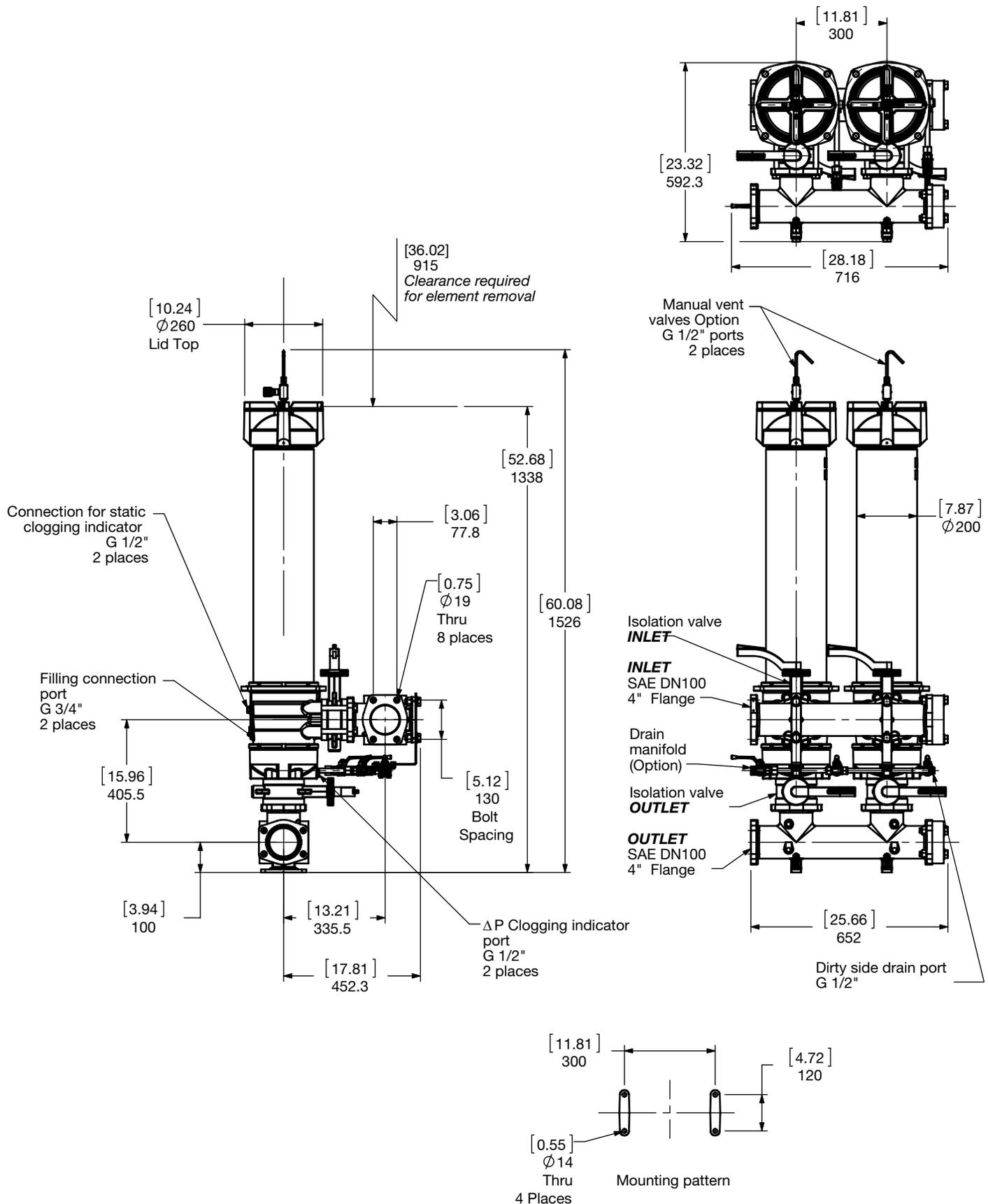
Underwriter's Approval (VM type C, D, J, J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition
 (For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions

NF 5210 2.0 Version (Modular Parallel)

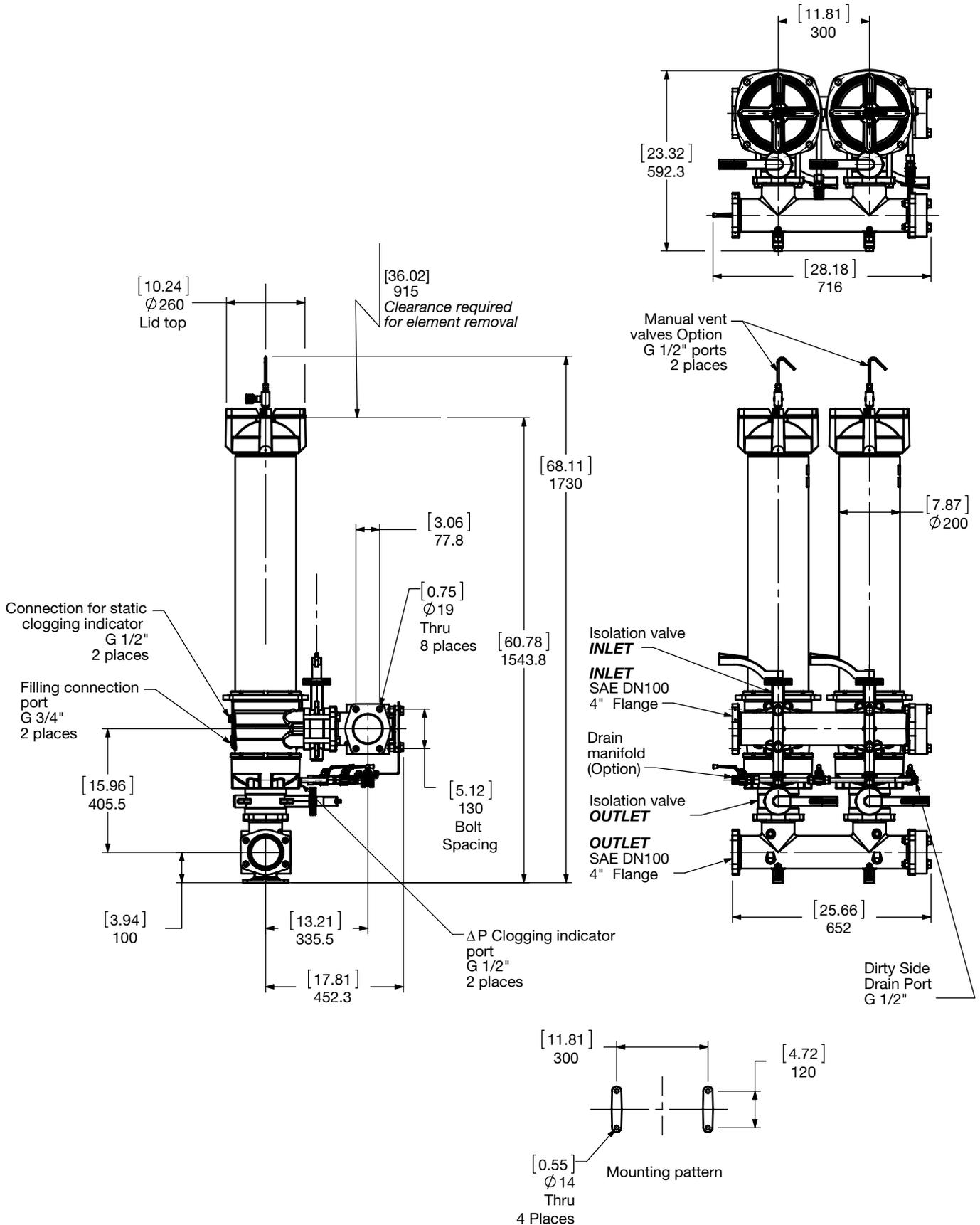


Size	5210
Weight (lbs.)	287

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions: NF 5214 2.0 Version (Modular Parallel)



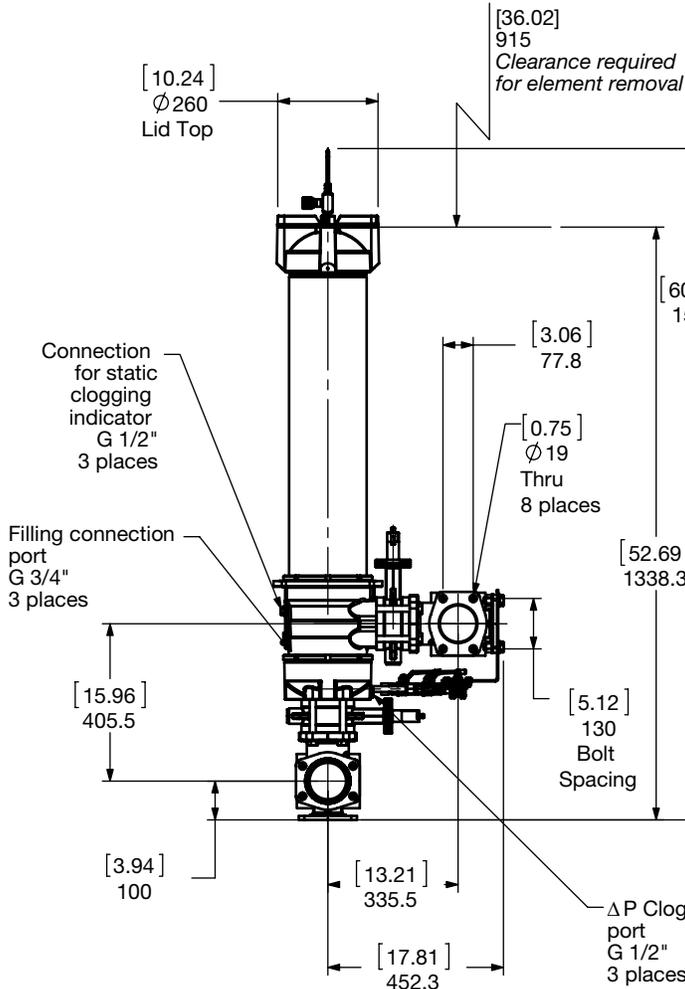
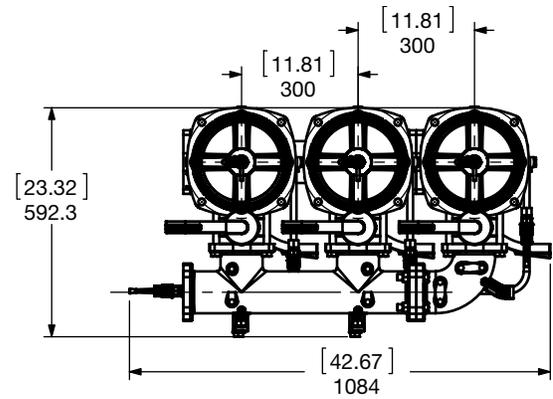
Size	5214
Weight (lbs.)	291

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

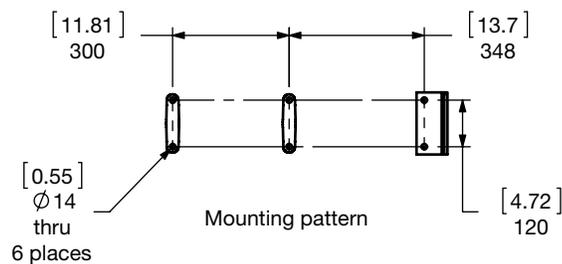
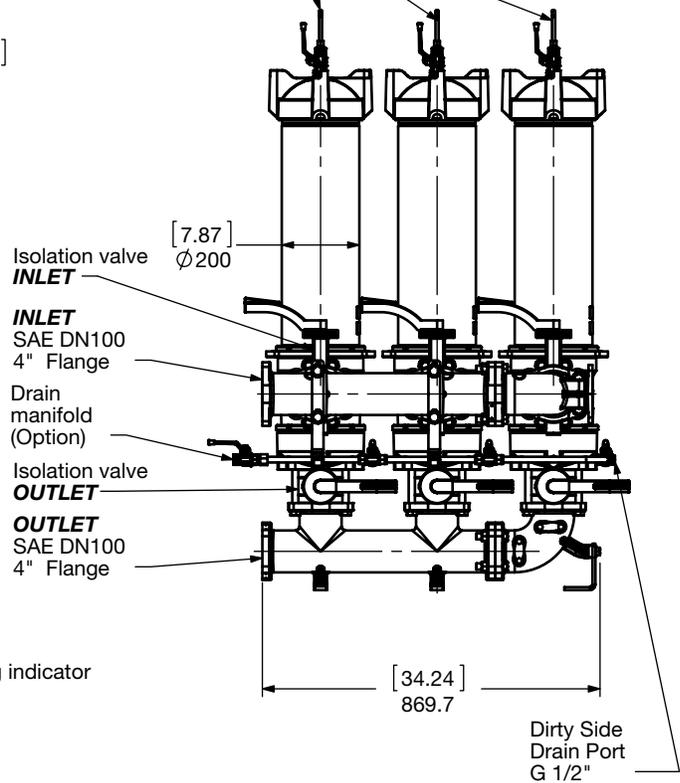
LOW PRESSURE FILTERS

Dimensions:

NF 7810 2.0 Version (Modular Parallel)



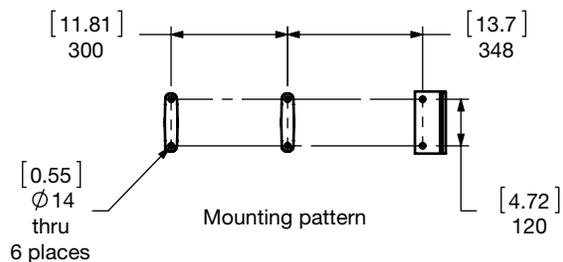
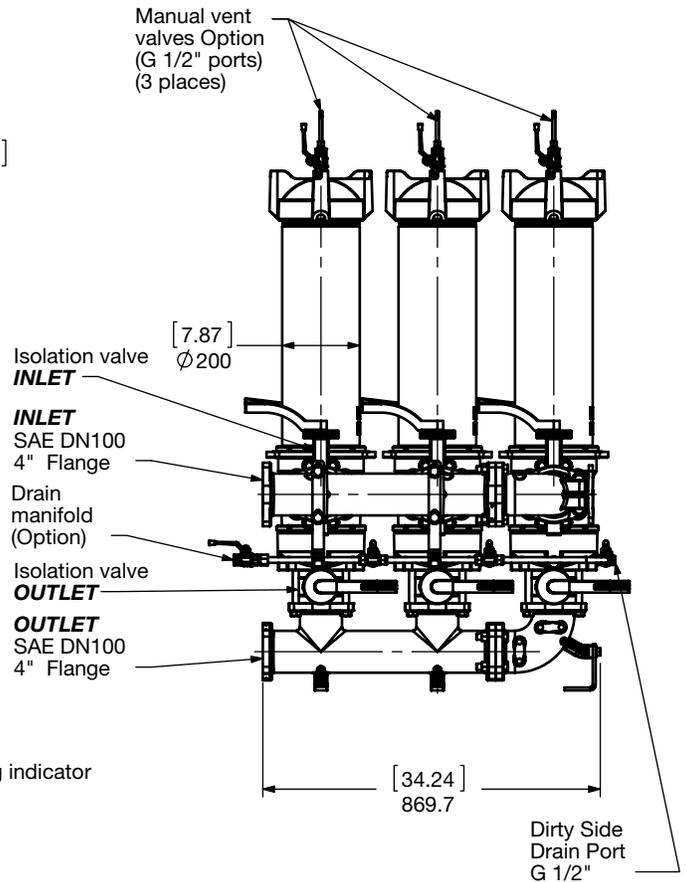
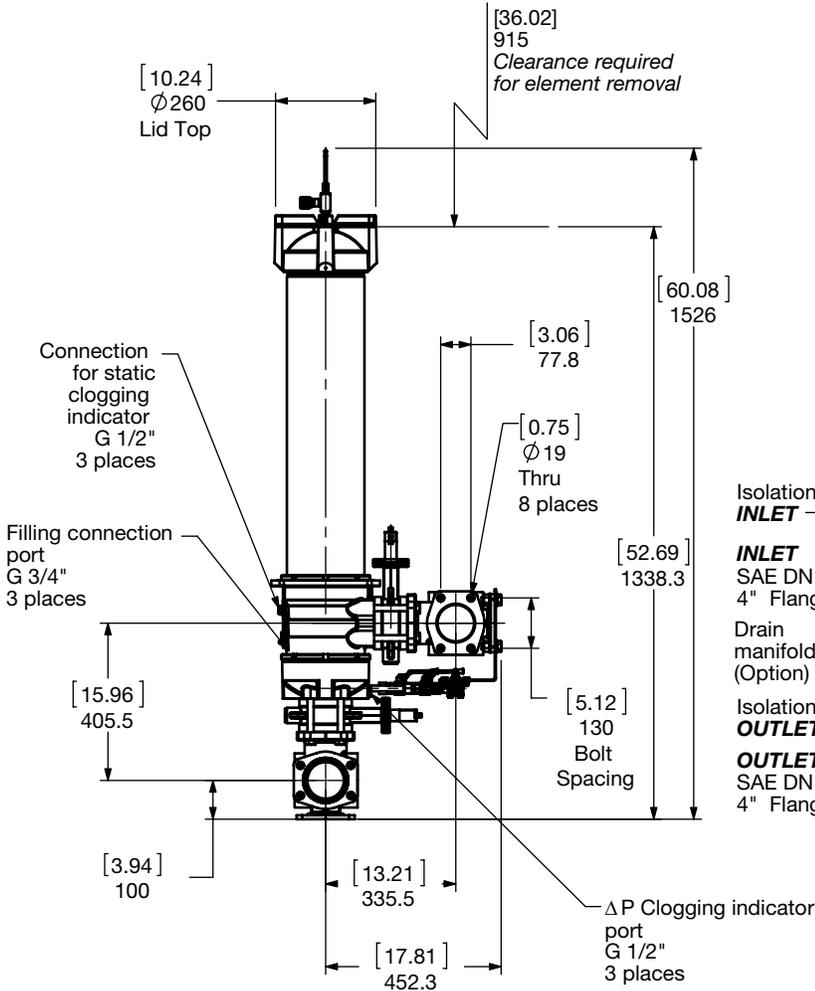
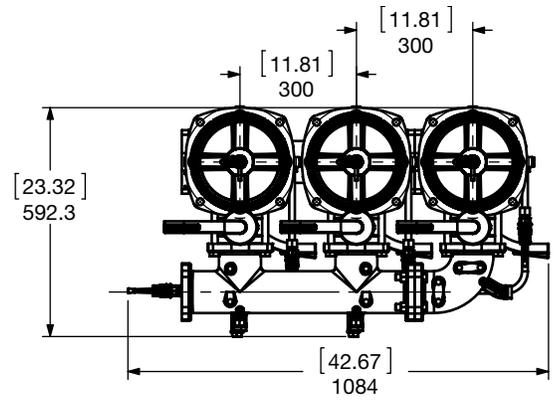
Manual vent valves Option
(G 1/2" ports)
(3 places)



Size	7810
Weight (lbs.)	370

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 7814 2.0 Version (Modular Parallel)



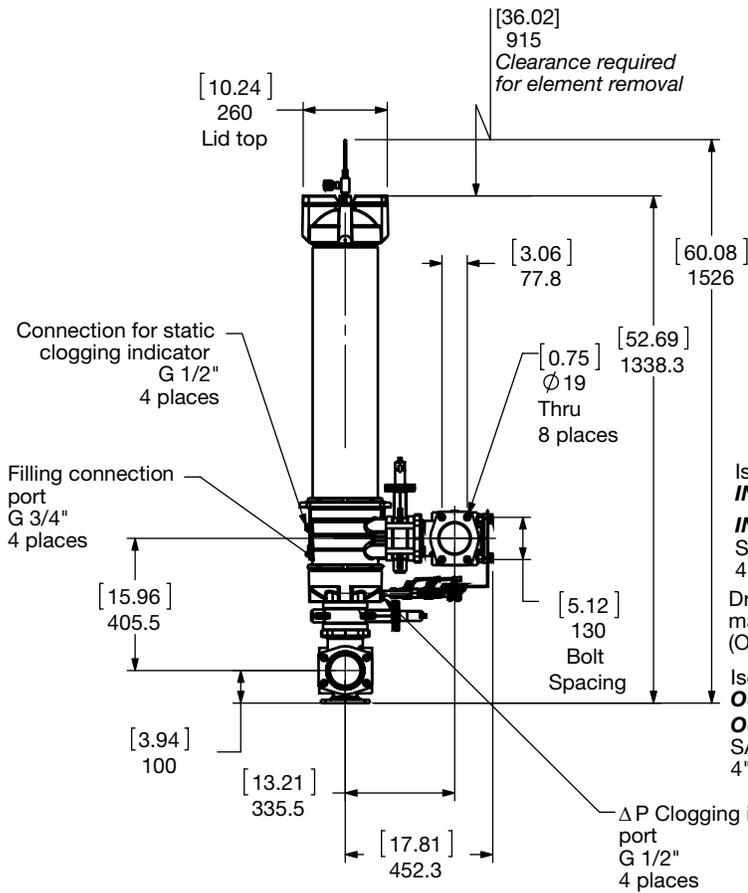
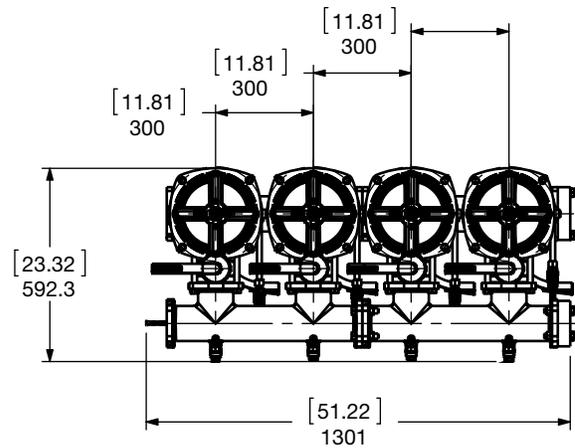
Size	7814
Weight (lbs.)	380

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

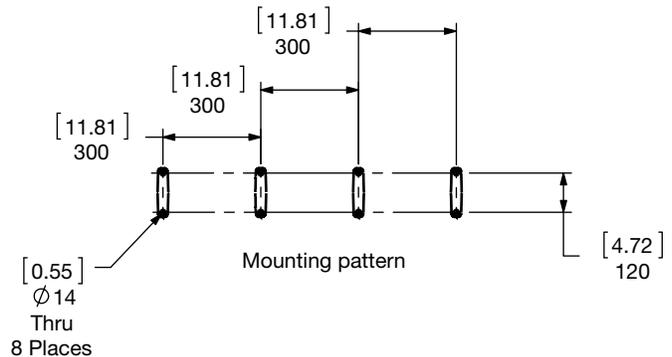
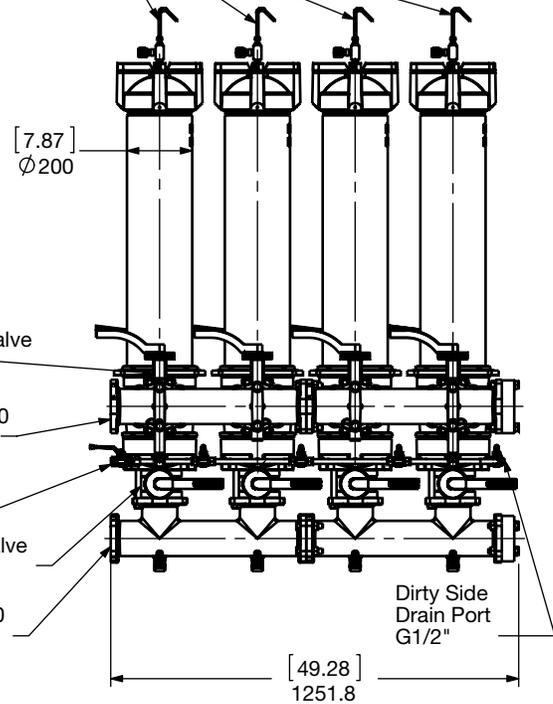
LOW PRESSURE FILTERS

Dimensions:

NF 10410 2.0 Version (Modular Parallel)



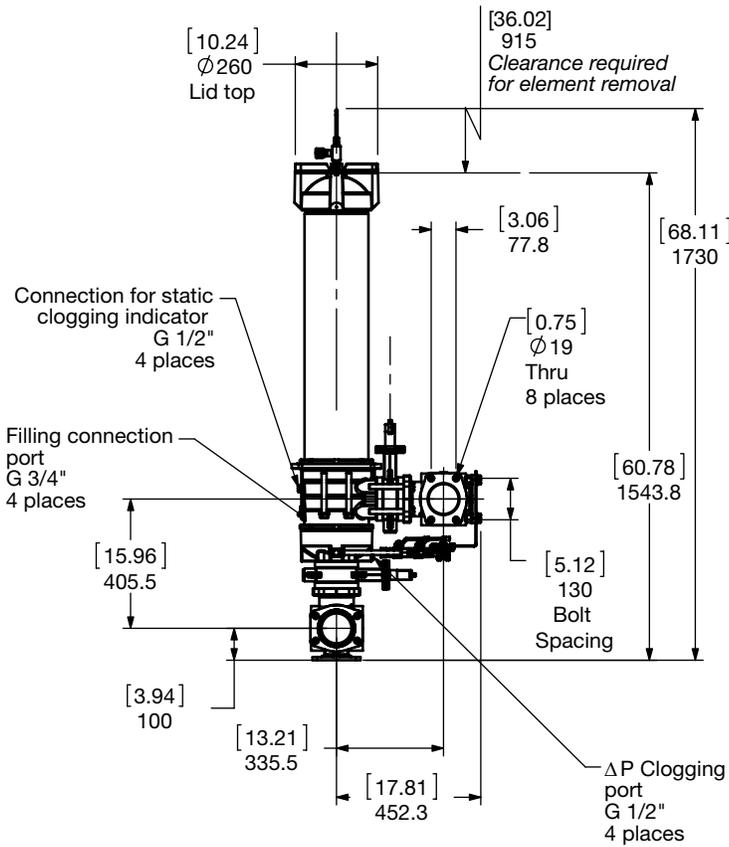
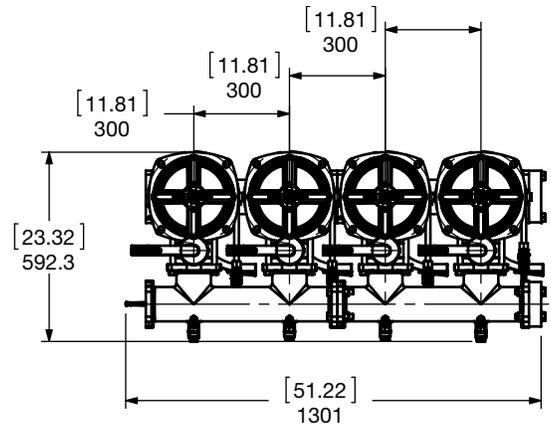
Manual vent valves Option (G 1/2" ports) (4 places)



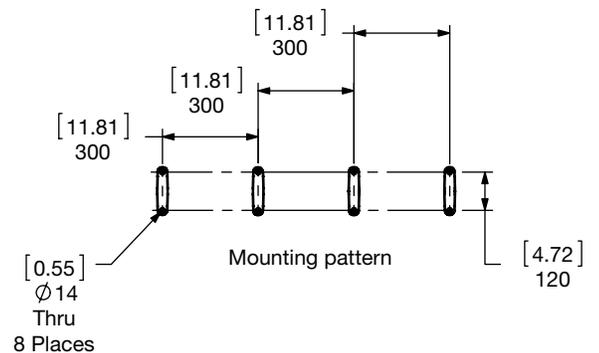
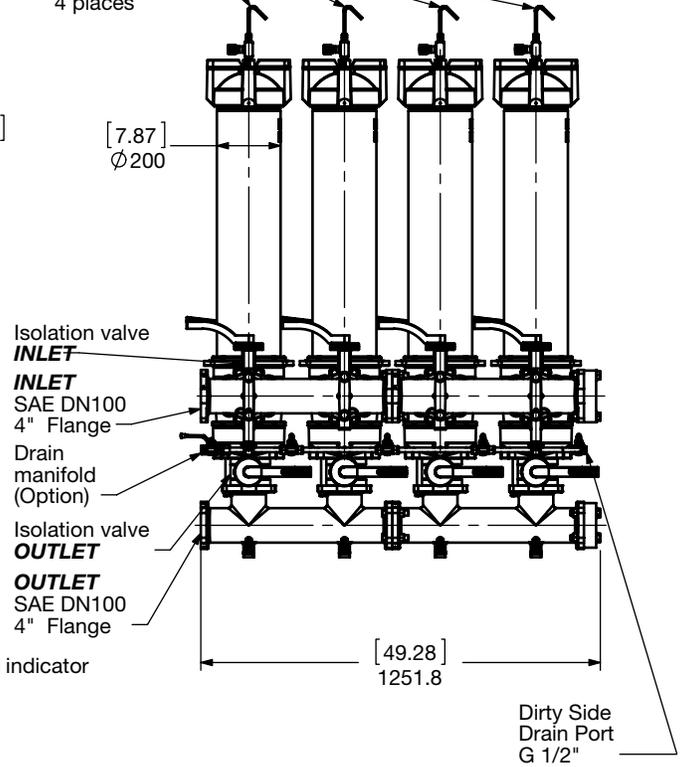
Size	10410
Weight (lbs.)	554

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 10414 2.0 Version (Modular Parallel)



Manual vent valves Option G 1/2" ports 4 places

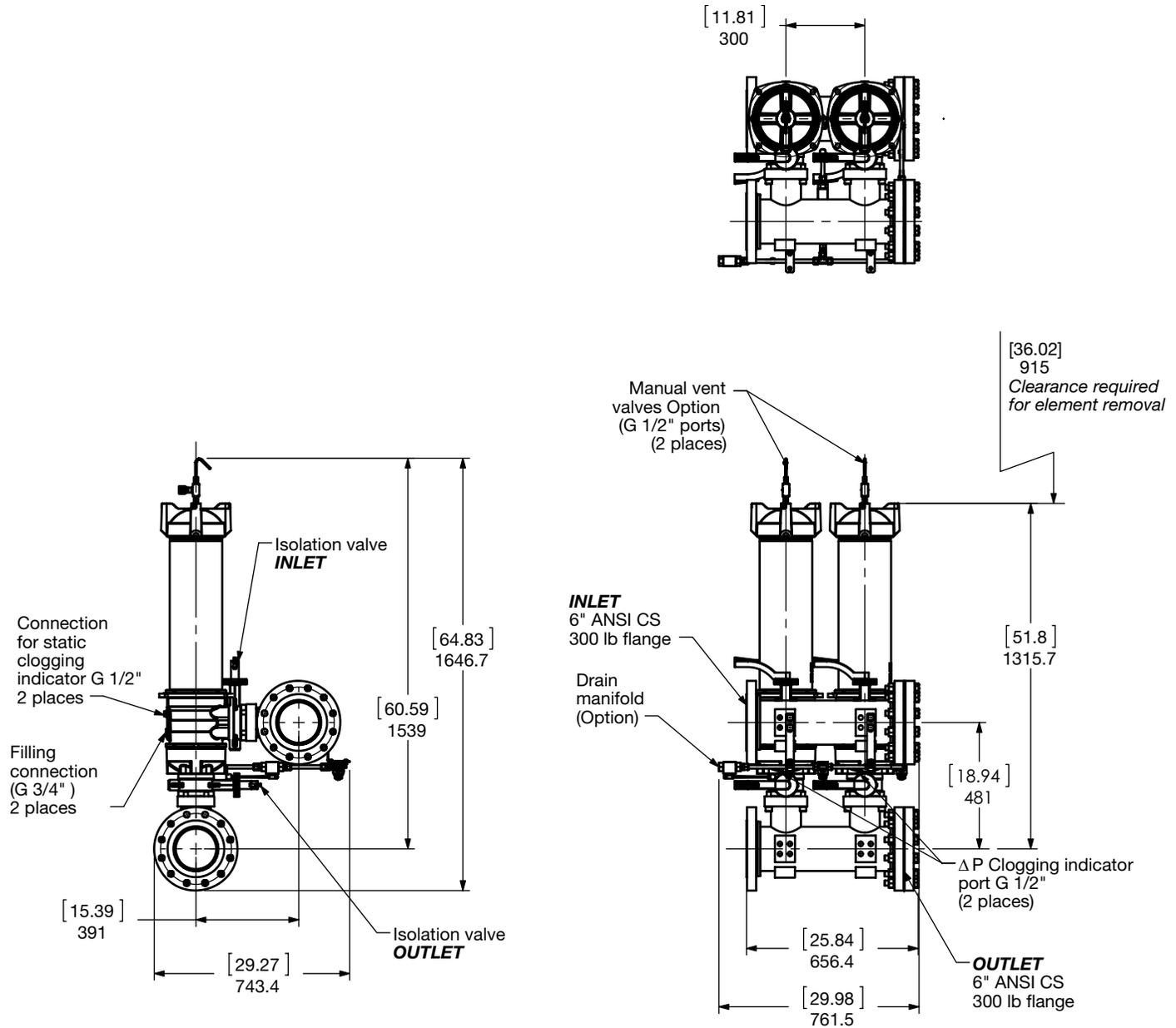


Size	10414
Weight (lbs.)	562

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

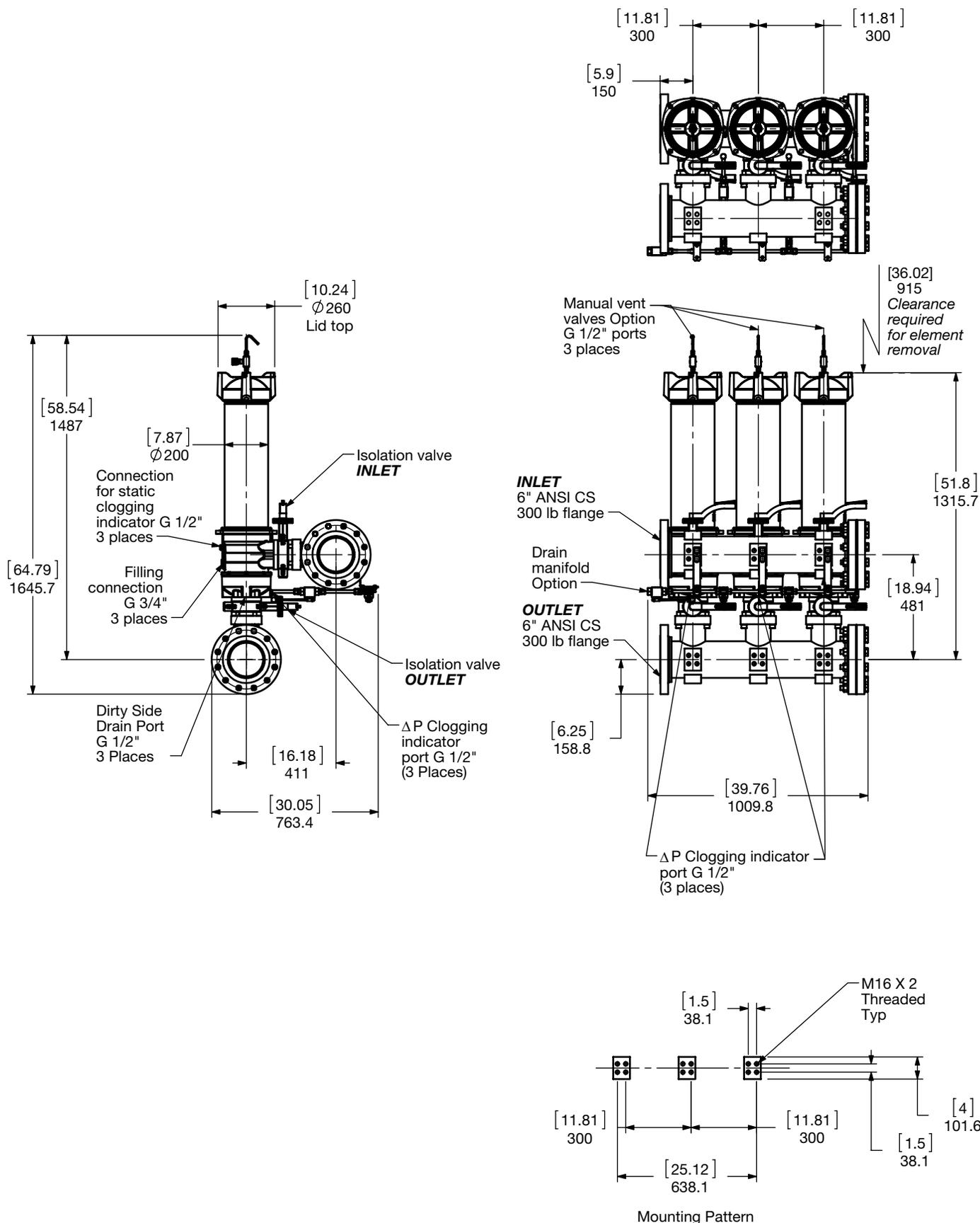
Dimensions:
NF 5210DC7 2.0 Version (Modular Parallel High Flow)



Size	5210DC7
Weight (lbs.)	530

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions: NF 7810DC7 2.0 Version (Modular Parallel High Flow)



Size	7810DC7
Weight (lbs.)	679

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

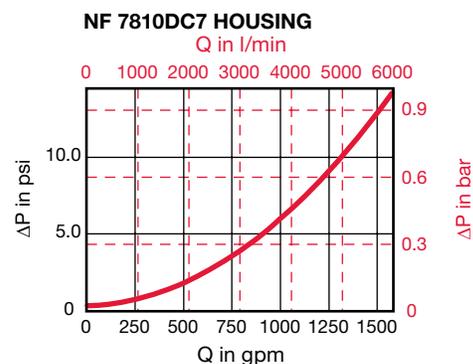
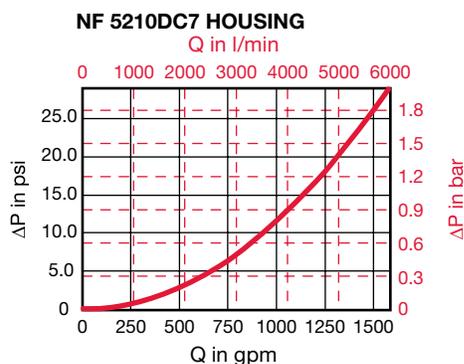
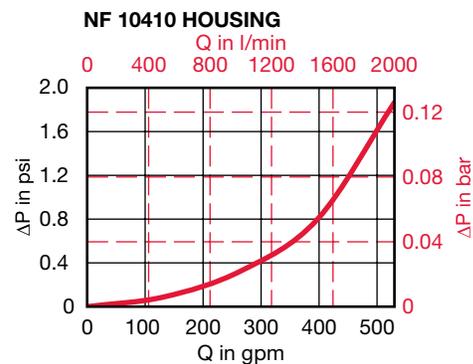
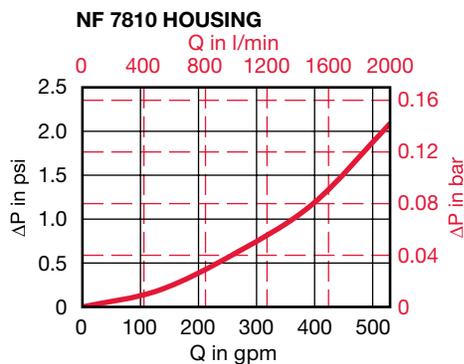
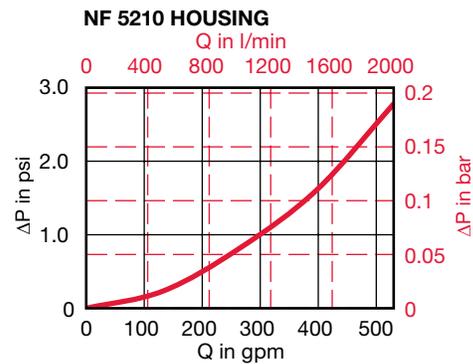
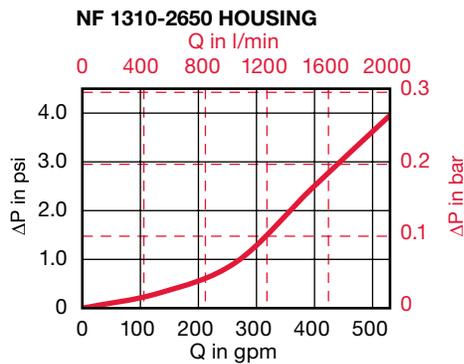
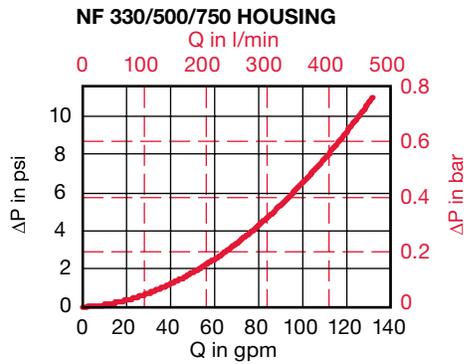
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

MF, MFD, MFDS Series

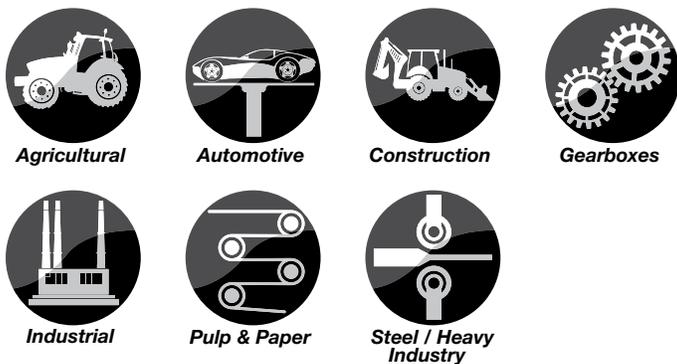
Spin-On Filters
250 PSI • up to 120 GPM



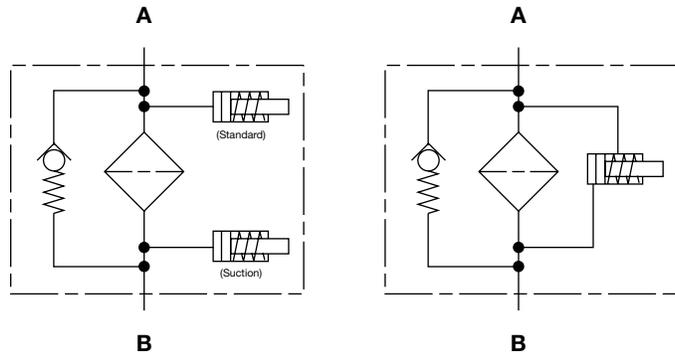
Features

- 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 are designed to be used with hydrocarbon based fluids only – (not suitable for use with high water based fluids or phosphate esters)
- MF Filters are available in static and differential pressure sensing configurations.
- Static Indication for Mobile/Return Applications - Sizes 40/80/85/160/180
- Differential Indication for Inline Applications - Sizes 90/95/190/195

Applications



Hydraulic Symbol
MF 80/85/160/180 MF 90/95/190/195



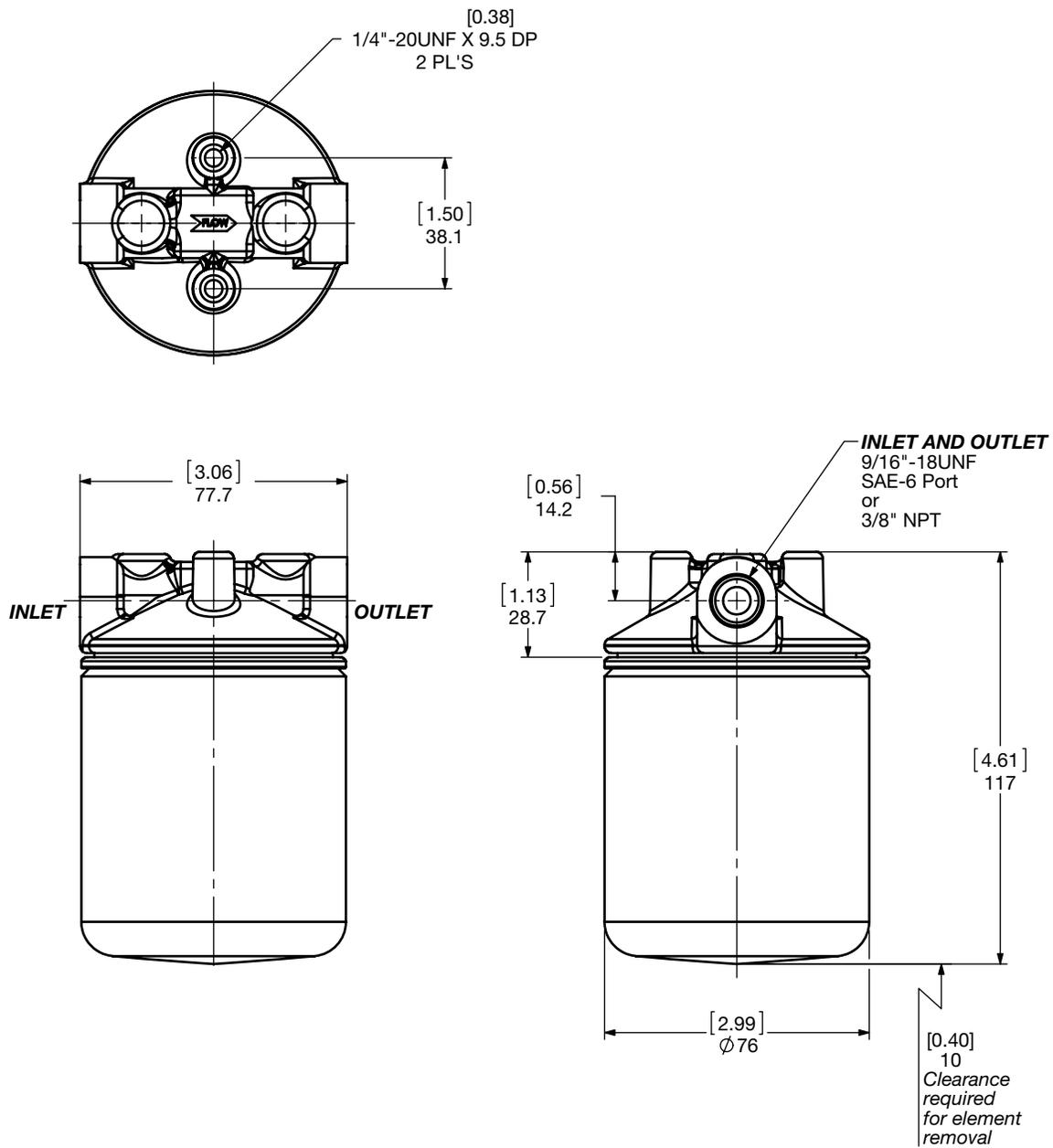
Technical Specifications

Mounting Method		
MF40/80/85	2 mounting holes	
MF90/95	3 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	
*Note: Max. allowable torque for flanged ports is 26 ft-lbs (1/2" - 13 UNC bolts)		
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. Allowable		
Working Pressure**	120 psi (8 bar)	250 psi (17 bar)
Fatigue Pressure	Contact HYDAC	
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
BN, P, AM	80 psid (5.5 bar)	
Fluid Temp. Range -14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)		
Fluid Compatibility Compatible with all petroleum oils and synthetic fluids rated for use with Nitrile rubber (NBR) seals and aluminum and steel metals		
Indicator Trip Pressure		
20 psid (1.4 bar) -10%	ΔP Units (Differential) ΔP 14.5 psid (1 bar) - 10%	
25 psid (1.7 bar) -10%	ΔP 22 psid (1.5 bar) - 10%	
40 psid (2.7 bar) (B3.4 Bypass)	ΔP 44 psid (3 bar) - 10%	
Vacuum = 2 psid (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/surface type filters)		
ΔP = 50 psid (3.4 bar) +10% (standard for absolute/depth filters)		
(standard for absolute/depth type BN filters, MF 80/90/95/160/180/190/195, MFD 160/180, MFDS 160/180)		

**Note: All MF, MFD, MFDS MAWP reduce to 60 psi (4 bar) when using the following "VMF" indicators: B, BM, E, ES, GC, LE, LZ.

LOW PRESSURE FILTERS

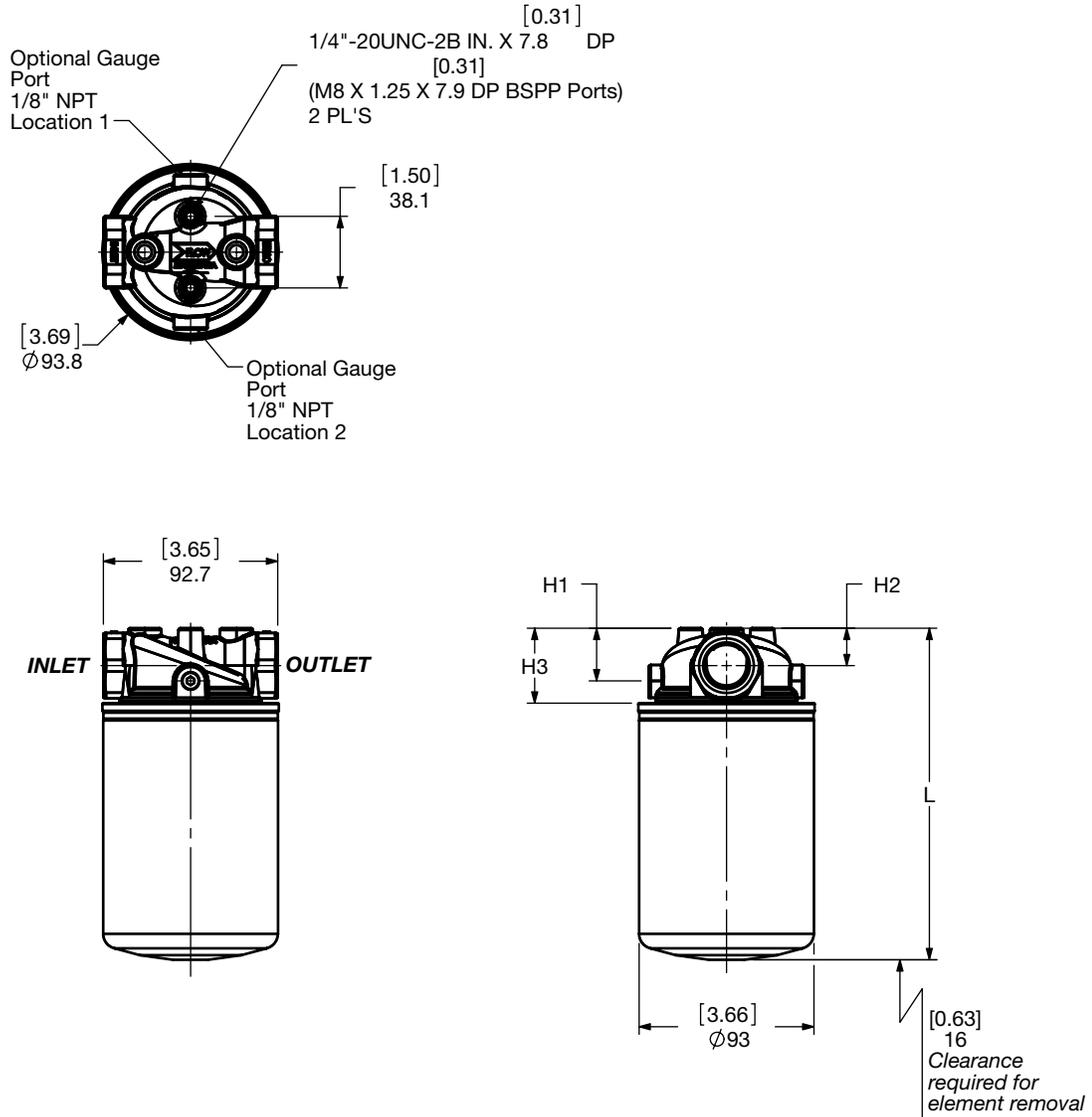
Dimensions
MF 40



Size	40
Weight (lbs.)	1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions MF 80 / 85



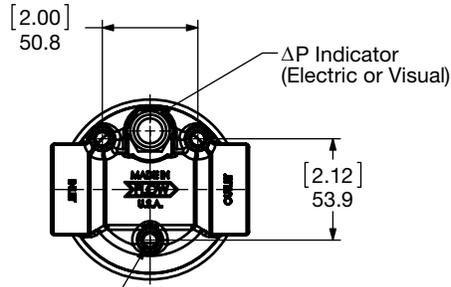
SIZE	PORT SIZE (INLET & OUTLET)	H1	H2	H3	L
MF80	3/4" NPT	[1.12] 28.4	[0.79] 20.1	[1.52] 38.6	[6.89] 175
	3/4" BSPP				
	SAE-12				
	1" NPT	[1.42] 36.1	[1.91] 23.1	[1.83] 46.5	[7.20] 182.9
	SAE-16				
MF85	3/4" NPT	[1.12] 28.4	[0.79] 20.1	[1.52] 38.6	[9.61] 244.1
	3/4" BSPP				
	SAE-12				
	1" NPT	[1.42] 36.1	[0.91] 23.1	[1.83] 46.5	[9.92] 252
	SAE-16				

Size	80	85
Weight (lbs.)	1.8	2.2

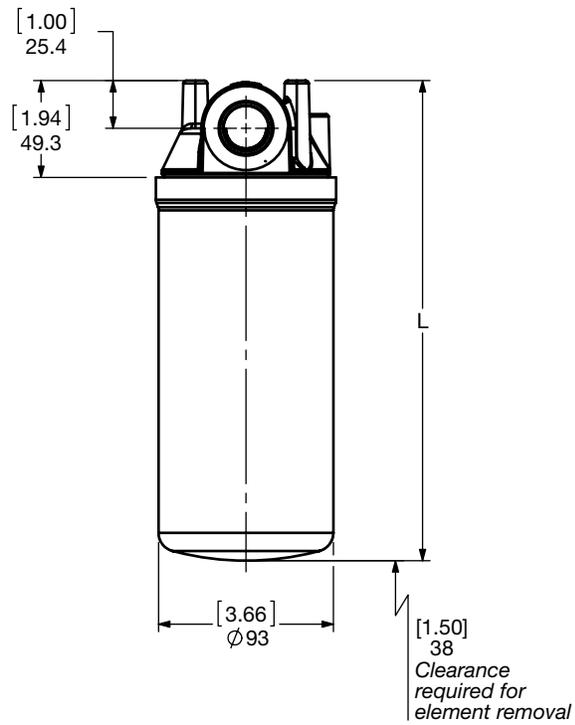
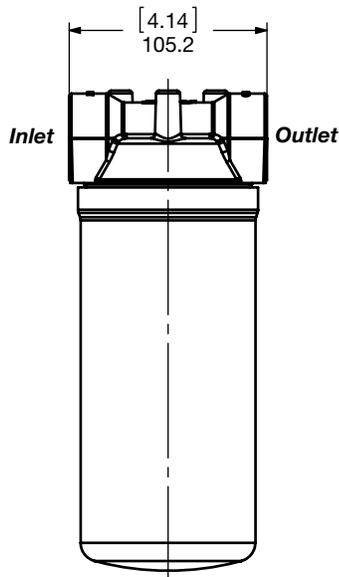
Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions MF 90 / 95



5/16"-18UNC-2B X [0.50]
12.7
(M10 X 1.5 [0.55] For BSPP Port)
14
3 PL'S



SIZE	PORT SIZE (INLET & OUTLET)	L
MF90	3/4" NPT	[7.20] 182.9
	3/4" BSPP	
	SAE-12	
	1" NPT	
	SAE-16	
MF95	3/4" NPT	[7.82] 198.7
	3/4" BSPP	
	SAE-12	
	1" NPT	
	SAE-16	

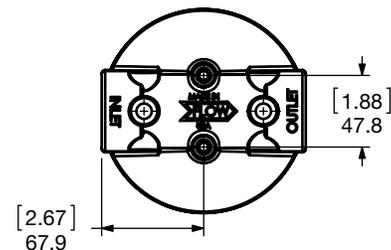
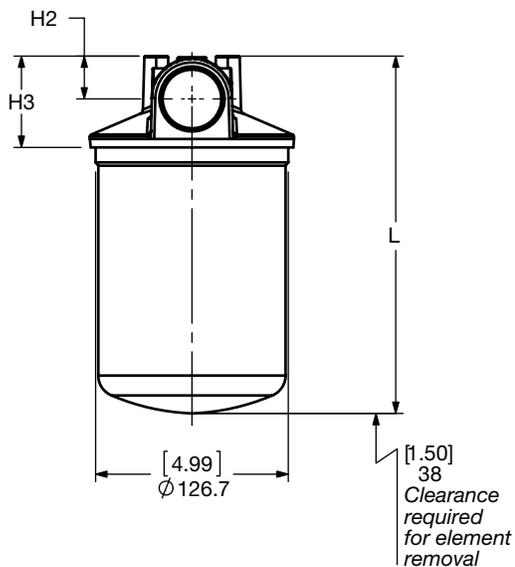
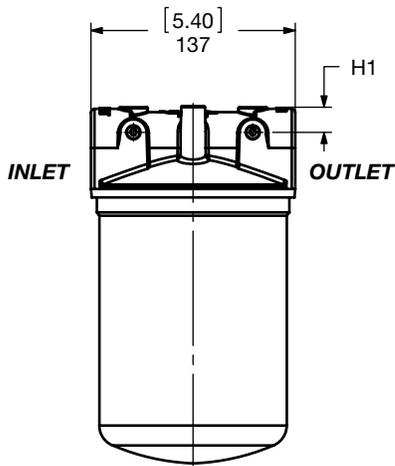
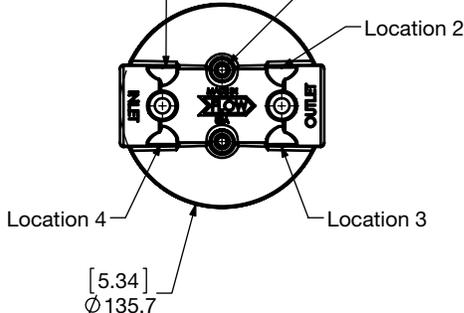
Size	90	95
Weight (lbs.)	2.7	3.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

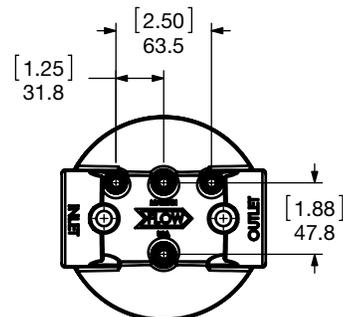
Dimensions MF 160 / 180

Gauge port options (1/8" NPTF)
Location 1
(Locations 1 thru 4)

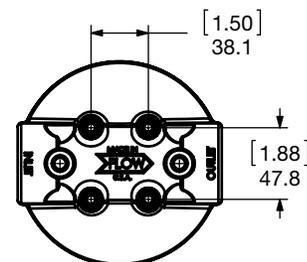
5/16"-18UNC-2B X 14.2 DP
[0.78]
(M10 X 1.5 X 20 DP for BSPP ports)
2 PL'S



1 1/4" BSPP
SAE-20
(2 Bolt Mounting)



1 1/2" NPTF
SAE-24
(3 Bolt Mounting)
(Special Order)



1 1/4" NPTF
SAE-20
(4 Bolt Mounting)

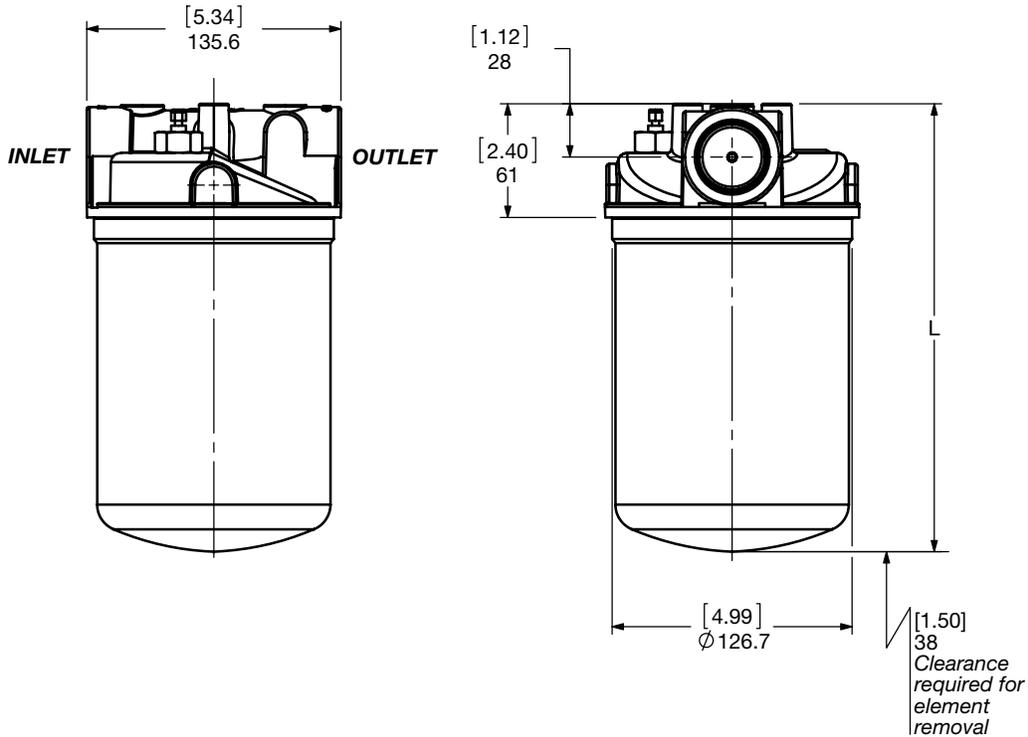
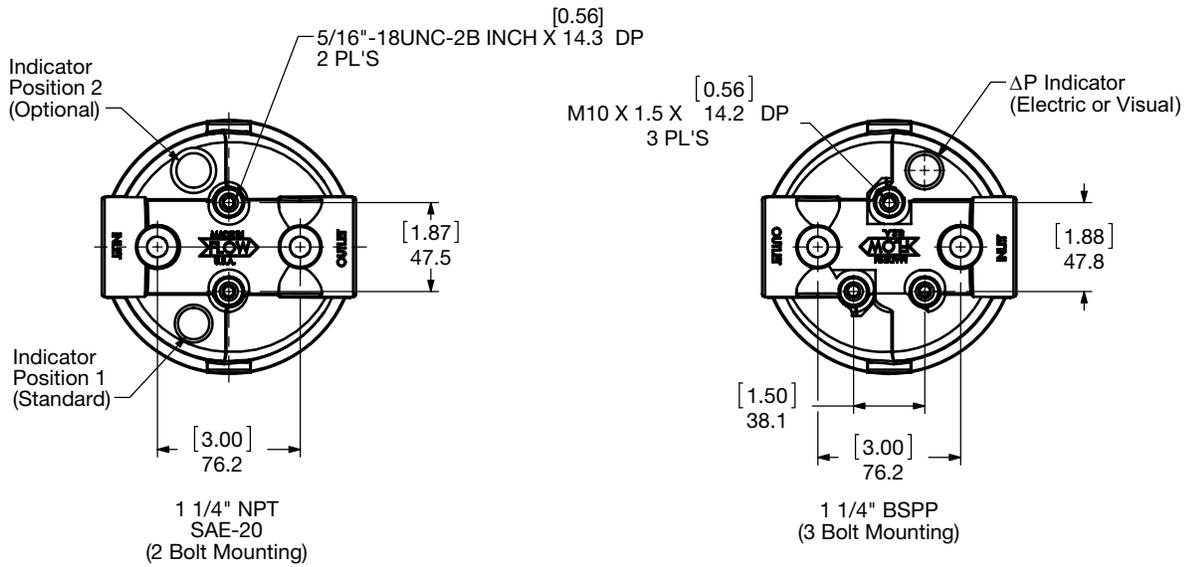
SIZE	PORT SIZE (INLET & OUTLET)	H1	H2	H3	L
MF160	1 1/4" BSPP	[0.79] 20.1	[1.08] 27.4	[2.35] 59.7	[9.35] 237.5
	1 1/4" NPT				
	SAE-20	[1.10] 27.9	[1.30] 33	[2.80] 71.1	[9.80] 248.9
	1 1/2" NPT				
MF180	1 1/4" BSPP	[0.79] 20.1	[1.08] 27.4	[2.35] 59.7	[13.35] 339.1
	1 1/4" NPT				
	SAE-20	[1.10] 27.9	[1.30] 33	[2.80] 71.1	[13.80] 350.5
	1 1/2" NPT				
	SAE-24				

Size	160	180
Weight (lbs.)	5.1	7.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

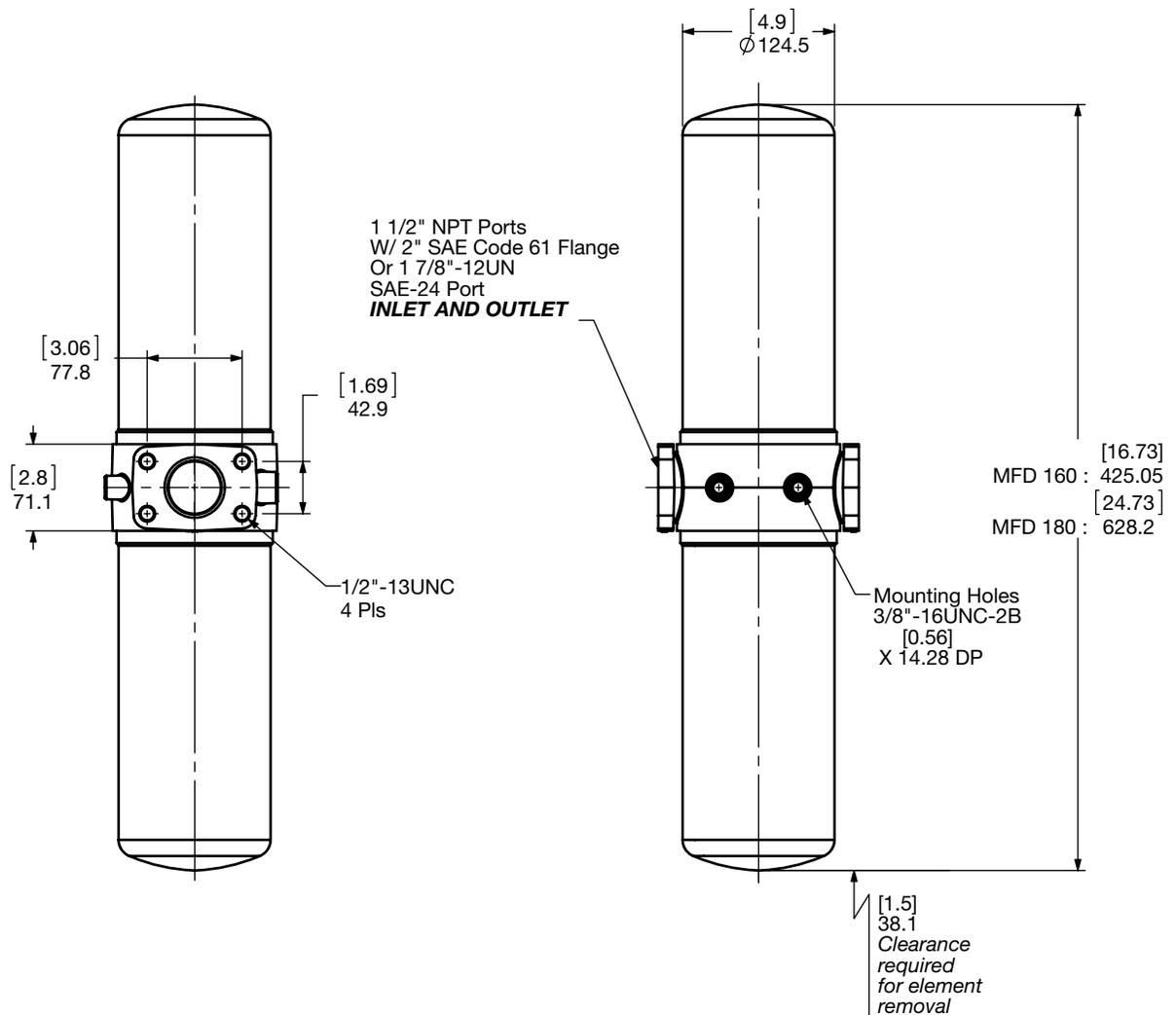
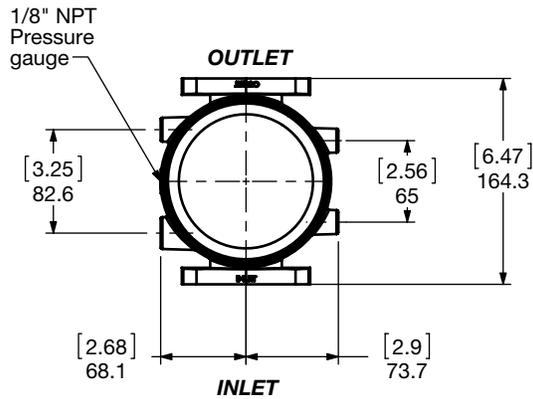
Dimensions MF 190 / 195



Size	190	195
Weight (lbs.)	4.3	5.4

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions MFD 160 / 180



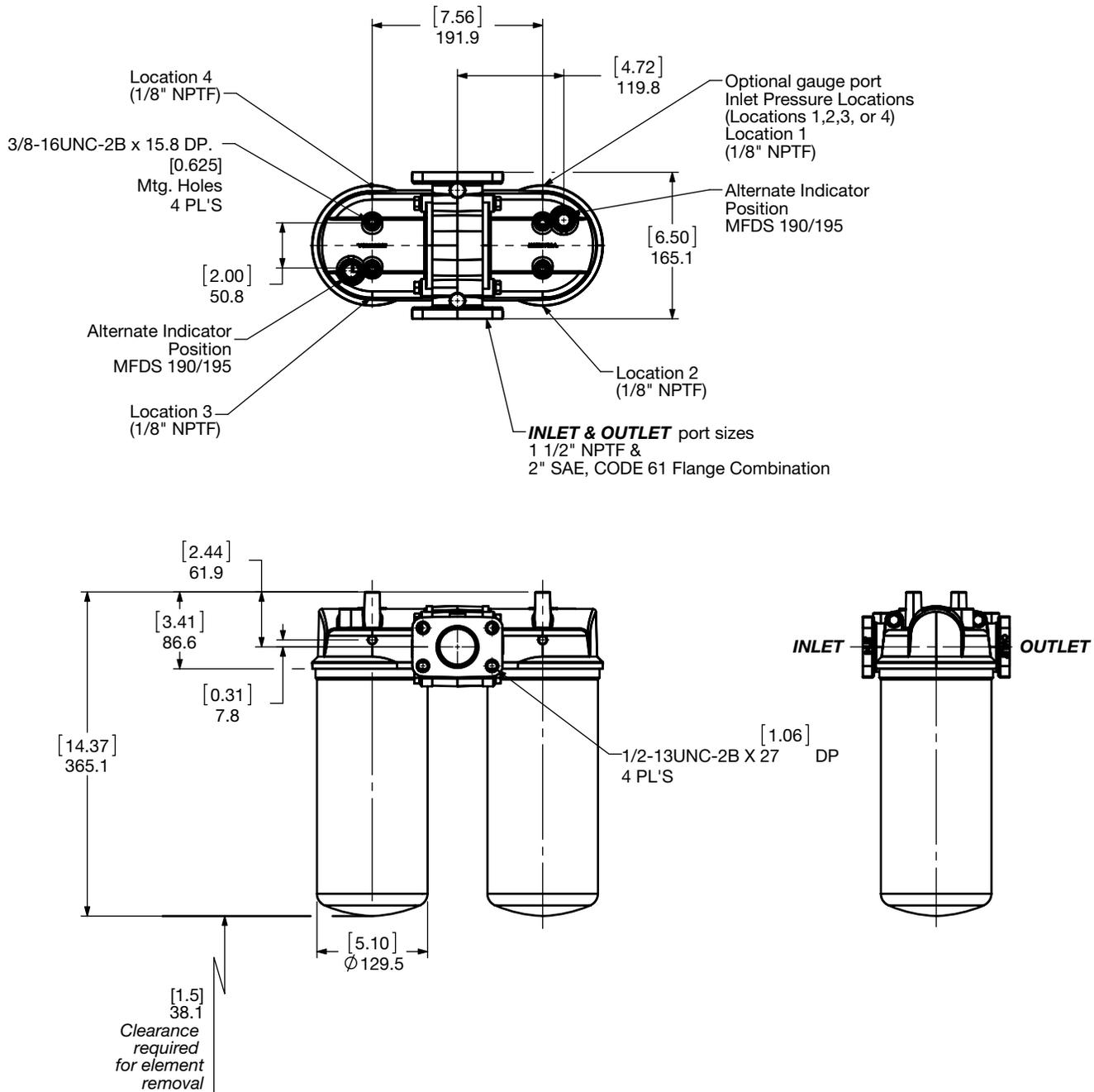
Size	160	180
Weight (lbs.)	8.8	11

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

LOW PRESSURE FILTERS

Dimensions

MFDS 160 / 180 / 190 / 195



Size - MFD	160	180	190	195
Weight (lbs.)	11.6	13.8	8.8	11

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

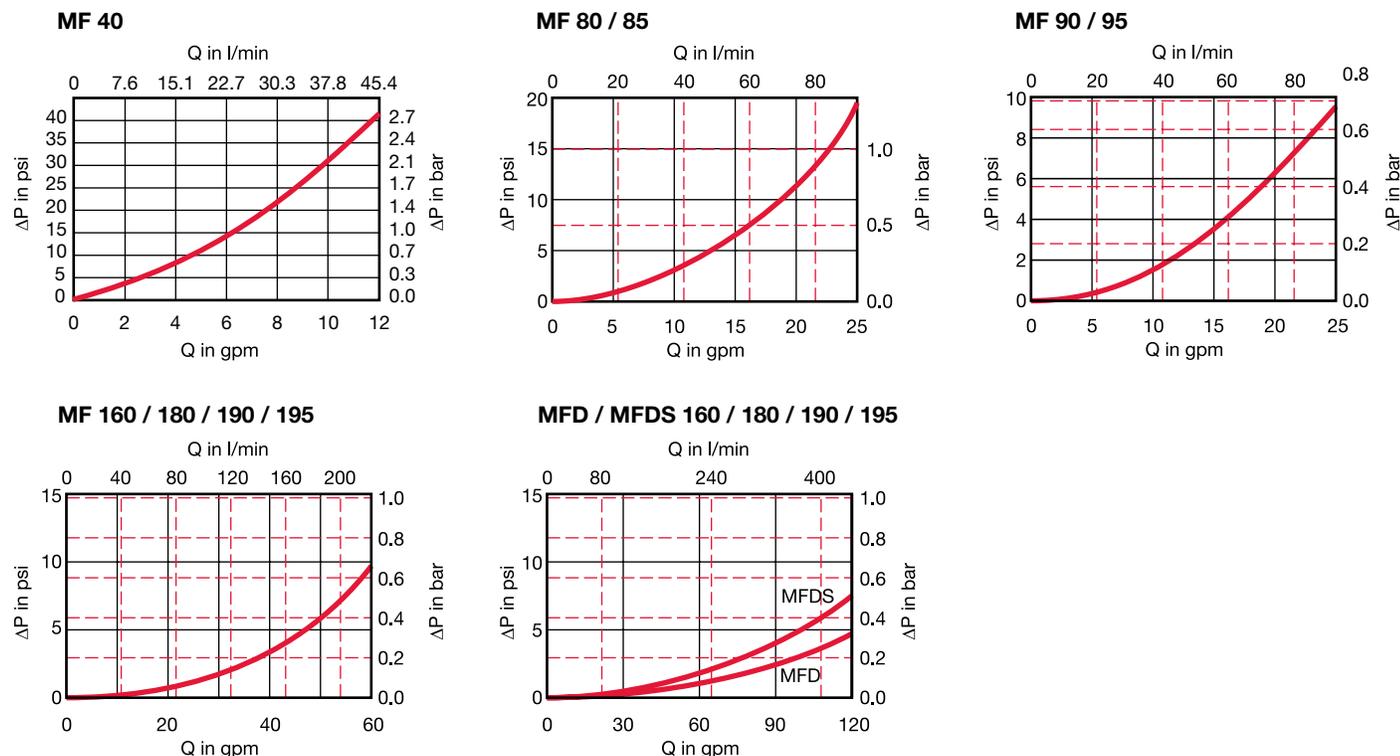
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Aquamicon 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

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

(From Tables Below)

Size	...MA...BN			
	3 μm	5 μm	10 μm	20 μm
0040	—	1.1799	0.6289	0.3613
0080	—	0.4423	0.2357	0.1354
0090	0.4841	0.3702	0.3451	0.1911
0095	0.2762	0.2112	0.1969	—
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	—
0090	—	0.482	—
0095	0.894	0.270	—
0160	0.839	0.192	0.145
0180	0.443	0.134	0.087

Size	...MA...AM
	010 μm
0080	0.513
0085	—
0090	0.507
0095	0.284
0160	0.233
0180	0.136

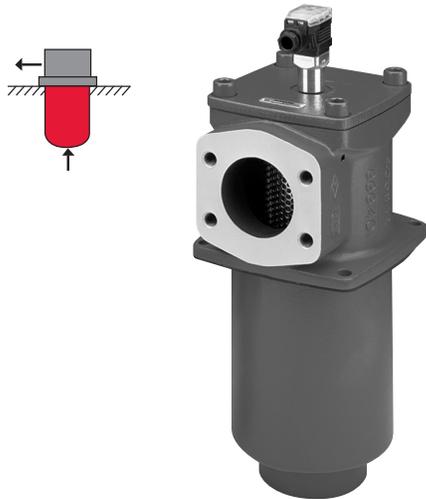
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

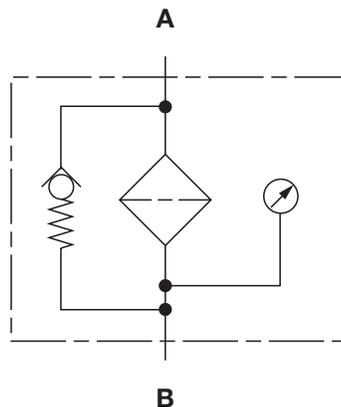
SF Series

In-tank Suction Filters

360 psi • up to 200 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 rubber, fluorocarbon elastomer, or ethylene propylene rubber) 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, located in element end cap, with low cracking pressure prevents pump cavitation.

Technical Specifications

Mounting Method	4 mounting holes - filter head	
Port Connection	Inlet	Outlet
110	3/4" SAE-12 3/4" BSPP 3/4" SAE-12	3/4" SAE-12 3/4" BSPP 3/4" NPT
240	1 1/4" SAE-20 1 1/4" BSPP 1 1/4" SAE-20	1 1/4" SAE-20 1 1-4" BSPPP 1 1/4" NPT
330	2" NPT 2" BSPP 2" NPT 2" NPT	2" SAE-32 2" BSPP 2" SAE CODE 61 1 1/4" SAE-20
950	3 1/2" SAE Code 61	3 1/2" SAE Code 61
1300	4" SAE Code 61	4" SAE Code 61
Flow Direction	Inlet: Bottom	Outlet: Side
Construc. Materials	Housing	Lid
SF 110-330	Aluminum	Aluminum
SF 950-1300	Ductile Iron	Ductile iron
Flow Capacity		
110	5 gpm (20 lpm)	
240	15 gpm (57 lpm)	
330	30 gpm (114 lpm)	
950	175 gpm (662 lpm)	
1300	200 gpm (757 lpm)	
Housing Pressure Rating		
Max. allowable working pressure	360 psi (25 bar)	
Fatigue Pressure	360 psi (25 bar) @ 700,000 cycles	
Burst Pressure	110	1080 psi (75 bar)
	240	1230 psi (85 bar)
	330	1440 psi (100 bar)
	950-1300	>1440 psi (100 bar)
Element Collapse Pressure Rating		
W/HC	290 psid (20 bar)	
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C)	
	Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility		
	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected	
Indicator Trip Pressure		
	$\Delta P = 3 \text{ psi (0.2 bar) } -10\%$ (standard)	
Bypass Valve Cracking Pressure		
	$\Delta P = 3 \text{ psi (0.2 bar) } +10\%$ (standard - sizes 60, 950, 1300)	
	$\Delta P = 4.4 \text{ psi (0.3 bar) } +10\%$ (standard - sizes 110,160,240,330)	

Applications



Agricultural



Automotive



Construction



Gearboxes

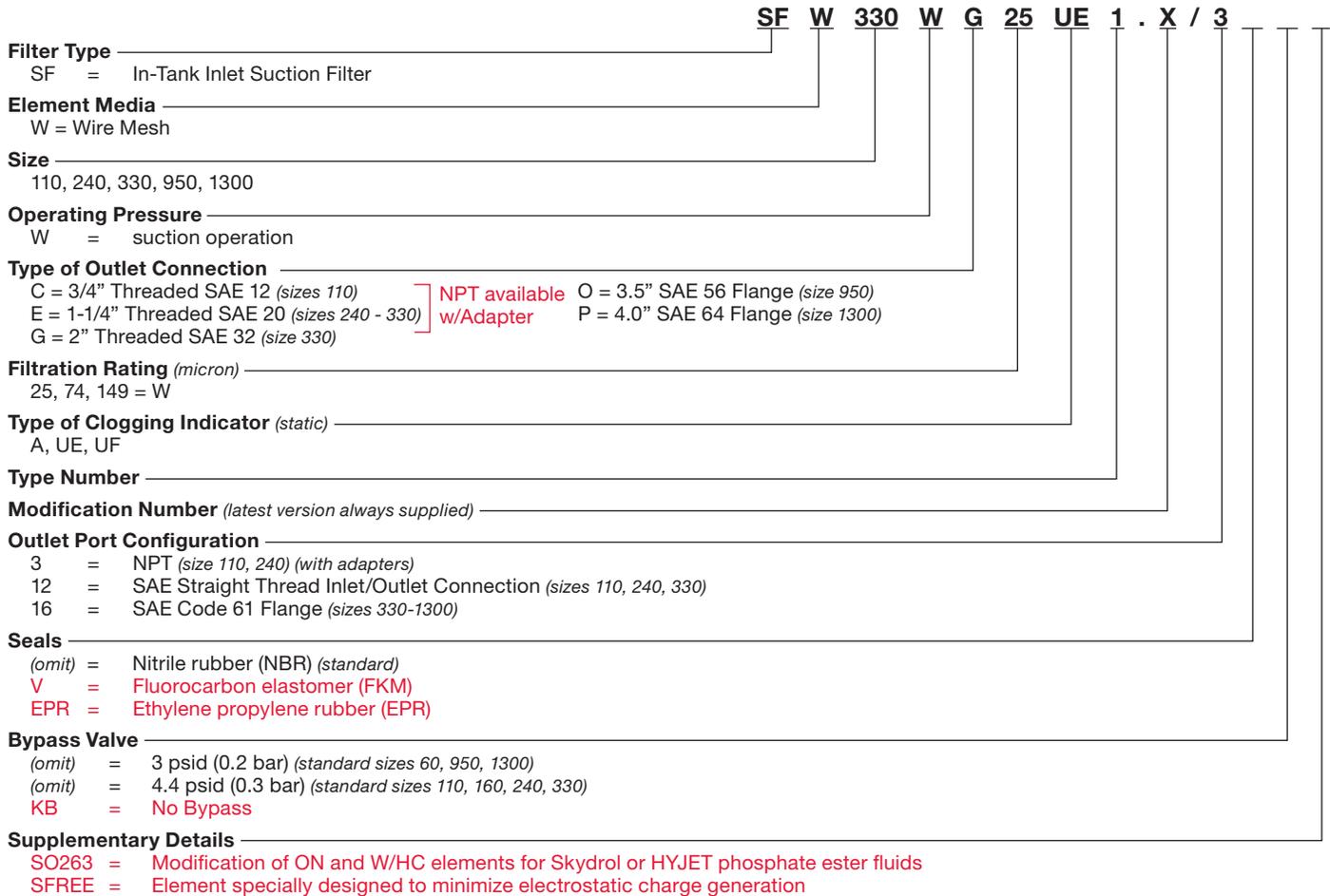


Industrial

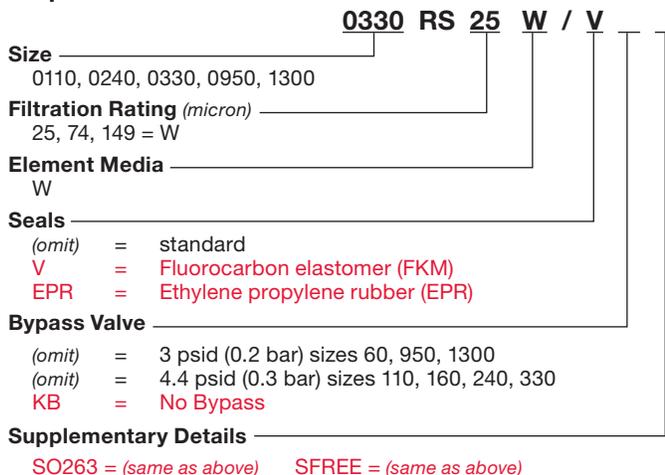


Steel / Heavy Industry

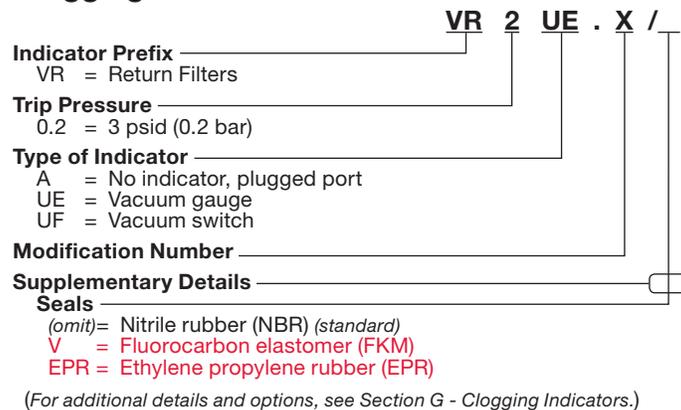
Model Code



Replacement Element Model Code



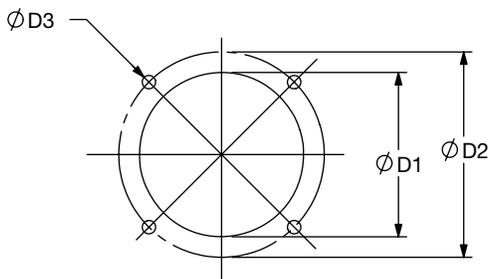
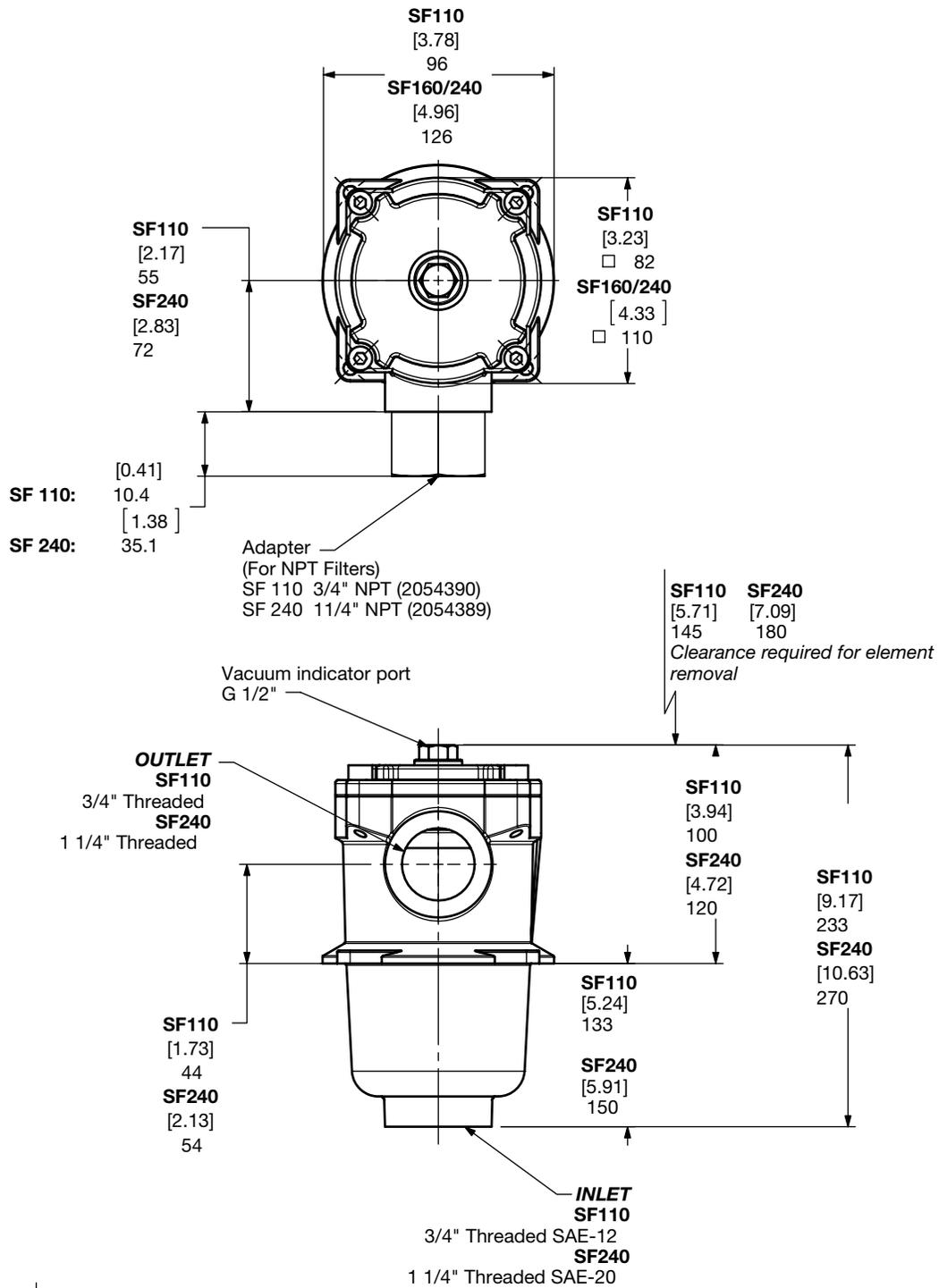
Clogging Indicator Model Code



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

LOW PRESSURE FILTERS

Dimensions SF 110 / 240

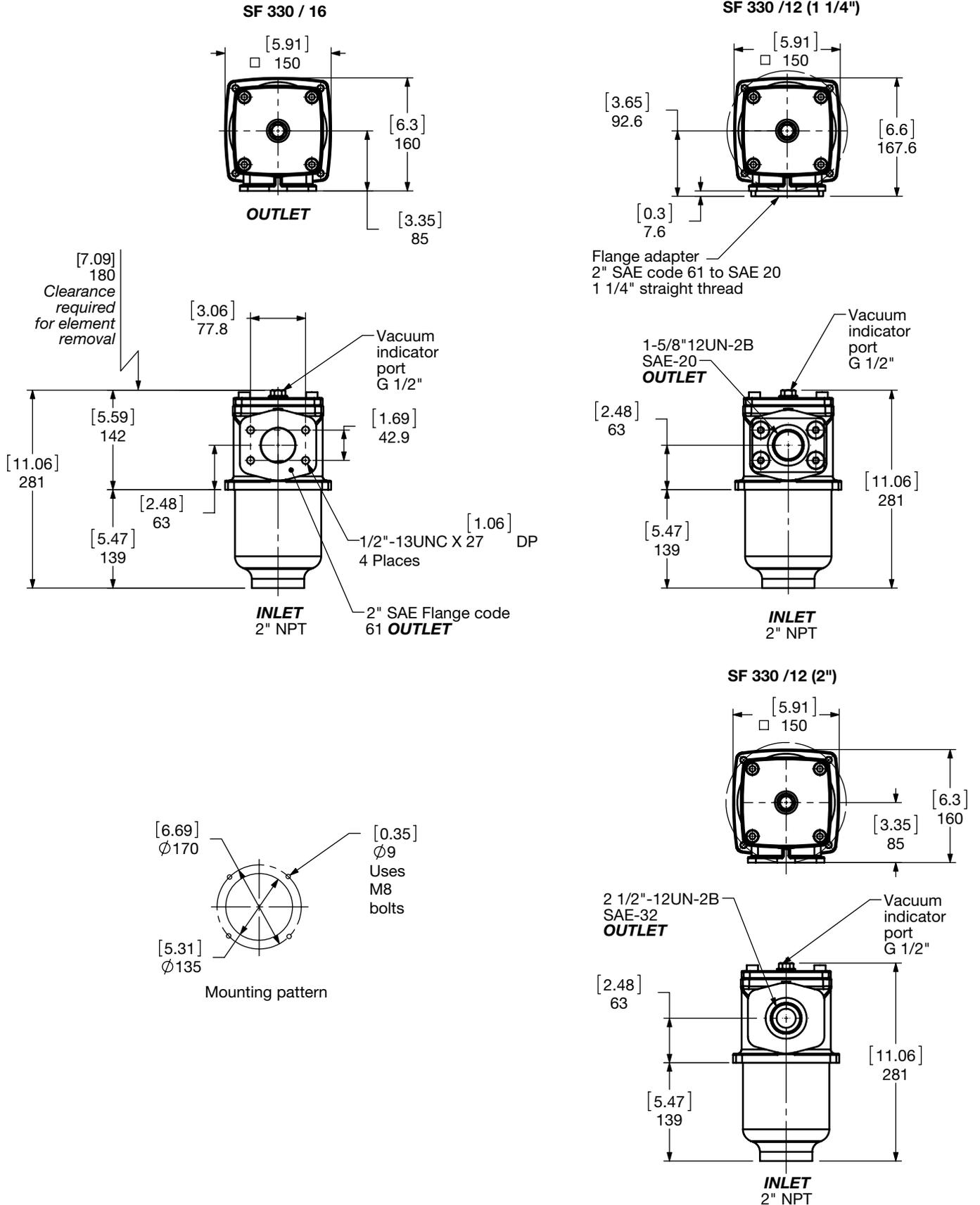


Size	øD1	øD2	øD3	USES BOLTS
110	[3.15"] 80mm	[3.94"] 100mm	[0.26"] 6.5mm	M5
240	[4.17"] 106mm	[5.32"] 135mm	[0.30"] 7.5mm	M6

Size	SF 110	SF 240
Weight (lbs.)	2.5	5.0

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions SF 330



Size	SF 330
Weight (lbs.)	9.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

WIRESCREEN SIZE	...RS...W/HC		
	25 μm	74 μm	125 μm
0110 RS XXX W/HC	0.029	0.029	0.014
0240 RS XXX W/HC	0.014	0.014	0.007
0330 RS XXX W/HC	0.010	0.010	0.005
0950 RS XXX W/HC	0.003	0.003	0.002
1300 RS XXX W/HC	0.003	0.003	0.002

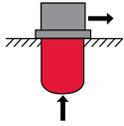
All Element K Factors in psi / gpm.

LOW PRESSURE FILTERS

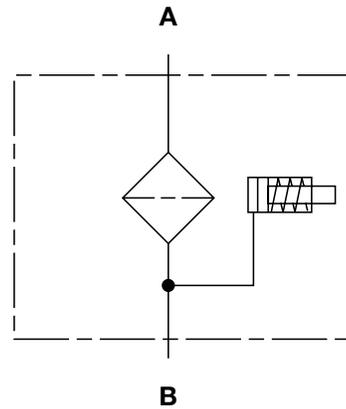
SFW60412 Series

In-tank Filters

145 psi • up to 80 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (nitrile rubber, fluorocarbon elastomer, or ethylene propylene rubber) provides compatibility with oil/water emulsions, high water based fluids, and synthetic fluids.
- Screw-on lid requires minimal clearance for removal.
- Non-bypass
- A mechanically actuated, electrical, electrical / visual (lamp), or vacuum gauge bypass indicator can be installed.
- Can be mounted horizontally or upside down due to inlet shut off valve
- 10 piece magnet set-upstream side to capture ferrous particles before entering filter media layers-increases separation efficiency

Technical Specifications

Mounting Method	4 mounting holes ϕ 195 mm BC 6 mounting holes ϕ 210 mm BC
Port Connection	2-1/2" SAE Flange + 2 X SAE-24
Flow Direction	Inlet: Bottom Outlet: Side
Construction Materials	Lid: Ductile Iron Housing: Casted Aluminum
Flow Capacity	80 gpm (300 lpm)
Housing Pressure Rating	Max. Allowable Working Pressure: 145 psi (10 bar)
Element Collapse Pressure Rating	145 psi (10 bar)
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.

Applications



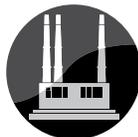
Agricultural



Automotive



Construction

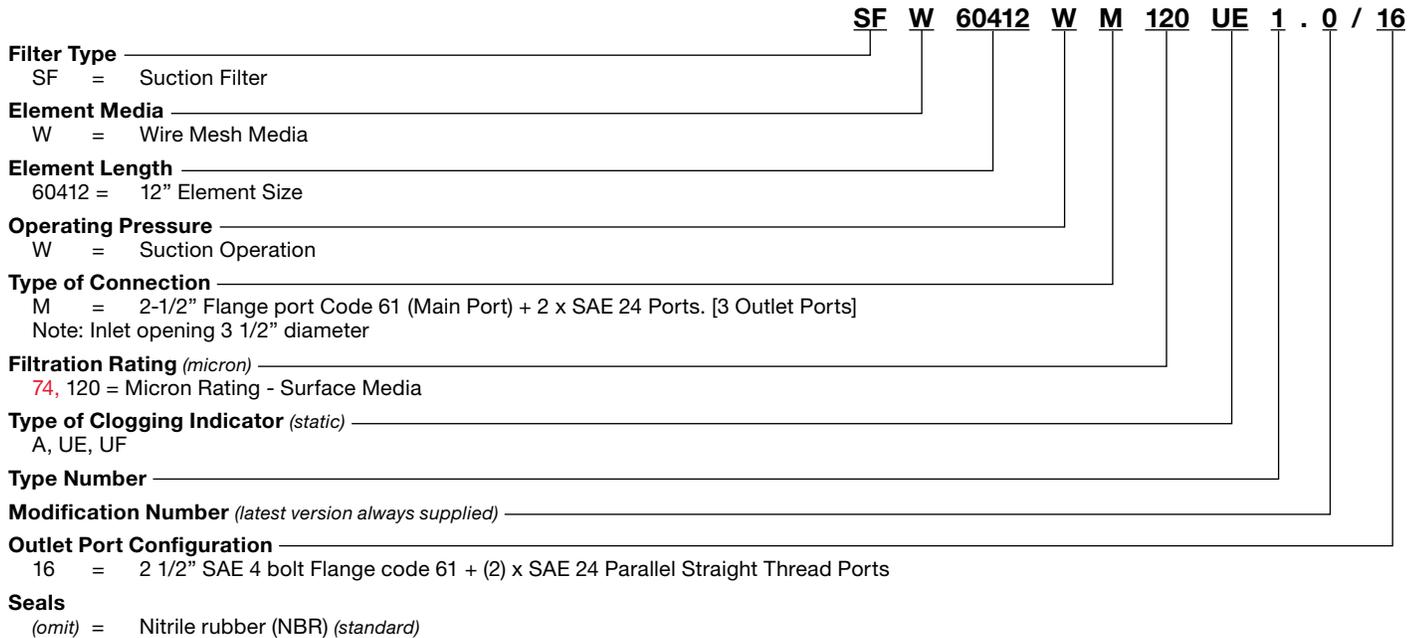


Industrial

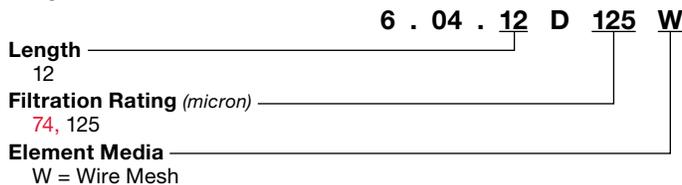


Steel / Heavy Industry

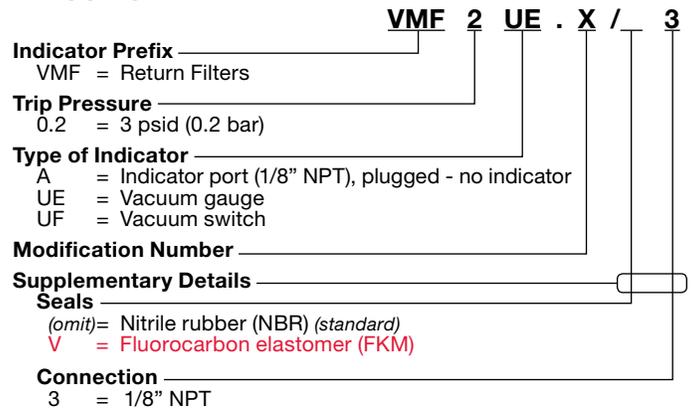
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

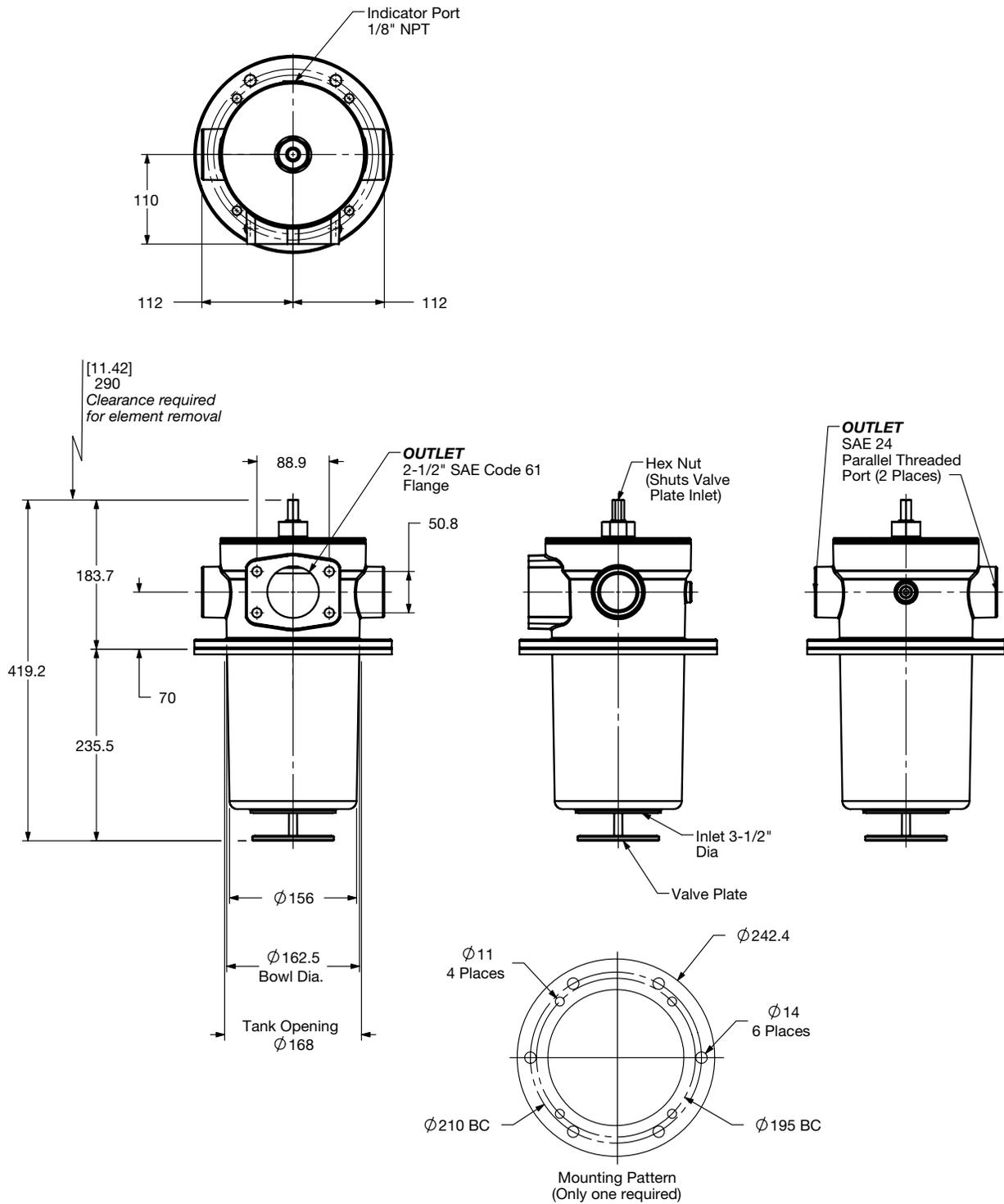


(For additional details and options, see Section G - Clogging Indicators.)

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

LOW PRESSURE FILTERS

Dimensions
SFW 60412



Size	SFW60412
Weight (lbs.)	30

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

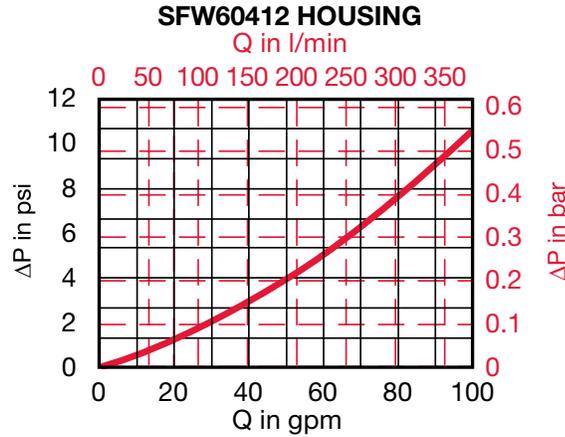
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

Wire Mesh	6.04.12 D XXX W			
SIZE	20 μm	25 μm	74 μm	149 μm
6.04.12 D XXX W	0.066	0.01	0.01	0.01

All Element K Factors in psi / gpm.

E Medium Pressure Filters 601-2999 psi

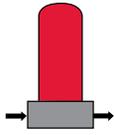
Low-cost aluminum construction inline filters, provide flexibility for use in both mobile and industrial applications. Durable and light weight, these filters are ideal for light industrial and demanding agriculture and construction applications. Duplex filters allow for uninterrupted operation during element change-out.

MEDIUM PRESSURE FILTERS

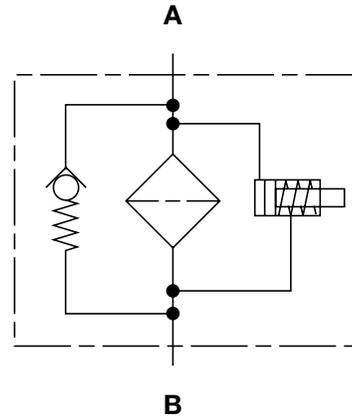
HF4RL Series

Inline Filters

750 psi • up to 90 gpm



Hydraulic Symbol



Features

- Inlet/outlet port options include SAE straight thread O-ring boss, and 1 1/2" SAE 4-bolt flange to allow easy installation without costly adapters.
- Choice of Nitrile rubber or Fluorocarbon elastomer seal material provides compatibility with petroleum oils, and most synthetic fluids, water-glycols, oil/water emulsions, and water based fluids.
- Screw-in cap mounted on top of the filter bowl allows quick and easy element changeout.
- To allow fluid to be drained from the filter before changing the element, a vent plug and a drain plug are provided. Element changes can be made with no mess and minimal loss of fluid.
- Clogging indicators, with and without thermal lockout, are magnetically actuated and have no external dynamic seal. High reliability is achieved and magnetic actuation eliminates leakage.
- A cartridge type bypass valve (optional) is mounted in-line in the filter head between the inlet and outlet port to provide positive sealing during normal operation and fast response during cold starts and flow surges.

Technical Specifications

Mounting Method	4 mounting holes
Port Connection	SAE-24, 1 1/2" BSPP, 1 1/2" SAE Flange, Code 61
Flow Direction	
Inlet / Outlet	Side
Construction Materials	
Head, Cap	Cast Aluminum
Housing	Steel
Flow Capacity	
09	50 gpm (190 lpm)
18	70 gpm (265 lpm)
27	90 gpm (341 lpm)
Housing Pressure Rating	
Max. Allowable Working Pressure	750 psi (52 bar)
Fatigue Pressure	750 psi (52 bar) @ 1 million cycles
Burst Pressure	3200 psi (221 bar)
Element Collapse Pressure Rating	
BH	3045 psid (210 bar)
BN, W	145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C)
Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	
$\Delta P = 29$ psid (2 bar) -10% (optional)	
$\Delta P = 72$ psid (5 bar) -10% (standard)	
Bypass Valve Cracking Pressure	
$\Delta P = 43$ psid (3 bar) +10% (optional)	
$\Delta P = 87$ psid (6 bar) +10% (standard)	

Applications



Automotive



Gearboxes



Industrial



Pulp & Paper

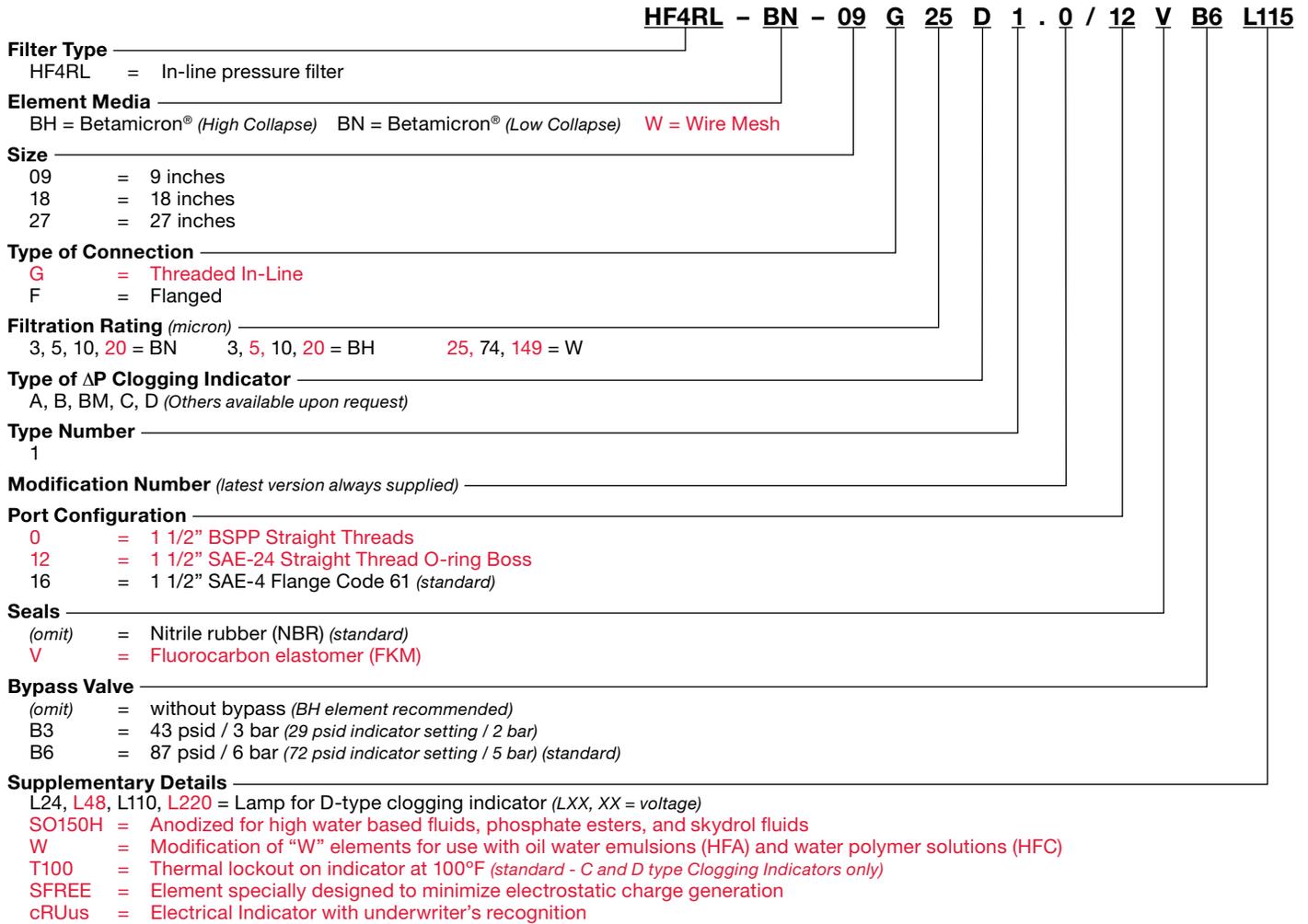


Shipbuilding

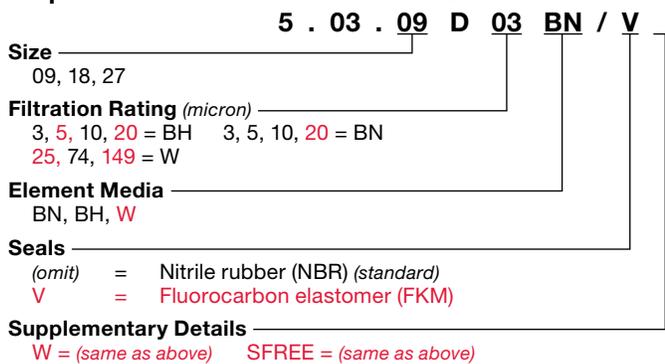


Steel / Heavy Industry

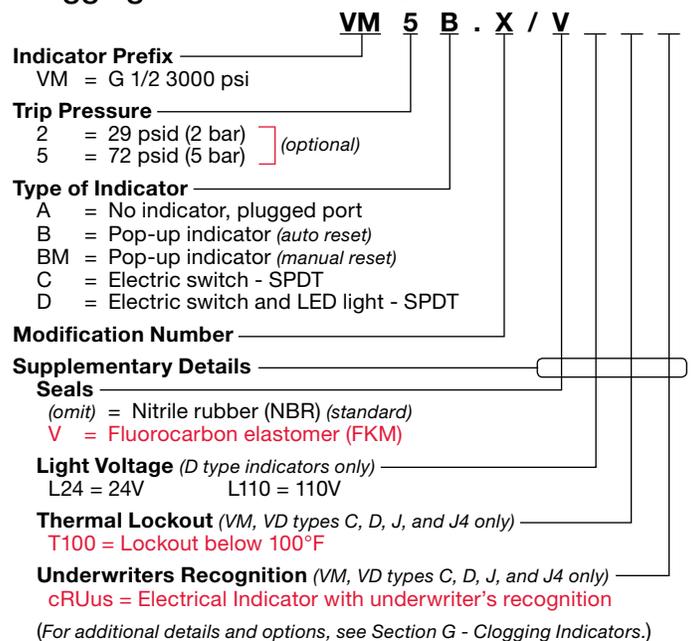
Model Code



Replacement Element Model Code



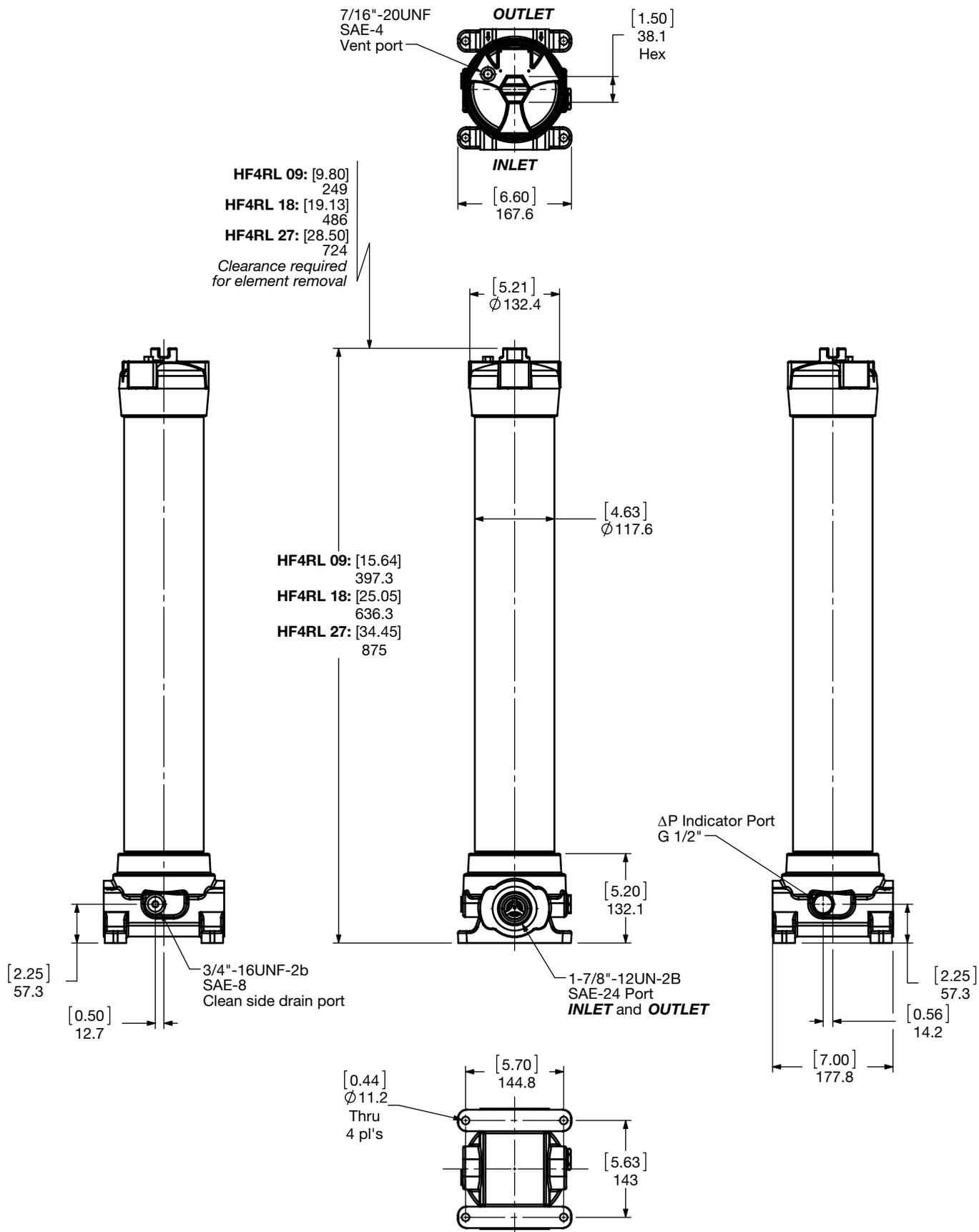
Clogging Indicator Model Code



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

MEDIUM PRESSURE FILTERS

Dimensions HF4RL



Size	09	18	27
Weight (lbs.)	10.7	33	45.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

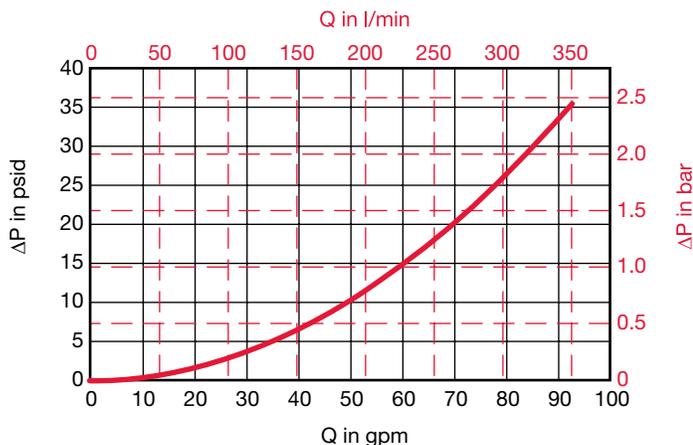
Housing Curve:

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 HYDAC Filter Assemblies" in Section B - Overview)

HF4RL Housing



Element K Factors

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

(From Tables Below)

Autospec HF4 Depth	5.03.XXDXXBN Low Collapse			
Size	3 μm	5 μm	10 μm	20 μm
5.03.09DXXBN	0.168	0.141	0.079	0.044
5.03.18DXXBN	0.080	0.067	0.038	0.021
5.03.27DXXBN	0.052	0.043	0.024	0.014

Autospec HF4 Depth	5.03.XXDXXBH High Collapse			
Size	3 μm	5 μm	10 μm	20 μm
5.03.09DXXBH	0.207	0.146	0.089	0.047
5.03.18DXXBH	0.097	0.068	0.041	0.022
5.03.27DXXBH	0.063	0.044	0.027	0.014

Autospec HF4 Wire Mesh	5.03.XXDXXW
Size	25, 74, 149 μm
5.03.09DXXW	0.007
5.03.18DXXW	0.004
5.03.27DXXW	0.002

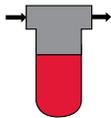
All Element K Factors in psi / gpm.

MEDIUM PRESSURE FILTERS

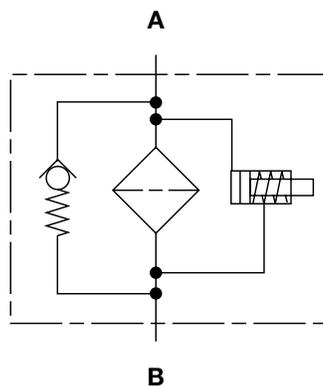
LPF Series

Inline Filters

725 psi • up to 74 gpm



Hydraulic Symbol



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).
- 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, located in the filter head, 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.

Technical Specifications

Mounting Method	35 - 55: 3 mounting holes 160 - 280: 2 mounting holes
Port Connection	35 - 55 SAE-8, 1/2" BSPP 160 - 280 SAE-20, 1 1/4" BSPP
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)
Housing Pressure Rating	Max. Allowable Working Pressure 35 - 55 580 psi (40 bar) 160 - 280 725 psi (50 bar)* *Note: 580 psi (40 bar) when using BF indicator Fatigue Pressure 35 - 55 580 psi (40 bar) (10 ⁷ cycles) 160 - 280 725 psi (50 bar) (10 ⁶ cycles) 35 - 55 Contact HYDAC Burst Pressure 160 - 280 > 3625 psi (200 bar)
Element Collapse Pressure Rating	BH4HC, V 3045 psid (210 bar) ON, W/HC 290 psid (20 bar)
Fluid Temp. Range	-22°F to 212°F (-30°C to 100°C) Consult HYDAC for applications operating below -22°F (-30°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/ water emulsion, and high water based fluids when the appropriate seals are selected
ΔP Indicator Trip Pressure	ΔP = 29 psid (2 bar) -10% (optional) ΔP = 36.25 psid (2.5 bar) (BF indicator) 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)

Applications



Agricultural



Automotive



Construction

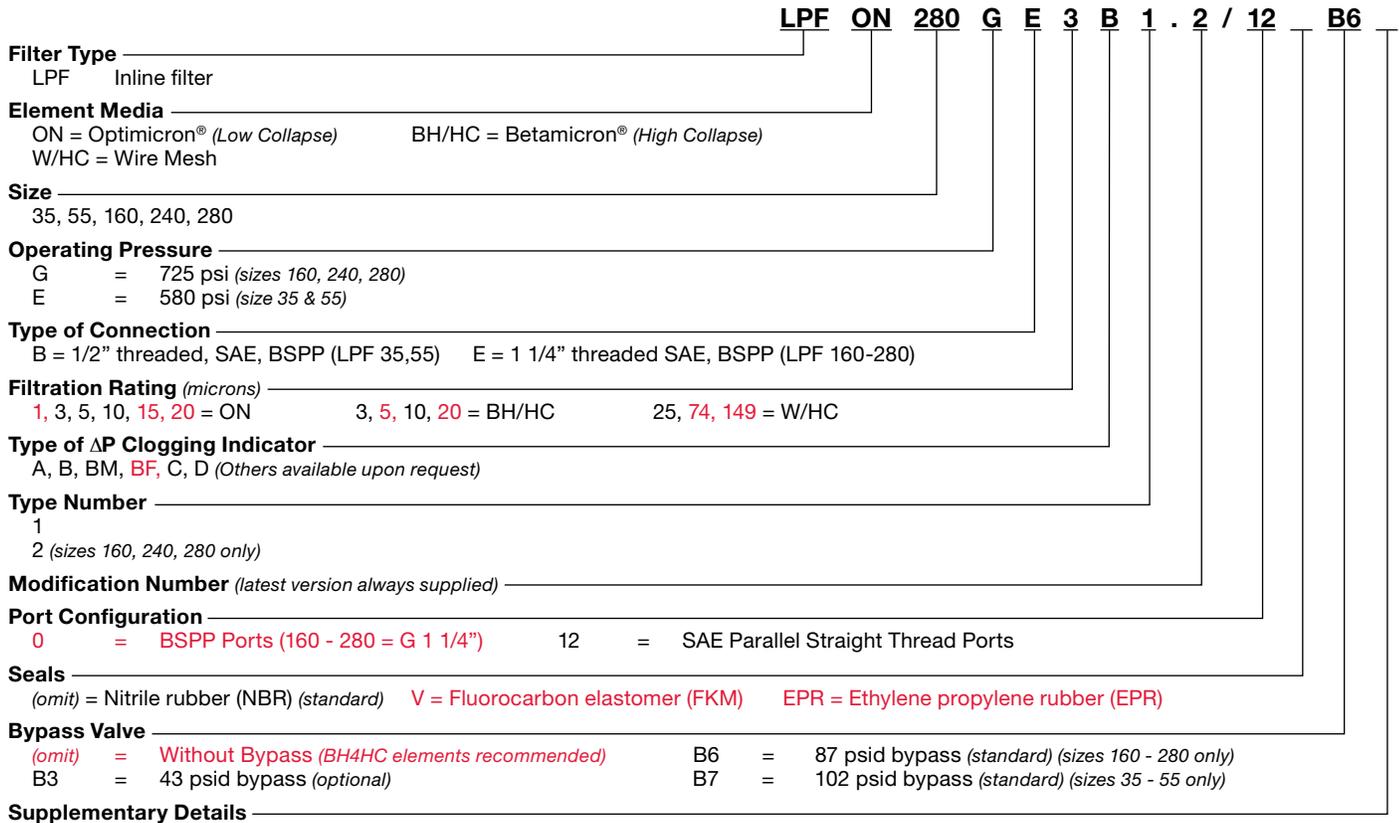


Industrial



Steel / Heavy Industry

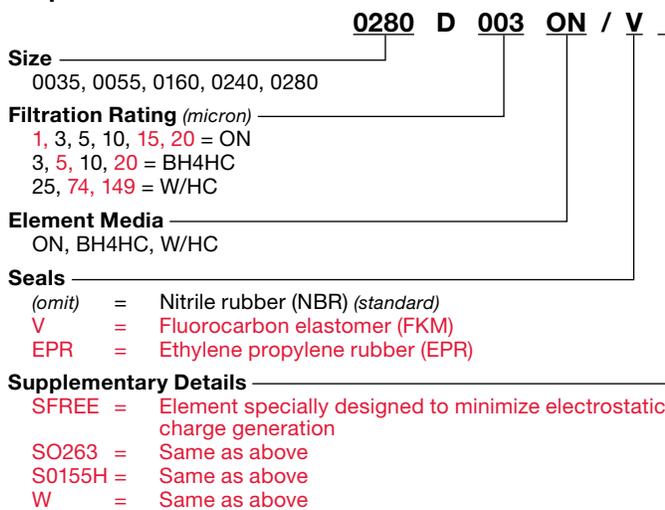
Model Code



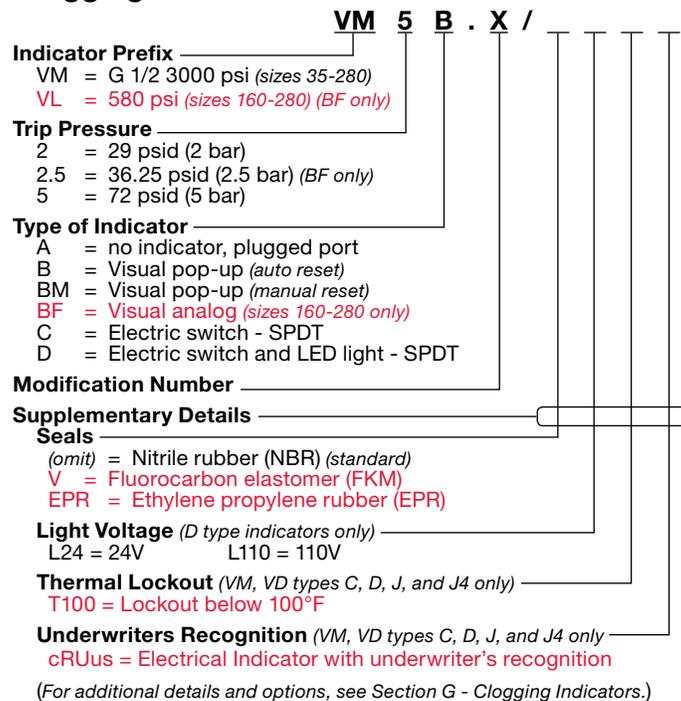
Supplementary Details

- L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
- SO263 = Modification of ON & W/HC (Betamicon® Low Collapse) Elements For Phosphate Ester Fluids
- SO155H = Modification of BH4HC (Betamicon® High Collapse) Element For Phosphate Ester Fluids
- T100 = Thermal Lockout on indicator at 100°F (contact HYDAC for B or BM type indicators)
- W = Modification of "W/HC" and "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)
- BFL = BF Clogging indicator on left looking into inlet.
- BFR = BF Clogging indicator on right looking into inlet.
- SFREE = Element specially designed to minimize electrostatic charge generation
- cRUus = Electrical Indicator with underwriter's recognition

Replacement Element Model Code



Clogging Indicator Model Codes

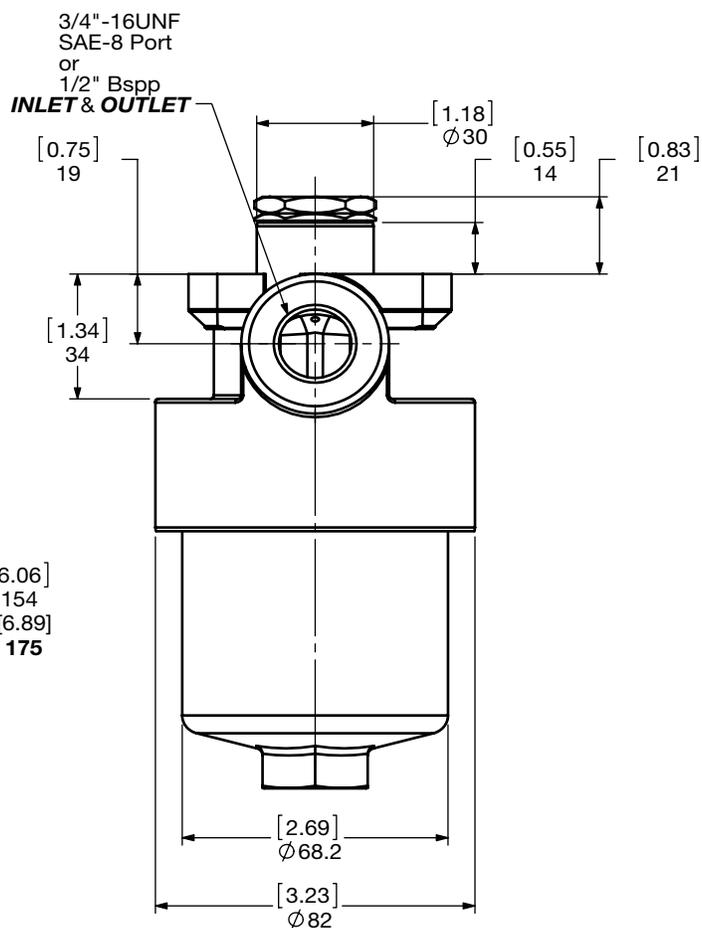
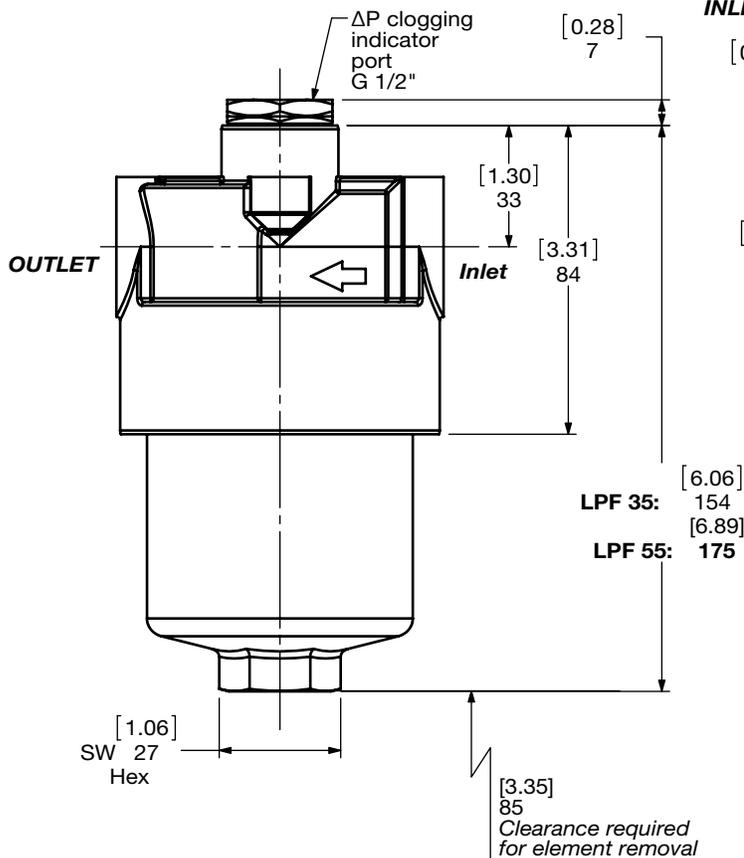
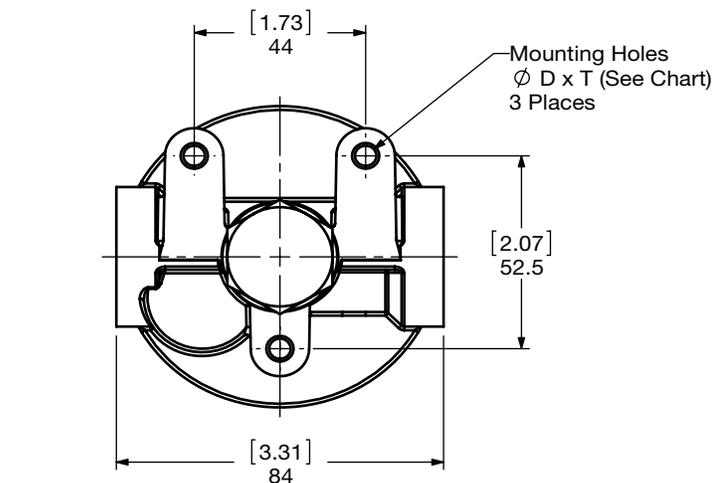


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

MEDIUM PRESSURE FILTERS

Dimensions LPF 35 / 55

INLET/OUTLET	øD	Depth T
SAE-8	1/4-28UNF-2B	[0.63]
G 1/2 (BSPP)	M8 x 1.25	16

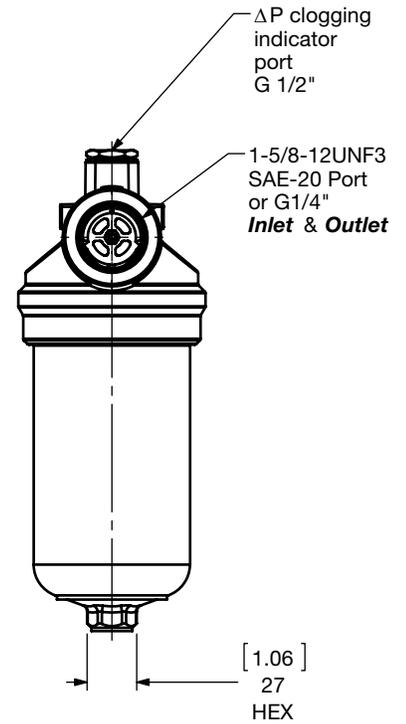
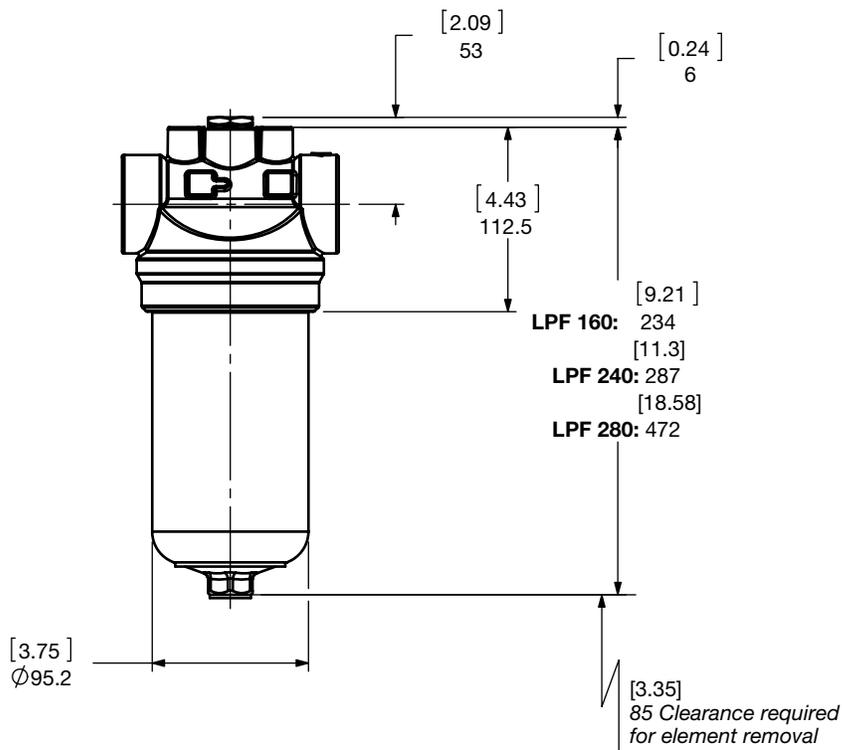
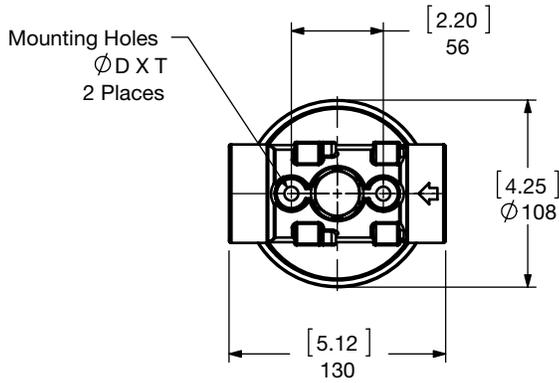


Size	35	55
Weight (lbs.)	2.3	2.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions LPF 160 / 240 / 280

INLET/OUTLET	øD	Depth T
SAE-20	3/8-24 UNF-2B	[0.551] 14
G 1-1/4 (BSPP)	M10 x 1.50	



Size	160	240	280
Weight (lbs.)	4.5	5.1	7.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

MEDIUM PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

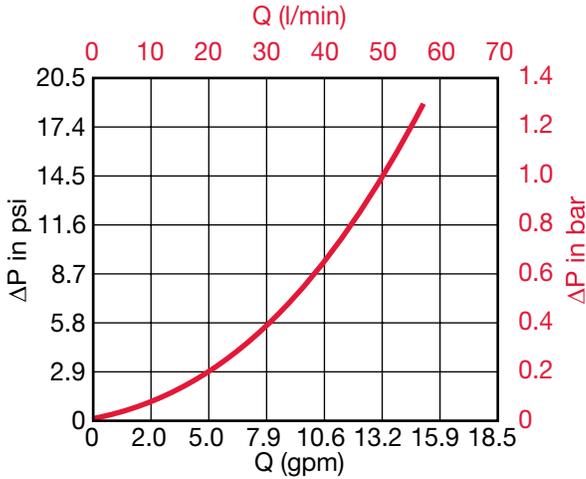
Housing Curve:

Pressure loss through housing is as follows:

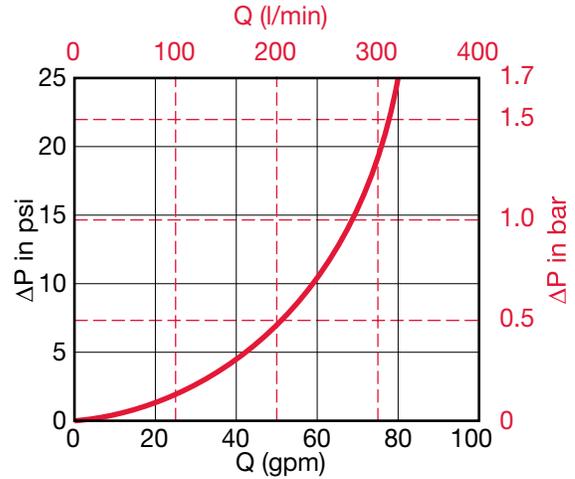
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

LPF 35 / 55 Housing



LPF 160 / 240 / 280 Housing



Element K Factors

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

(From Tables Below)

"ON" Pressure Elements	...D...ON (Optimicron Pressure Elements)						
	Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0035 D XXX ON		2.755	1.169	0.938	0.752	0.549	0.408
0055 D XXX ON		1.427	0.675	0.543	0.434	0.284	0.211
0160 D XXX ON		1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON		0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON		0.304	0.185	0.15	0.082	0.075	0.064

"D" Pressure Elements	...D...BH4HC (Betamicron High Collapse)				
	Size	3 μm	5 μm	10 μm	20 μm
0035 D XXX BH4HC		2.623	1.542	0.922	0.576
0055 D XXX BH4HC		1.328	0.779	0.466	0.291
0160 D XXX BH4HC		0.922	0.571	0.324	0.241
0240 D XXX BH4HC		0.582	0.373	0.214	0.159
0280 D XXX BH4HC		0.313	0.187	0.099	0.088

Wire Mesh	...D...W/HC Elements (Low Collapse)	
	Size	...D...W/HC Elements 25, 50, 74, 100, 149, 200 μm
0160 D XXX W/HC		0.035
0240 D XXX W/HC		0.023
0280 D XXX W/HC		0.020

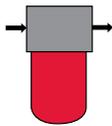
All Element K Factors in psi / gpm.

MEDIUM PRESSURE FILTERS

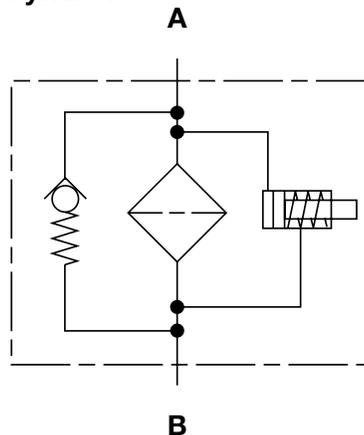
LF Series

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, BSPP and SAE straight thread O-ring boss to allow easy installation with maximum flexibility.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (nitrile rubber, fluorocarbon elastomer, ethylene propylene rubber) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based 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.
- HYDAC differential Pressure 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, in the filter head, 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.

Technical Specifications

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 - 660) Steel (size 280)	
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) Fatigue Pressure 1500 psi (100 bar) Burst Pressure size 30 5510 psi (380bar) sizes 60 - 660 > 6090 psi (420 bar)	
Element Collapse Pressure Rating	BH4HC, V 3045 psid (210 bar) ON, W/HC 290 psid (20 bar)	
Fluid Temperature Range	-22°F to 212°F (-30°C to 100°C) Consult HYDAC for applications operating below -22°F (-30°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected	
ΔP 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



Automotive



Construction



Industrial



Railways



Steel / Heavy Industry

Model Code

LF ON 30 I B 3 B 1 . 0 / 12

Filter Type _____
 LF = Inline filter

Element Media _____
 ON = Optimicron® (low collapse) BH/HC = Betamicron® (High Collapse)
 W/HC = Wire Mesh V = Metal Fiber

Size _____
 30, 60, 110, 160, 240, 280, 330, 660

Operating Pressure _____
 I = 1500 psi (100 bar)

Type of Connection _____
 B = 1/2" Threaded (size 30 only) E = 1 1/4" Threaded (sizes 160 - 280 only)
 C = 3/4" Threaded (sizes 60 & 110 only) F = 1 1/2" Threaded (sizes 330 - 660 only)

Filtration Rating (microns) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = BH/HC 25, 50, 74, 100, 149, 200 = W/HC 3, 5, 10, 20 = V

Type of ΔP Clogging Indicator _____
 A, B, BM, C, D (others available upon request)

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 rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
 (omit) = Non-Bypass – Critical applications (high collapse element required)
 B3 = 43 psid (3 bar) (optional)
 B6 = 87 psid (6 bar) (standard setting for pressure filters)

Supplementary Details _____
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 SO263H = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids
 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)
 T100 = Indicator Thermal Lockout, 100°F (C and D indicators only)
 W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)
 SFREE = Element specially designed to minimize electrostatic charge generation
 cRUus = Electrical Indicator with underwriter's recognition

Replacement Element Model Code

0030 D 003 ON / V

Size _____
 0030, 0060, 0110, 0160,
 0240, 0280, 0330, 0660

Filtration Rating (micron) _____
 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = BH4HC
 25, 74, 149 = W/HC 3, 5, 10, 20 = V

Element Media _____
 ON, BH4HC, W/HC, V

Seals _____
 (omit) = Nitrile rubber (NBR)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Supplementary Details _____
 SO263H = Same as above
 SO155H = Same as above
 W = Same as above
 SFREE = Element specially designed to minimize electrostatic charge generation

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 = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seal _____
 (omit) = Nitrile rubber (NBR)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

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

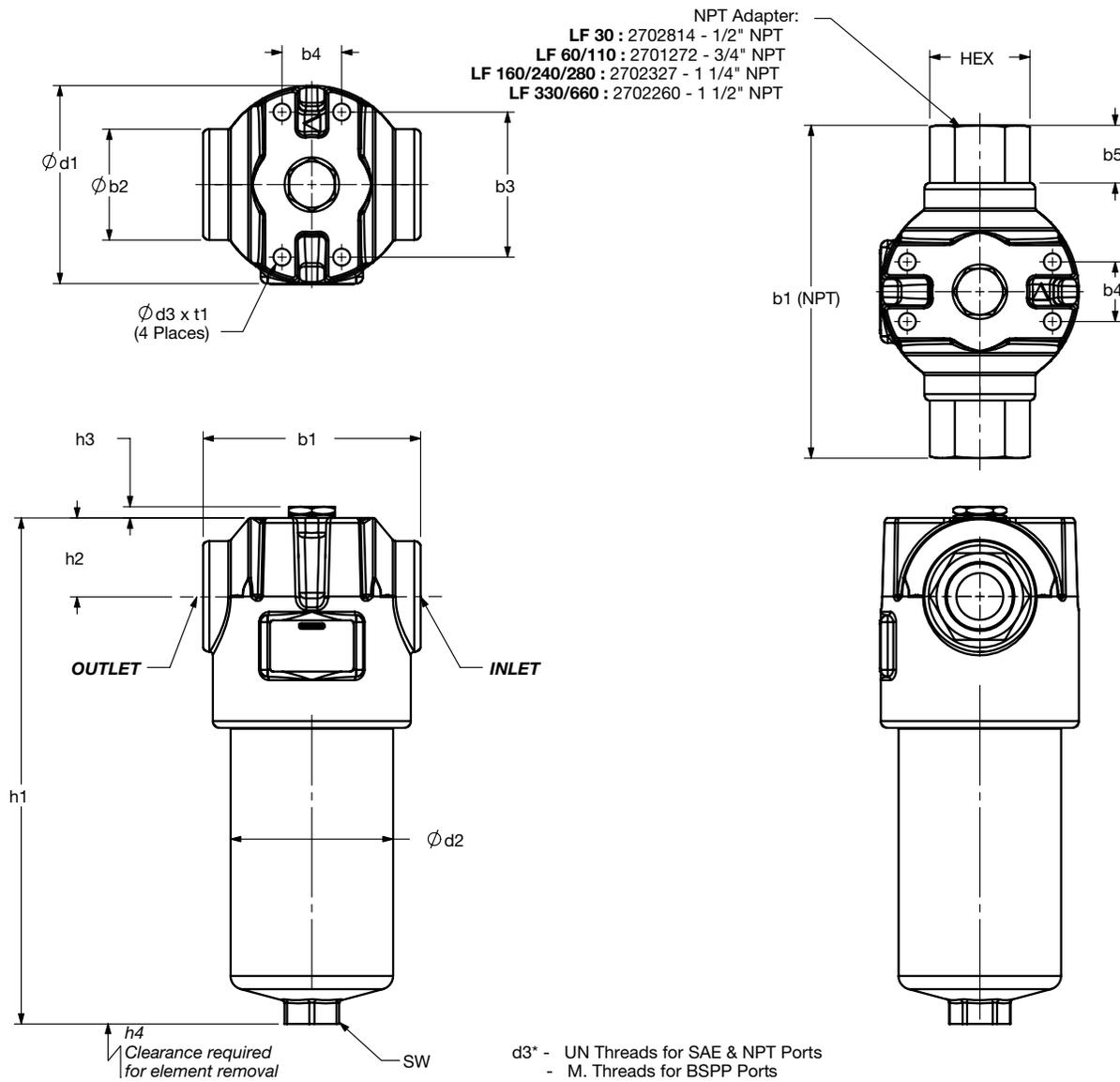
Underwriters Recognition (VM, VD types C, D, J, and J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition
 (For additional details and options, see Section G - Clogging Indicators.)

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

MEDIUM PRESSURE FILTERS

Dimensions

LF 30 - 660



Size	b1	b1 (NPT)	b2	b3	b4	b5	d1	d2	d3*	h1	h2	h3	h4	SW	t1	HEX
30	(2.72) 69	(4.84) 123	(1.42) 36	(1.77) 45	(1.18) 30	(1.062) 27	(2.64) 67	(2.05) 52	10-32UNF-2B M5 X 0.8	(6.16) 156	(1.22) 31	(0.28) 7	(2.95) 75	(0.94) 24	(0.24) 6	(1.125) 28.6
60	(3.54) 90	(5.80) 147.2	(1.89) 48	(2.20) 56	(1.26) 32	(1.126) 28.6	(3.31) 84	(2.68) 68	1/4-28UNF-2B M6 X 1.0	(6.95) 176.5	(1.54) 39	(0.24) 6	(2.95) 75	(1.06) 27	(0.35) 9	(1.38) 34.93
110	(3.54) 90	(5.80) 147.2	(1.89) 48	(2.20) 56	(1.26) 32	(1.126) 28.6	(3.31) 84	(2.68) 68	1/4-28UNF-2B M6 X 1.0	(9.68) 246	(1.54) 39	(0.24) 6	(2.95) 75	(1.06) 27	(0.35) 9	(1.38) 34.93
160	(4.92) 125	(7.67) 194.9	(2.56) 65	(3.35) 85	(1.38) 35	(1.376) 34.95	(4.57) 116	(3.74) 95	3/8-24UNF-2B M10 X 1.5	(9.29) 236	(1.81) 46	(0.24) 6	(3.74) 95	(1.26) 32	(0.55) 14	(2.00) 50.8
240	(4.92) 125	(7.67) 194.9	(2.56) 65	(3.35) 85	(1.38) 35	(1.376) 34.95	(4.57) 116	(3.74) 95	3/8-24UNF-2B M10 X 1.5	(11.67) 296.5	(1.81) 46	(0.24) 6	(3.74) 95	(1.26) 32	(0.55) 14	(2.00) 50.8
280	(4.92) 125	(7.67) 194.9	(2.56) 65	(3.35) 85	(1.38) 35	(1.376) 34.95	(4.57) 116	(3.74) 95	3/8-24UNF-2B M10 X 1.5	(18.98) 482	(1.81) 46	(0.24) 6	(3.74) 95	(1.26) 32	(0.55) 14	(2.00) 50.8
330	(6.26) 159	(9.07) 230.4	(3.35) 85	(4.53) 115	(2.36) 60	(1.406) 35.71	(6.3) 160	(5.12) 130	1/2-20UNF-2B M12 X 1.75	(11.90) 302.5	(1.97) 50	(0.24) 6	(4.13) 105	(1.42) 36	(0.67) 17	(2.25) 57.15
660	(6.26) 159	(9.07) 230.4	(3.35) 85	(4.53) 115	(2.36) 60	(1.406) 35.71	(6.3) 160	(5.12) 130	1/2-20UNF-2B M12 X 1.75	(18.40) 467.5	(1.97) 50	(0.24) 6	(4.13) 105	(1.42) 36	(0.67) 17	(2.25) 57.15

Size	30	50	110	160	240	330	660
Weight (lbs.)	1.8	3.4	4	8.2	9.5	17.7	24.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

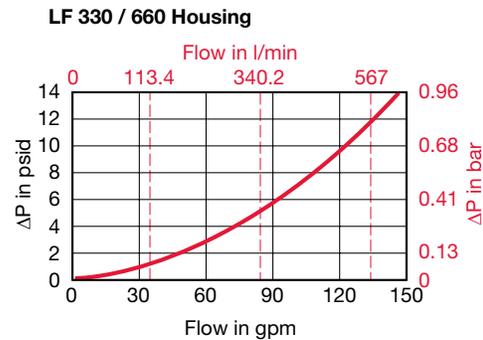
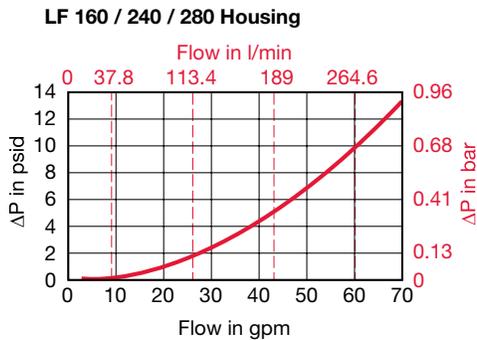
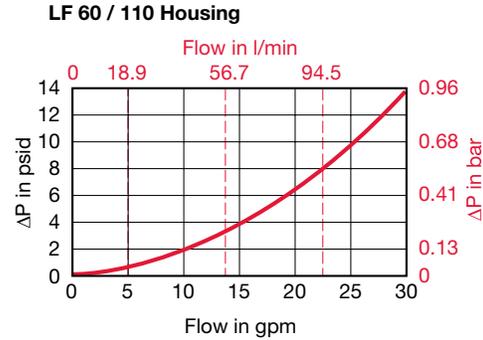
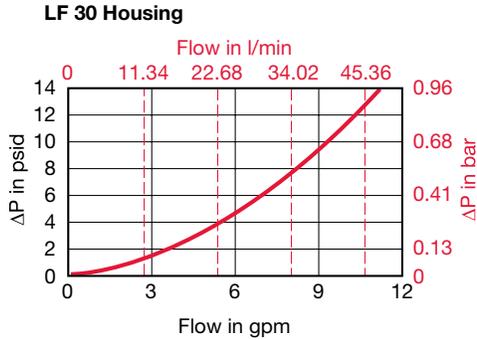
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

"ON" Pressure Elements:	...D...ON (Optimicron Pressure Elements)					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0030 D XXX ON	4.27	3.507	2.376	1.251	0.768	0.62
0060 D XXX ON	2.936	1.427	1.004	0.664	0.537	0.347
0110 D XXX ON	1.416	0.735	0.527	0.333	0.254	0.164
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031

"D" Pressure Elements	...D...BH4HC (Betamicron High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0030 D XXX BH4HC	5.005	2.782	1.992	1.043
0060 D XXX BH4HC	3.216	1.789	0.993	0.670
0110 D XXX BH4HC	1.394	0.818	0.489	0.307
0160 D XXX BH4HC	0.922	0.571	0.324	0.241
0240 D XXX BH4HC	0.582	0.373	0.214	0.159
0280 D XXX BH4HC	0.313	0.187	0.099	0.088
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049

Wire Mesh	...D...W/HC Elements (Low Collapse)
	Size
0030 D XXX W/HC	0.185
0060 D XXX W/HC	0.092
0110 D XXX W/HC	0.050
0160 D XXX W/HC	0.035
0240 D XXX W/HC	0.023
0280 D XXX W/HC	0.020
0330 D XXX W/HC	0.020
0660 D XXX W/HC	0.008

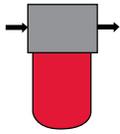
All Element K Factors in psi / gpm.

MEDIUM PRESSURE FILTERS

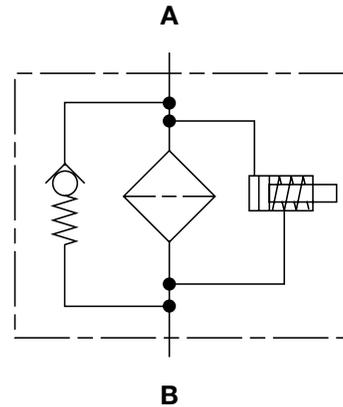
MFX Series

Inline Filters

725 psi • up to 35 gpm



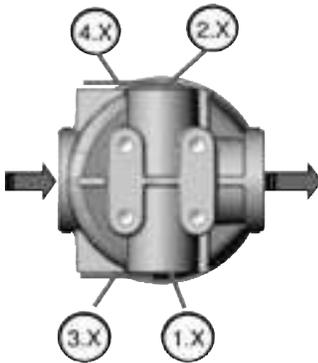
Hydraulic Symbol



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 of operational safety - Bowl seal and bypass valve are integrated in the filter element and therefore replaced at every element change
- "Missing Element Protection" - cannot operate without element installed.
- Many choices of clogging indicators available
- Various port connection types (SAE-12, G 3/4, SAE-16, G 1, M33x2)

Clogging Indicator Assignment



Technical Specifications

Mounting Method	4 Mounting holes (3/8-16UNC) or (M10-13) Ref. Drawing
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: 26 gpm (100 lpm) 200: 35 gpm (130 lpm)
Housing Pressure Rating	Max. Allowable Working Pressure: 725 psi (50 bar) Fatigue Pressure: 725 psi (50 bar) @ 1 million cycles Burst Pressure: 2600 psi (183 bar)
Element Collapse Pressure Rating	BN4HC: 290 psid (20 bar) ECON2, MM: 145 psid (10 bar)
Fluid Temperature Range	-22°F to 212°F (-30°C to 100°C) Consult HYDAC for applications below -22°F (-30°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, and high water based fluids compatible with Nitrile Rubber (NBR) seals
ΔP Indicator Trip Pressure	ΔP = 36.25 psid (2.5 bar) -10% (standard). ΔP = 14.5 psid (1 bar) -10% (optional)
Bypass Valve Cracking Pressure	ΔP = 50.75 psid (3.5 bar) +10% (standard) ΔP = 25 psid (1.7 bar) -10% (optional)

Applications



Agricultural



Automotive



Construction

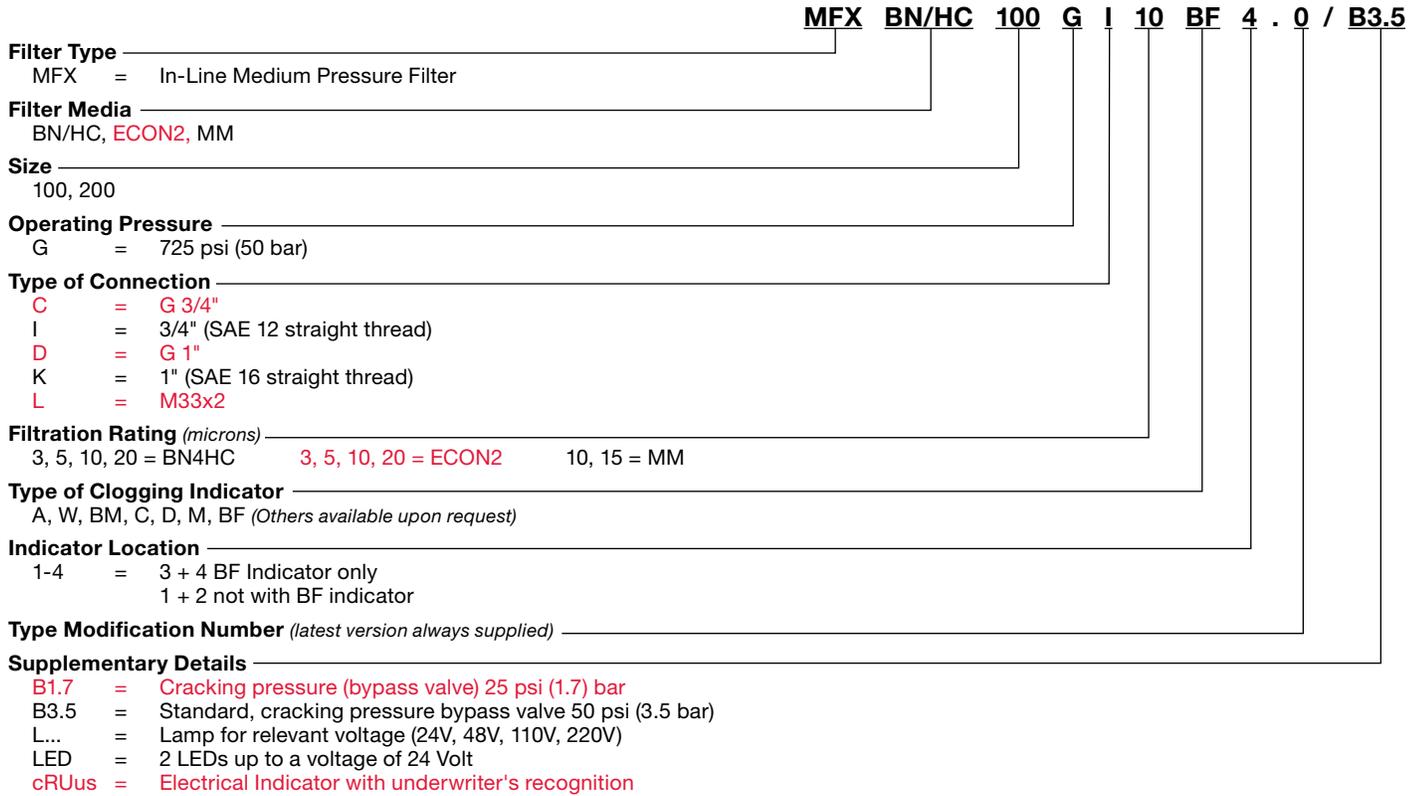


Commercial
Municipal

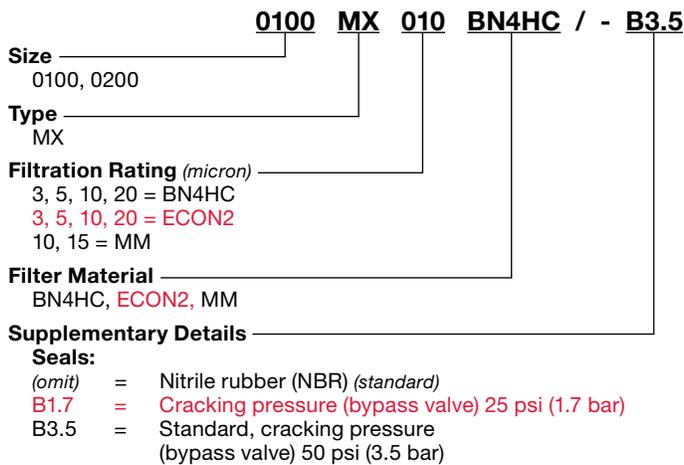


Railways

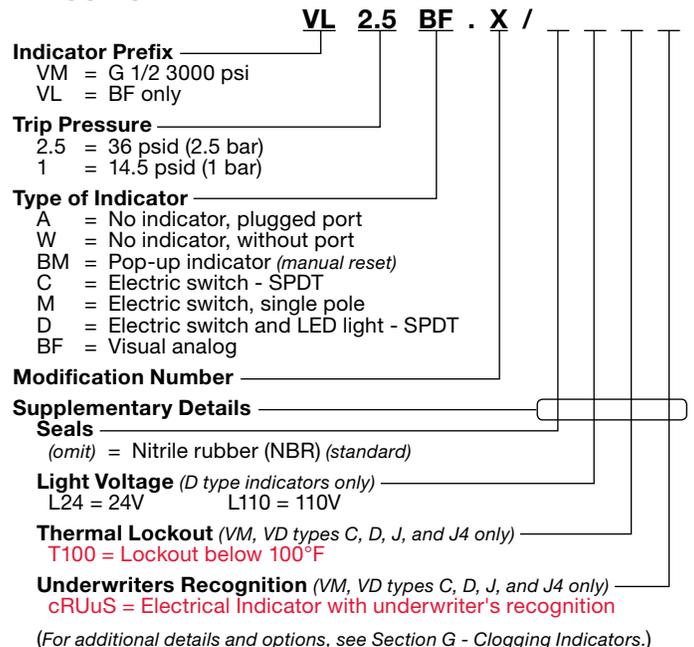
Model Code



Replacement Element Model Code



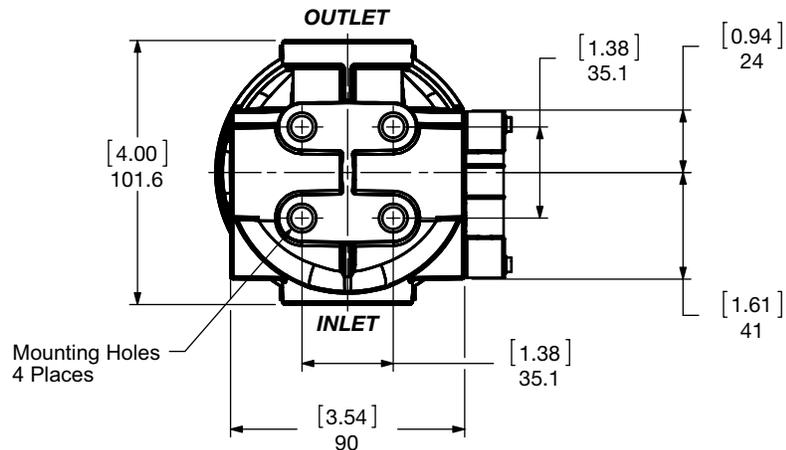
Clogging Indicator Model Code



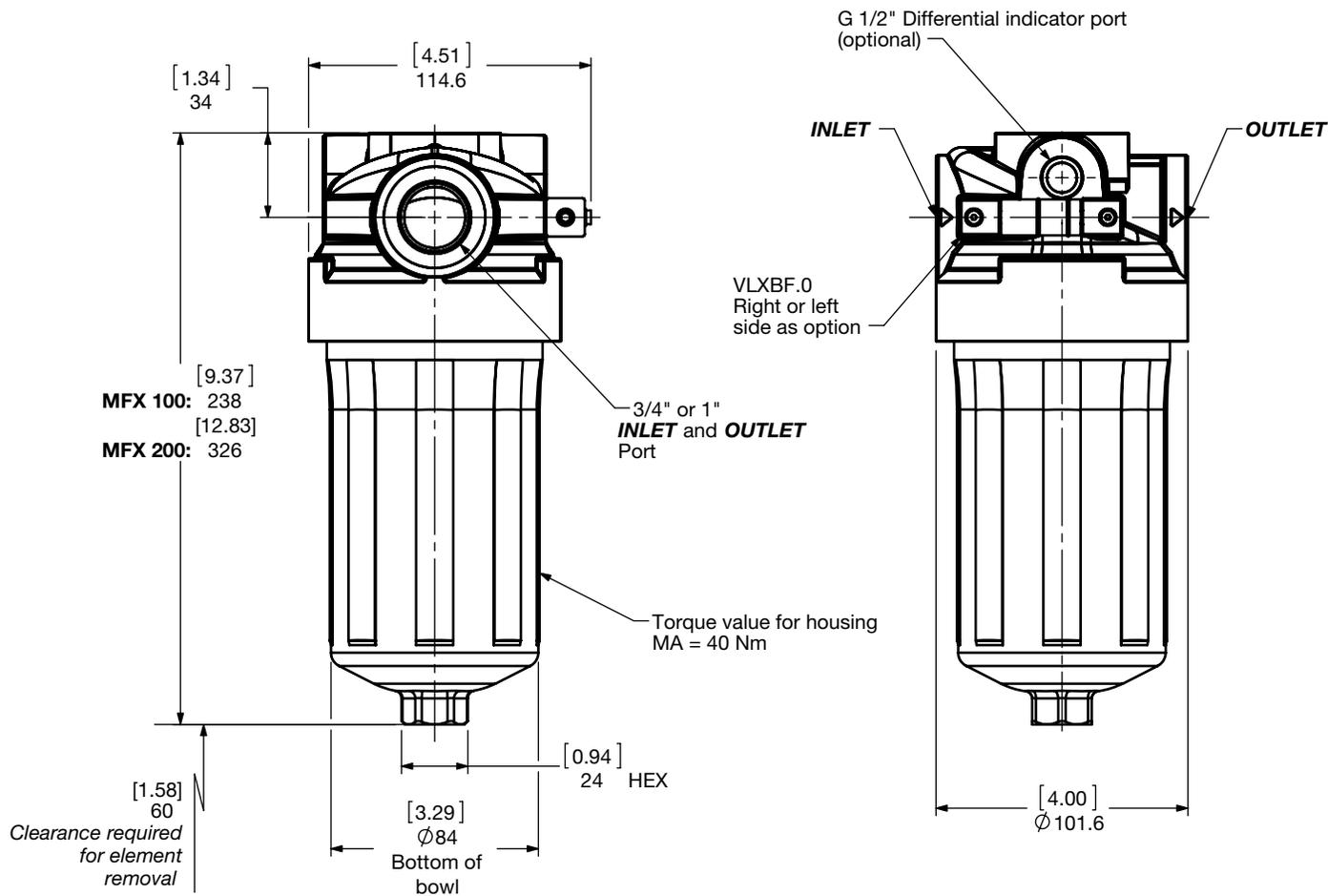
Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

MEDIUM PRESSURE FILTERS

Dimensions MFX 100 / 200



MFX 100/200...	Mounting x
...G C...	M10-13 [0.5] Deep
...G D...	M10-13 [0.5] Deep
...G I...	3/- 16UNC. 13 [0.5] Deep
...G K...	3/8-16UNC. 13 [0.5] Deep
...G L...	M10-13 [0.5] Deep



Size	100	200
Weight (lbs.)	3.3	3.9

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

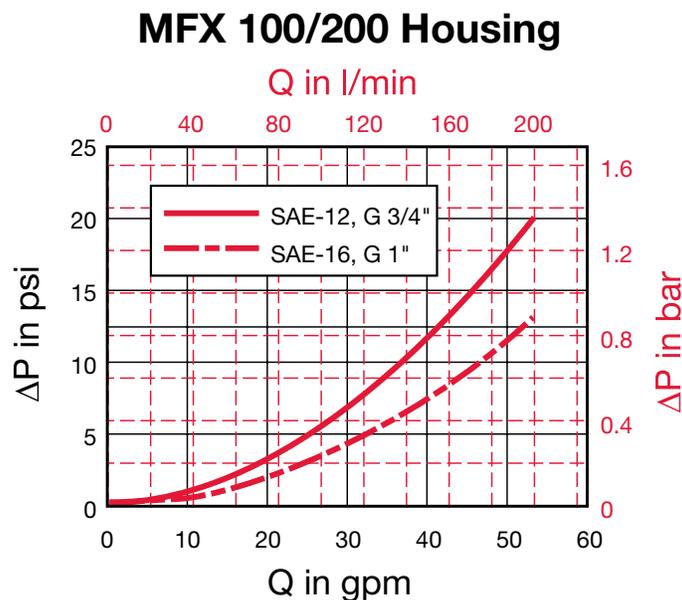
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Betamicron	...MX...BN4HC (Betamicron® Low Collapse)			
	3 μm	5 μm	10 μm	20 μm
0100 MX XXX BN4HC	0.659	0.494	0.252	0.187
0200 MX XXX BN4HC	0.384	0.291	0.148	0.110

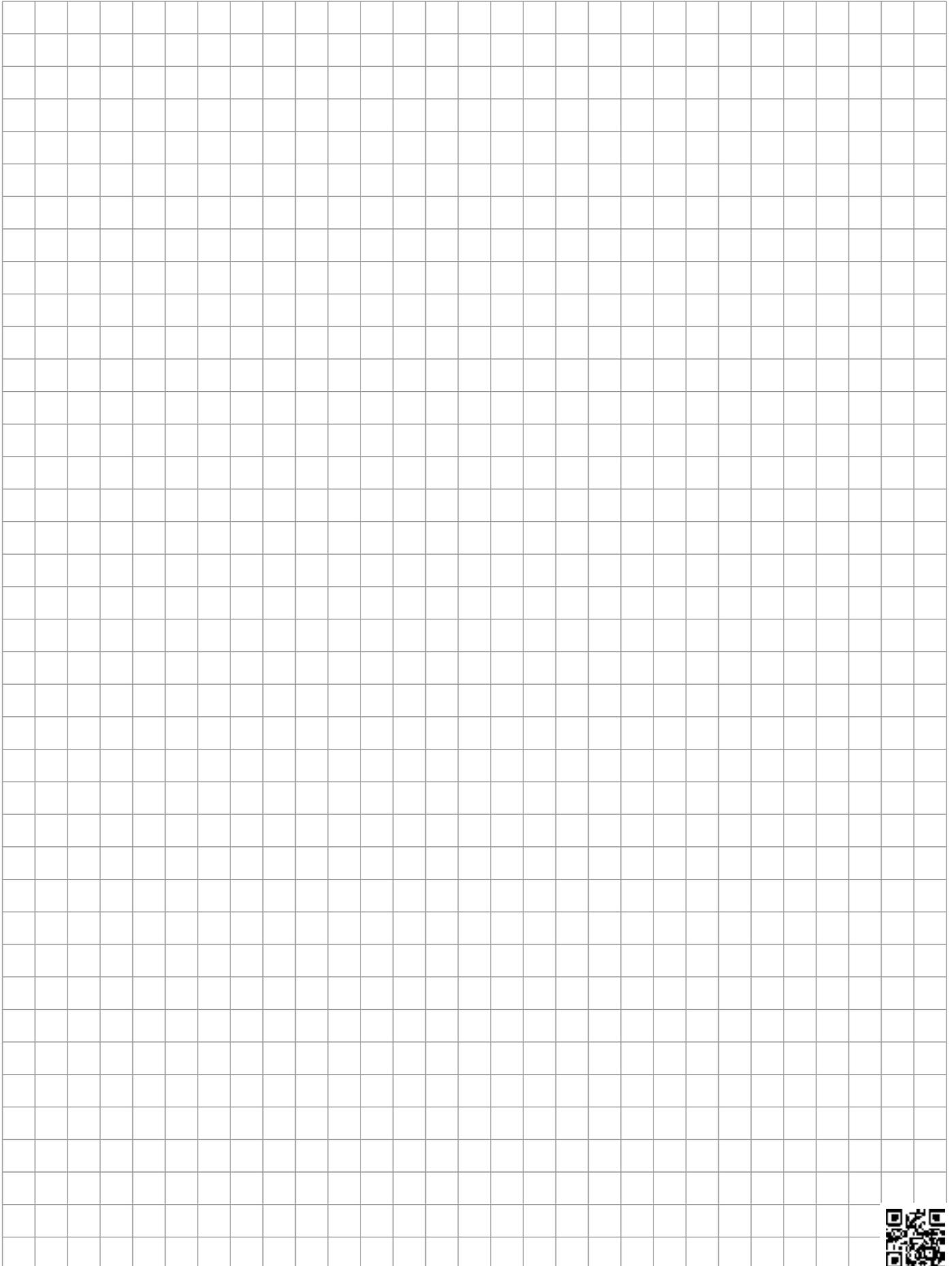
ECOMICRON	...MX...ECON2			
	3 μm	5 μm	10 μm	20 μm
0100 MX XXX ECON2	0.713	0.549	0.357	0.263
0200 MX XXX ECON2	0.439	0.324	0.209	0.154

MOBILEMICRON	...MX...MM		
	8 μm	10 μm	15 μm
0100 MX XXX MM	0.148	0.148	0.121
0200 MX XXX MM	0.088	0.088	0.071

All Element K Factors in psi / gpm.

MEDIUM PRESSURE FILTERS

Notes



F High Pressure Filters 3000-6000 psi

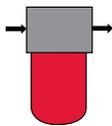
Robust carbon steel/ductile iron construction filters, provide reliability in demanding industrial applications. Inline, manifold-mount, reverse-flow, bi-directional-flow configurations provide flexibility to accommodate any application. Duplex filters allow for uninterrupted operation during element change-out.

HIGH PRESSURE FILTERS

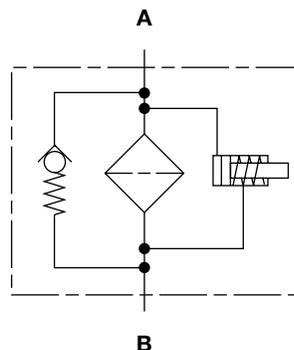
DF Series

Inline Filters

6090 psi • up to 200 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Choice of NPT, BSPP, SAE straight thread O-ring boss, and SAE 4-bolt flange porting (sizes 60 - 1320) to allow easy installation with maximum flexibility.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (nitrile rubber, fluorocarbon elastomer, and ethylene propylene rubber) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based fluids.
- Screw-in bowl or lid (on 2-pc. bowls) 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.
- HYDAC Differential Pressure 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 located in the filter head provides positive sealing during normal operation and fast opening during cold starts and flow surges. *(Optional non-bypass available)*
- For special finishes and coatings – consult HYDAC for minimum quantities, availability and pricing.
- Fatigue pressure ratings equal maximum allowable working pressure rating.

Technical Specifications

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 (30-660) Steel Housing/Bowl (660-1320 - 2.0) Steel Cap/Lid (660-1320 type) Steel	
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 200 gpm (757 lpm)	
Housing Pressure Rating	Max. Allowable Working Pressure 6090 psi (420 bar) Fatigue Pressure 6090 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	BH4HC, V 3045 psid (210 bar) ON, W/HC 290 psid (20 bar)	
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
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	

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



Offshore



Commercial Municipal



Power Generation



Pulp & Paper



Railways



Shipbuilding



Steel / Heavy Industry

Model Code

DF ON 30 T B 5 D 1 . X / 12 - V B6 L24

Filter Type _____
DF = Inline filter

Element Media _____
ON = Optimicron® BH/HC = Betamicon® (High Collapse)
W/HC = Wire Mesh V = Metal Fiber

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 = 3/4" SAE Code 62 Flange (sizes 60-140 only)
C = 3/4" Threaded (sizes 60-140 only) J = 1 1/4" SAE Code 62 Flange (sizes 160-280 only)
E = 1 1/4" Threaded (sizes 160-280 only) L = 2" SAE Code 62 Flange (sizes 330-1320 only)
F = 1 1/2" Threaded (sizes 330-1320 only)

Filtration Rating (microns) _____
1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = BH/HC 25, 74, 149 = W/HC 3, 5, 10, 20 = V

Type of ΔP Clogging Indicator _____
A, B, BM, C, D (others available upon request)

Type Number _____
1 = One piece bowl (sizes 30-660 only) 2 = Two piece bowl (sizes 660-1320 only)
3 = Upside down mount (two-piece bowl) - (sizes 330-1320)

Modification Number (latest version always supplied) _____

Port Configuration _____
0 = 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 rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
(omit) = Non-bypass B3 = Bypass (3 bar) B6 = Bypass (6 bar)

Supplementary Details _____
SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids
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 = "VD..." indicator modified with a brass piston for use with High water based emulsions/solutions (HFA) & (HFC) or when using "V" elements
L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
T100 = Indicator Thermal Lockout, 100°F (C and D indicators only)
cRUus = Electrical Indicators with underwriter's recognition
SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0030 D 005 ON / V

Size _____
0030, 0060, 0110, 0160,
0240, 0280, 0330, 0660, 1320

Filtration Rating (micron) _____
3, 5, 10, 20 = BH4HC 1, 3, 5, 10, 15, 20 = ON
25, 74, 149 = W/HC 3, 5, 10, 20 = V

Element Media _____
BH4HC, ON, W/HC, V

Seals _____
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EP = Ethylene propylene rubber (EPR)

Supplementary Details _____
SO263 = (same as above)
W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC) usually polyglycol
SFREE = (same as above)

Clogging Indicator Model Code

VD 5 D . X / V L24

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 = Pop-up indicator (auto reset)
BM = Pop-up indicator (manual reset)
C = Electric switch – SPDT
D = Electric switch and LED light – SPDT

Modification Number _____

Supplementary Details _____

Seals _____
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EP = Ethylene propylene rubber (EPR)

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

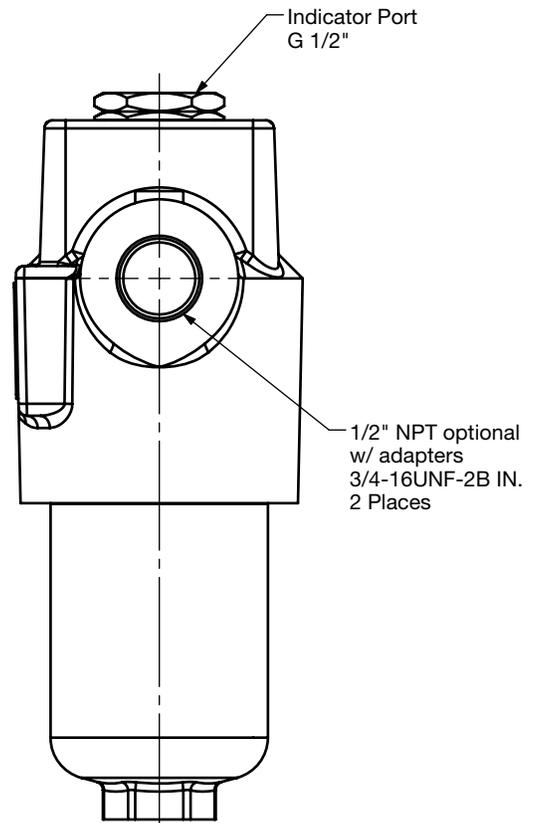
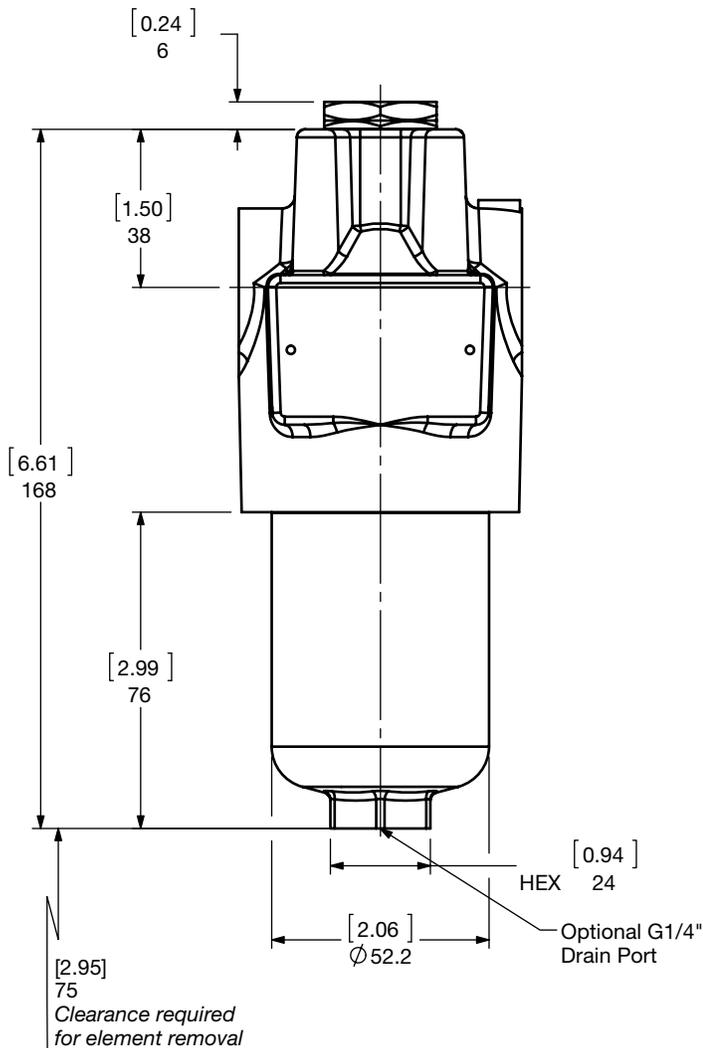
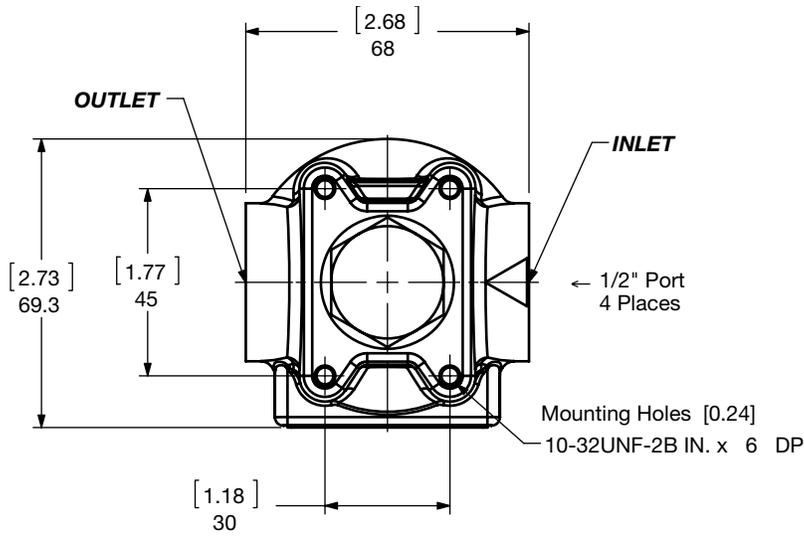
Thermal Lockout (VM, VD types C, D, J, and J4 only) _____
T100 = Lockout below 100°F

Underwriters Recognition (VM, VD types C, D, J, and J4 only) _____
cRUus = Electrical Indicators with underwriter's recognition
W = "VD..." indicator modified with a brass piston for use with High water based emulsions/solutions (HFA) & (HFC) (For additional details and options, see Section G - Clogging Indicators.)

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

HIGH PRESSURE FILTERS

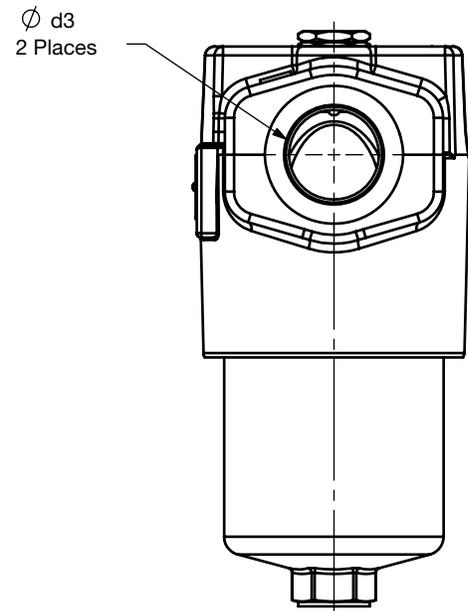
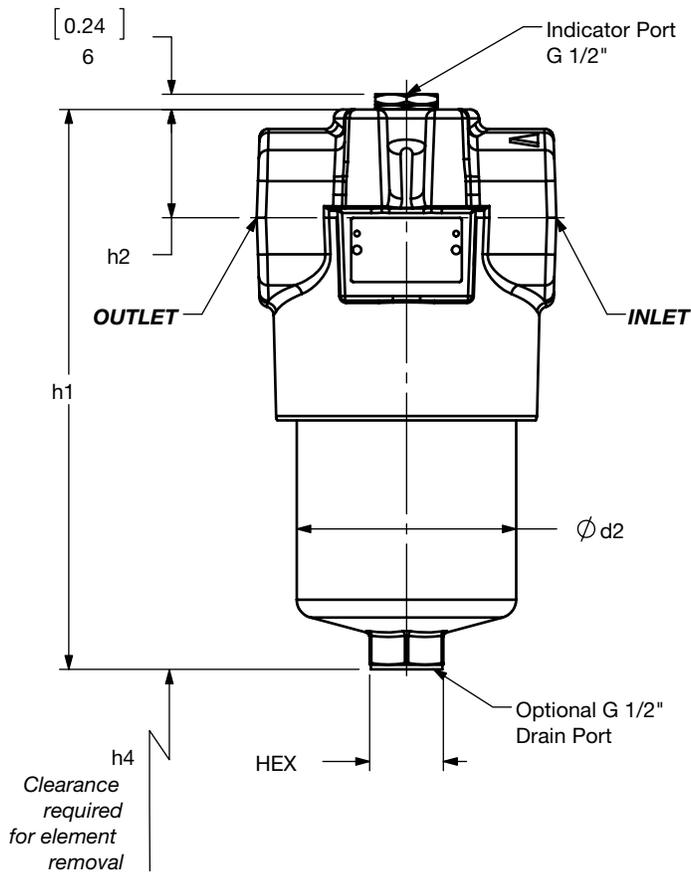
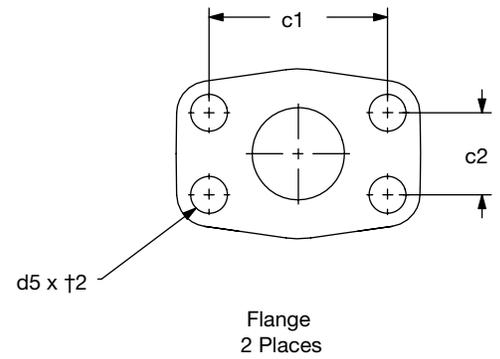
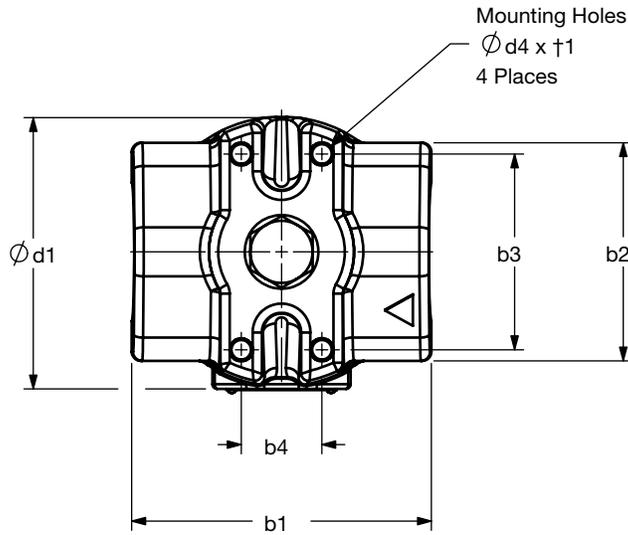
Dimensions DF 30



Size	30
Weight (lbs.)	5.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions DF 60-330

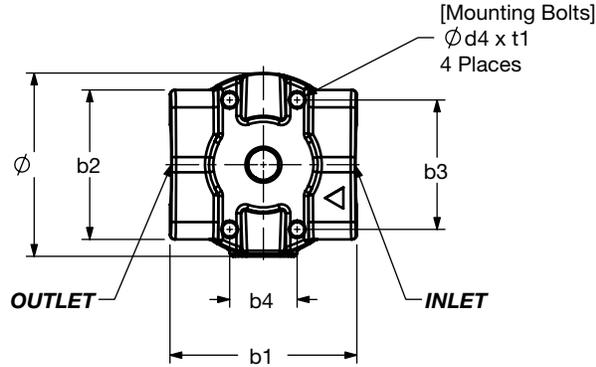


Size	60	110	160	240	280	330
Weight (lbs.)	10	12	22.8	26.1	36	54.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

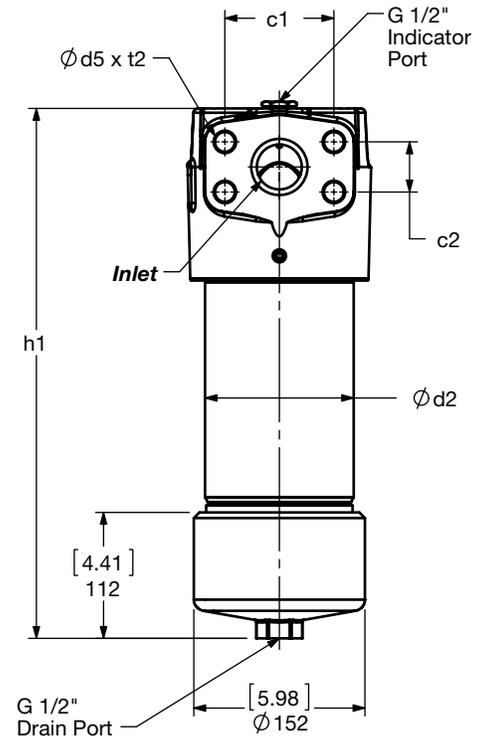
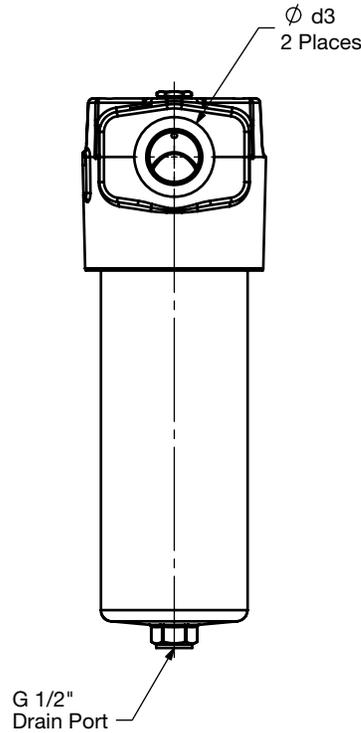
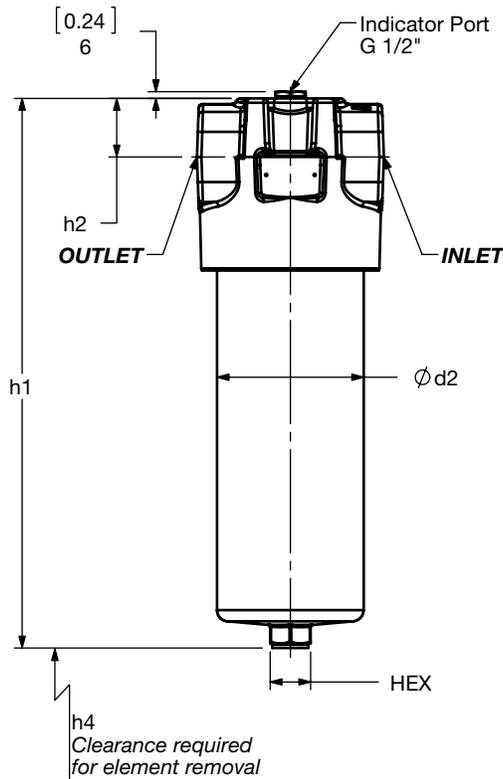
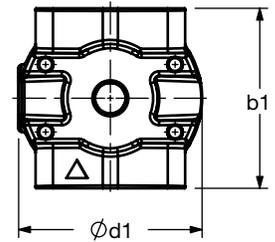
Dimensions DF 660-1320

660 1.0 Version



660-1320 2.0 Version

Note - See 1.X Version for mounting



Size	b1	b2	b3	b4	c1	c2	d1	d2	d3 NOM	d4*	d5	h1	h2	h4	HEX	†1	†2
660...F... 1.X	(6.3) 160	(5.24) 133	(4.53) 115	(2.36) 60	-	-	(6.42) 163	(5.12) 130	1- 1/2"	1/2-	-	(18.93) 481	(2.05) 52	(4.53) 115	(1.42) 36	(0.67) 17	-
660...L... 1.X	(6.3) 160	(5.24) 133	(4.53) 115	(2.36) 60	(3.81) 96.8	(1.75) 44.5	(6.42) 163	(5.12) 130	2"	20UNF- 2B M12x1.75	3/4- 10UNC- 2B M20x2.5	(18.93) 481	(2.05) 52	(4.53) 115	(1.42) 36	(0.67) 17	(0.98) 25
660...F... 2.X	(6.3) 160	(5.24) 133	(4.53) 115	(2.36) 60	-	-	(6.42) 163	(5.12) 130	1- 1/2"	1/2-	-	(18.54) 471	(2.05) 52	(4.53) 115	(1.42) 36	(0.67) 17	-
660...L... 2.X	(6.3) 160	(5.24) 133	(4.53) 115	(2.36) 60	(3.81) 96.8	(1.75) 44.5	(6.42) 163	(5.12) 130	2"	20UNF- 2B M12x1.75	3/4- 10UNC- 2B M20x2.5	(18.54) 471	(2.05) 52	(4.53) 115	(1.42) 36	(0.67) 17	(0.98) 25
1320...F... 2.X	(6.3) 160	(5.24) 133	(4.53) 115	(2.36) 60	-	-	(6.42) 163	(5.12) 130	1- 1/2"	1/2-	-	(29.25) 743	(2.05) 52	(26.38) 670	(1.42) 36	(0.67) 17	-
1320...L... 2.X	(6.3) 160	(5.24) 133	(4.53) 115	(2.36) 60	(3.81) 96.8	(1.75) 44.5	(6.42) 163	(5.12) 130	2"	20UNF- 2B M12x1.75	3/4- 10UNC- 2B M20x2.5	(29.25) 743	(2.05) 52	(26.38) 670	(1.42) 36	(0.67) 17	(0.98) 25

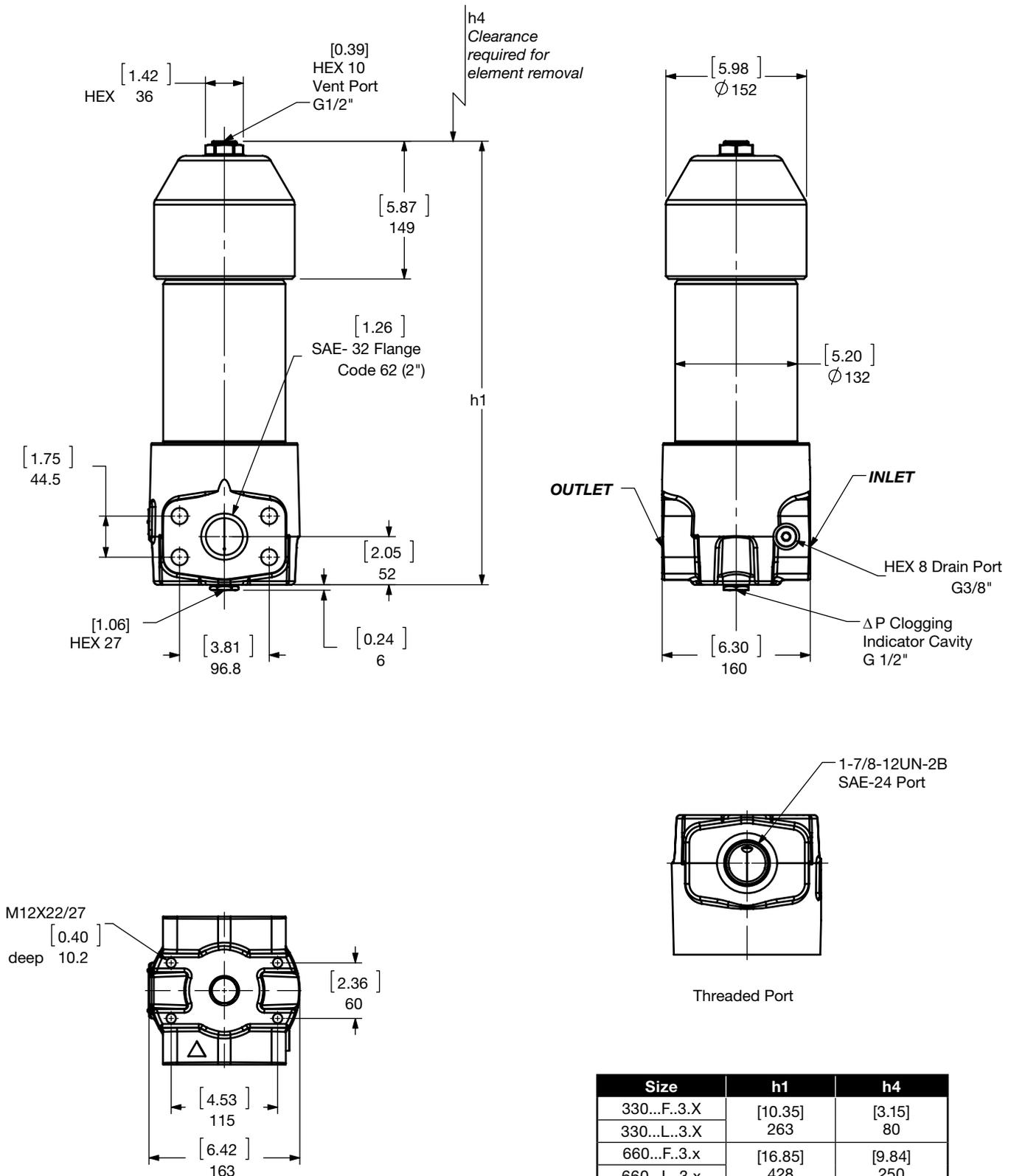
Size	660 1.0	660 2.0	1320 2.0
Weight (lbs.)	70	75.9	112.7

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Dimensions

DF 330/660/1320 3.0 Version



Size	h1	h4
330...F..3.X	[10.35]	[3.15]
330...L..3.X	263	80
660...F..3.x	[16.85]	[9.84]
660...L..3.x	428	250
1320...F..3.x	[29.49]	[22.44]
1320...L..3.x	749	570

Size	330	660	1320
Weight (lbs.)	61.5	74.8	112.0

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

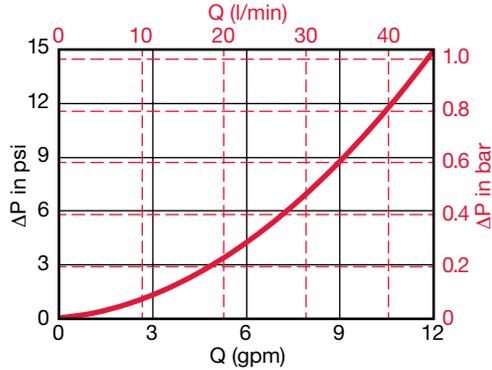
Housing Curve:

Pressure loss through housing is as follows:

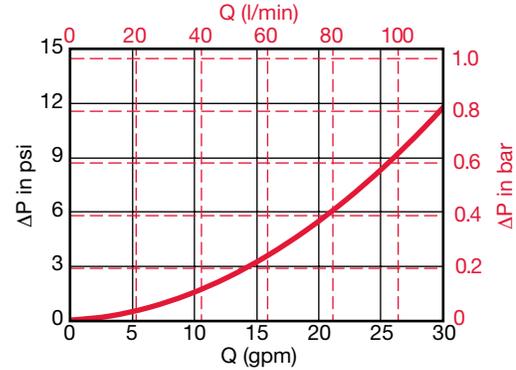
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

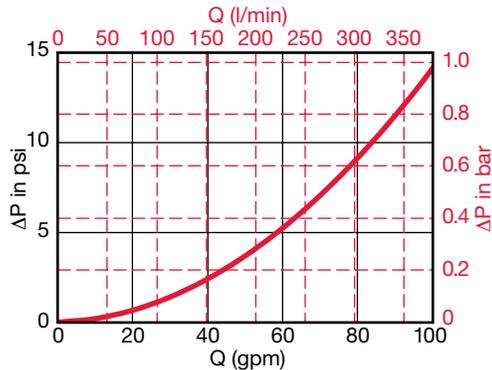
DF 30 Housing



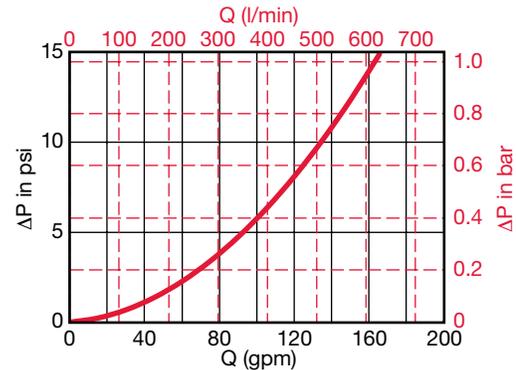
DF 60/110 Housing



DF 160/240/280 Housing



DF 330/660/1320 Housing



Element K Factors

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

(From Tables Below)

Betamicon® Size	...D...BH4HC Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0030 D XXX BH4HC	5.005	2.782	1.992	1.043
0060 D XXX BH4HC	3.216	1.789	0.993	0.670
0110 D XXX BH4HC	1.394	0.818	0.489	0.307
0160 D XXX BH4HC	0.922	0.571	0.324	0.241
0240 D XXX BH4HC	0.582	0.373	0.214	0.159
0280 D XXX BH4HC	0.313	0.187	0.099	0.088
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049
1320 D XXX BH4HC	0.088	0.055	0.033	0.022

Optimicon	...D...ON Elements					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0030 D XXX ON	4.27	3.507	2.376	1.251	0.768	0.62
0060 D XXX ON	2.936	1.427	1.004	0.664	0.537	0.347
0110 D XXX ON	1.416	0.735	0.527	0.333	0.254	0.164
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031
1320 D XXX ON	0.102	0.053	0.042	0.025	0.019	0.015

Wire Mesh Size	...D...W/HC Elements
	25, 50, 74, 100, 149, 200 μm
0030 D XXX W/HC	0.185
0060 D XXX W/HC	0.092
0110 D XXX W/HC	0.050
0160 D XXX W/HC	0.035
0240 D XXX W/HC	0.023
0280 D XXX W/HC	0.020
0330 D XXX W/HC	0.020
0660 D XXX W/HC	0.008
1320 D XXX W/HC	0.004

Metal Fiber Size	...D...V Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0030 D XXX V	1.011	0.740	0.411	0.200
0060 D XXX V	0.877	0.511	0.296	0.183
0110 D XXX V	0.452	0.304	0.182	0.118
0160 D XXX V	0.251	0.177	0.123	0.079
0240 D XXX V	0.169	0.137	0.093	0.062
0280 D XXX V	0.126	0.093	0.064	0.041
0330 D XXX V	0.121	0.097	0.065	0.043
0660 D XXX V	0.063	0.050	0.034	0.021
1320 D XXX V	0.032	0.026	0.018	0.012

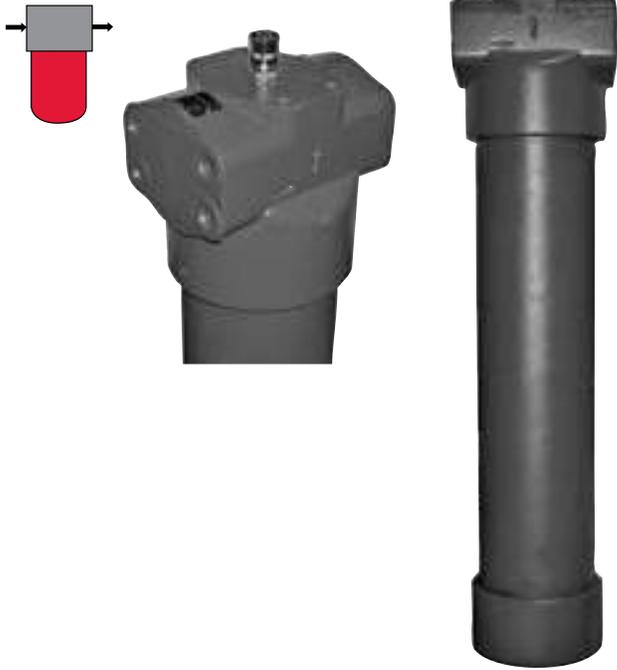
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

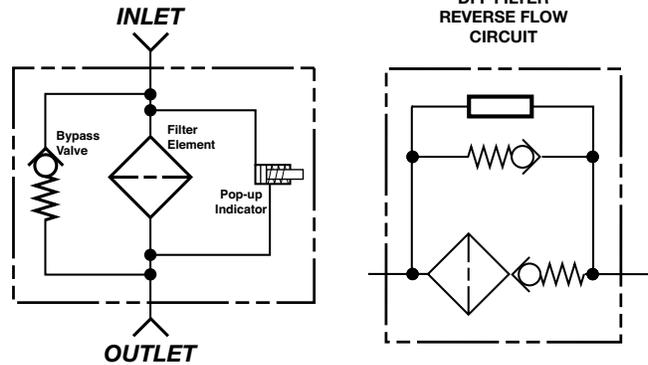
DF/DFF 1500 Series

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 bidirectional flow and single flow configurations
- Two part bowl for ease of operation and element change-out
- Filter head made of ductile iron
- Filter housing (bowl) and lid made of steel
- Can mount head on top with bottom access (2.x) or head on bottom with top access (3.x)
- Single flow version (DF) can be supplied with bypass (located in head assembly).
- Bidirectional flow version (DFF) can only be supplied with no-bypass.

Technical Specifications

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 (M20 x 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) Filter housing (bowl) & lid: Steel
Flow Capacity	250 gpm (950 lpm)
Housing Pressure Rating	Max. Allowable Working Pressure 6090 psi (420 bar) Fatigue Pressure 6090 psi (420 bar) @ 300,000 cycles Burst Pressure Contact HYDAC
Element Collapse Pressure Rating	ON, W/HC 290 psid (20 bar) BH4HC, V 3045 psid (210 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% $\Delta P = 72$ psid (5 bar) -10% $\Delta P = 116$ psid (8 bar) -10% (non-bypass)
Bypass Valve Cracking Pressure	$\Delta P = 43$ psid (3 bar) +10% $\Delta P = 87$ psid (6 bar) +10% Non Bypass Available

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



Offshore



Commercial Municipal



Power Generation



Pulp & Paper



Railways

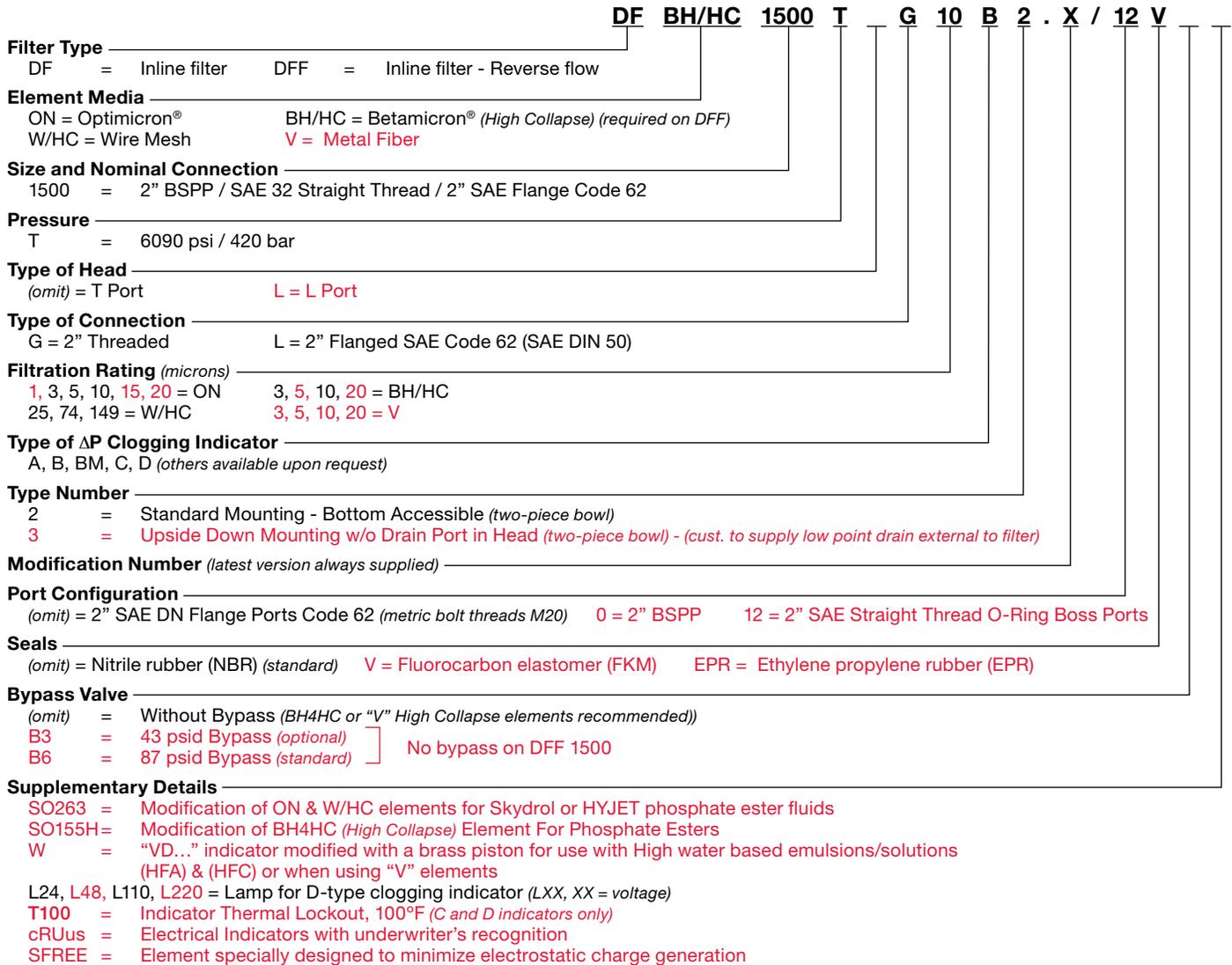


Shipbuilding

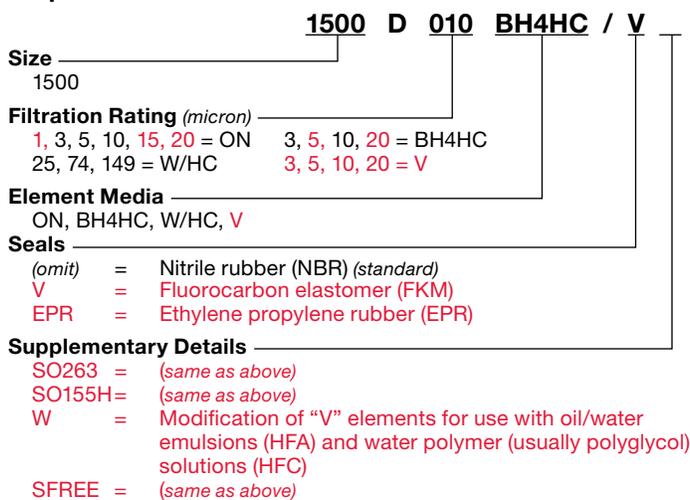


Steel / Heavy Industry

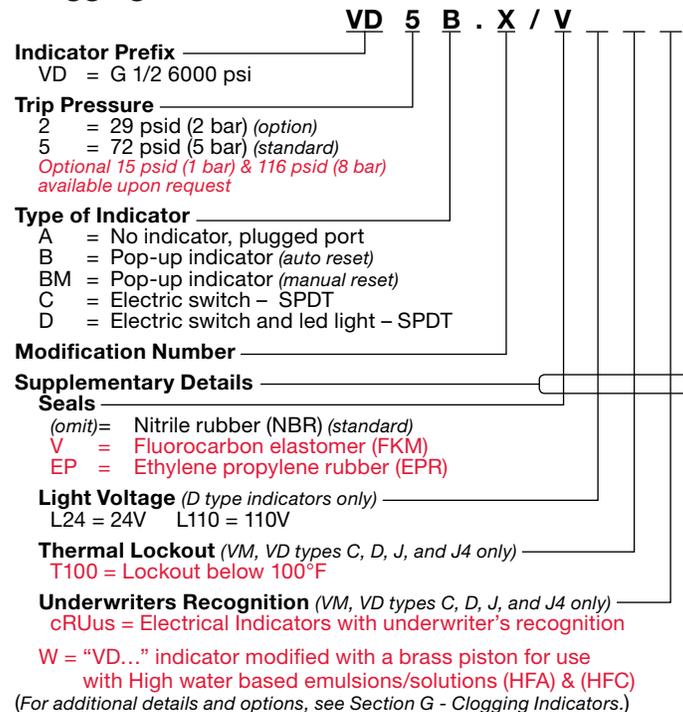
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

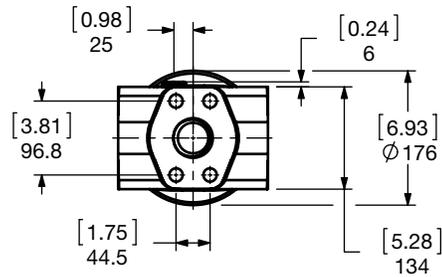


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

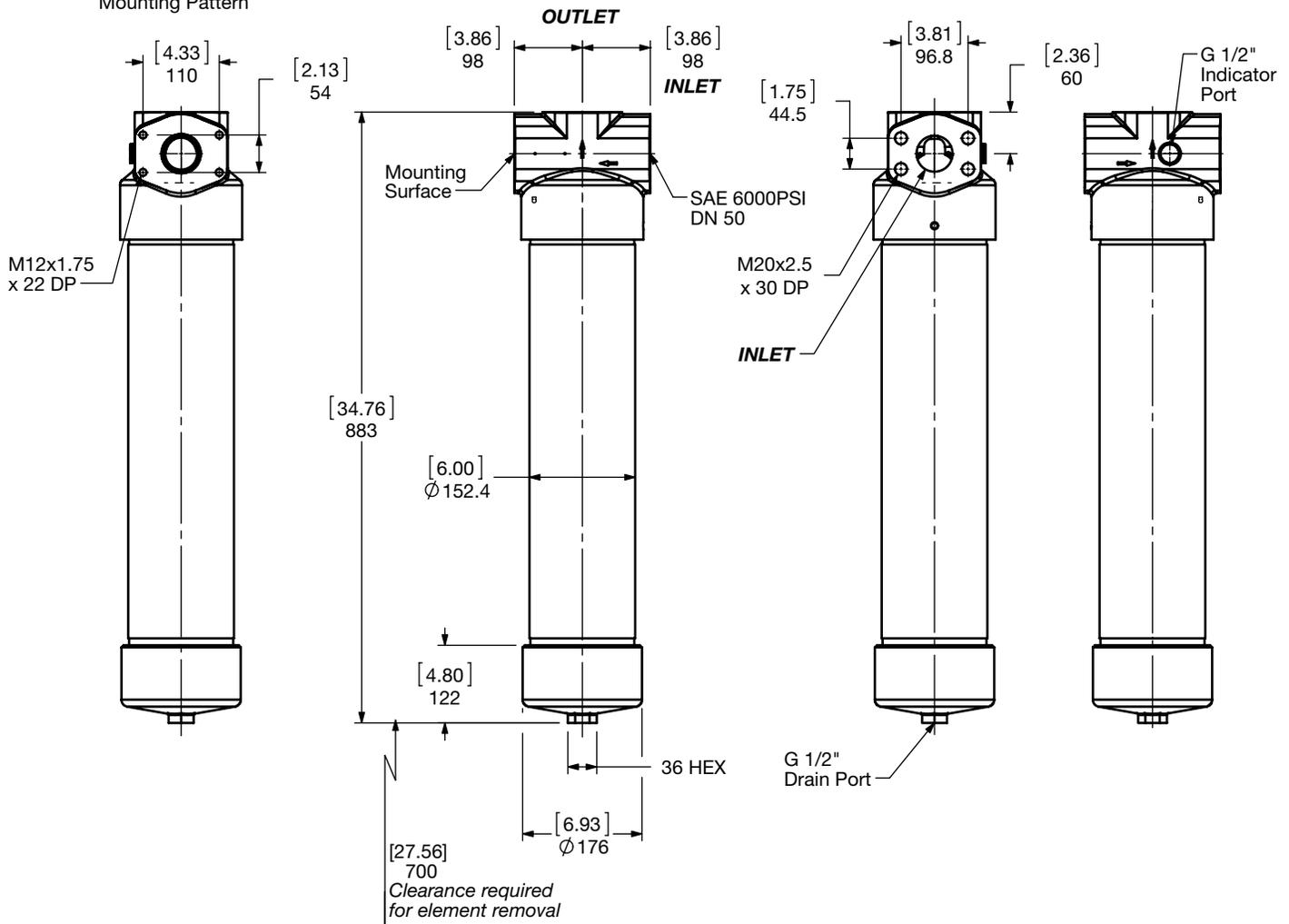
HIGH PRESSURE FILTERS

Dimensions

DF/DFE 1500 2.0 L Configuration



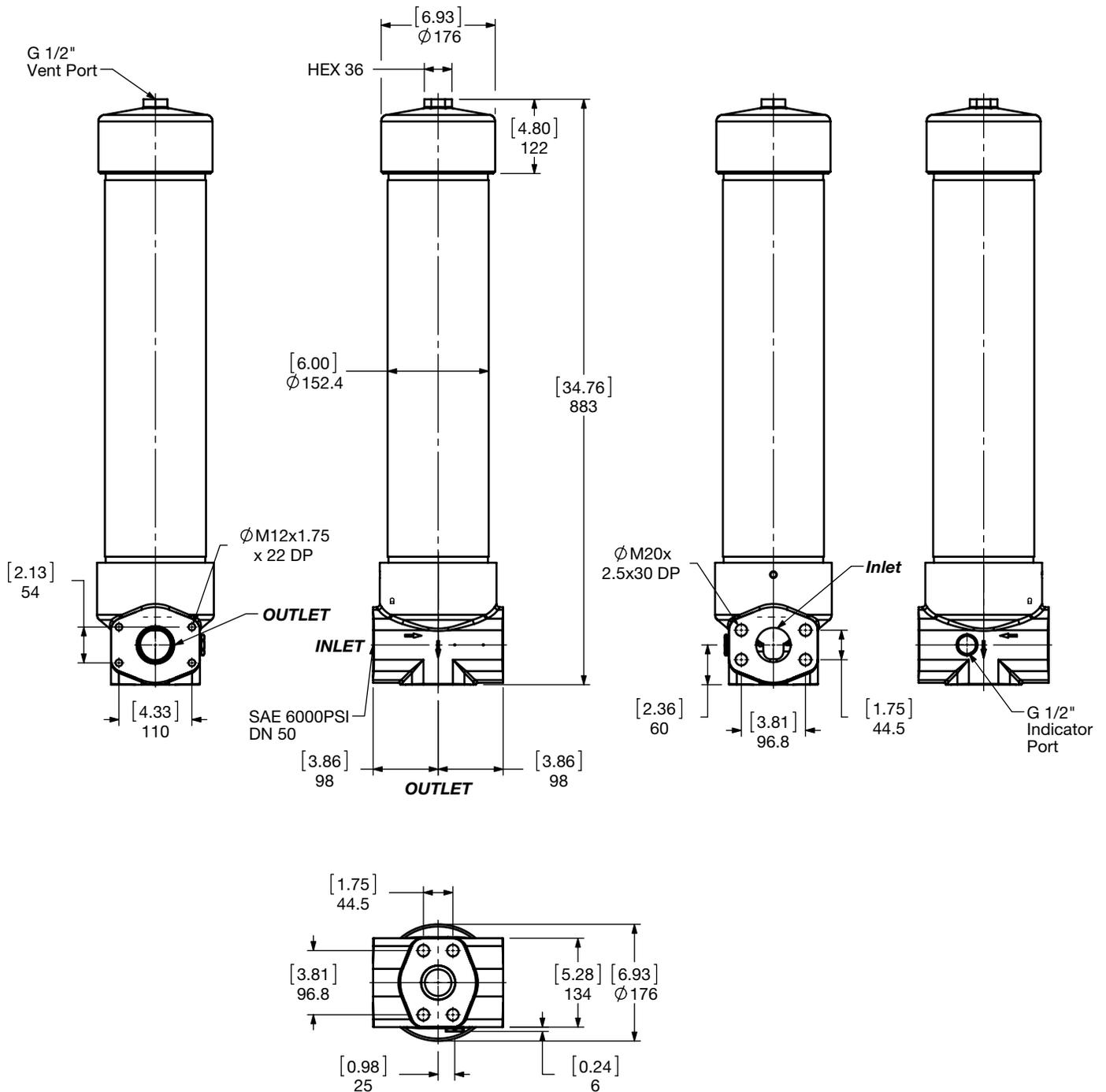
Mounting Pattern



Size	DF/DFE 1500 2.0 "L"
Weight (lbs.)	152.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions DF/DFE 1500 3.0 L Configuration



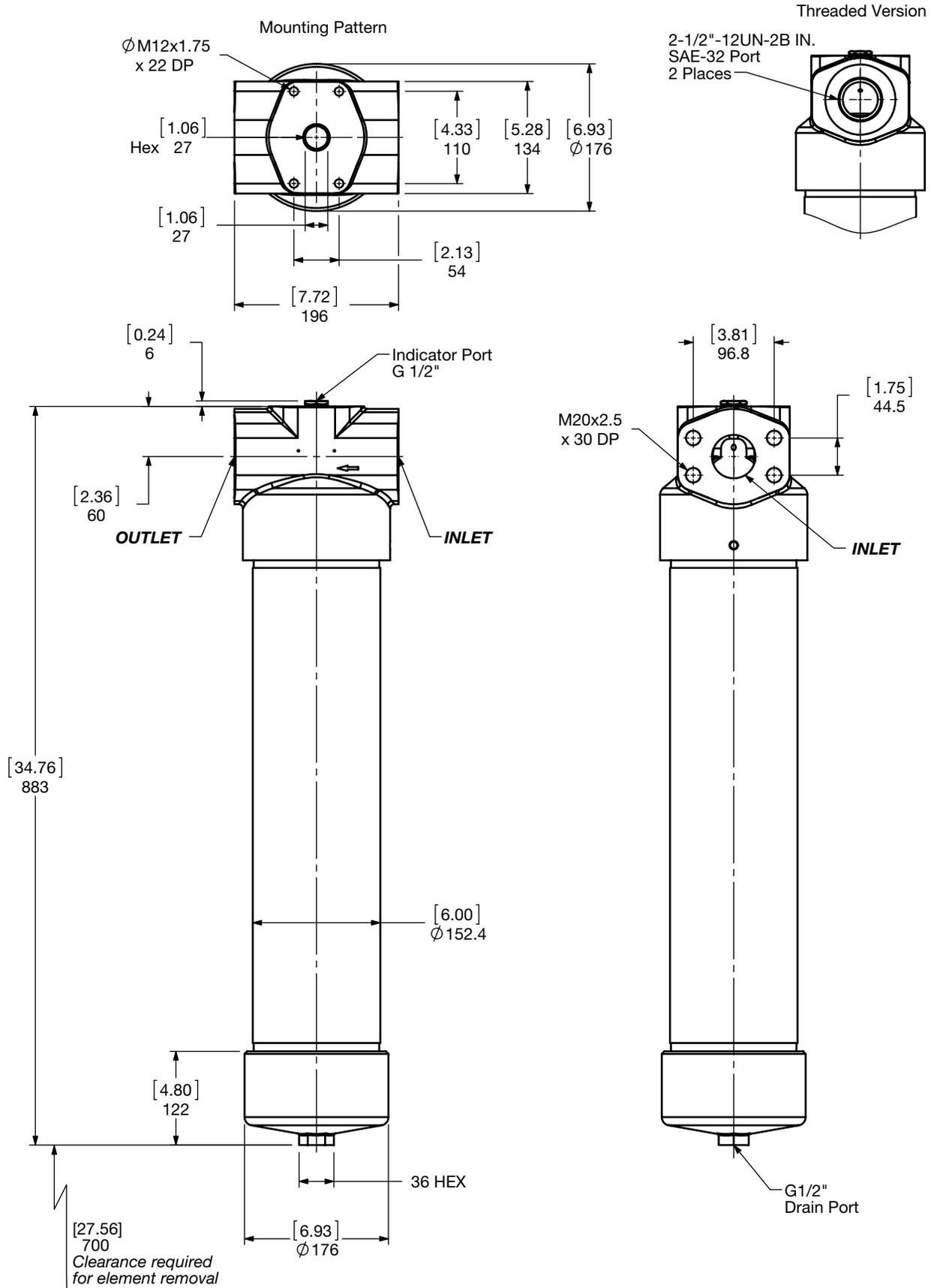
Size	DF/DFE 1500 3.0 "L"
Weight (lbs.)	152.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Dimensions

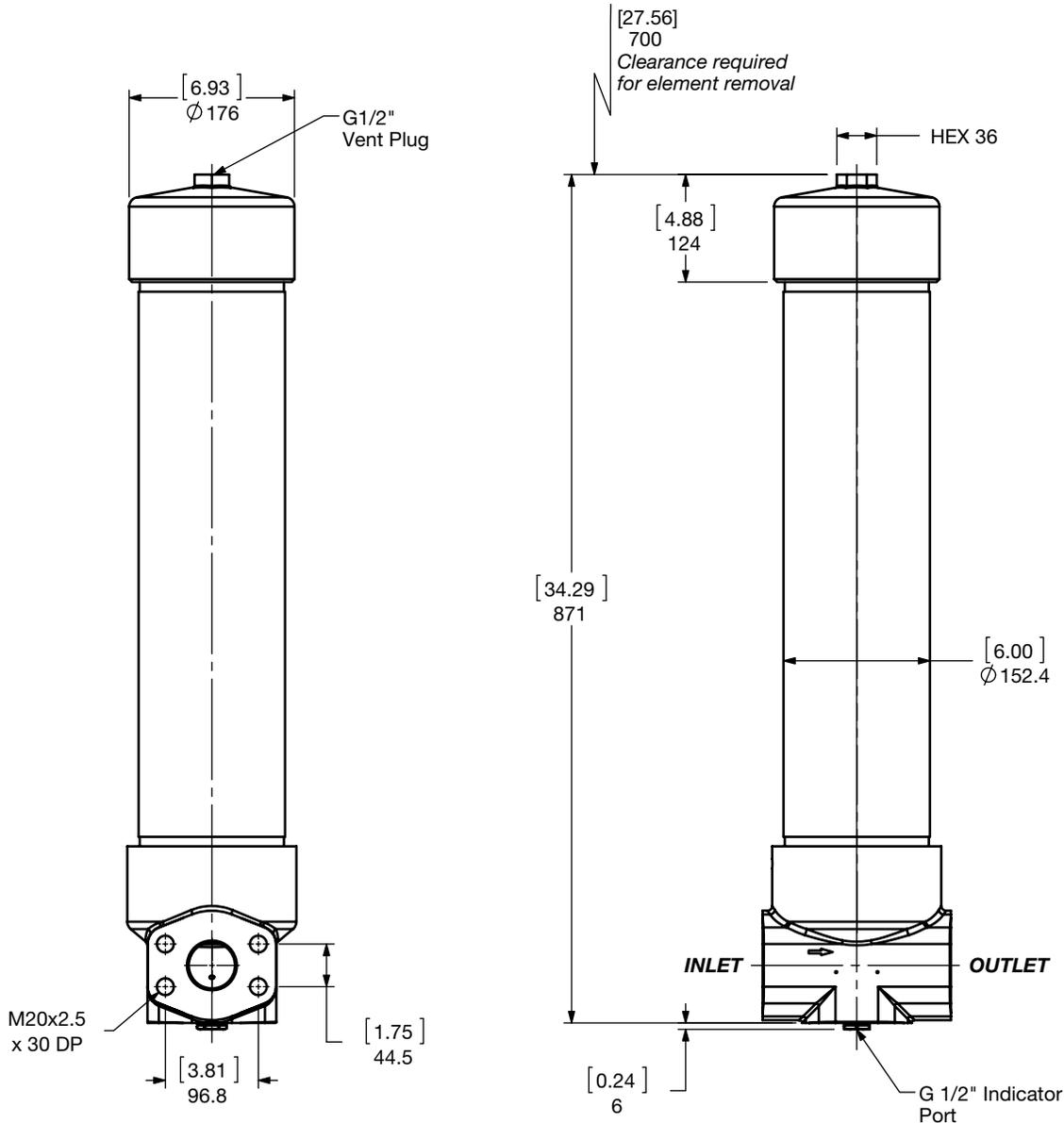
DF/DFE 1500 2.0 T Configuration



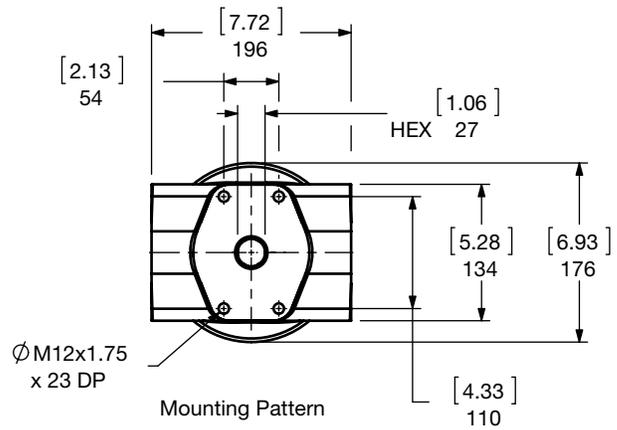
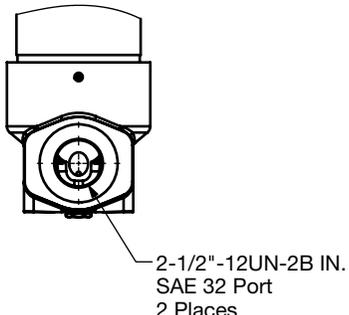
Size	DF/DFE 1500 2.0 "T"
Weight (lbs.)	152.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions DF/DFE 1500 3.0 T Configuration



Threaded Version



Size	DF/DFE 1500 3.0 "T"
Weight (lbs.)	152.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

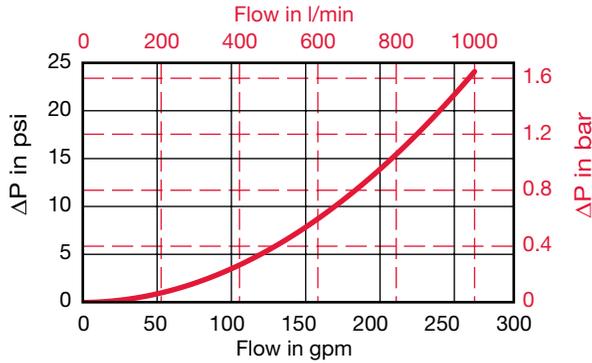
Housing Curve:

Pressure loss through housing is as follows:

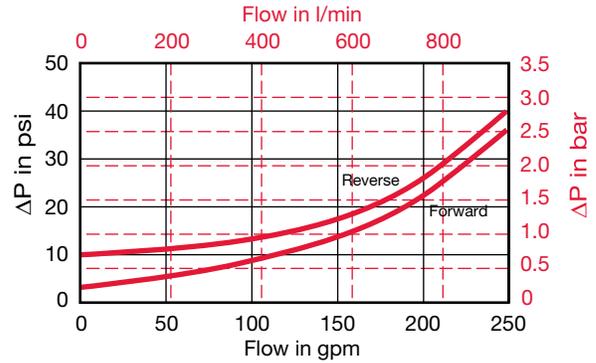
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

DF 1500



DFF 1500



Element K Factors

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

(From Tables Below)

Optimicron	...D...ON (Pressure Elements)					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
1500 D XXX ON	0.09	0.053	0.038	0.026	0.02	0.015

Betamicron	...D...BH4HC (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
1500 D XXX BH4HC	0.077	0.044	0.033	0.027

Wire Mesh	...D...W/HC Elements
Size	...D...W/HC Elements 25, 50, 74, 100, 149, 200 μm
1500 D XXX W/HC	0.020

Metal Fiber	...D...V Elements (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
1500 D XXX V	0.016	0.011	0.011	0.005

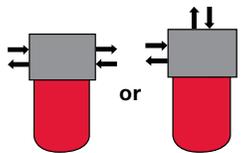
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

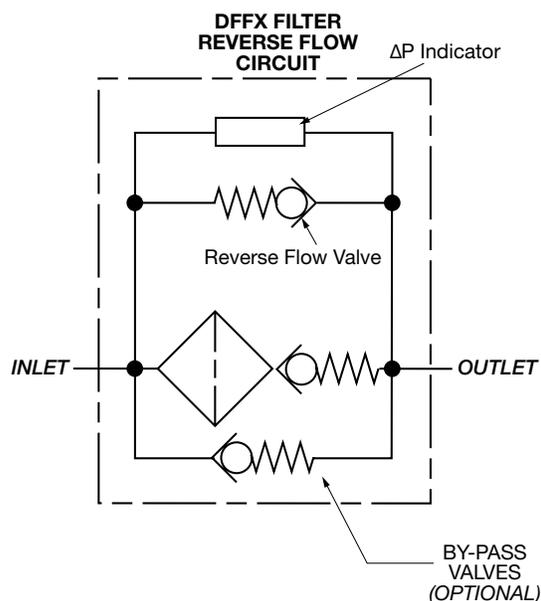
DFFX Series

Reverse Flow Differential Pressure Optimized Filters

6090 psi • up to 160 gpm



Hydraulic Symbol



Features

- DFFX Reverse Flow models filter fluid in the forward direction and bypass the filter element when the flow direction is reversed.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials provide compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based fluids.
- Screw-in bowl/lid 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) located in the filter head provides positive sealing during normal operation and fast opening during cold starts and flow surges.

Applications



Agricultural



Automotive



Construction



Industrial

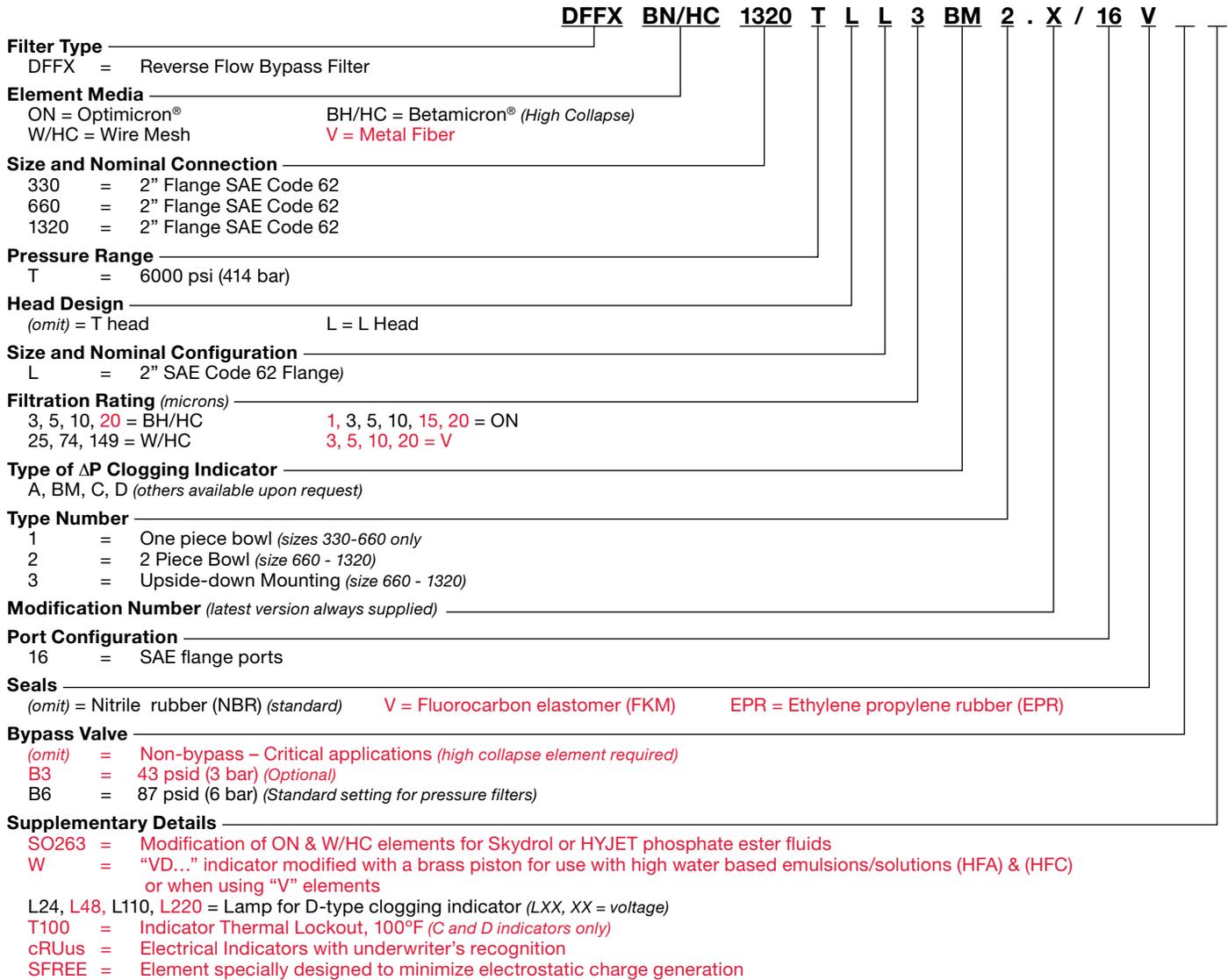


Railways

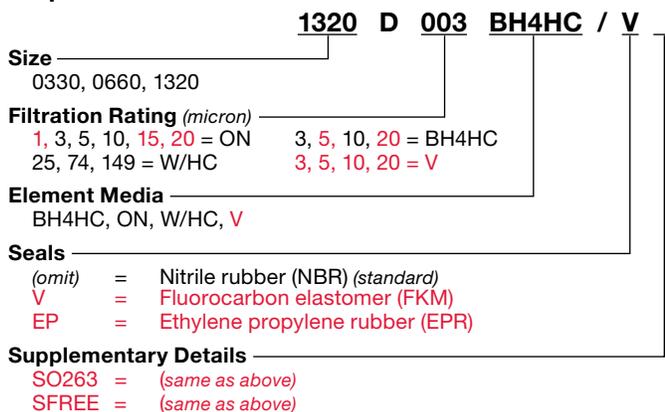
Technical Specifications

Mounting Method	4 mounting holes
Port Connection	DFFX 330/660/1320 2" SAE Flange Code 62
Flow Direction	Inlet: Side Outlet: Side or Top
Construction Materials	Head Ductile iron Single piece bowl "1.X" Bowl Steel Two piece bowl "2.X" Housing Steel Lid/Cap Steel
Flow Capacity	330 80 gpm (303 lpm) 660/1320 100 gpm (379 lpm)/160 gpm (606 lpm)
Housing Pressure Rating	Max. Allowable Working Pressure 6090 psi (420 bar) Fatigue Pressure Contact HYDAC Office Burst Pressure Contact HYDAC Office
Element Collapse Pressure Rating	BH4HC, V 3045 psid (210 bar) ON, W/HC 290 psid (20 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	ΔP = 29 psid (2 bar) -10% (optional) ΔP = 72 psid (5 bar) -10% (standard) ΔP = 116 psid (8 bar) -10% (optional)
Bypass Valve Cracking Pressure	ΔP = 43 psid (3 bar) +10% (optional) ΔP = 87 psid (6 bar) +10% (standard) Non Bypass Available

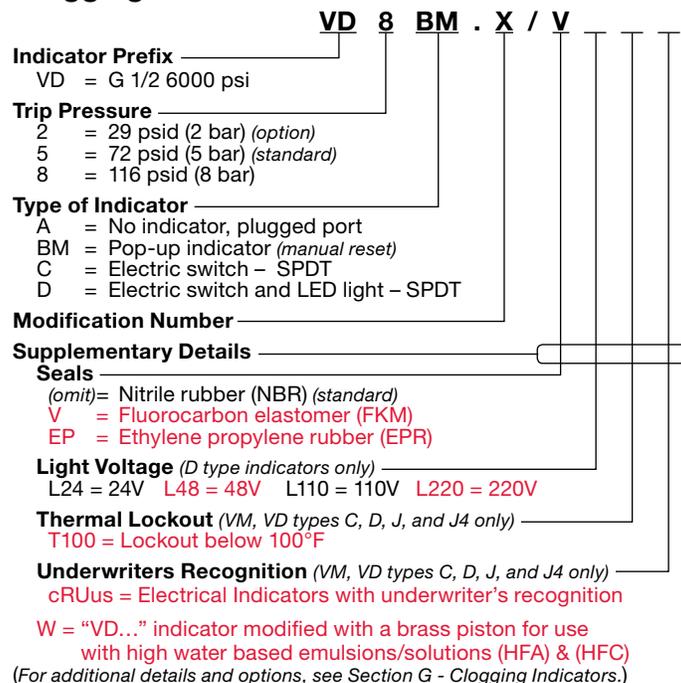
Model Code



Replacement Element Model Code

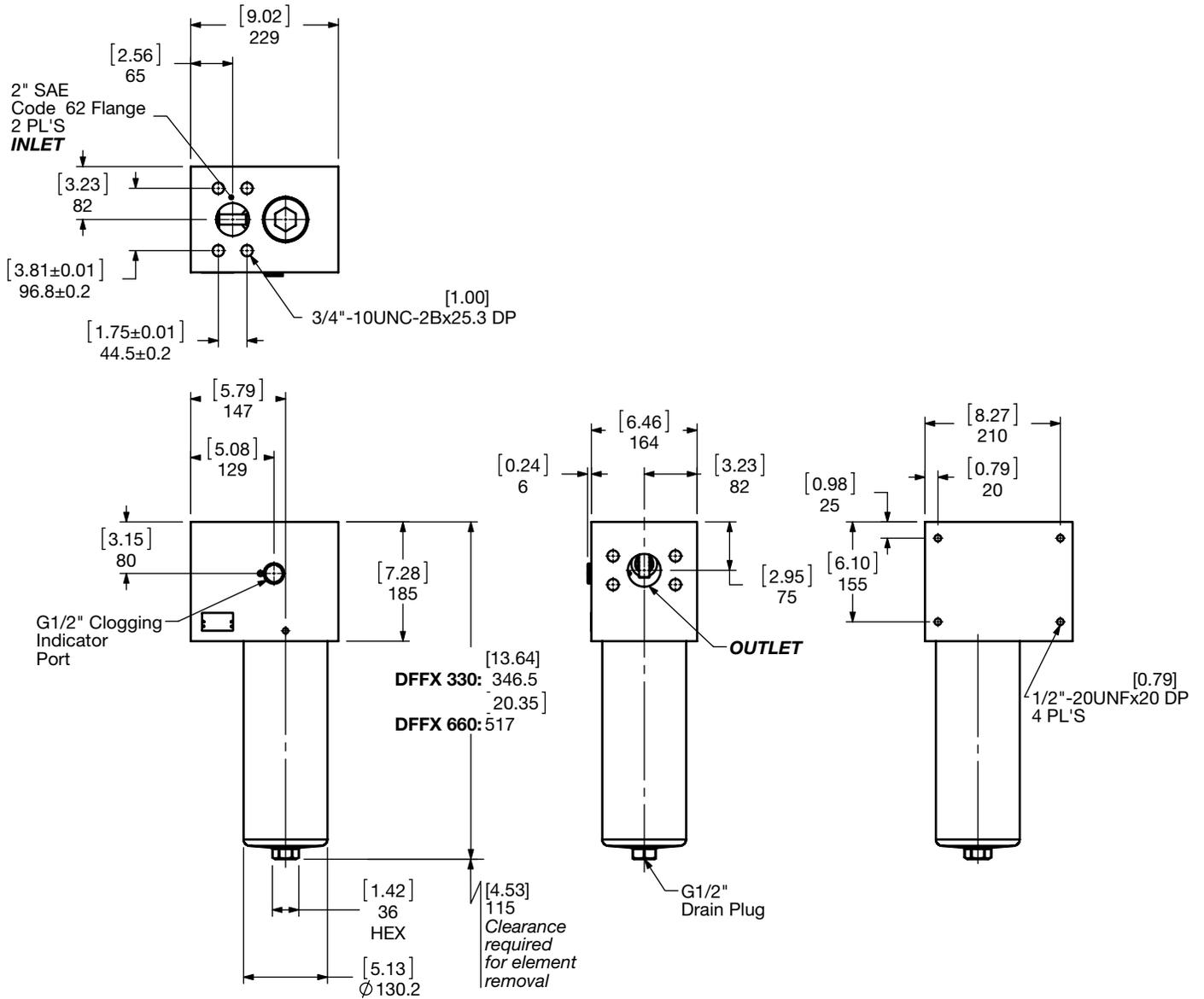


Clogging Indicator Model Code



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

Dimensions DFFX 330 / 660 TLL 1.X Version



Size	330 TLL1.0v	660 TLL1.0v
Weight (lbs.)	109.2	124.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

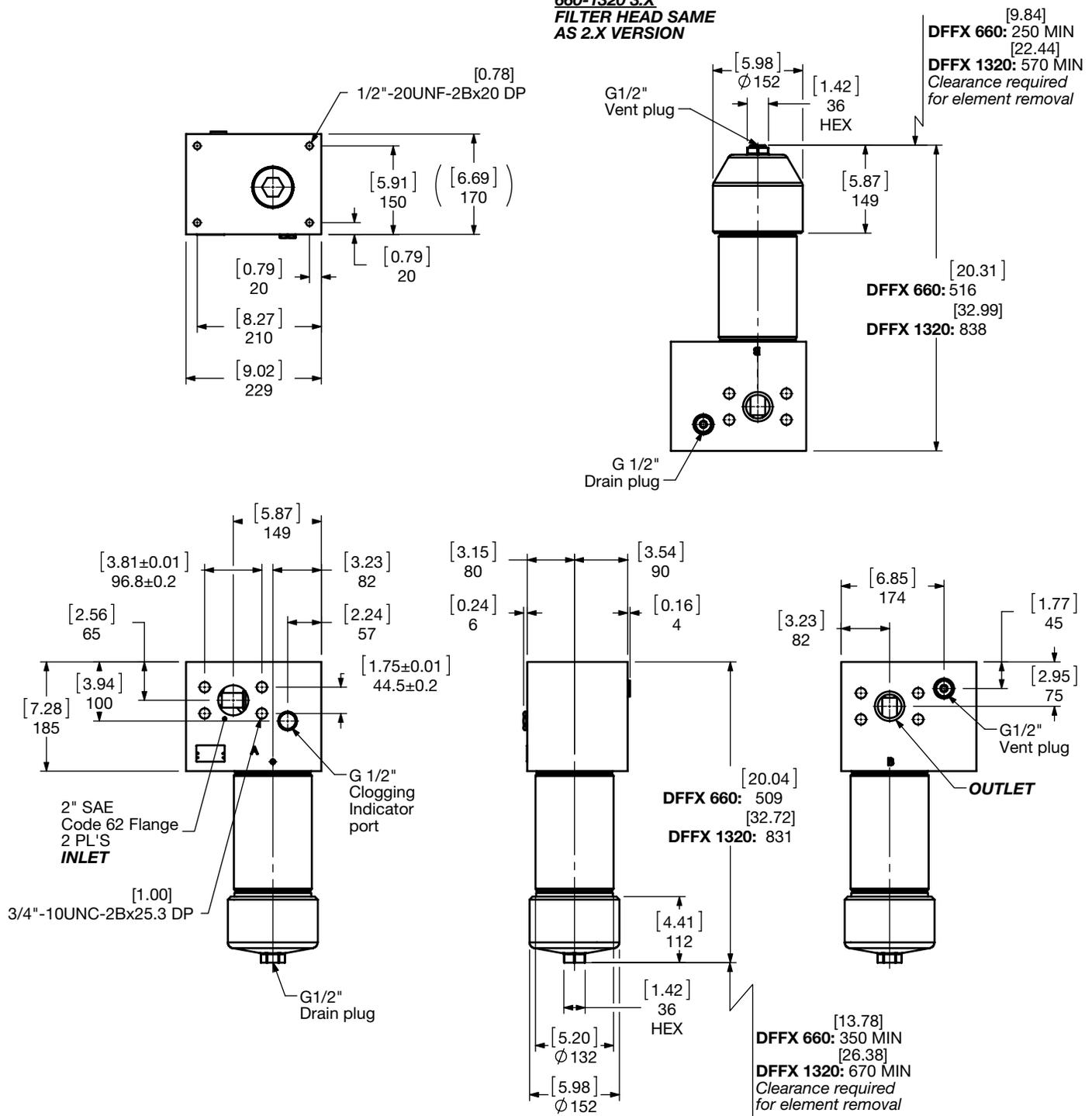
HIGH PRESSURE FILTERS

Dimensions

DFFX 660 / 1320 TL 2.X & 3.X Version

660 / 1320 2.X Version

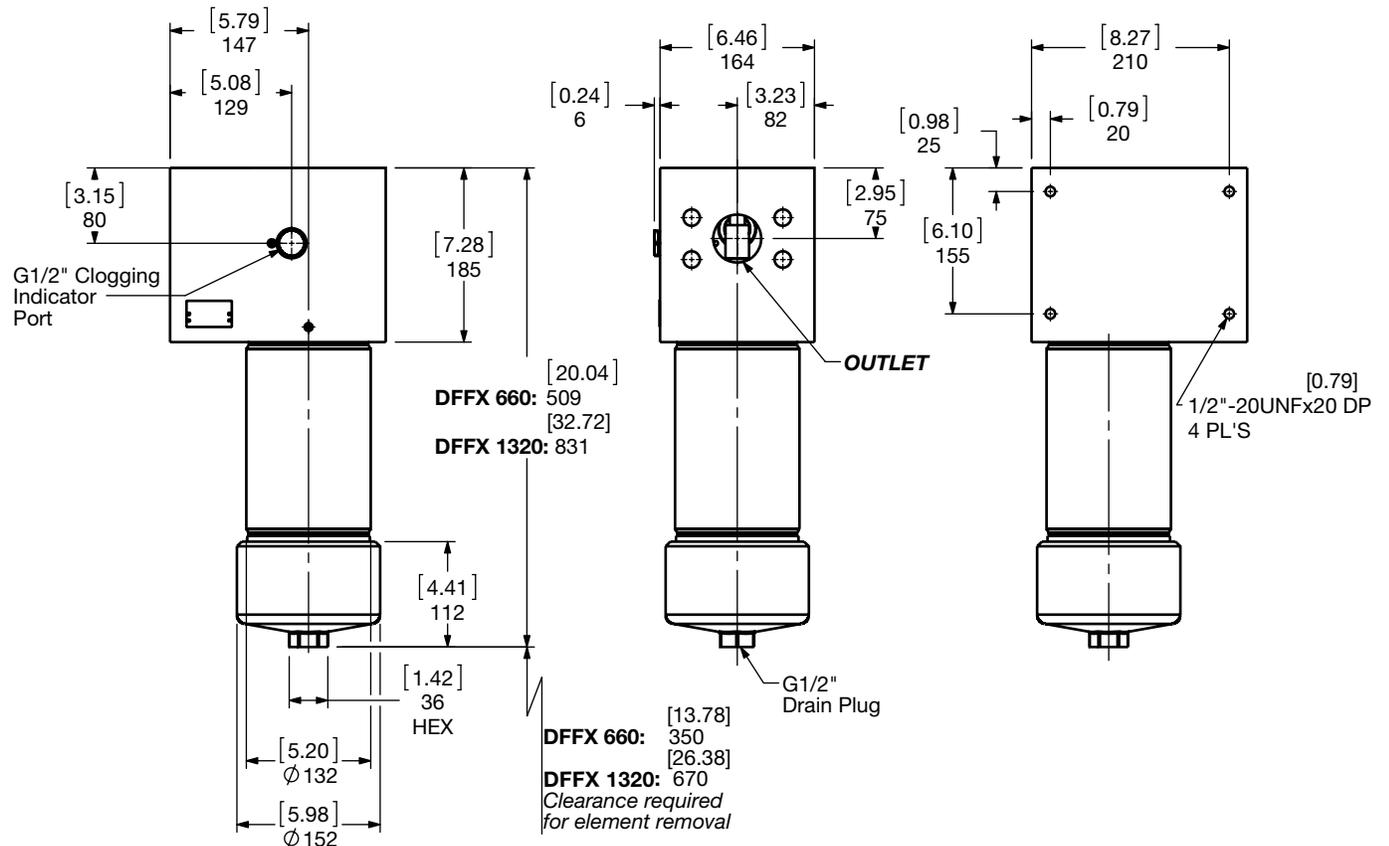
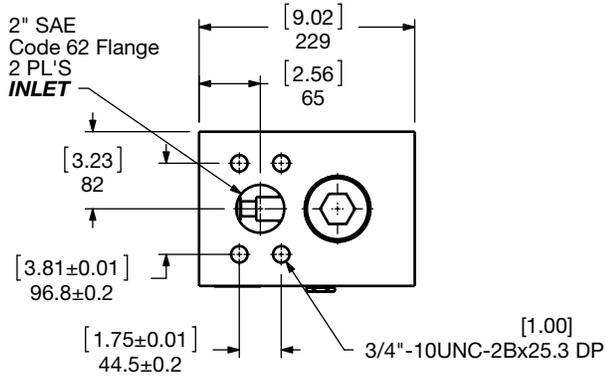
660-1320 3.X FILTER HEAD SAME AS 2.X VERSION



Size	660 TL2.0 3.0v	1320 TL2.0 3.0v
Weight (lbs.)	124.8	167.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions DFFX 660 / 1320 TLL 2.X Version



Size	660 TLL2.0v	1320 TLL2.0v
Weight (lbs.)	124.8	167.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

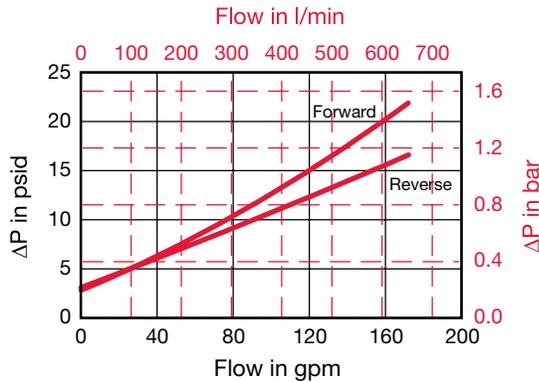
Housing Curve:

Pressure loss through housing is as follows:

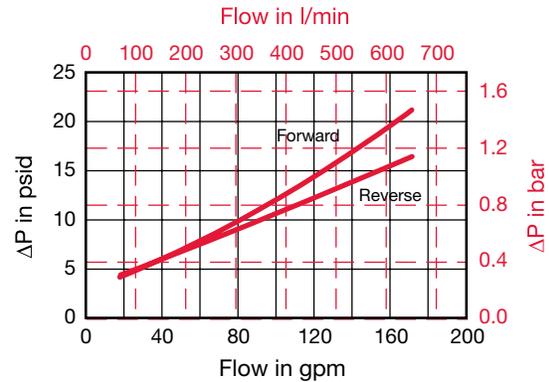
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

DDFX 330 / 660 / 1320 TL Housing



DDFX 330 / 660 / 1320 TLL Housing



Element K Factors

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

(From Tables Below)

Betamicon	...D...BH4HC Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049
1320 D XXX BH4HC	0.088	0.055	0.033	0.022

Optimicon	...D...ON Elements					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031
1320 D XXX ON	0.102	0.053	0.042	0.025	0.019	0.015

Wire Mesh	...D...W/HC Elements
	25, 50, 74, 100, 149, 200 μm
0330 D XXX W/HC	0.020
0660 D XXX W/HC	0.008
1320 D XXX W/HC	0.004

Metal Fiber	...D...V Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0330 D XXX V	0.121	0.097	0.065	0.043
0660 D XXX V	0.063	0.050	0.034	0.021
1320 D XXX V	0.032	0.026	0.018	0.012

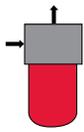
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

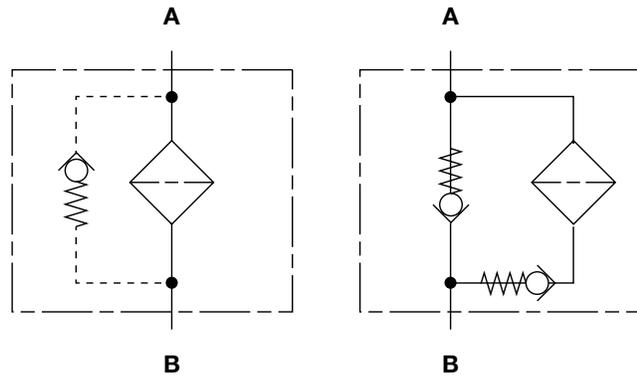
HDF/HDFF Series

Inline Filters & Inline Filters With Reversible Flow

4060 psi • up to 100 gpm



Hydraulic Symbol



Features

- Non-welded housing design reduces stress concentrations and prevents fatigue failure.
- Choice of SAE straight thread O-ring boss, and straight thread BSPP (sizes 300 - 900) to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. We offer a choice of O-ring materials (Nitrile rubber or Fluorocarbon elastomer), to provide compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based 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.
- HYDAC Differential Pressure 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.
- The HDF is available with a bypass valve. The HDFF is offered in non bypass only.
- Fatigue pressure ratings equal maximum allowable working pressure rating.
- Inlet/outlet ports in "L" configuration
- No element valve-only available with HDF in "L" configuration.

Technical Specifications

Mounting Method	4 mounting holes
Port Connection 300, 450, 650, 900:	1" SAE-16 parallel straight thread or 1" BSPP or 1 1/4" SAE-20 parallel straight thread or 1 1/4" BSPP or 1 1/2" SAE-24 parallel straight thread or 1 1/2" BSPP
Flow Direction	Inlet: Side Outlet: Top
Construction Materials	
Head	Ductile iron
Bowl	Steel
Flow Capacity	
300	30 gpm (114 lpm)
450	60 gpm (227 lpm)
650	90 gpm (340 lpm)
900	100 gpm (378.5 lpm)
Housing Pressure Rating	
Max. Allowable Working Pressure	4060 psi (280 bar)
Fatigue Pressure	4060 psi (280 bar) @ 1 million cycles 6090 psi (420 bar) @ 250,000 cycles
Burst Pressure	(Consult HYDAC)
Element Collapse Pressure Rating	
BH4HC	3045 psid (210 bar)
ON	290 psid (20 bar)
Fluid Temp. Range	14°F to 212°F (-10°C to 100°C)
Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
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-HDF only)	
ΔP = 87 psid (6 bar) +10% (standard)	
Non Bypass Available for HDF (HDFF available only with no bypass)	

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



Offshore



Commercial
Municipal



Power
Generation



Pulp & Paper



Railways

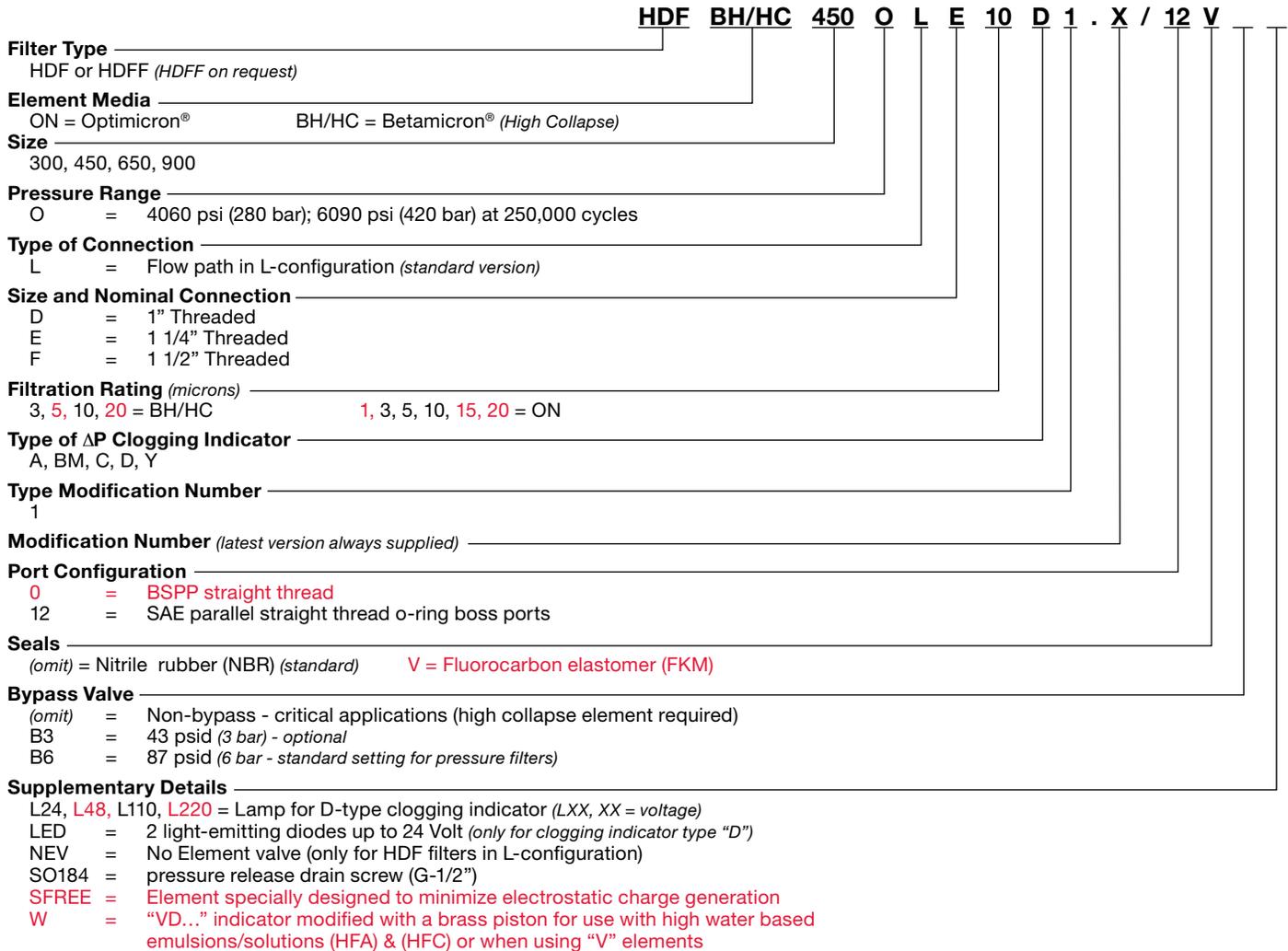


Shipbuilding

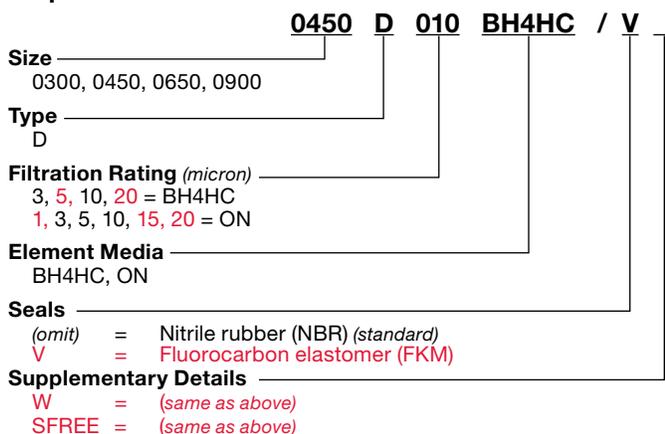


Steel / Heavy
Industry

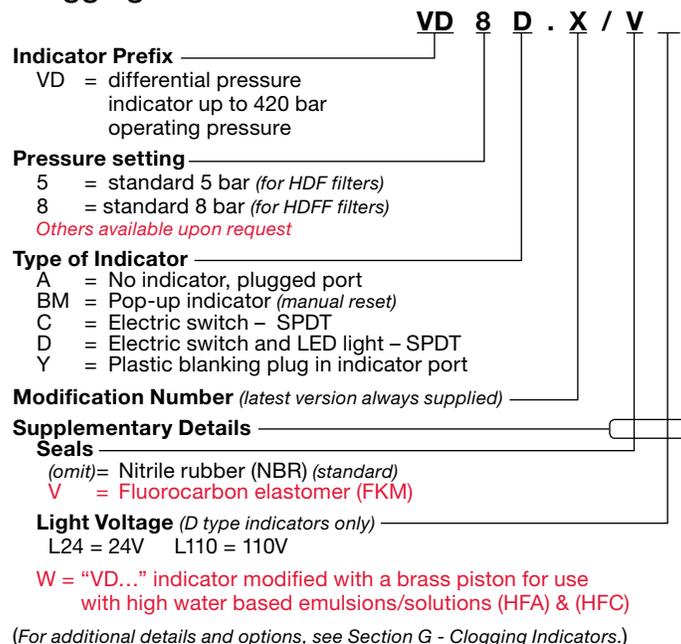
Model Code



Replacement Element Model Code



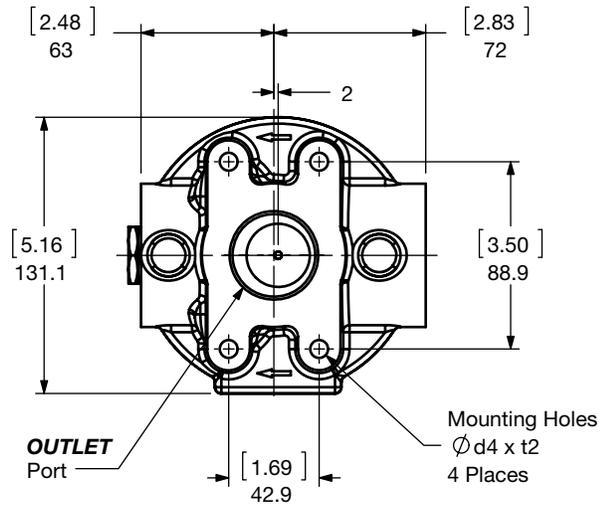
Clogging Indicator Model Code



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

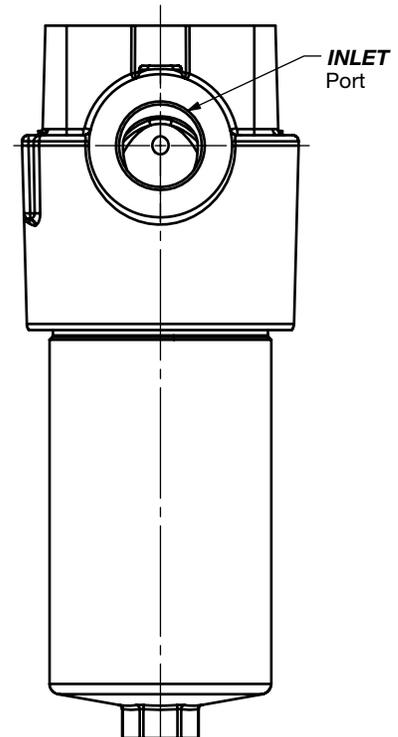
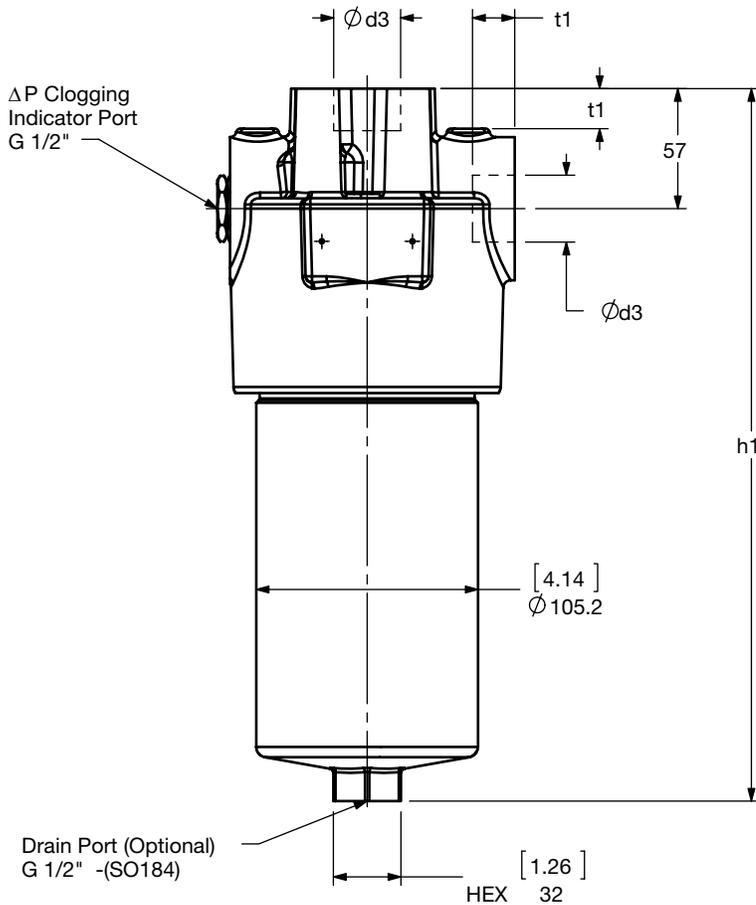
HIGH PRESSURE FILTERS

Dimensions HDF/HDFF 300-900



HDF/HDFF	h1
300	[9.680] 246
450	[13.35] 339
650	[18.11] 460
900	[22.28] 566

$\varnothing d3$	$\dagger 1$	$\varnothing d4$	$\dagger 2$
G1	[0.71] 18	M10 X 1.5	[0.71] 18
G1-1/4	[0.79] 20		
G1-1/2	[0.87] 22		
SAE-16	[0.75] 19	3/8-24UNF-2B	[0.55] 14
SAE-20	[0.75] 19		
SAE-24	[0.75] 19		



Size	300	450	650	900
Weight (lbs.)	24.7	28.9	35.8	47.4

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

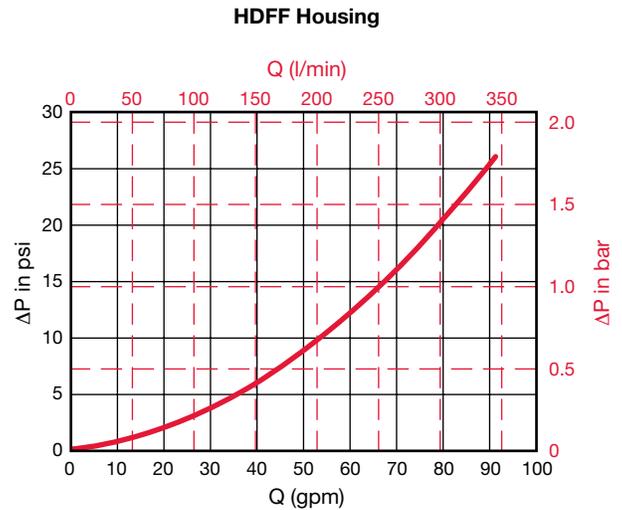
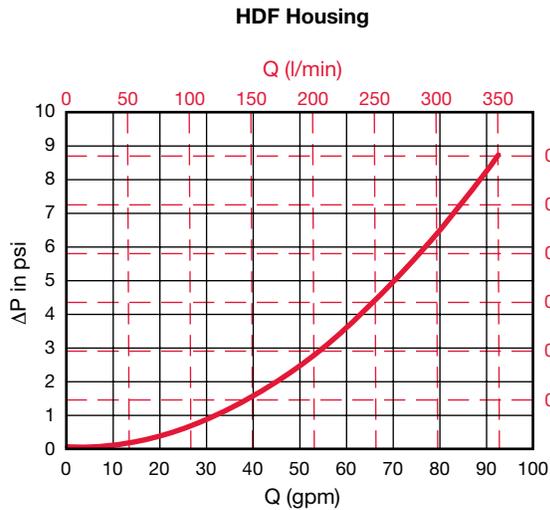
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Optimicron Size	...D...ON Elements					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0300 D XXX ON	0.801	0.488	0.391	0.268	0.154	0.143
0450 D XXX ON	0.401	0.244	0.193	0.131	0.077	0.069
0650 D XXX ON	0.245	0.148	0.121	0.081	0.047	0.044
0900 D XXX ON	0.185	0.115	0.092	0.06	0.036	0.035

Betamicron Size	...D...BH4HC Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0300 D XXX BH4HC	0.878	0.488	0.390	0.181
0450 D XXX BH4HC	0.428	0.236	0.187	0.088
0650 D XXX BH4HC	0.258	0.143	0.115	0.055
0900 D XXX BH4HC	0.192	0.110	0.088	0.038

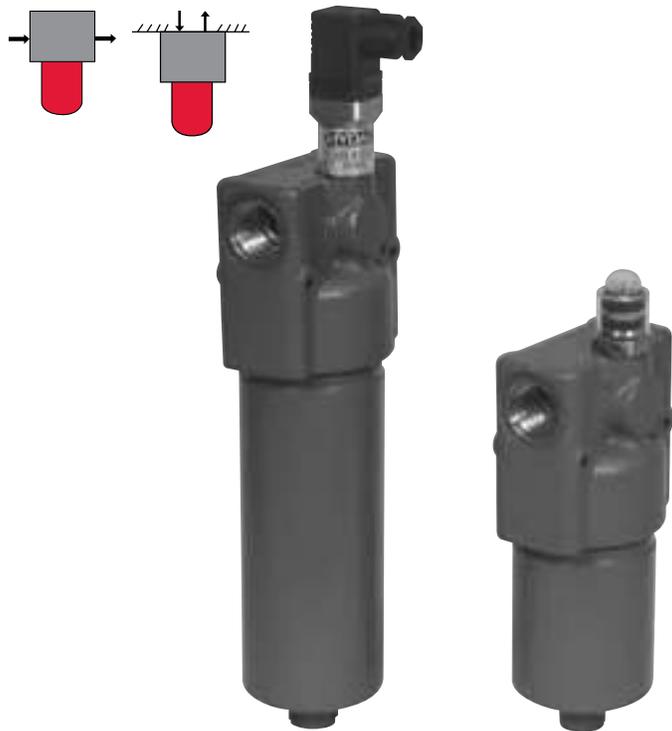
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

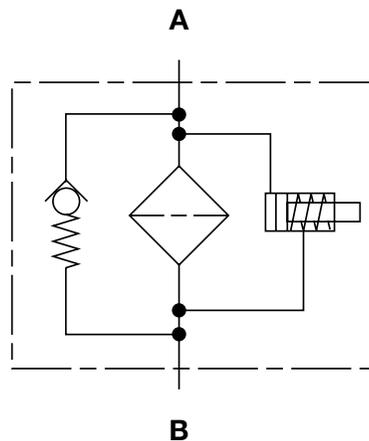
HF2P Series

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. A choice of O-ring materials (nitrile, fluorocarbon elastomer, ethylene propylene rubber) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based 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 in the filter head 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

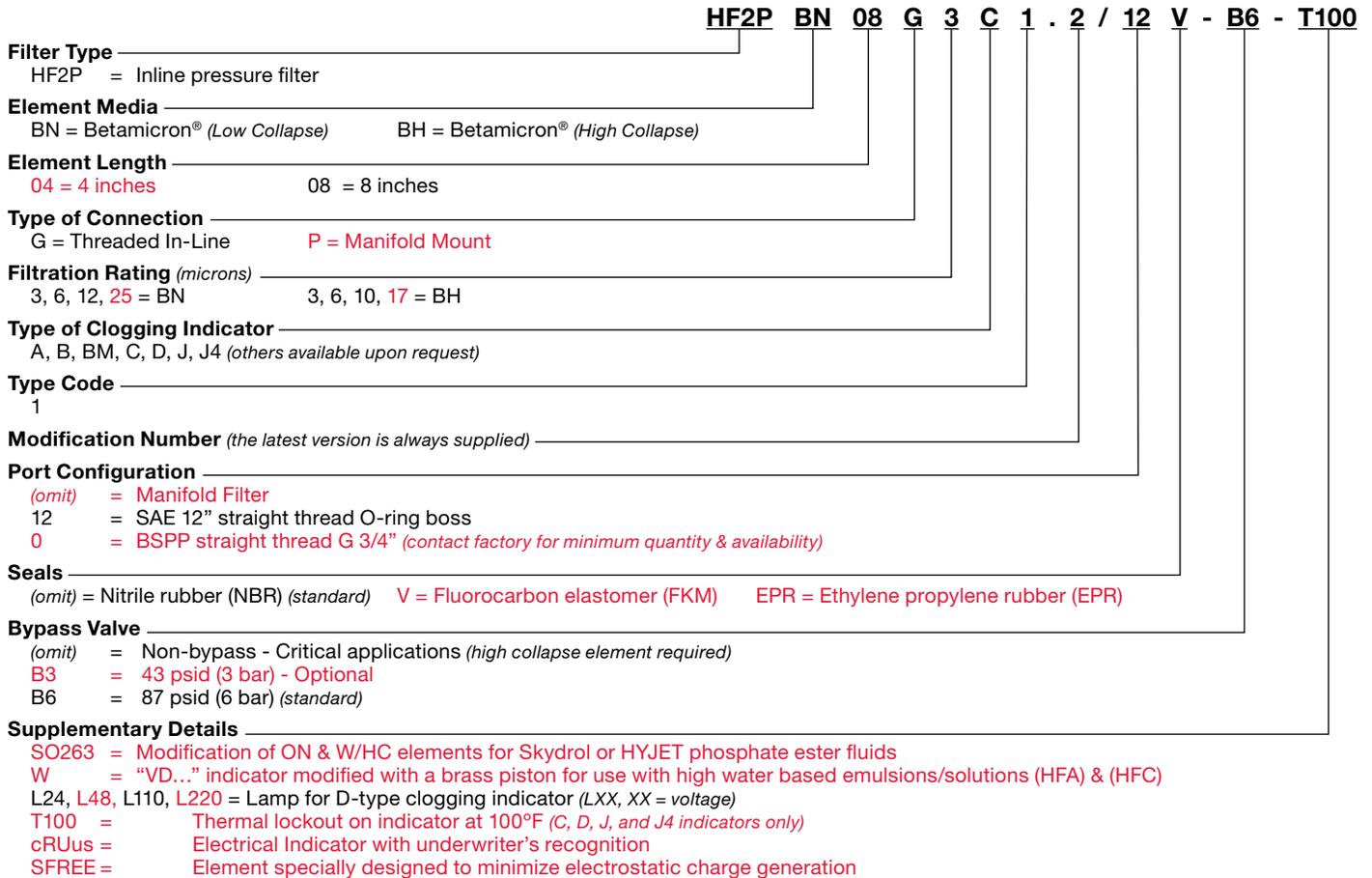


Railways

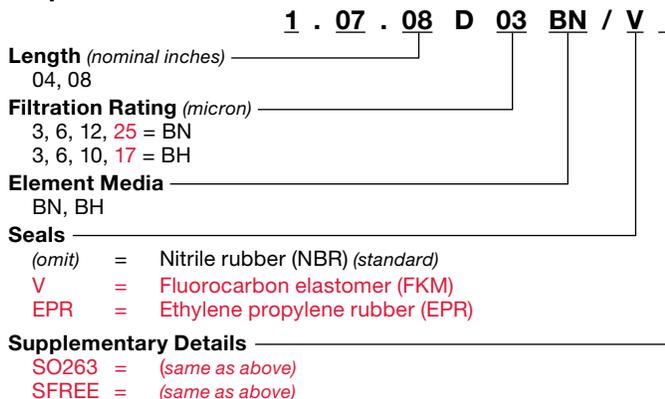
Technical Specifications

Mounting Method	2 mounting holes	
Port Connection	SAE-12, 3/4" BSPP, Manifold Mount – (0.689")	
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Flow Capacity		
4"	16 gpm (60 lpm)	
8"	25 gpm (95 lpm)	
Housing Pressure Rating		
Max. Allowable Working Pressure	4000 psi (276 bar)	
Fatigue Pressure	4000 psi (276 bar) @ 1 million cycles	
Burst Pressure	14,680 psi (1012 bar)	
Element Collapse Pressure Rating		
BH4HC	3045 psid (210 bar)	
BN	290 psid (20 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure		
$\Delta P = 29$ psid (2 bar) -10% (optional)		
$\Delta P = 72$ psid (5 bar) -10% (standard)		
$\Delta P = 116$ psid (8 bar) -10% (optional on bypass)		
Bypass Valve Cracking Pressure		
$\Delta P = 43$ psid (3 bar) +10% (optional)		
$\Delta P = 87$ psid (6 bar) +10% (standard)		
Non Bypass Available		

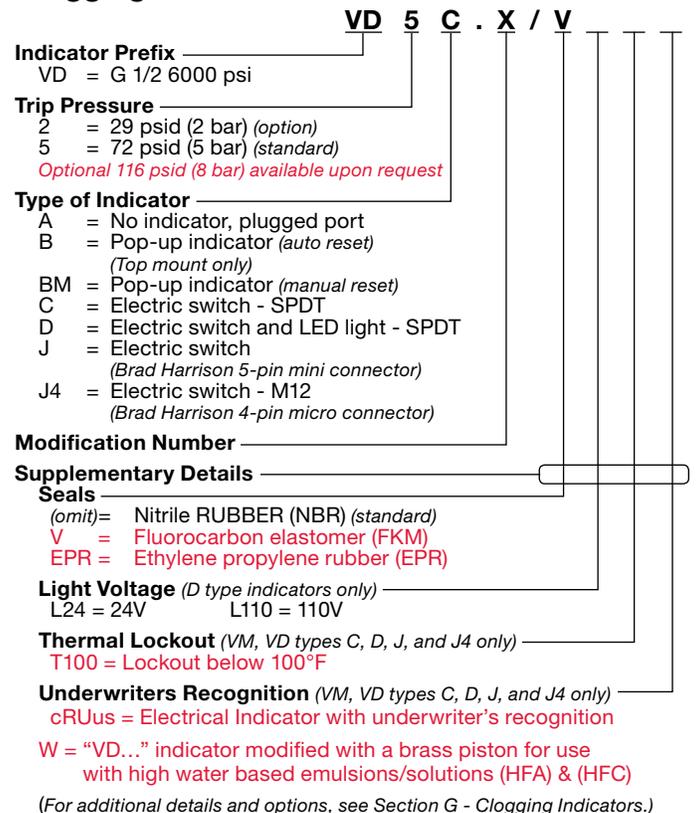
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

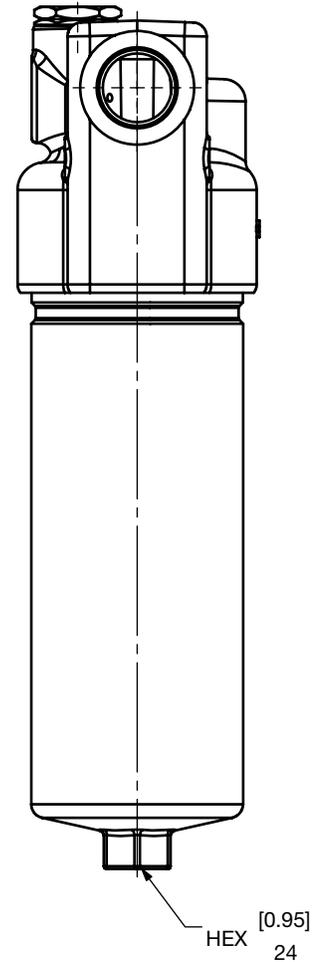
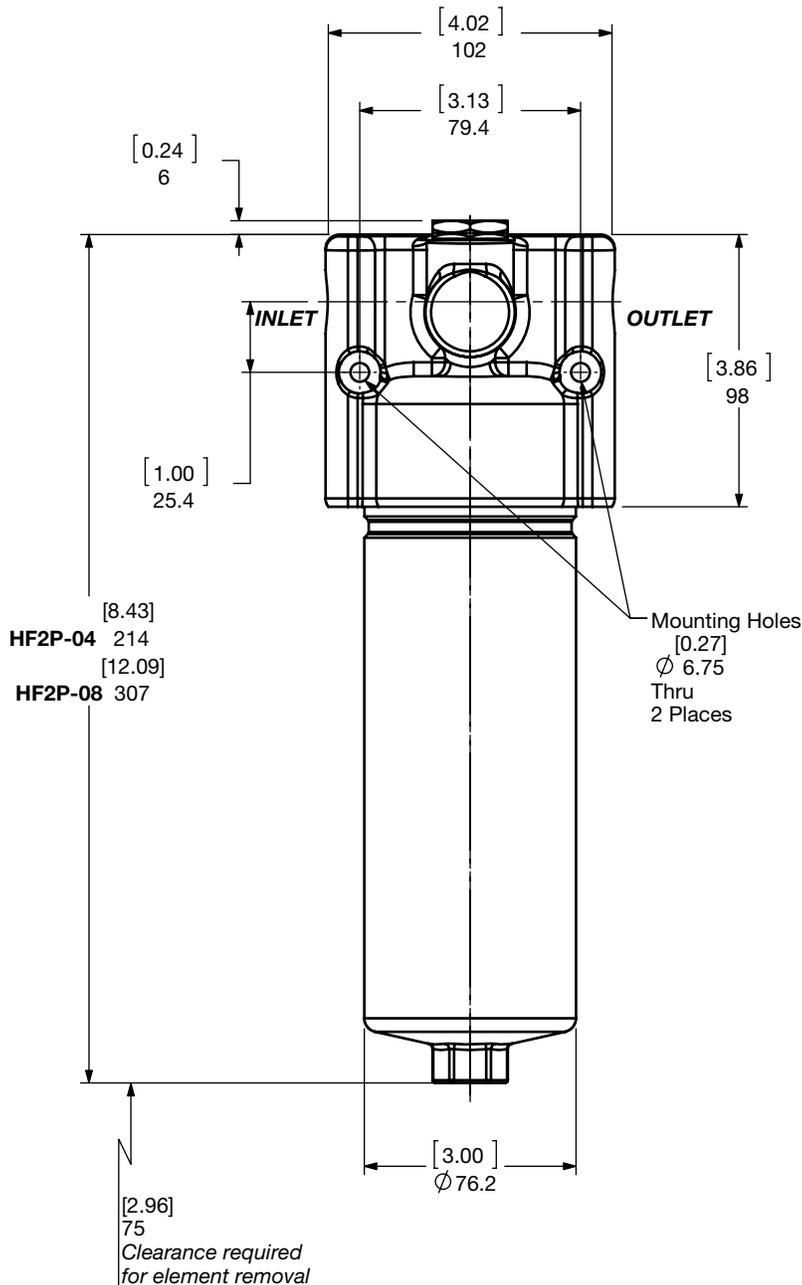
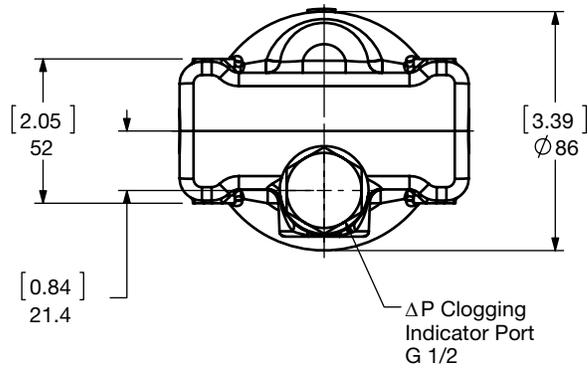


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

HIGH PRESSURE FILTERS

Dimensions

HF2P Inline Mounting

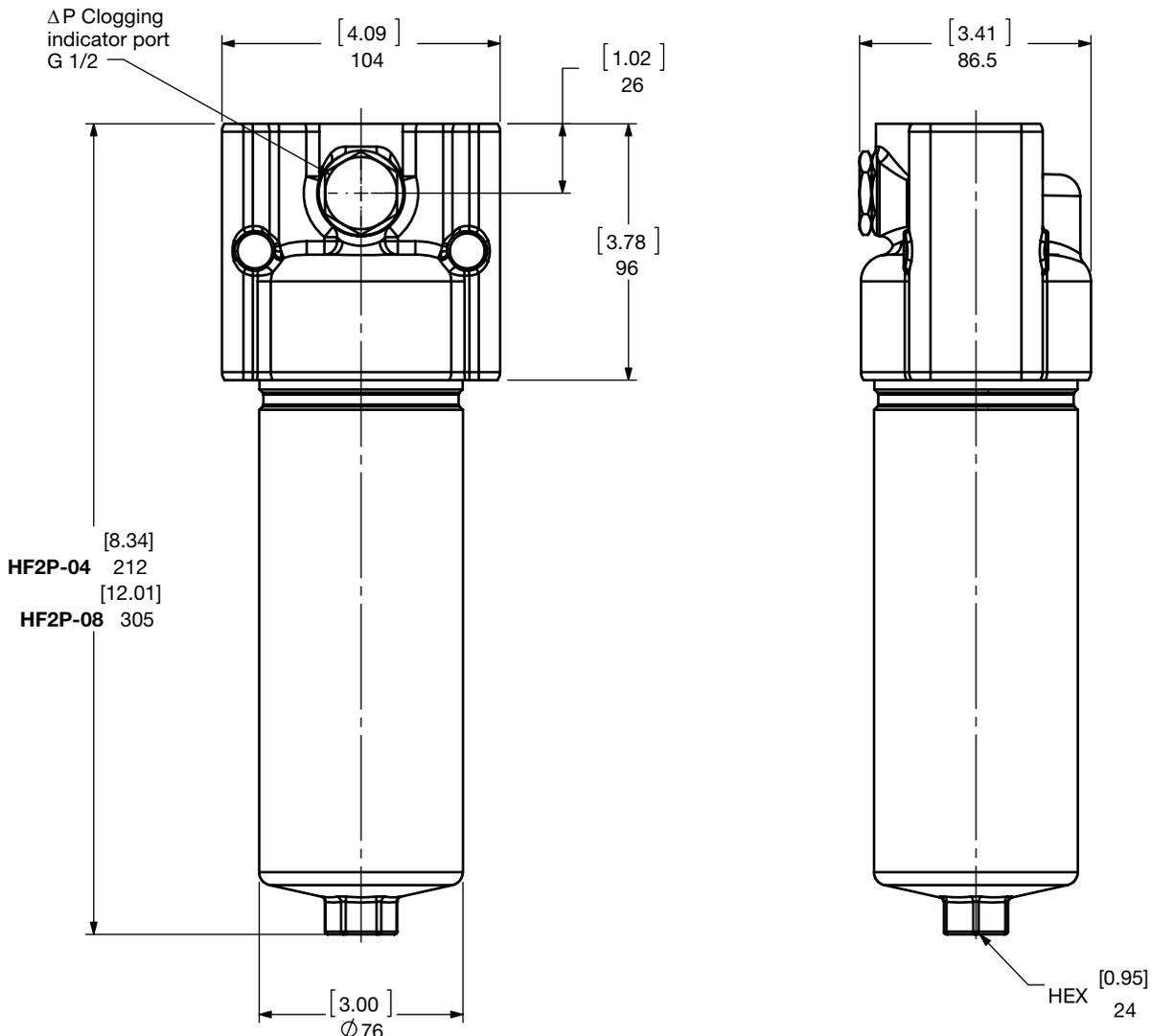
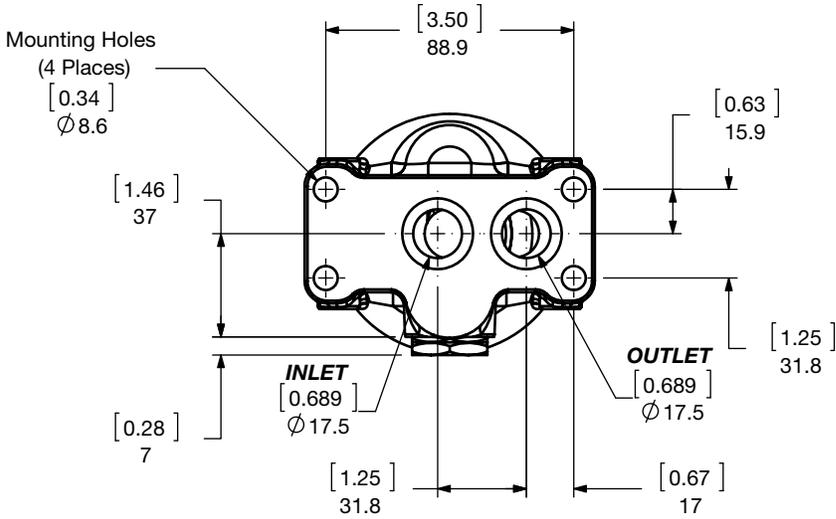


HF2P-04 214 [8.43]
 HF2P-08 307 [12.09]

Size	04	08
Weight (lbs.)	10.7	14.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions HF2P Subplate Mounting



Size	04	08
Weight (lbs.)	10.7	14.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

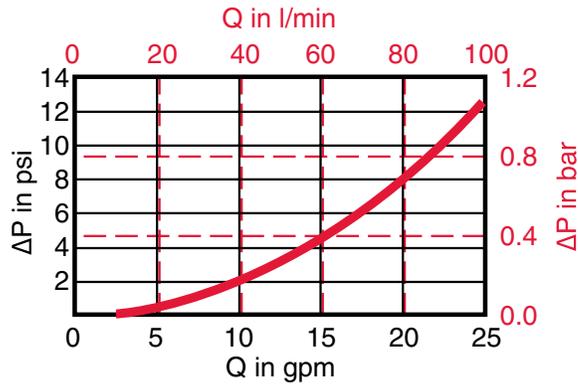
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Autospec HF2 Depth	1.07.08DXXBN (Low Collapse)			
Size	3 μm	6 μm	12 μm	25 μm
1.07.04DXXBN	2.046	1.735	0.925	0.531
1.07.08DXXBN	0.975	0.815	0.457	0.257

Autospec HF2 Depth	1.07.08DXXBH (High Collapse)			
Size	3 μm	6 μm	10 μm	17 μm
1.07.04DXXBH	2.400	1.690	1.027	0.538
1.07.08DXXBH	1.165	0.820	0.499	0.262

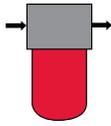
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

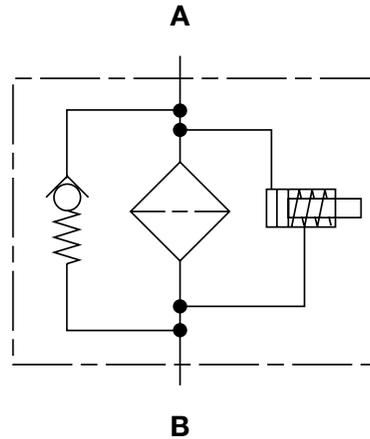
HF3P Series

Inline Filters

6090 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 flange mounting to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. Choice of O-ring materials (nitrile rubber, fluorocarbon elastomer, ethylene propylene rubber) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based fluids.
- Screw-in bowl or lid (on 2 piece bowls), 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, located in filter head, mounted between the inlet and outlet port to provides positive sealing during normal operation and fast response during cold starts and flow surges, while additionally providing low operating ΔP .
- Fatigue pressure rating equals maximum allowable working pressure rating.

Applications



Automotive



Construction



Industrial



Railways

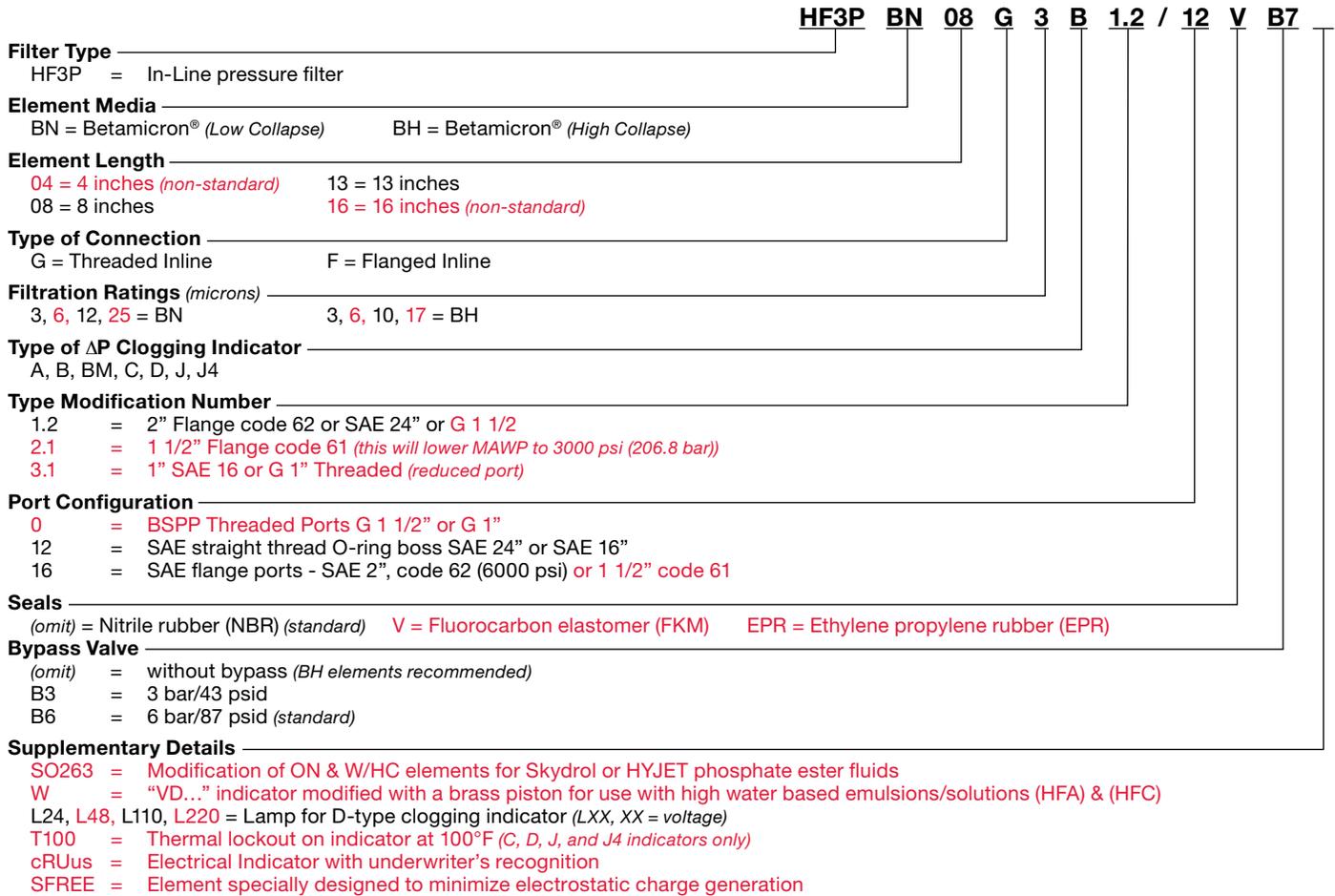


Steel / Heavy Industry

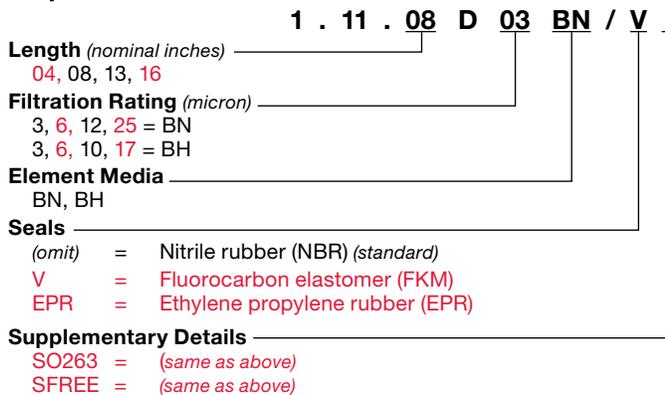
Technical Specifications

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. Allowable Working Pressure	6090 psi (420 bar)
Fatigue Pressure	6090 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	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	
$\Delta P = 29$ psid (2 bar) -10% (optional)	
$\Delta P = 72$ psid (5 bar) -10% (standard)	
$\Delta P = 116$ psid (8 bar) -10% (optional)	
Bypass Valve Cracking Pressure	
$\Delta P = 43$ psid (3 bar) +10% (optional)	
$\Delta P = 87$ psid (6 bar) +10% (standard)	
Non Bypass Available	

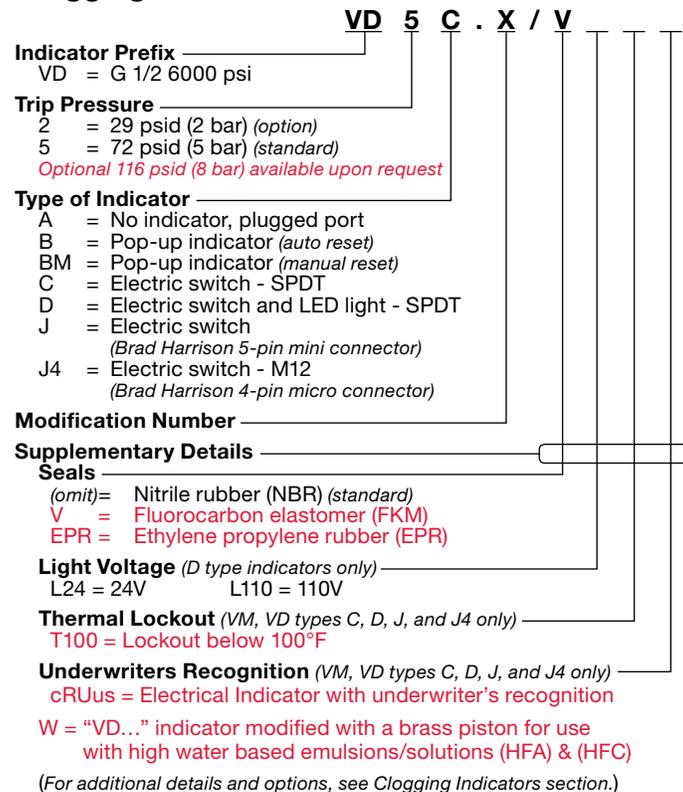
Model Code



Replacement Element Model Code



Clogging Indicator Model Code



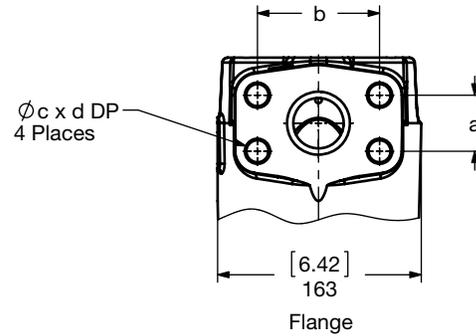
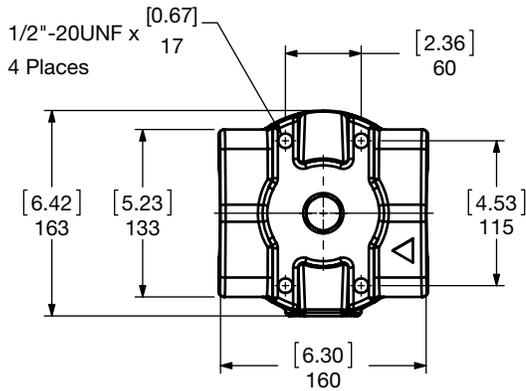
Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

HIGH PRESSURE FILTERS

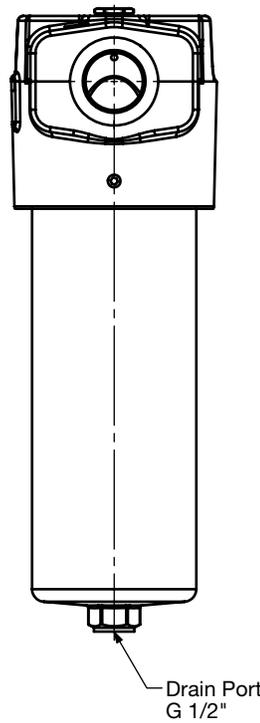
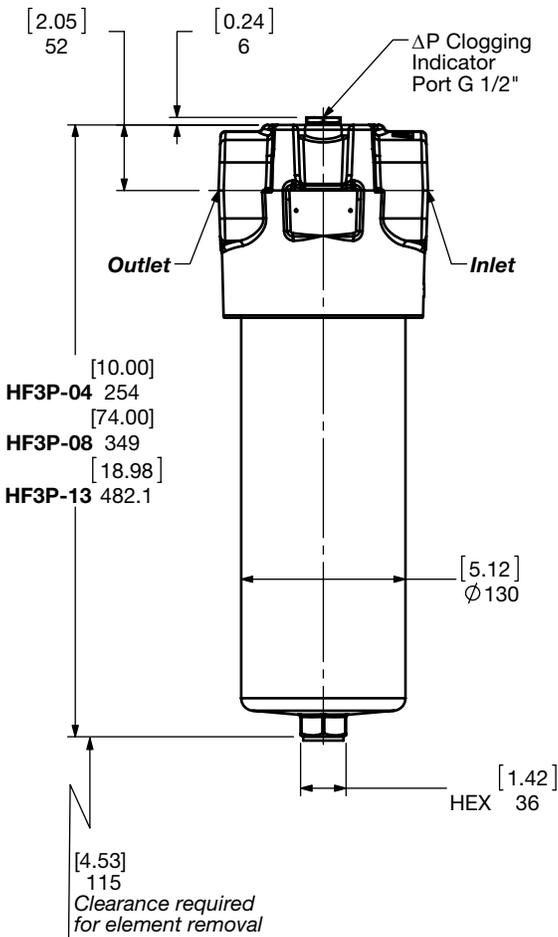
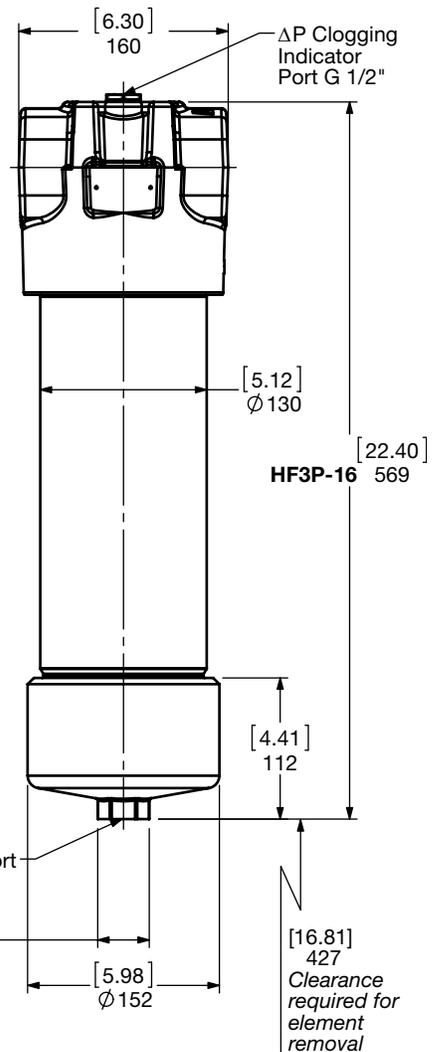
Dimensions

HF3P-04/08/13/16

	a	b	c	d
1-1/2" Code 61	(1.406) 35.71	(2.750) 69.85	1/2-13UNC-2B	(0.87) 22
2" Code 62	(1.750) 44.45	(3.812) 96.80	3/4-10UNC-2B	(0.98) 25



HF3P-16



Size	04	08	13	16
Weight (lbs.)	49.2	56.1	72.5	107.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

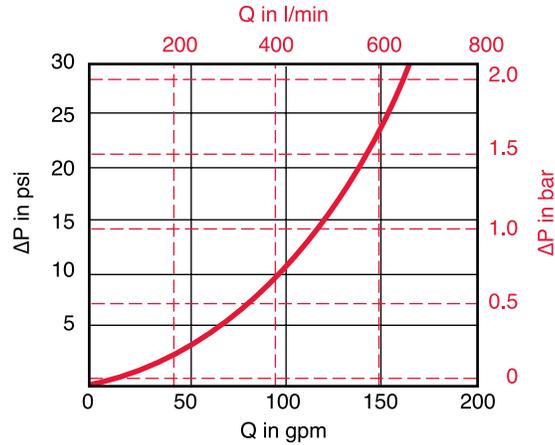
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Autospec HF3 Depth	1.11.08DXXBN (Low Collapse)			
Size	3 μm	6 μm	12 μm	25 μm
1.11.04DXXBN	0.590	0.500	0.266	0.153
1.11.08DXXBN	0.289	0.241	0.135	0.076
1.11.13DXXBN	0.175	0.146	0.082	0.046
1.11.16DXXBN	0.132	0.110	0.062	0.035

Autospec HF3 Depth	1.11.08DXXBH (High Collapse)			
Size	3 μm	6 μm	10 μm	17 μm
1.11.04DXXBH	0.937	0.660	0.401	0.210
1.11.08DXXBH	0.460	0.321	0.195	0.102
1.11.13DXXBH	0.274	0.193	0.117	0.615
1.11.16DXXBH	0.206	0.145	0.089	0.046

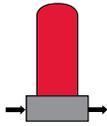
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

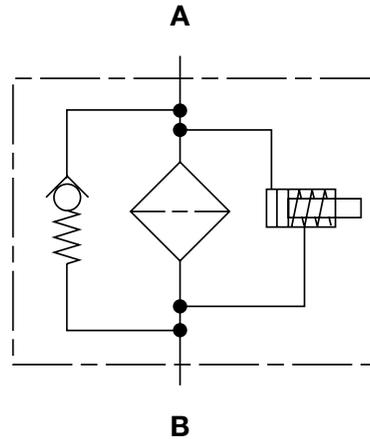
HF4P Series

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, SAE flange code 62 and code 61 (optional) BSPP and subplate mounting to allow easy installation without costly adapters.
- O-ring seals are used to provide positive, reliable sealing. A choice of O-ring materials (nitrile rubber or fluorocarbon elastomer) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based fluids.
- The element filter housing is permanently mounted above the filter head for easy top access and minimal clearance to remove elements for replacement.
- 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 located in filter head base is mounted 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



Power Generation



Pulp & Paper



Railways



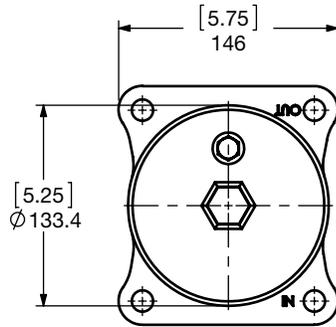
Steel / Heavy Industry

Technical Specifications

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 <i>(opposite each other)</i>
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. Allowable Working Pressure 5000 psi (345 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 145 psid (10 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% <i>(optional)</i> $\Delta P = 72$ psid (5 bar) -10% <i>(standard)</i> $\Delta P = 116$ psid (8 bar) -10% <i>(optional on non-bypass filters)</i>
Bypass Valve Cracking Pressure	$\Delta P = 43$ psid (3 bar) +10% <i>(optional)</i> $\Delta P = 87$ psid (6 bar) +10% <i>(standard)</i> Non Bypass Available

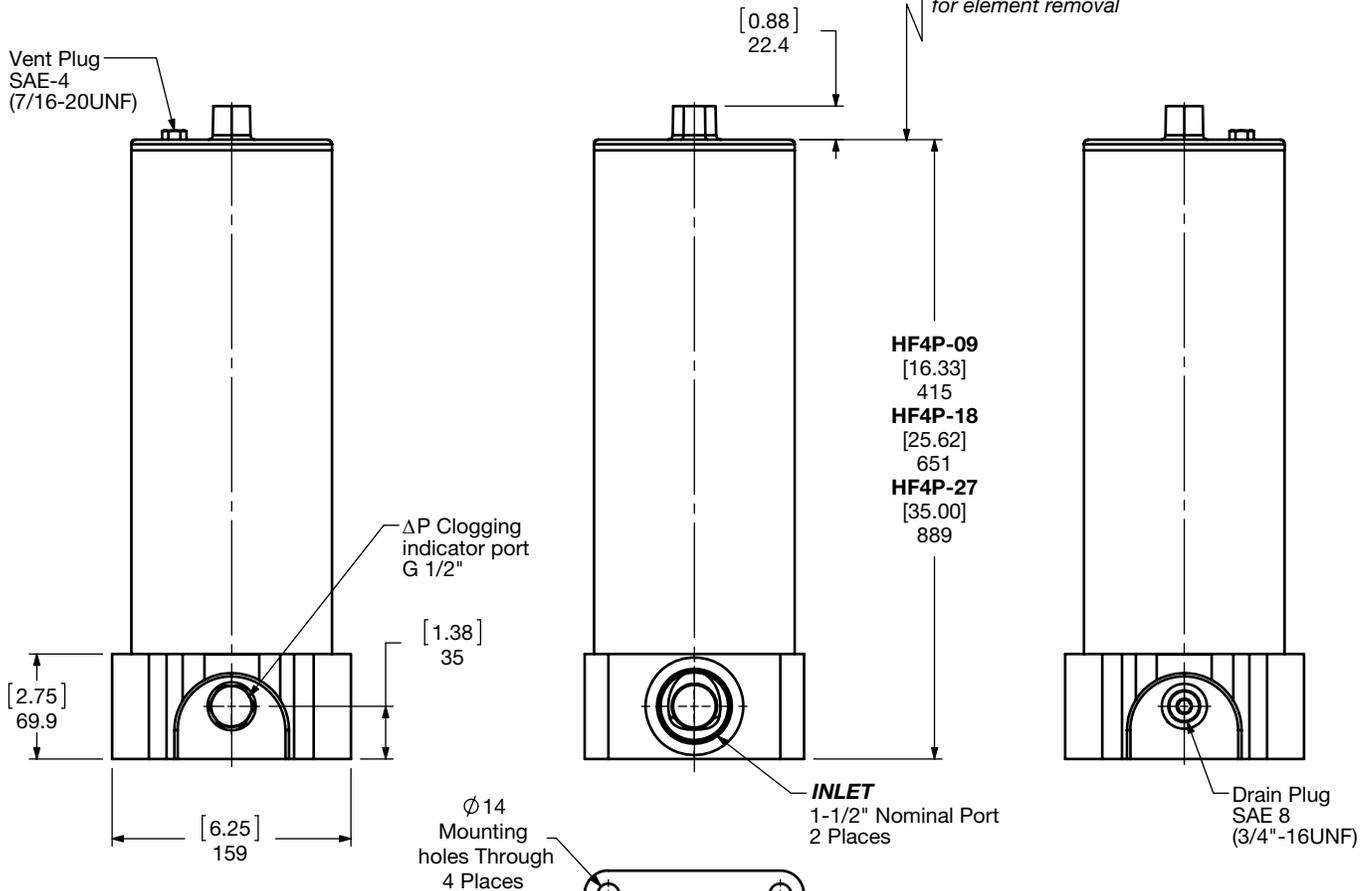
HIGH PRESSURE FILTERS

Dimensions HF4P Inline



HF4P-09 [12.00] 305
HF4P-18 [21.00] 533
HF4P-27 [30.00] 762
Clearance required for element removal

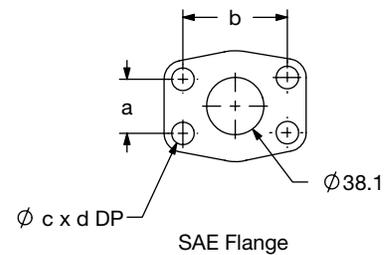
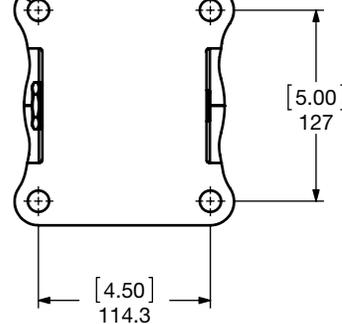
Vent Plug
SAE-4
(7/16-20UNF)



HF4P-09 [16.33] 415
HF4P-18 [25.62] 651
HF4P-27 [35.00] 889

\varnothing 14
 Mounting
 holes Through
 4 Places

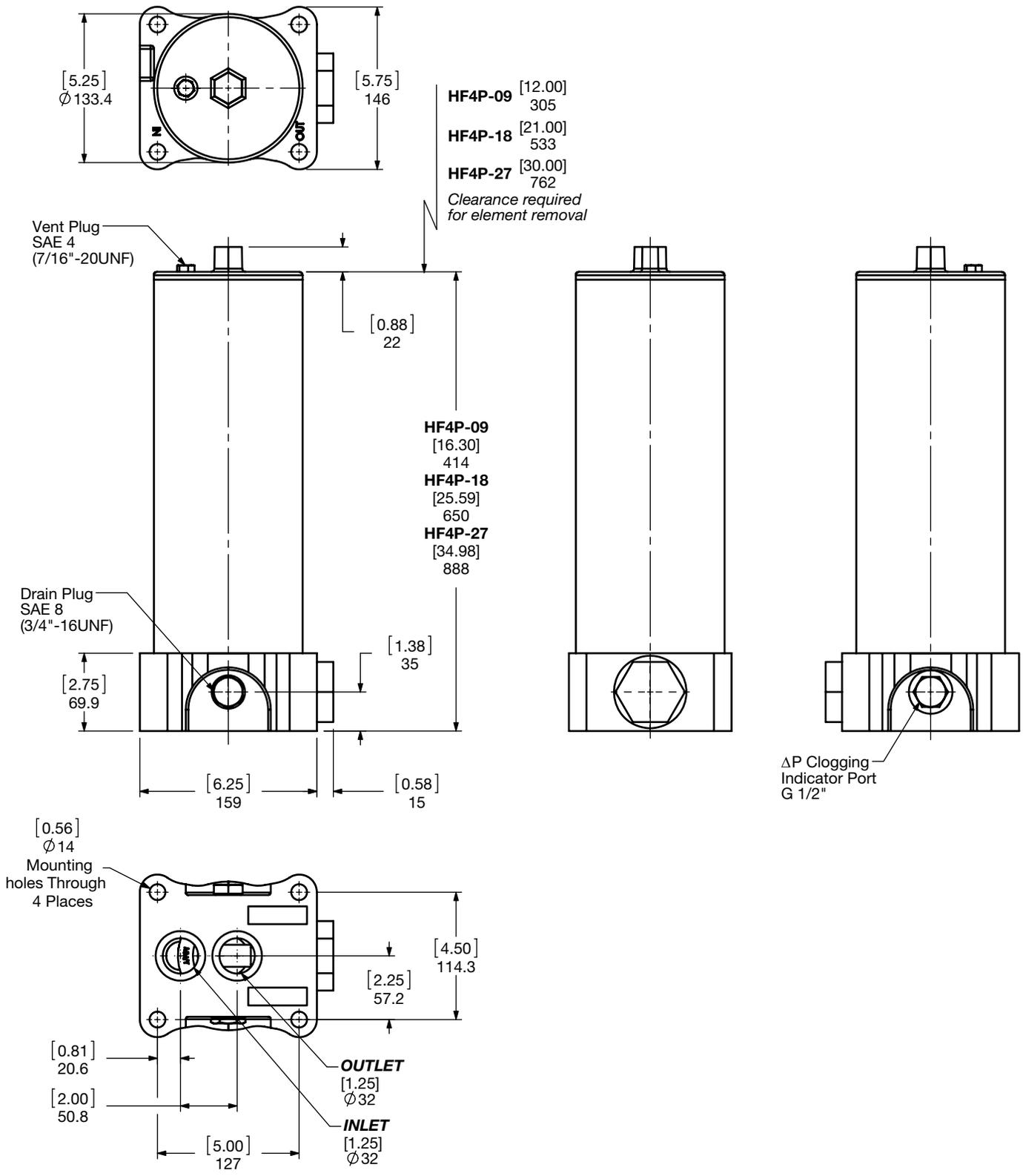
Flange Details	a	b	c	d
Code 61	(1.406) 35.7	(2.750) 69.8	1/2-13UNC	(1.06) 27
Code 62	(1.437) 36.50	(3.125) 79.38	5/8-11UNC	(1.38) 35



Size	09	18	27
Weight (lbs.)	69.9	98.4	132.8

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions HF4P Manifold



Size	09	18	27
Weight (lbs.)	71.7	100.2	134.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

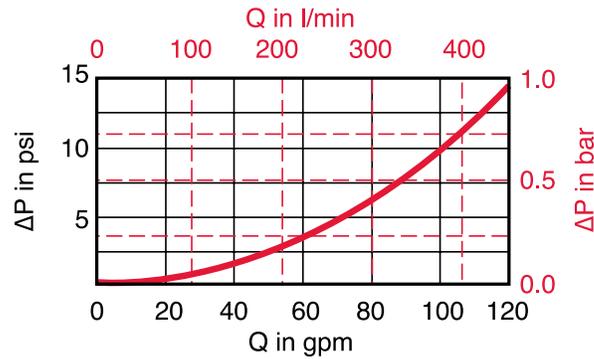
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Autospec HF4 Depth	5.03.XXDXXBN (Low Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
5.03.09DXXBN	0.168	0.141	0.079	0.044
5.03.18DXXBN	0.080	0.067	0.038	0.021
5.03.27DXXBN	0.052	0.043	0.024	0.014

Autospec HF4 Depth	5.03.XXDXXBH (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
5.03.09DXXBH	0.207	0.146	0.089	0.047
5.03.18DXXBH	0.097	0.068	0.041	0.022
5.03.27DXXBH	0.063	0.044	0.027	0.014

Autospec HF4 Wire Mesh	5.03.XDXXW
Size	25, 74, 149, μm
5.03.09DXXW	0.007
5.03.18DXXW	0.004
5.03.27DXXW	0.002

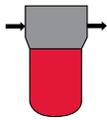
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

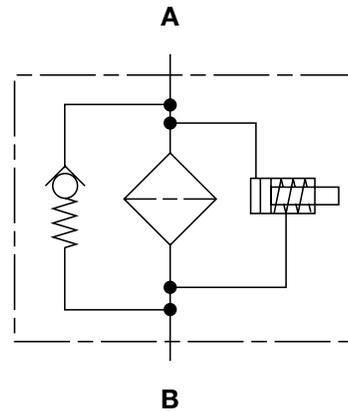
MFM Series

Inline Filters

4060 PSI • up to 25 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, 20, and 25 GPM respectively.
- A quick-response bypass valve located in filter head protects against high differential pressures caused by cold startups, flow surges and pressure spikes.
- The high bypass pressure setting (100 psid) minimizes the possibility of contamination due to premature bypassing.
- 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.

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial



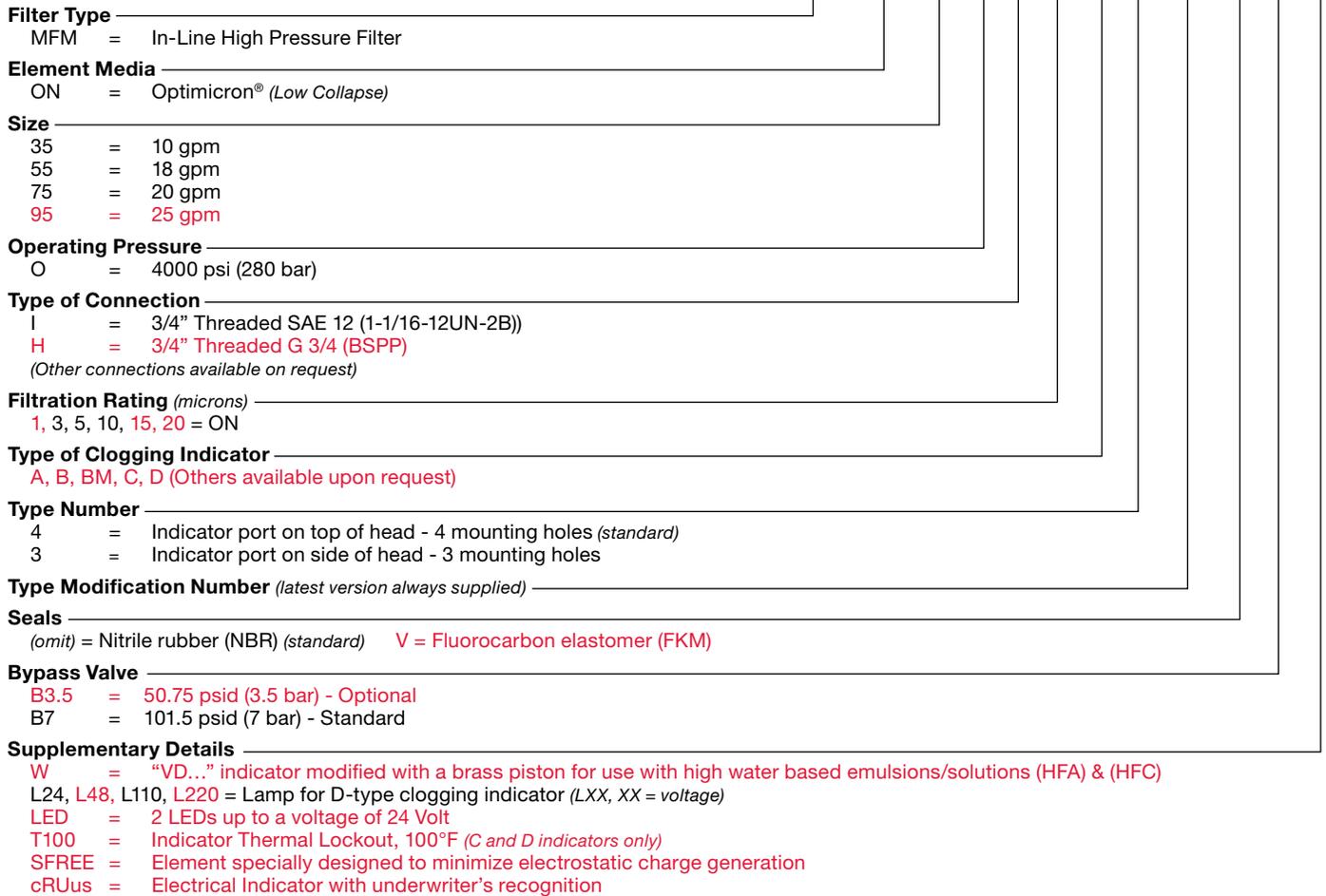
Commercial
Municipal

Technical Specifications

Mounting Method	4 mounting holes - filter head	
Port Connection	SAE-12, 3/4" BSPP	
Flow Direction	Inlet: Side	Outlet: Side <i>(opposite each other)</i>
Construction Materials		
Head	Ductile iron	
Bowl	Steel	
Flow Capacity		
35	10 gpm (35 lpm)	
55	18 gpm (68 lpm)	
75	20 gpm (76 lpm)	
95	25 gpm (95 lpm)	
Housing Pressure Rating		
Max. Allowable Working Pressure	4060 psi (280 bar)	
Fatigue Pressure	4060 psi (280 bar) @ 1 million cycles	
	4641 psi (320 bar) @ 100,000 cycles	
Burst Pressure	13,920 psi (960 bar)	
Element Collapse Pressure Rating		
ON	290 psid (20 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility		
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.		
Indicator Trip Pressure		
$\Delta P = 72$ psid (5 bar) -10%		
Bypass Valve Cracking Pressure		
$\Delta P = 50.75$ psid (3.5 bar) +10% <i>(optional)</i>		
$\Delta P = 100$ psid (7 bar) +10% <i>(standard)</i>		

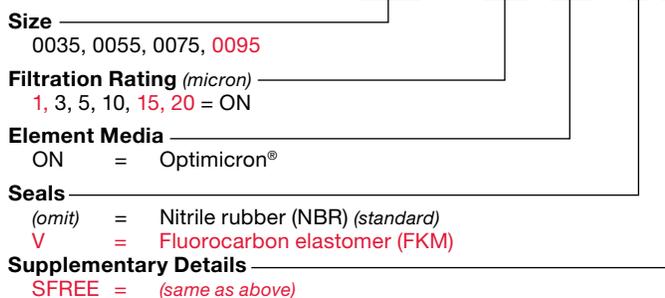
Model Code

MFM ON 35 O I 10 C 4 . 0 / V B7



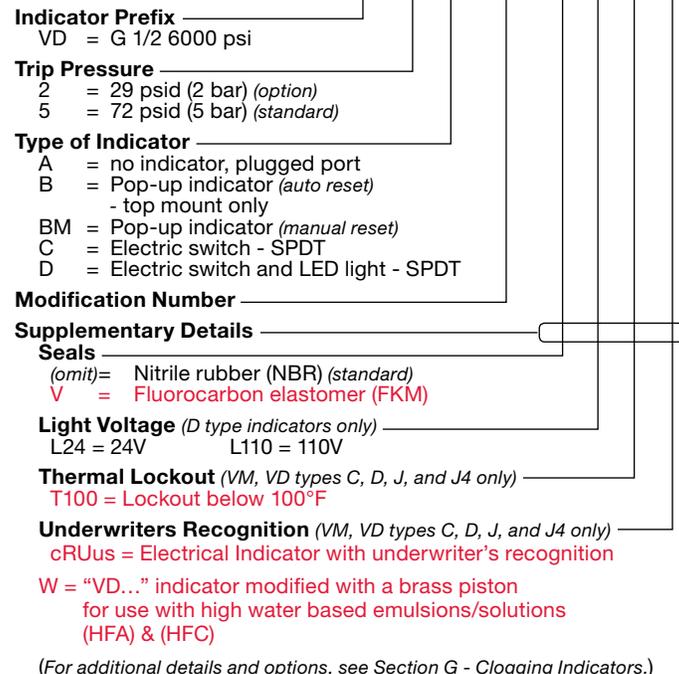
Replacement Element Model Code

0035 D 010 ON / V



Clogging Indicator Model Code

VD 5 C . X / V

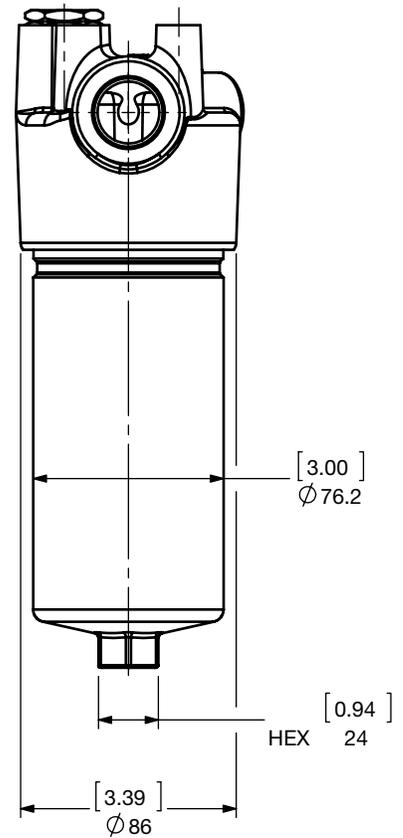
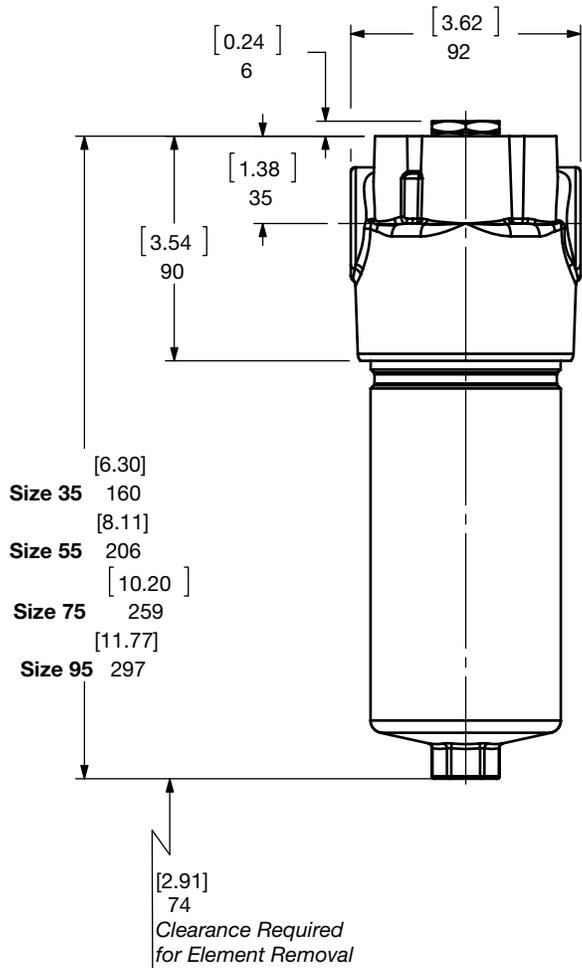
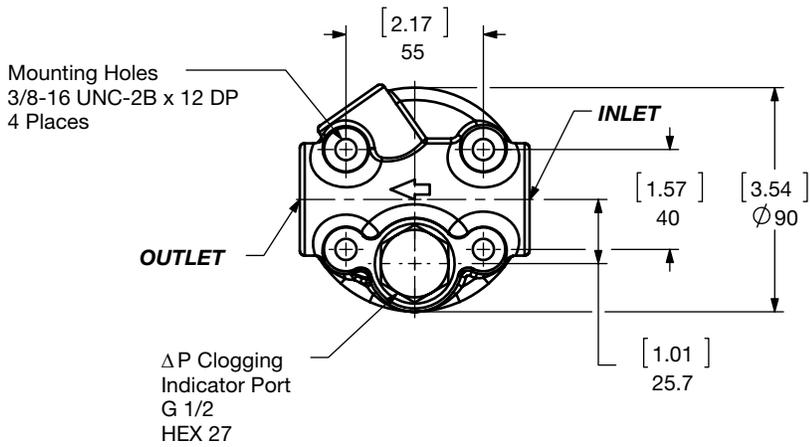


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

HIGH PRESSURE FILTERS

Dimensions

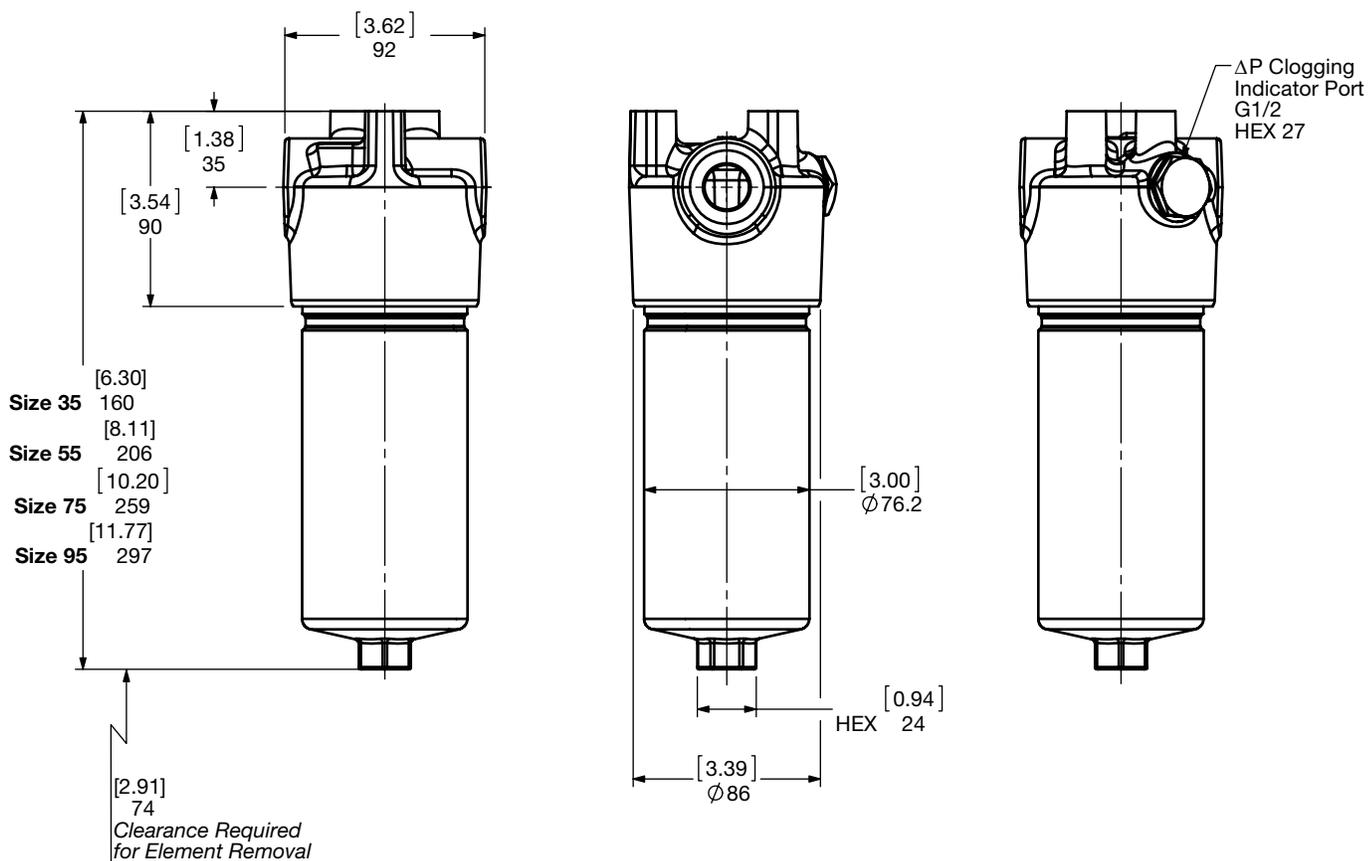
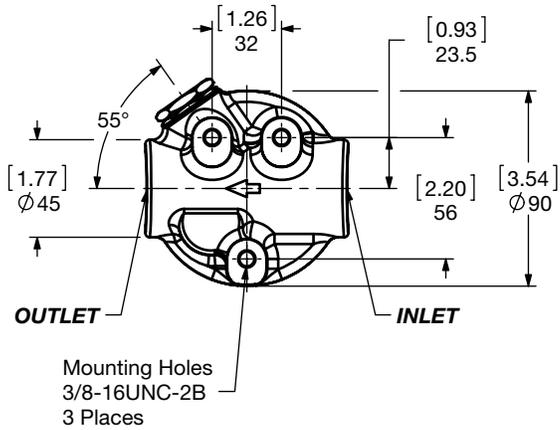
MFM 4.X Version (Standard)



Size	35	55	75	95
Weight (lbs.)	8.2	9.3	10.4	11.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions MFM 3.X Version



Size	35	55	75	95
Weight (lbs.)	8.2	9.3	10.4	11.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

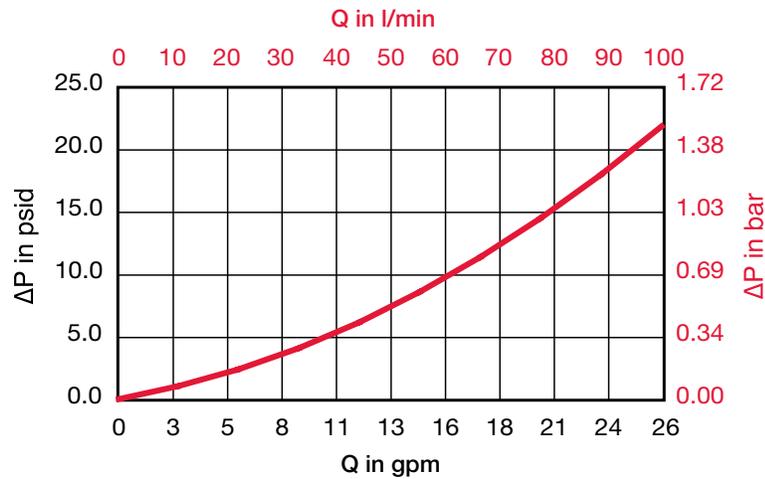
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Optimicron Size	...D...ON (Pressure Elements)					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0035 D XXX ON	2.755	1.169	0.938	0.752	0.549	0.408
0055 D XXX ON	1.427	0.675	0.543	0.434	0.284	0.211
0075 D XXX ON	0.916	0.461	0.37	0.296	0.183	0.136
0095 D XXX ON	0.724	0.37	0.296	0.238	0.144	0.105

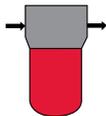
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

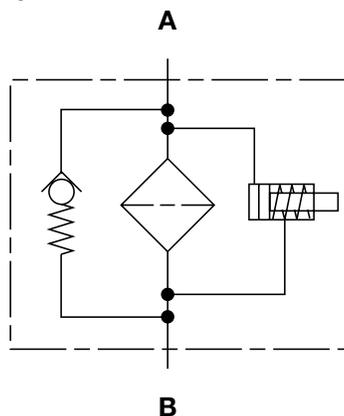
HFM Series

Inline Filters

5800 psi • up to 37 gpm



Hydraulic Symbol



Features

- The HFM filter is available in two sizes comprised of two 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 located in the filter head, 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.
- 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.
- Wide variety of indicators available with standard setting of 72 psid (5 bar).

Technical Specifications

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. Allowable Working Pressure	5800 psi (400 bar)
Fatigue Pressure	Contact HYDAC office
Burst Pressure	13,920 psi (960 bar)
Element Collapse Pressure Rating	
ON	290 psid (20 bar)
Fluid Temperature Range 14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications below 14°F (-10°C)	
Fluid Compatibility	
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	
$\Delta P = 72 \text{ psid (5 bar) } -10\% \text{ (standard)}$	
Bypass Valve Cracking Pressure	
$\Delta P = 101.5 \text{ psid (7 bar) } +10\% \text{ (standard)}$	

Applications



Agricultural



Automotive



Construction



Gearboxes



Industrial

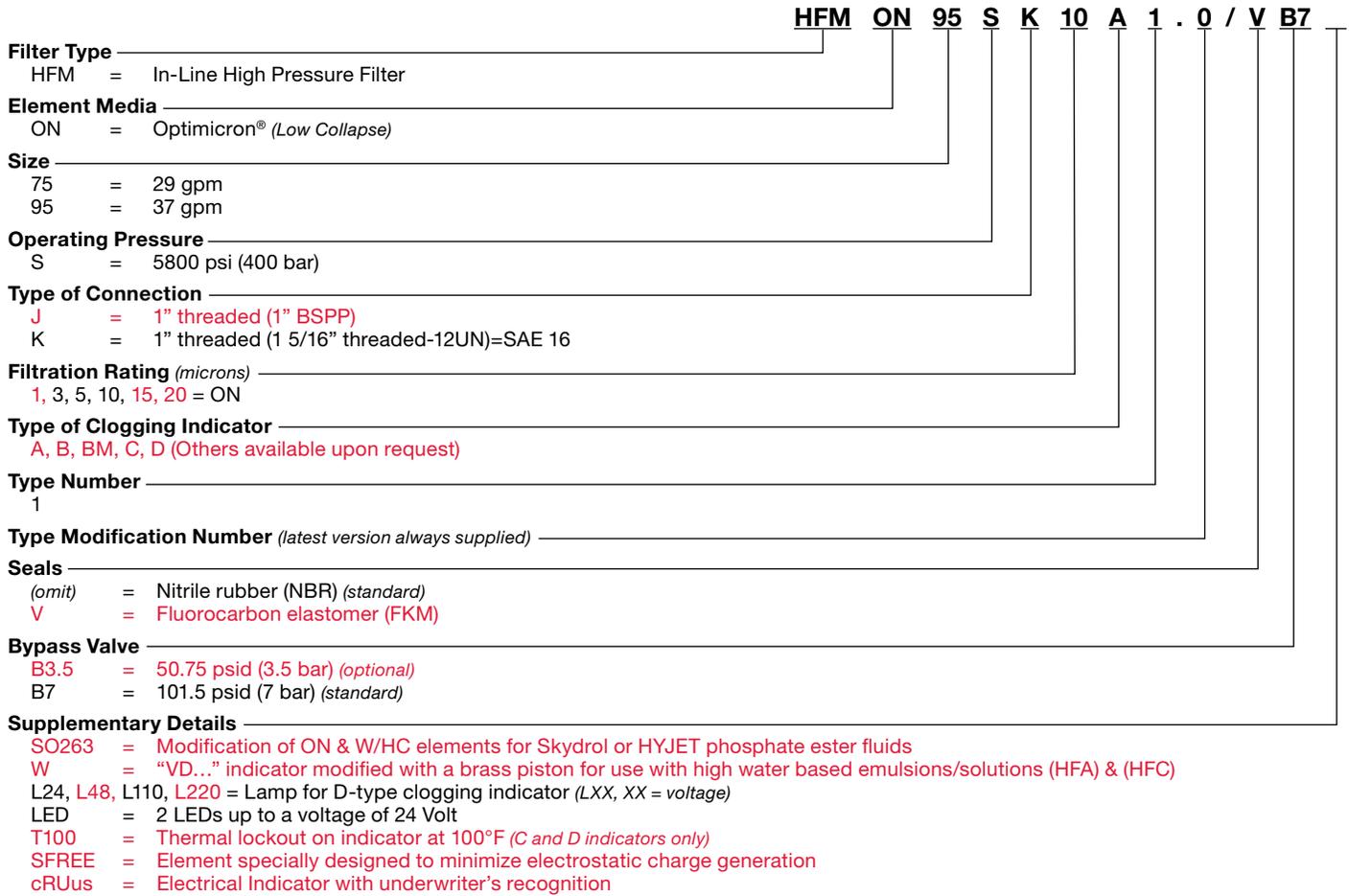


Commercial
Municipal

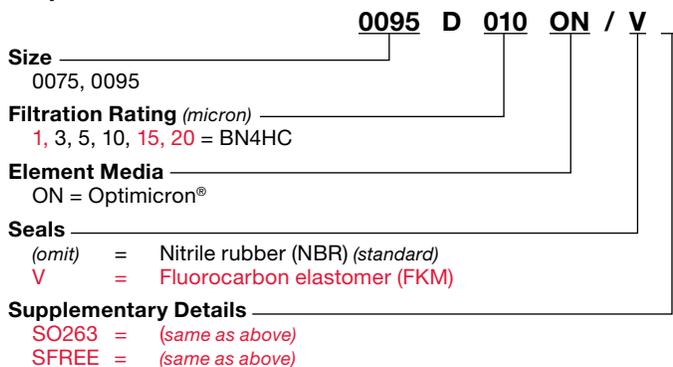


Power
Generation

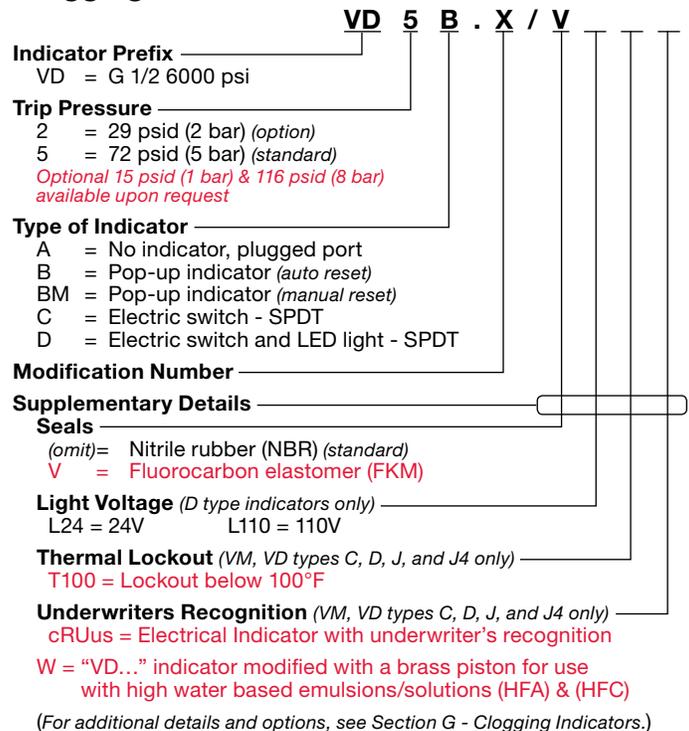
Model Code



Replacement Element Model Code



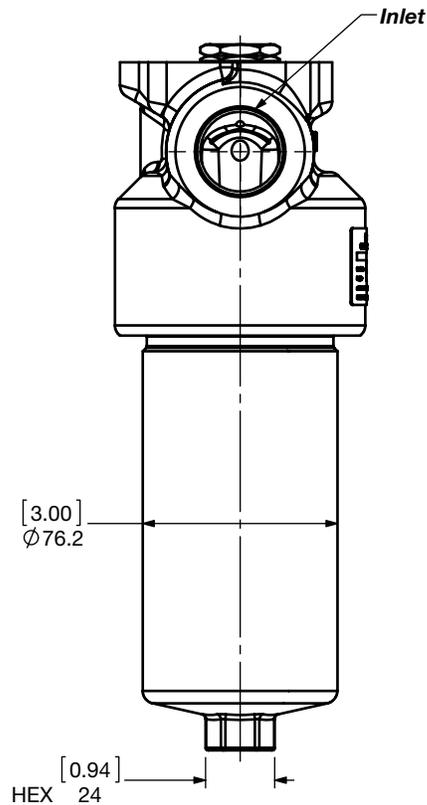
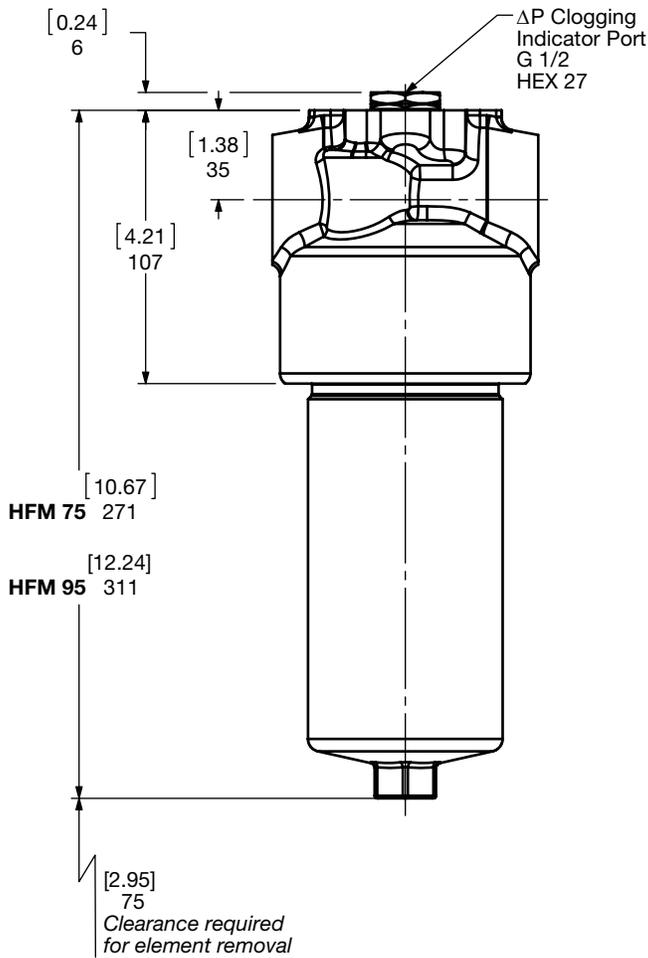
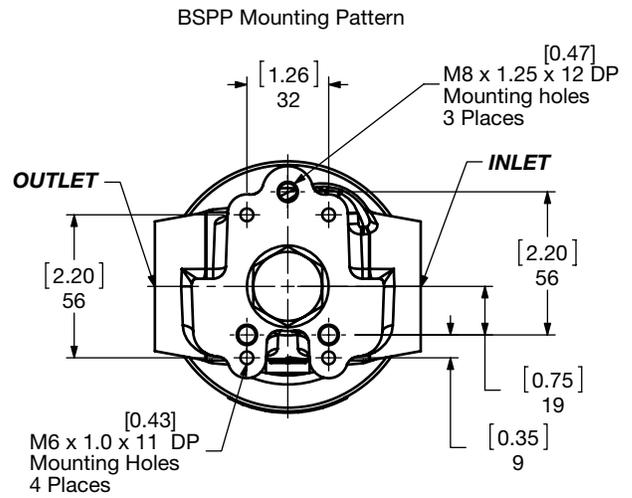
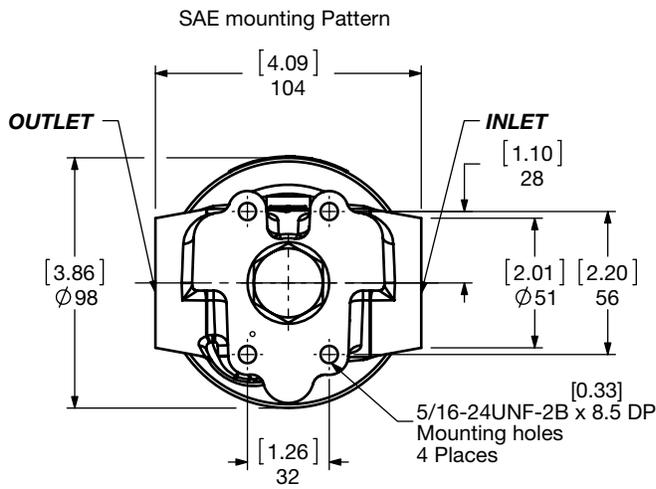
Clogging Indicator Model Code



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

HIGH PRESSURE FILTERS

Dimensions HFM 75/95



Size	75	95
Weight (lbs.)	12.4	13.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

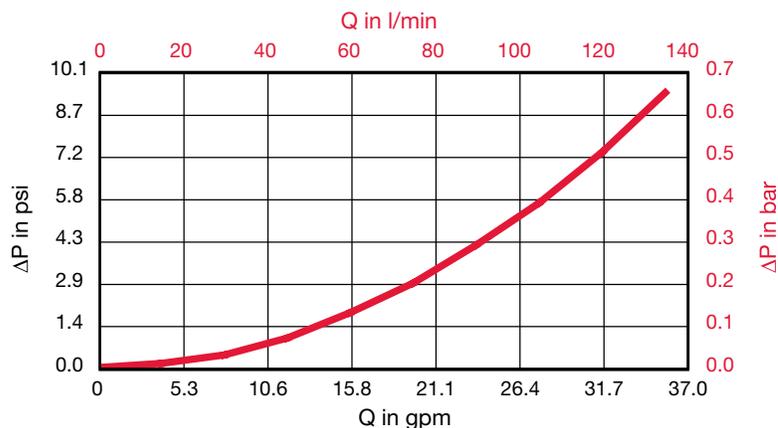
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

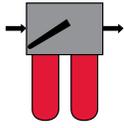
Optimicron Size	...D...ON (Pressure Elements)					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0075 D XXX ON	0.916	0.461	0.37	0.296	0.183	0.136
0095 D XXX ON	0.724	0.37	0.296	0.238	0.144	0.105

All Element K Factors in psi / gpm.

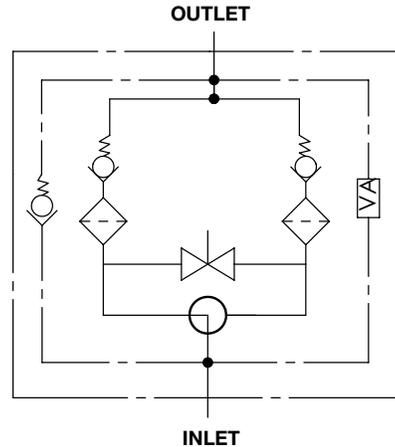
HIGH PRESSURE FILTERS

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 changeover valve and three different lengths of screw-in filter bowls.
- The FMND filter can be supplied with or without bypass valve, (located in head assembly) but includes vent and drain screws, and also a connection for a differential pressure clogging indicator.
- Pressure equalization requirement is achieved by raising the changeover lever prior to switching it to the relevant filter side.
- Fatigue pressure rating = maximum allowable working pressure rating.
- Germanischer Lloyd (GL) approved
- This filter meets the requirements of DIN 24550 as follows:
 - Filter size 0160 with G 1-1/4" port selection
 - Filter size 0250 with G 1-1/2" port selection
 - Filter size 0400 with SAE-DN 38 1-1/2" Flange Port Selection

Technical Specifications

Mounting Method	4 Mounting holes
Port Connections	Inlet / Outlet 1-1/4" Threaded – SAE 20, 1-1/4" BSPP 1-1/2" Threaded – SAE 24, 1-1/2" BSPP 1-1/2" Flange-SAE-DN 38
Flow Direction	Inlet: Side Outlet: Opposite 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. Allowable Working Pressure: 3000 psi (207 bar) Fatigue Pressure: 3000 psi (210 bar) @ 1 million cycles Burst Pressure: 10,650 psi (735 bar)
Element Collapse Pressure Rating	BH4HC: 3045 psid (210 bar) BN4HC, W/HC: 290 psid (20 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	$\Delta P = 36.25$ psid (2.5 bar) -10% (optional) $\Delta P = 50.75$ psid (3.5 bar) +10% (optional) $\Delta P = 72$ psid (5 bar) -10% (standard) $\Delta P = 116$ psid (8 bar) -10% (optional) [Used with non-bypass]
Bypass Valve Cracking Pressure	$\Delta P = 102$ psid (7 bar) +10%

Applications



Agricultural



Automotive



Construction



Industrial



Power Generation



Railways



Steel / Heavy Industry

Model Code

FMND BN/HC 250 L D F 10 C 1 . X / 12 - V -

Filter Type _____
 FMND = Inline Duplex Filter

Element Media _____
 BH/HC = Betamicon® (High Collapse) BN/HC = Betamicon® (Low Collapse)
 W/HC = Wire Mesh

Size _____
 160, 250, 400

Operating Pressure _____
 L = 3000 psi (210 bar)

Type of Changeover _____
 D = segment valve

Type and Size of Port _____
 E = 1-1/4" Threaded – SAE 20, 1-1/4" BSPP
 F = 1-1/2" Threaded – SAE 24, 1-1/2" BSPP
 K = 1-1/2" Flange-SAE-DN 38

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

Type of ΔP Clogging Indicator _____
 A, B, BM, C, D (Others available upon request)

Type Code _____
 1

Modification Number (the latest version is always supplied) _____

Port Configuration _____
 (omit) = SAE DN Flange
 0 = BSPP Threaded
 12 = SAE Straight Threaded

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

Bypass Valve _____
 (omit) = no bypass (optional)
 B3.5 = 50.75 psid (3.5 bar) (optional)
 B7 = 101.5 psid (7 bar) (standard)

Supplementary Details _____
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 RL = Flow Path reversed - Right inlet/Left outlet
 SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids
 SO155H = Modification of BH4HC (High Collapse) Element For Phosphate Esters
 cRUus = Electrical Indicator with underwriter's recognition
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0250 DN 010 BN4HC / V

Size _____
 0160, 0250, 0400

Type _____
 DN

Filtration Rating (micron) _____
 3, 6, 10, 25 = BH4HC
 3, 6, 10, 25 = BN4HC
 25, 50, 100, 200 = W/HC

Element Media _____
 BH/HC, BN/HC, W/HC

Supplementary Details _____
 (omit) = standard
 V = Fluorocarbon elastomer (FKM)
 SFREE = (same as above)
 SO263 = (same as above)
 SO155H = (same as above)

Clogging Indicator Model Code

VM 8 C . X / V

Indicator Prefix _____
 VM = G 1/2 3000 psi

Trip Pressure _____
 2 = 29 psid (2 bar)
 5 = 72 psid (5 bar)] (optional)
 8 = 116 psid (8 bar)

Type of Indicator _____
 A = No indicator, plugged port
 B = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)

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

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

Underwriters Recognition (VM types C, D, J, and J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition
 (For additional details and options, see Section G - Clogging Indicators.)

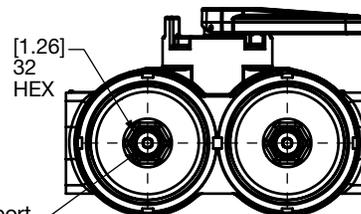
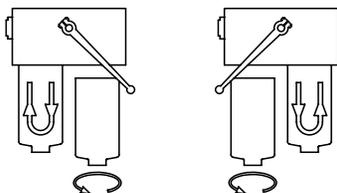
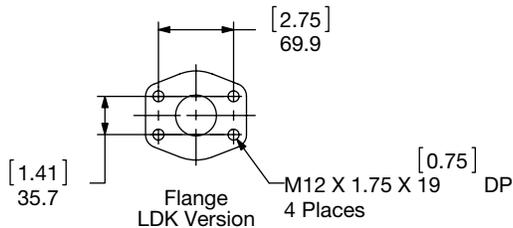
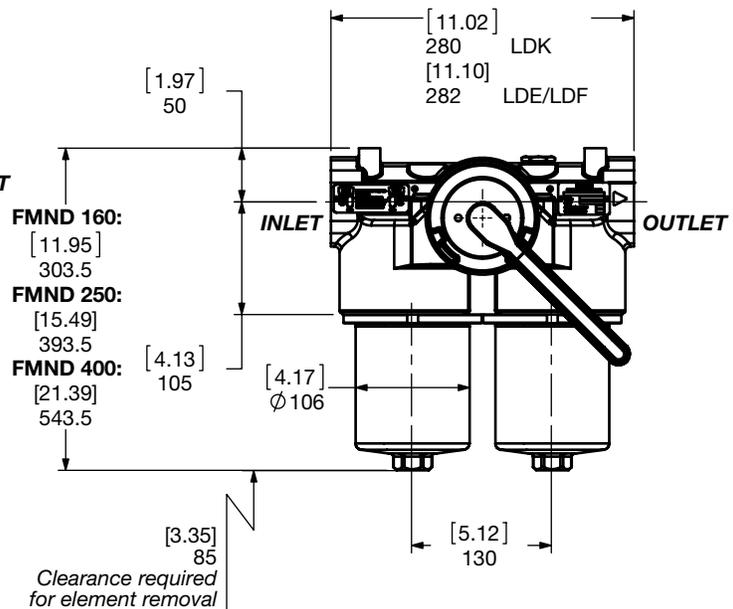
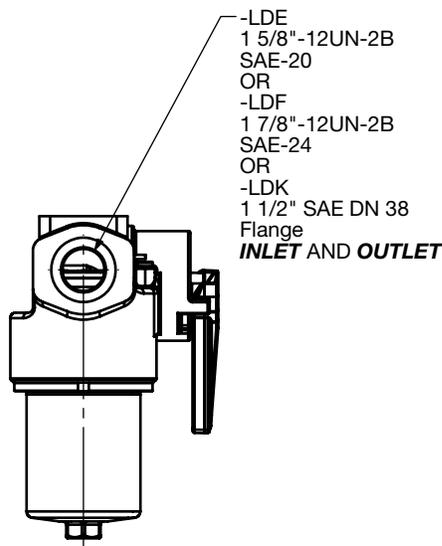
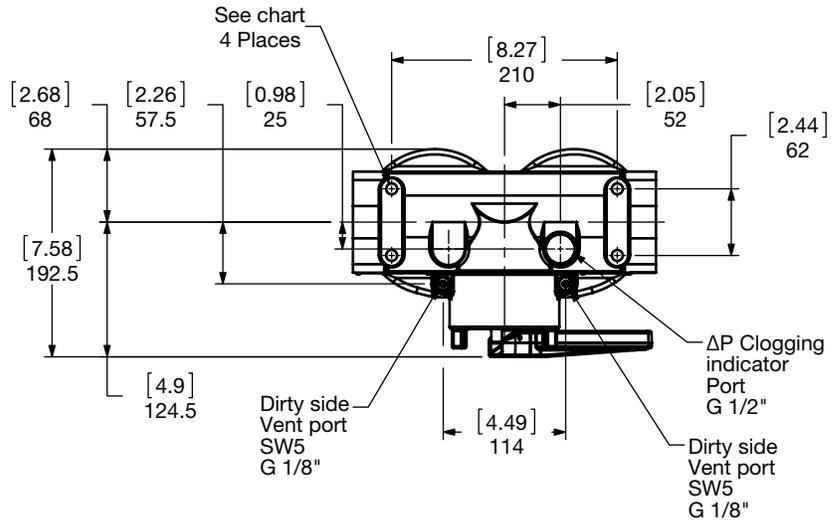
Model Codes Containing RED are non-stock items – Minimum quantities may apply – Contact HYDAC for information and availability

HIGH PRESSURE FILTERS

Dimensions

FMND 160/250/400

Model	Mounting Hole
FMND160-400LDE	M12X1.75 x 19mm Deep
FMND160-400LDE/12	3/8-24UNF x 14mm Deep
FMND160-400LDF	M12X1.75 x 19mm Deep
FMND160-400LDF/12	3/8-24UNF x 14mm Deep
FMND160-400LDK	M12X1.75 x 19mm Deep



Before changing the element, relieve pressure in the filter housing.

Size	160	250	400
Weight (lbs.)	52.7	59.8	71.0

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

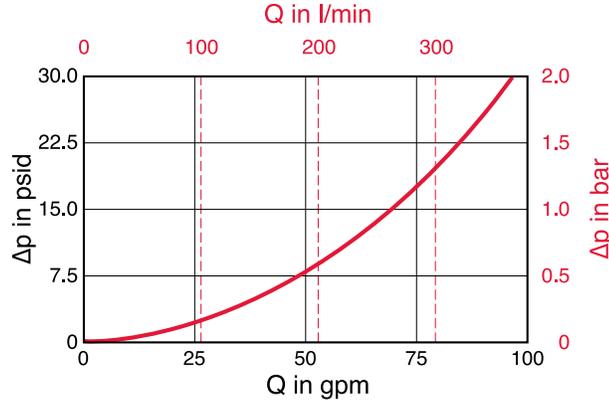
$$\text{Assembly } \Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$$

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

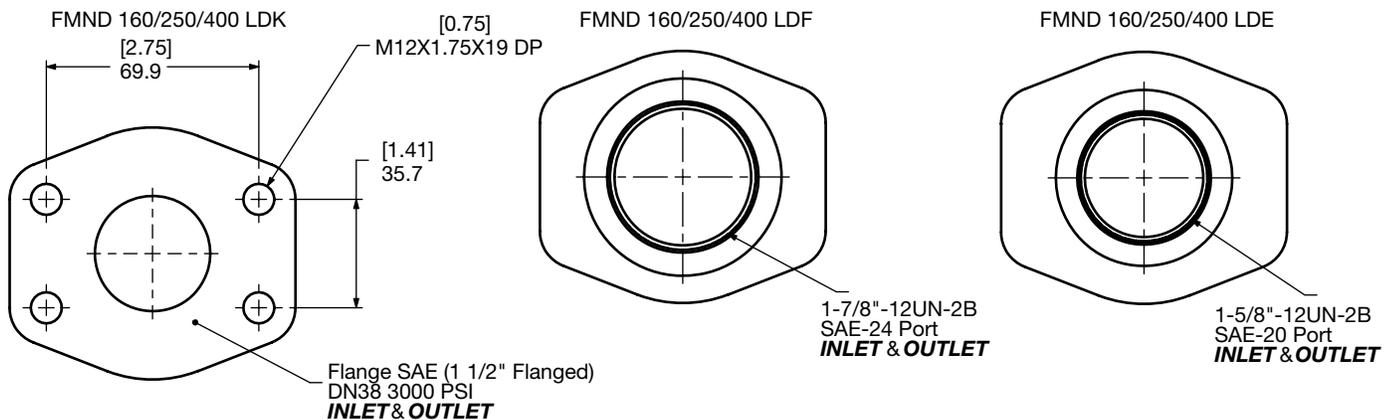
Betamicon	...DN...BN/HC Elements (Low Collapse)			
Size	3 μm	6 μm	10 μm	25 μm
0160 DN XXX BN4HC	0.434	0.280	0.187	0.143
0250 DN XXX BN4HC	0.280	0.176	0.115	0.099
0400 DN XXX BN4HC	0.176	0.110	0.071	0.055

Wire Mesh	...DN...W/HC Elements			
Size	25 μm	50 μm	100 μm	200 μm
0160 DN XXX W/HC	0.009	0.009	0.009	0.009
0250 DN XXX W/HC	0.006	0.006	0.006	0.006
0400 DN XXX W/HC	0.004	0.004	0.004	0.004

Betamicon	...DN...BH/HC Elements (High Collapse)			
Size	3 μm	6 μm	10 μm	25 μm
0160 DN XXX BH4HC	0.439	0.280	0.209	0.137
0250 DN XXX BH4HC	0.296	0.187	0.154	0.104
0400 DN XXX BH4HC	0.187	0.115	0.093	0.060

All Element K Factors in psi / gpm.

FMND 160/250/400 LDK

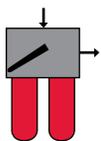


HIGH PRESSURE FILTERS

DFDK Series

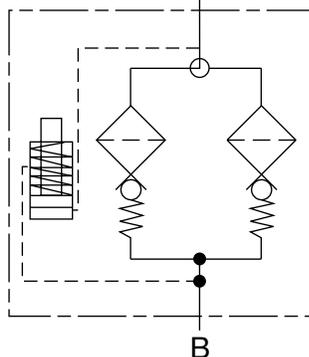
Inline Duplex Filters

4568 psi • up to 90 gpm

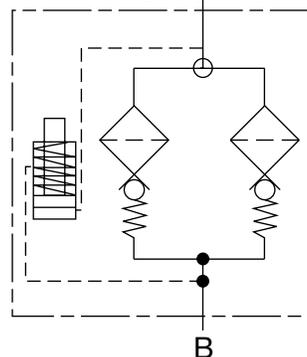


Hydraulic Symbol

DFDK...QL
"L" Ball Valve



DFDK...QT
"T" Ball Valve
(sizes 330 or larger)



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 or lid, 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.
- DFDK sizes 330 and above can be ordered with a T Ball Valve which can operate in mid position with both elements fully open and online in parallel.

Technical Specifications

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 Lid/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. Allowable Working Pressure 4568 psi (315 bar) Fatigue Pressure Contact HYDAC Office Burst Pressure > 18,270 psi (1260 bar)	
Element Collapse Pressure Rating	BH4HC, V 3045 psid (210 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	$\Delta P = 116$ psid (8 bar) -10% (standard) Non-bypass Only	

Applications



Automotive



Industrial



Power Generation



Pulp & Paper



Railways



Steel / Heavy Industry

Model Code

DFDK BH/HC 60 Q L C 3 A 1 . 2 -

Filter Type _____
 DFDK = Duplex Pressure Filter with Ball Valve Selector

Element Media _____
 BH/HC = Betamicon® (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 with type code 3 only - larger sizes upon request)
 Q = 4568 psi (315 bar) (sizes 30 - 1320 with type code 1 or 2 only)

Valve _____
 L = ball change-over valve in "L" configuration (standard)
 T = ball change-over valve in "T" configuration
 (full simultaneous flow through both sides - sizes 330 and larger)

Connection _____
 B = 1/2" SAE 8 (size 30 only) L = 2" SAE Code 62 (sizes 330 - 1320 only)
 C = 3/4" SAE 12 (sizes 60/110 only) M = 2 1/2" SAE Code 62 (sizes 1320 only)
 F = 1 1/2" SAE 24 (sizes 160 - 280 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 (others available upon request)

Type Code _____
 1 = One Piece Bowl (sizes 60 - 660 only)
 2 = Two Piece Bowl (size 660 to 1320 only)
 3 = Upside down mounting - Element top access (size 1320 only - larger sizes upon request)

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 rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene Propylene (EPR)

Supplementary Details _____
 L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
 W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)
 SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluids
 T100 = Thermal lockout on indicator at 100°F (C, D, J, and J4 indicators only)
 cRUus = Electrical Indicator with underwriter's recognition
 SFREE = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0060 D 003 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

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

Supplementary Details _____
 SO263 = (same as above)
 SFREE = (same as above)
 W = Modification of "V" elements for use with oil water emulsions (HFA) and water polymer solutions (HFC)

Clogging Indicator Model Code

VD 8 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 = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
 (omit) = Nitrile rubber (NBR) (standard)
 V = Fluorocarbon elastomer (FKM)
 EPR = Ethylene propylene rubber (EPR)

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

Underwriters Recognition (VM, VD types C, D, J, and J4 only) _____
 cRUus = Electrical Indicator with underwriter's recognition

W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)

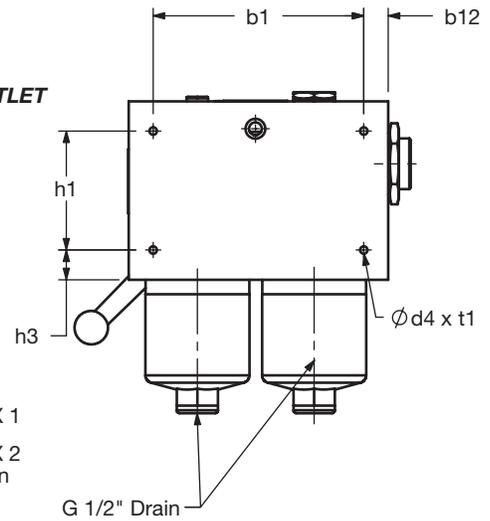
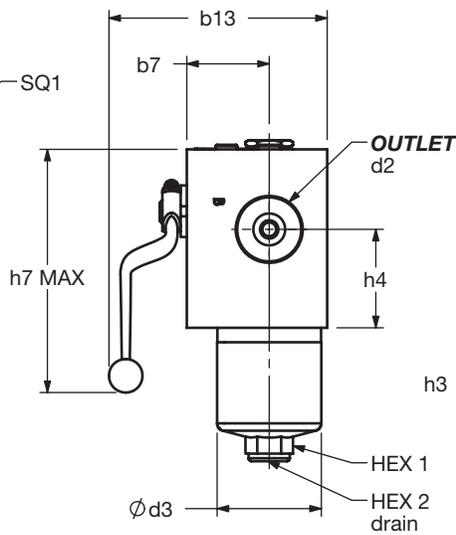
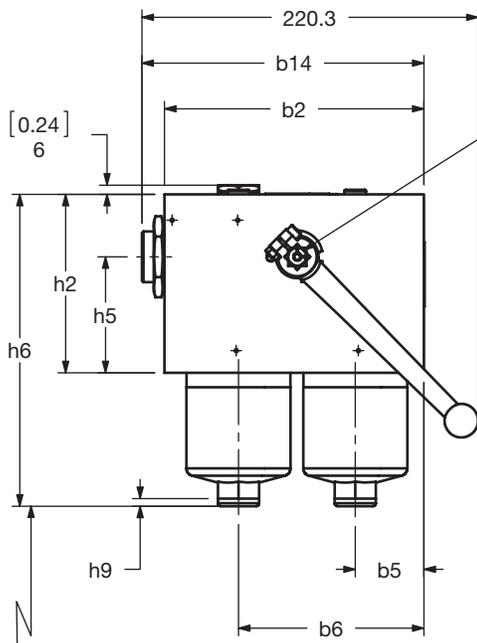
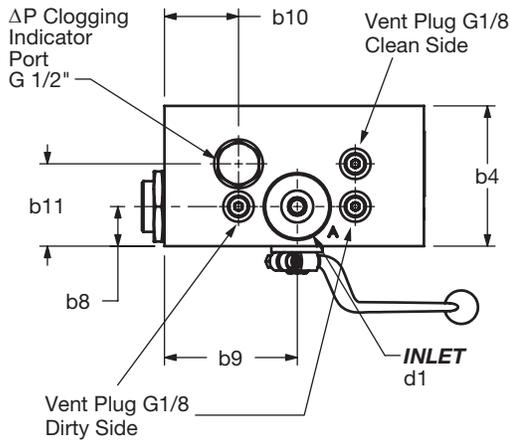
(For additional details and options, see Section G - Clogging Indicators.)

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

HIGH PRESSURE FILTERS

Dimensions

DFDK 60 / 110 / 160 / 240 / 280



h8
Clearance Required
for Element Removal

Size	60	110	160	240	280
Weight (lbs.)	33.1	37.5	72.8	79.4	99.3

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

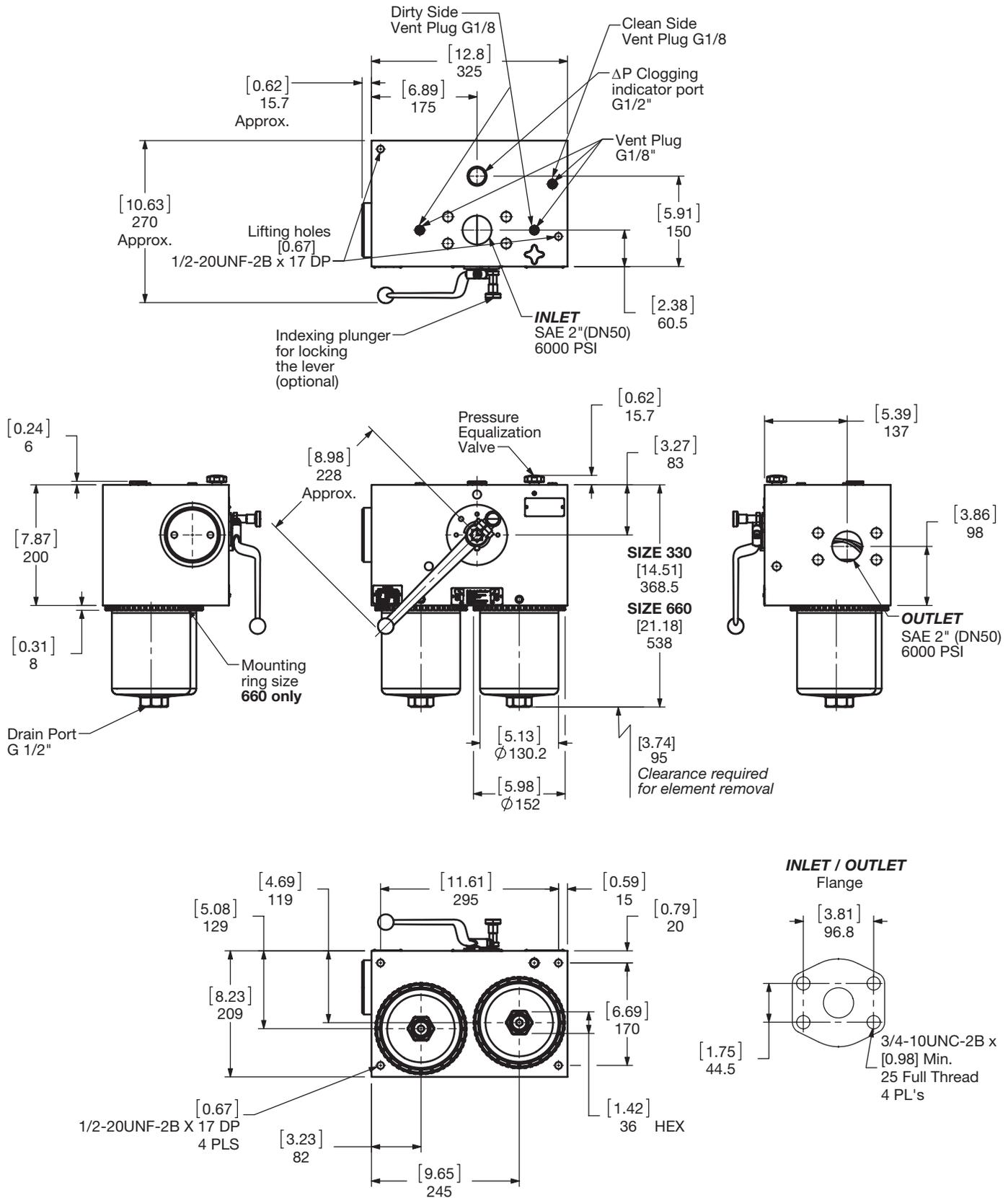
DFDK	60	110	160	240	280
b1	[5.43] 138	[5.43] 138	[7.48] 190	[7.48] 190	[7.48] 190
b2	[6.69] 170	[6.69] 170	[8.27] 210	[8.27] 210	[8.27] 210
b4	[3.62] 92	[3.62] 92	[5.04] 128	[5.04] 128	[5.04] 128
b5	[1.77] 45	[1.77] 45	[2.07] 52.5	[2.07] 52.5	[2.07] 52.5
b6	[4.78] 121.5	[4.78] 121.5	[6.20] 157.5	[6.20] 157.5	[6.20] 157.5
b7	[2.13] 54	[2.13] 54	[2.97] 75.5	[2.97] 75.5	[2.97] 75.5
b8	[1.02] 26	[1.02] 26	[1.40] 35.5	[1.40] 35.5	[1.40] 35.5
b9	[3.43] 87	[3.43] 87	[4.13] 105	[4.13] 105	[4.13] 105
b10	[1.91] 48.5	[1.91] 48.5	[2.07] 52.5	[2.07] 52.5	[2.07] 52.5
b11	[2.13] 54	[2.13] 54	[2.97] 75.5	[2.97] 75.5	[2.97] 75.5
b12	[0.63] 16	[0.63] 16	[0.39] 10	[0.39] 10	[0.39] 10
b13 (≈)	[5.91] 150	[5.91] 150	[7.60] 193	[7.60] 193	[7.60] 193
b14 (≈)	[7.13] 181	[7.13] 181	[8.70] 221	[8.70] 221	[8.70] 221
d1*	1-1/16-12UN-2B SAE-12		1-7/8-12UN-2B SAE-24		
d2*					
d3	[2.69] 68.2	[2.69] 68.2	[3.75] 95.2	[3.75] 95.2	[3.75] 95.2
d4	1/4-28UNF-2B		3/8-24UNF-2B		
h1	[3.07] 78	[3.07] 78	[3.78] 96	[3.78] 96	[3.78] 96
h2	[4.61] 117	[4.61] 117	[6.38] 162	[6.38] 162	[6.38] 162
h3	[0.77] 19.5	[0.77] 19.5	[1.30] 33	[1.30] 33	[1.30] 33
h4	[2.54] 64.5	[2.54] 64.5	[4.17] 106	[4.17] 106	[4.17] 106
h5	[2.99] 76	[2.99] 76	[3.94] 100	[3.94] 100	[3.94] 100
h6	[8.07] 205	[10.89] 276.5	[11.20] 284.5	[13.60] 345.5	[20.69] 525.5
h7 (≈)	[8.07] 205	[8.07] 205	[9.65] 245	[9.65] 245	[9.65] 245
h8	[2.95] 75	[2.95] 75	[3.35] 85	[3.35] 85	[3.35] 85
h9	[0.20] 5	[0.20] 5	[0.20] 5	[0.20] 5	[0.20] 5
t1	[0.28] 7	[0.28] 7	[0.43] 11	[0.43] 11	[0.43] 11
HEX1	[1.06] 27	[1.06] 27	[1.26] 32	[1.26] 32	[1.26] 32
HEX2	[0.39] 10	[0.39] 10	[0.39] 10	[0.39] 10	[0.39] 10
SQ1	[0.47] 12	[0.47] 12	[0.55] 14	[0.55] 14	[0.55] 14

Dimensions shown are [inches] millimeters for general information and overall envelope size only.

HIGH PRESSURE FILTERS

Dimensions

DFDK 330 / 660...1.2

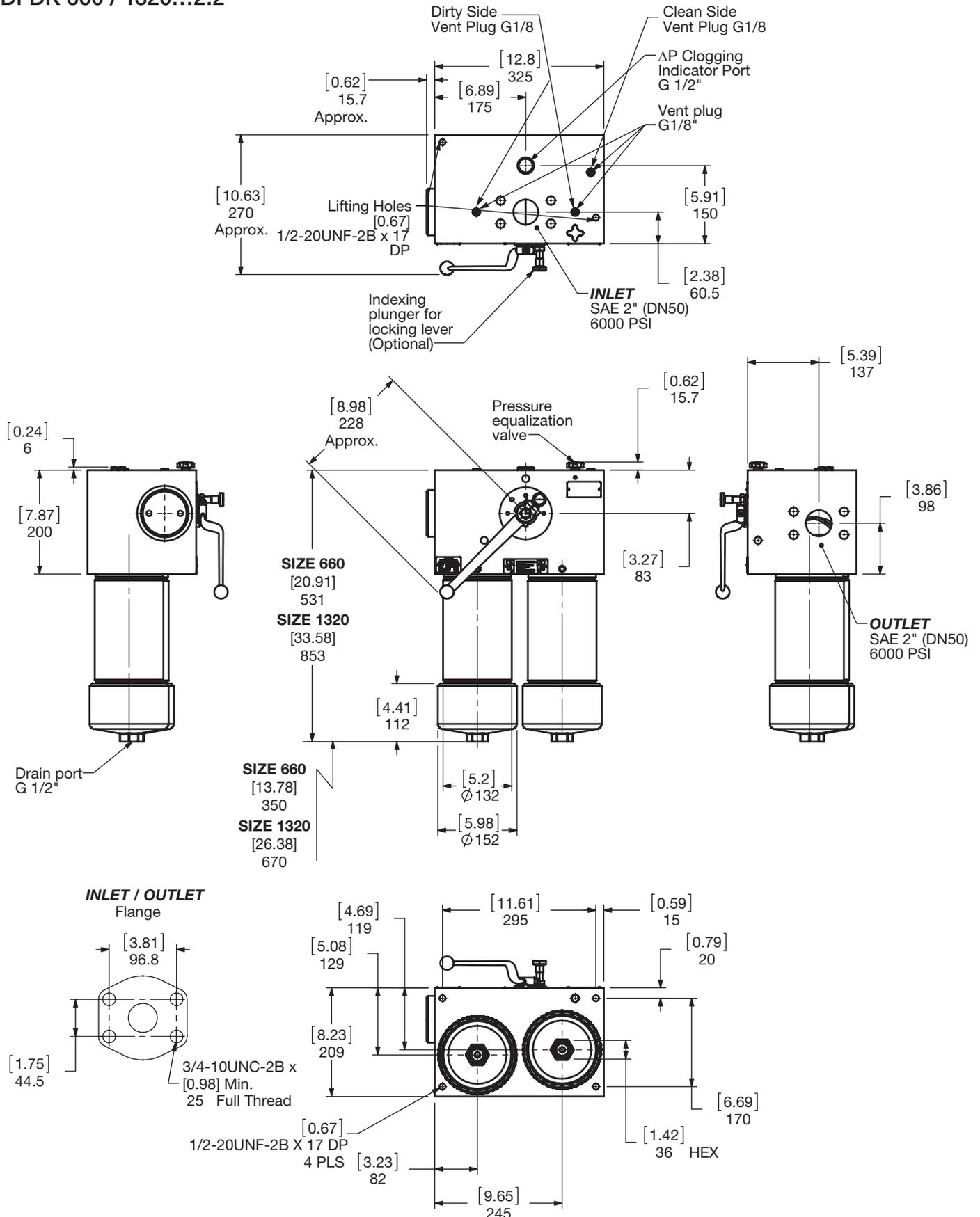


Size	330	660
Weight (lbs.)	213.9	249

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Dimensions DFDK 660 / 1320...2.2



Size	660	1320
Weight (lbs.)	262.5	335.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

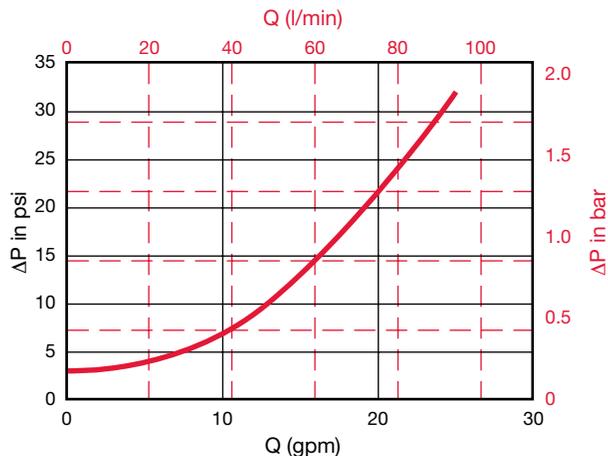
Housing Curve:

Pressure loss through housing is as follows:

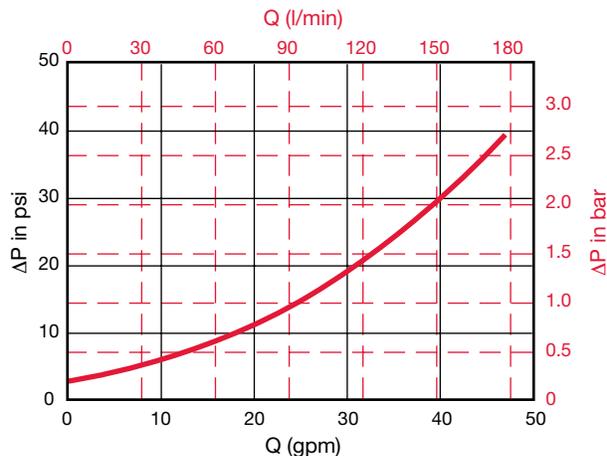
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

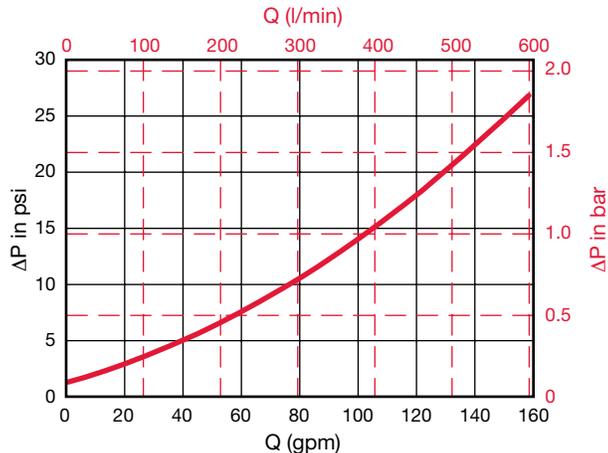
DFDK 60 / 110 Housing



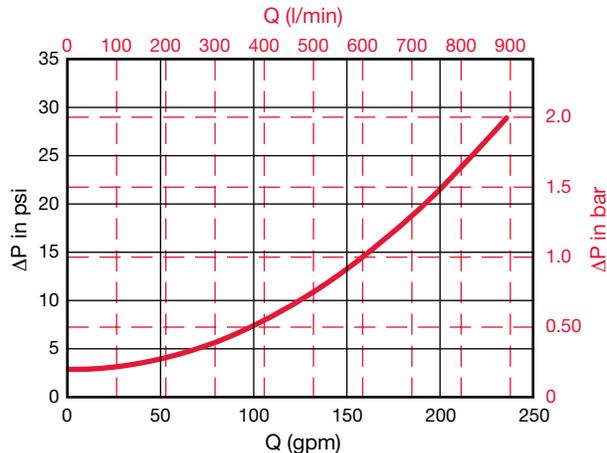
DFDK 160 / 240 / 280 Housing



DFDK 330 / 660 / 1320 QLL Housing "L" Ball Valve



DFDK 330 / 660 / 1320 QTL Housing "T" Ball Valve

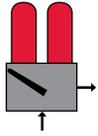


HIGH PRESSURE FILTERS

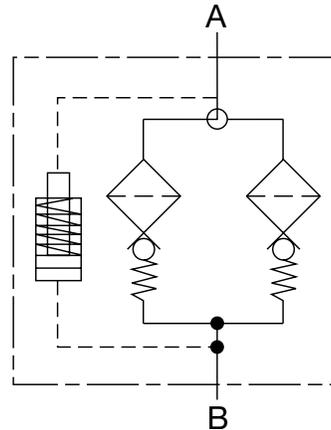
HFDK4P Series

Inline Duplex Filters

4568 psi • up to 90 gpm



Hydraulic Symbol



Features

- The HFDK4P pressure duplex filter meets HF4 automotive specification element requirements.
- 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.

Applications



Automotive



Industrial



Power Generation



Pulp & Paper



Shipbuilding

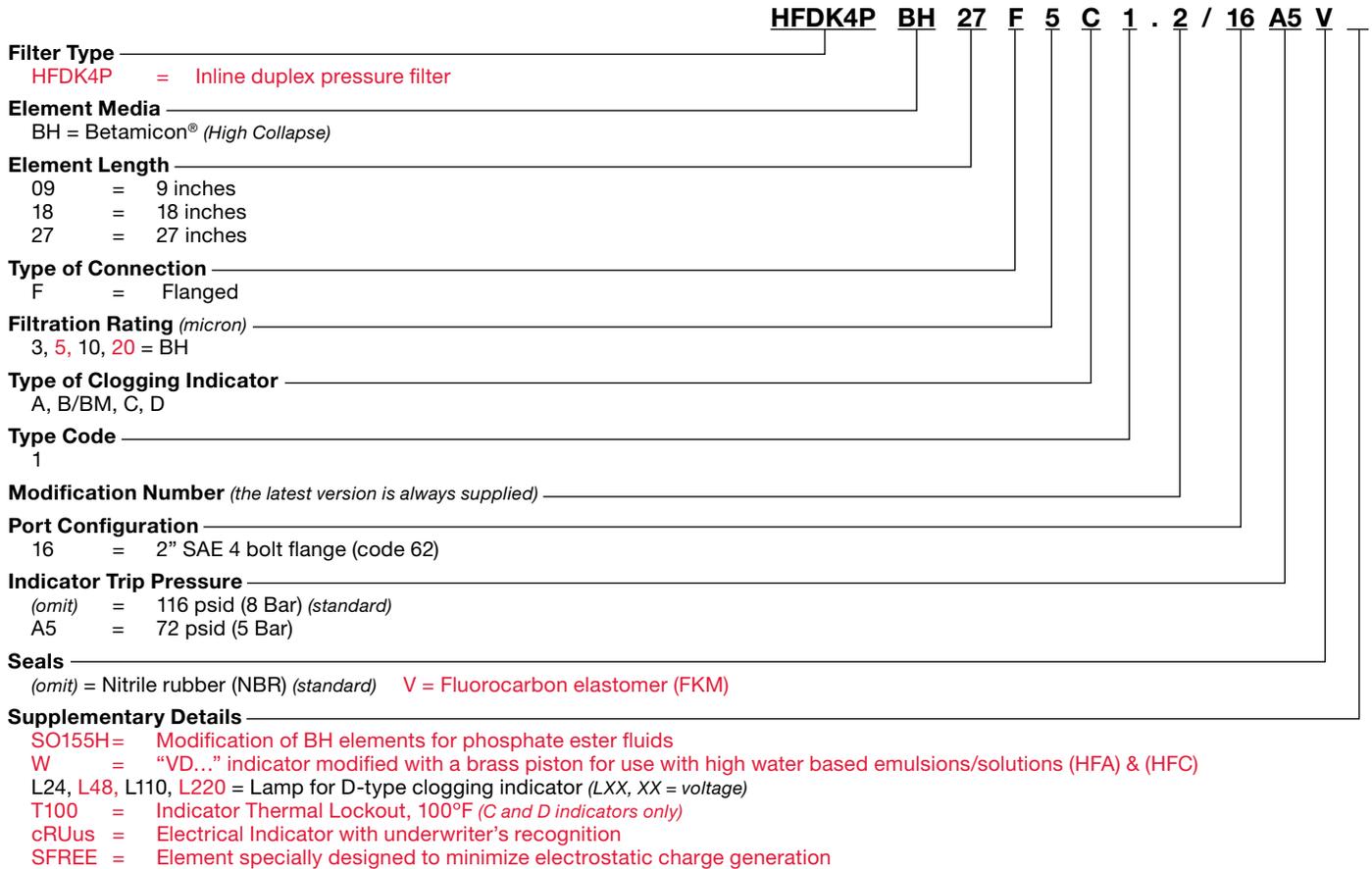


Steel / Heavy Industry

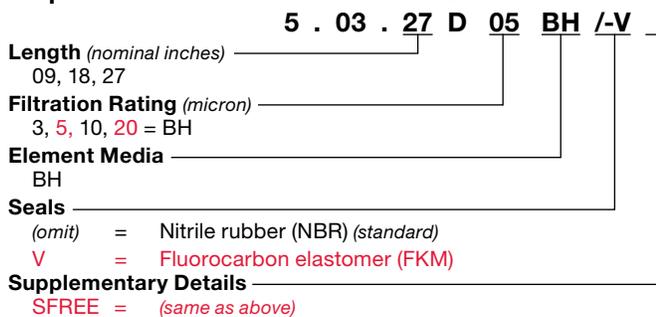
Technical Specifications

Mounting Method	4 mounting holes
Port Connection	2" SAE Flange Code 62
Flow Direction	Inlet: Bottom Outlet: Left Side
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. Allowable Working Pressure	4568 psi (315 bar)
Fatigue Pressure	4500 psi (315 bar)
Burst Pressure	Contact HYDAC Office
Element Collapse Pressure Rating	
BH	3045 psid (210 bar)
Fluid Temperature Range	
	14°F to 212°F (-10°C to 100°C)
Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure	
$\Delta P = 116$ psid (8 bar) -10% (standard)	
$\Delta P = 72$ psid (5 bar) -10% (optional)	

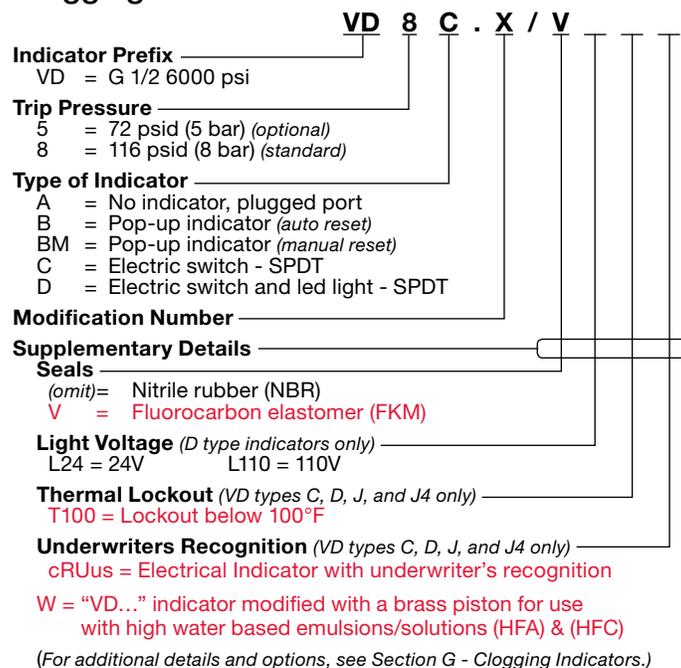
Model Code



Replacement Element Model Code



Clogging Indicator Model Code



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

Sizing Information

Total pressure loss through the filter is as follows:

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

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

(From Tables Below)

Autospec HF4 Depth Size	5.03.XXDXXBH (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
5.03.09DXXBH	0.207	0.146	0.089	0.047
5.03.18DXXBH	0.097	0.068	0.041	0.022
5.03.27DXXBH	0.063	0.044	0.027	0.014

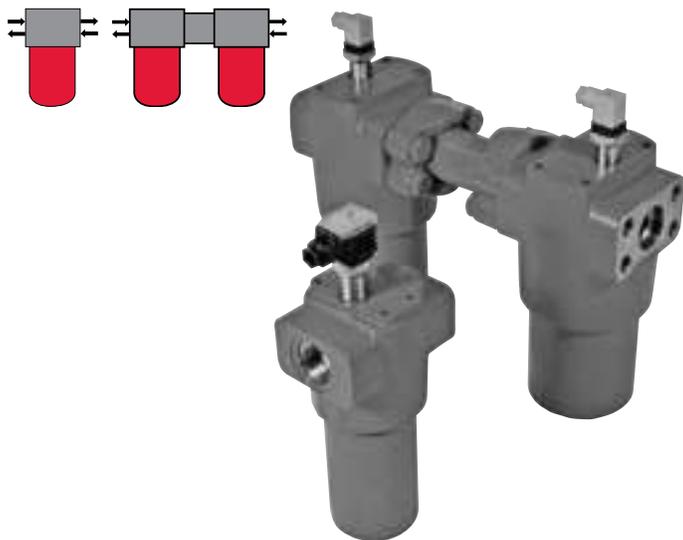
All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

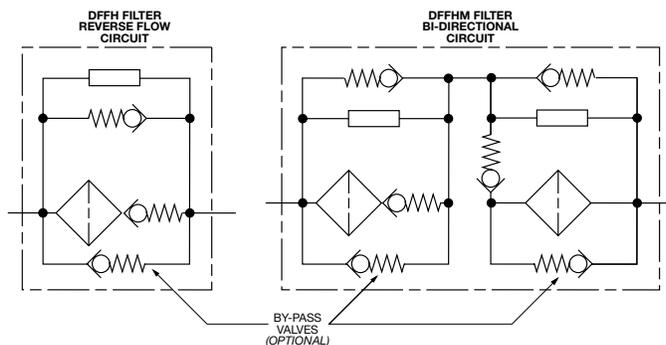
DFFH & DFFHM Series

Reverse Flow Bypass & Bi-Directional Filters

6090 psi • up to 100 gpm



Hydraulic Symbol



Features

- DFFH Reverse bypass Flow models filter fluid in the forward direction and bypass the filter element when the flow direction is reversed.
- DFFHM Bi-Directional model provides fluid filtering in both directions. There are separate filter elements for each direction.
- 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. A choice of O-ring materials (nitrile rubber, Fluorocarbon elastomer, and ethylene propylene rubber) provides compatibility with petroleum oils, synthetic fluids, water-glycols, oil/water emulsions, and high water based fluids.
- Screw-in bowl or lid, 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, located in filter head, (optional) provides positive sealing during normal operation and fast opening during cold starts and flow surges.

Applications



Agricultural



Automotive



Construction



Industrial



Railways

Technical Specifications

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 2" SAE Flange Code 62
Flow Direction	Inlet: Side Outlet: Side
Construction Materials	Head Ductile iron Single piece bowl "1.X" Steel Bowl Steel Two piece bowl "2.X" Steel Housing Steel Lid/Cap 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 (378.5 lpm)
Housing Pressure Rating	Max. Allowable Working Pressure 6090 psi (420 bar) Fatigue Pressure 6000 psi (420 bar) Burst Pressure Contact HYDAC Office
Element Collapse Pressure Rating	BH4HC, V 3045 psid (210 bar) ON, W/HC 290 psid (20 bar)
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.
Indicator Trip Pressure	$\Delta P = 29$ psid (2 bar) -10% (optional) $\Delta P = 72$ psid (5 bar) -10% (standard) $\Delta P = 116$ psid (8 bar) (non-bypass application)
Bypass Valve Cracking Pressure	$\Delta P = 43$ psid (3 bar) +10% (optional) $\Delta P = 87$ psid (6 bar) +10% (standard)

Model Code

DDFFH BH/HC 160 G 3 B 1 . 0 / 12

Filter Type ————
 DFFH = Reverse Flow bypass Filter **DDFFHM = Bi-Directional Filter**

Element Media ————
 ON = Optimicron® (Low Collapse) BH/HC = Betamicon® (High Collapse)
 W/HC = Wire Mesh **V = Metal Fiber**

Size and Nominal Connection ————

DDFFH		DDFFHM	
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 DDFFHM) F = Flange

Filtration Rating (micron) ————
 3, 5, 10, 20 = BH/HC, BN/HC **3, 5, 10, 20 = V** 1, 3, 5, 10, 15, 20 = ON 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator ————
 A, B, BM, C, D (Others available upon request)

Type Number ————
 1
 2 = 2 Piece Bowl (size 660/1320 only)

Modification Number (latest version is always supplied) ————

Port Configuration ————
 12 = SAE Straight Thread O-Ring Boss Ports (available on DDFFH only) 16 = SAE Flange Ports

Seals ————
 (omit) = Nitrile rubber (NBR) (standard) **V = Fluorocarbon elastomer (FKM)** **EPR = Ethylene Propylene rubber (EPR)**

Bypass Valve ————
 (omit) = Non-bypass - Critical applications (high collapse element required)
 B3 = 43 psid (3 bar) - Optional
 B6 = 87 psid (6 bar) - Standard setting for pressure filters

Supplementary Details ————
SO263 = Modification of ON & W/HC elements for Skydrol or HYJET phosphate ester fluid
SO184 = G-1/2" Drain in Bowl Option For Sizes 160 - 280 (standard for sizes 330 & 660)
W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)
L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
T100 = Indicator Thermal Lockout, 100°F (C and D indicators only)
cRUus = Electrical Indicator with underwriter's recognition
SFREET = Element specially designed to minimize electrostatic charge generation

Replacement Element Model Code

0160 D 003 BH4HC /

Size ————
 0160, 0240, 0280,
 0330, 0660, 1320

Filtration Rating (micron) ————
 3, 5, 10, 20 = BH4HC 1, 3, 5, 10, 15, 20 = ON
3, 5, 10, 20 = V 25, 74, 149 = W/HC

Element Media ————
 BH4HC, ON, **V**, W/HC

Seals ————
 (omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

Supplementary Details ————
SO263 = (same as above)
SFREET = (same as above)

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 116 psid (8 bar) available upon request

Type of Indicator ————
 A = No indicator, plugged port
 B = Pop-up indicator (auto reset)
 BM = Pop-up indicator (manual reset)
 C = Electric switch - SPDT
 D = Electric switch and LED light - SPDT

Modification Number ————

Supplementary Details ————

Seals ————
 (omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

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

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

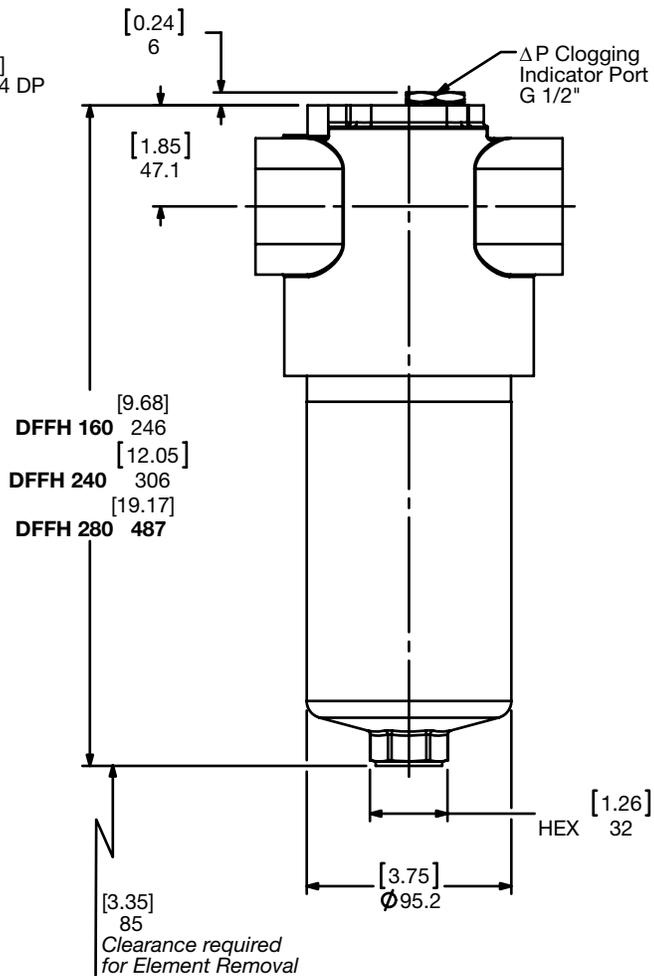
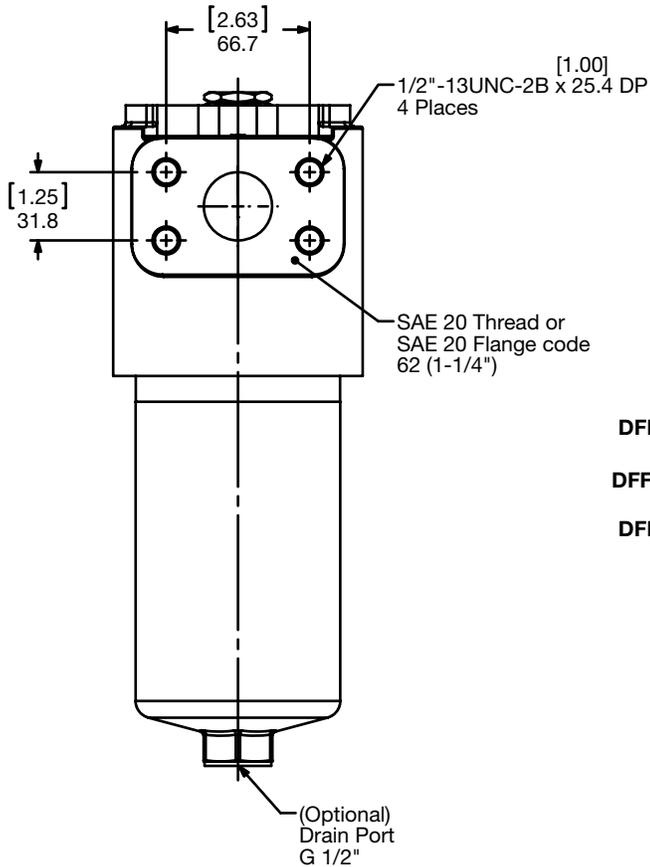
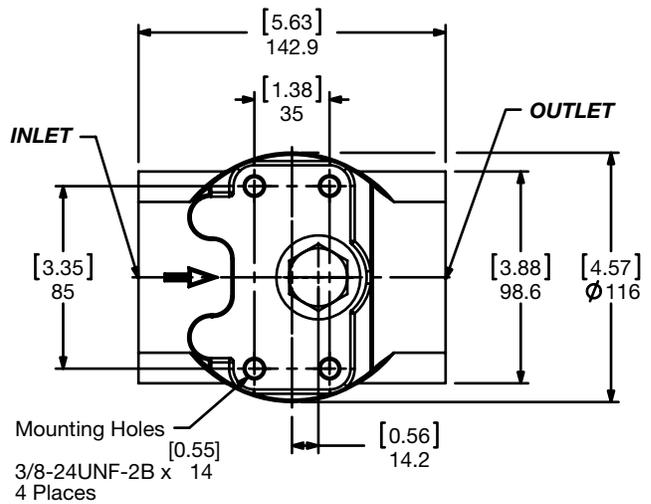
Underwriters Recognition (VD types C, D, J, and J4 only) ————
cRUus = Electrical Indicator with underwriter's recognition
W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)
 (For additional details and options, see Section G - Clogging Indicators.)

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

HIGH PRESSURE FILTERS

Dimensions

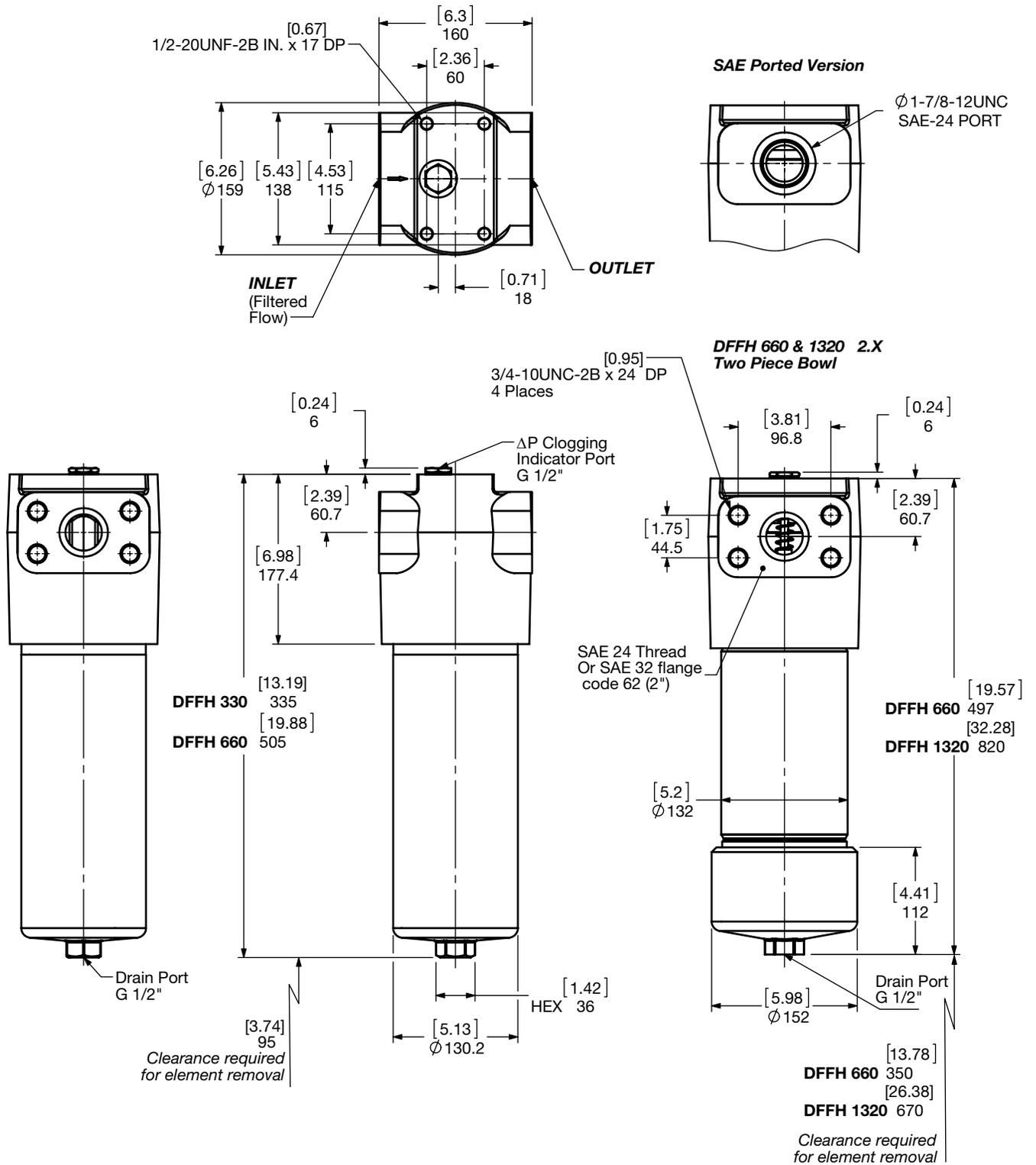
DFFH 160 / 240 / 280



Size - DFFH	160	240	280
Weight (lbs.)	25.6	29.2	39.6

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions DFFH 330 / 660 / 1320



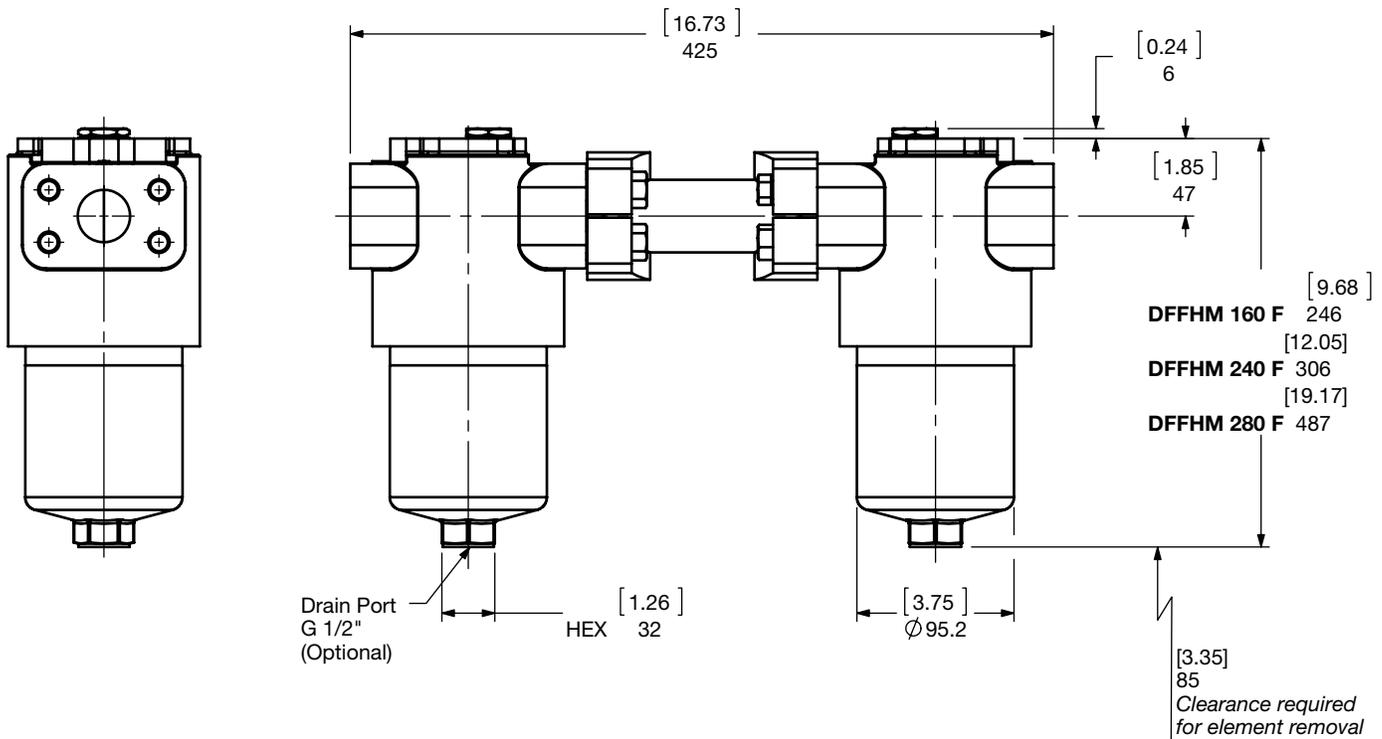
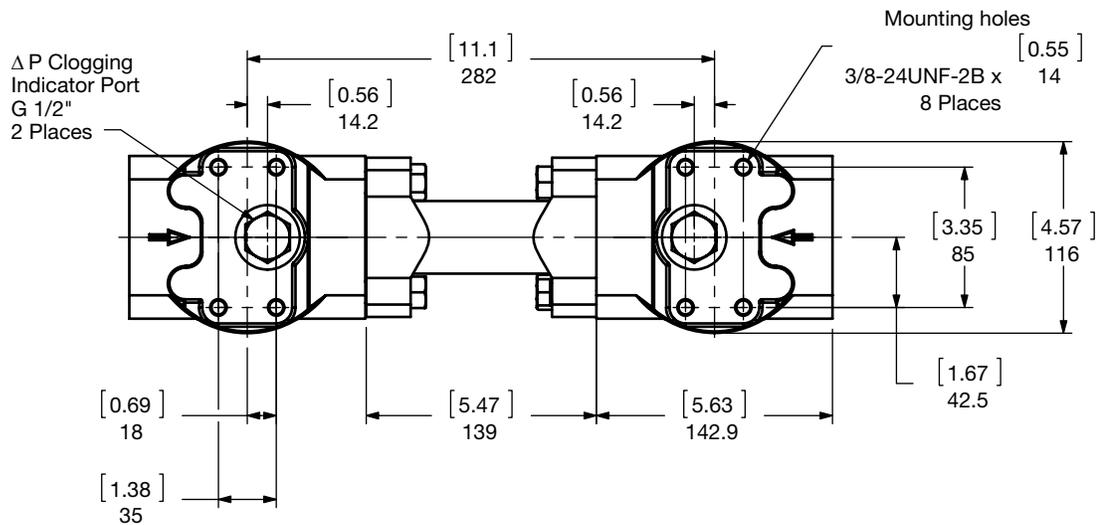
Size - DFFH	330	660	1320
Weight (lbs.)	61.3	78.7	127

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

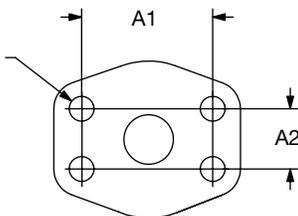
HIGH PRESSURE FILTERS

Dimensions

DFFHM 160 / 240 / 280



$\phi A3$
Flange bolt holes
(4 Places)

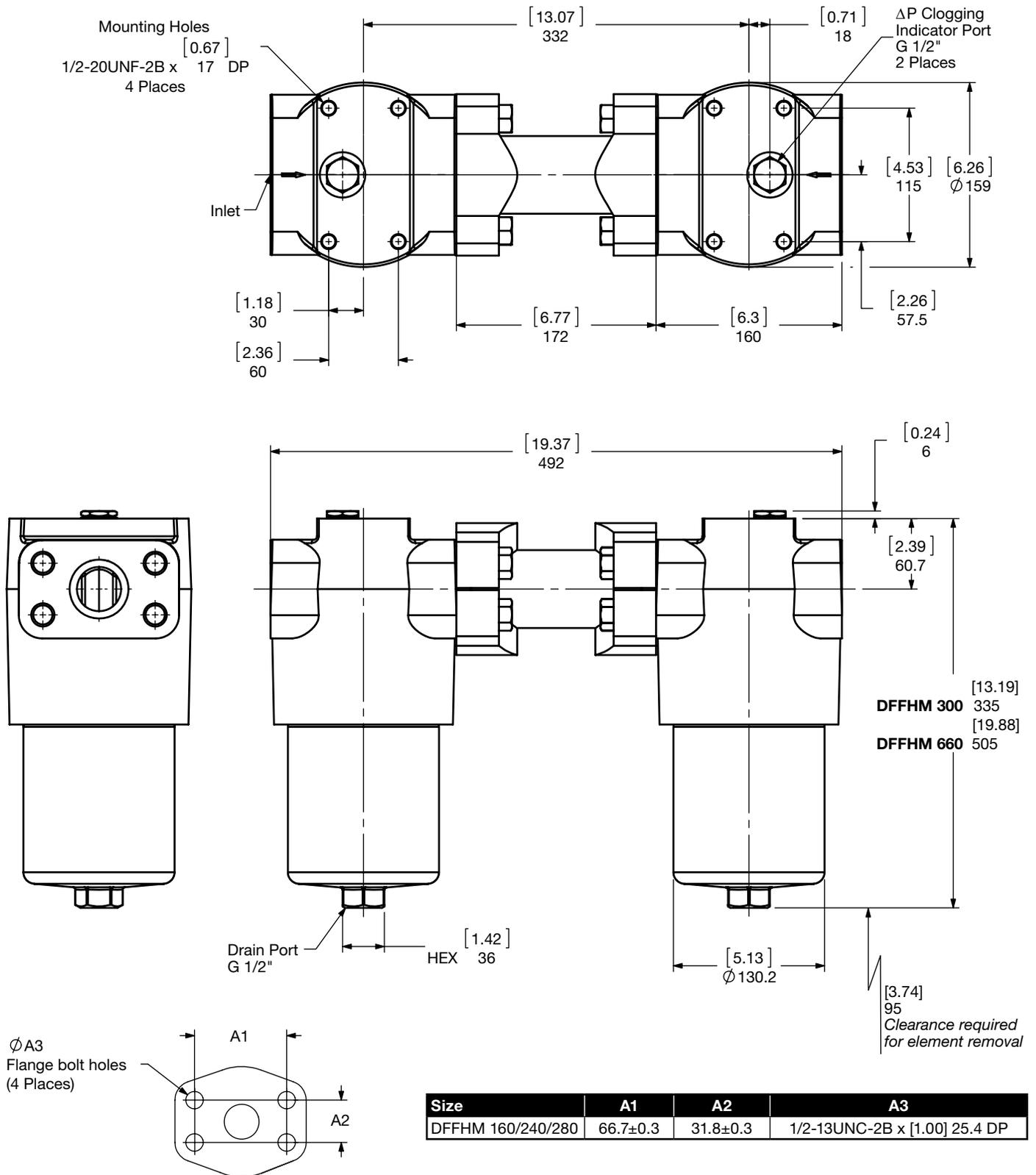


Size	A1	A2	A3
DFFHM 160/240/280	66.7±0.3	31.8±0.3	1/2-13UNC-2B x [1.00] 25.4 DP

Size - DFFHM	160	240	280
Weight (lbs.)	59.1	66.3	77

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions DFFHM 330 / 660

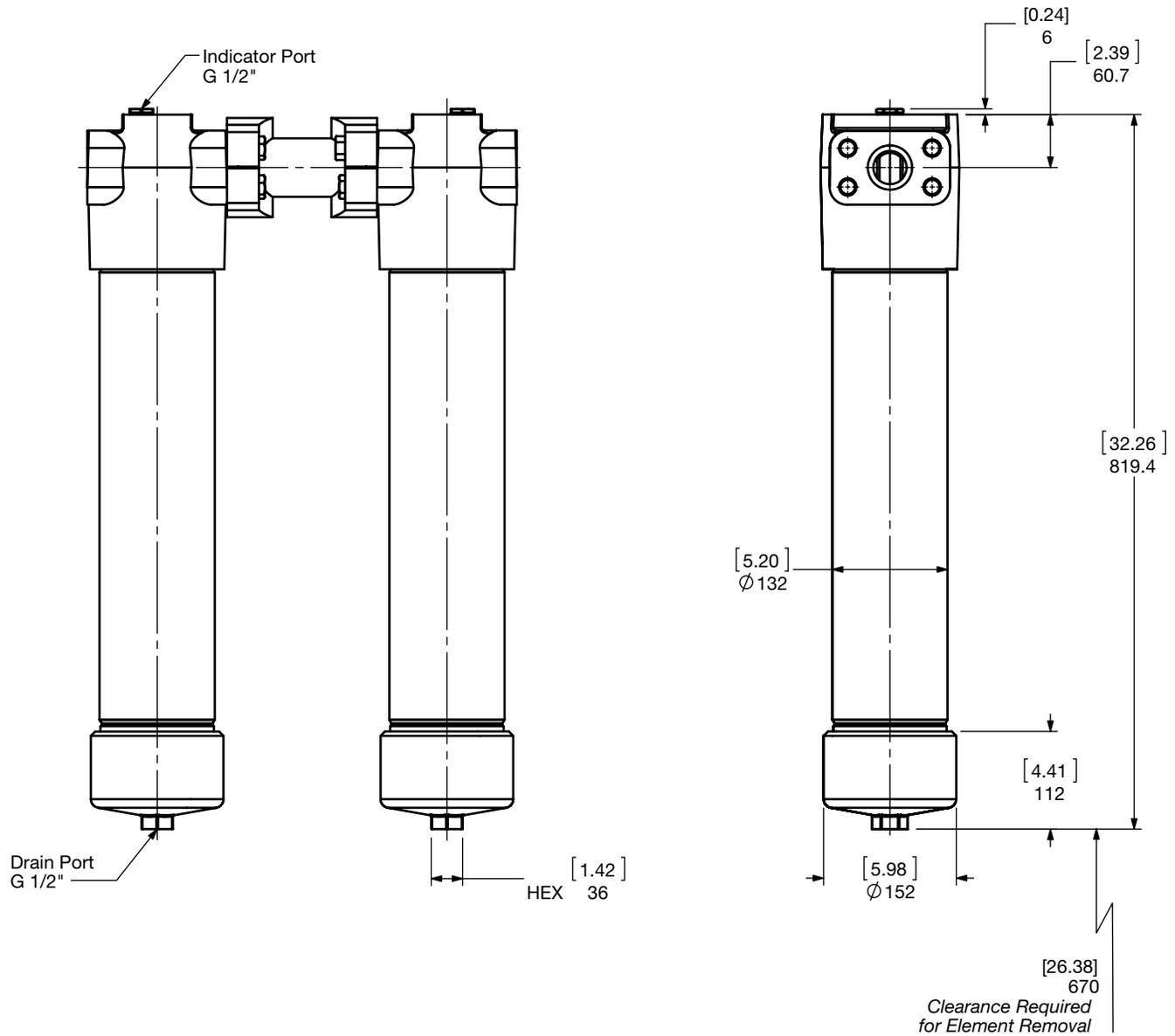
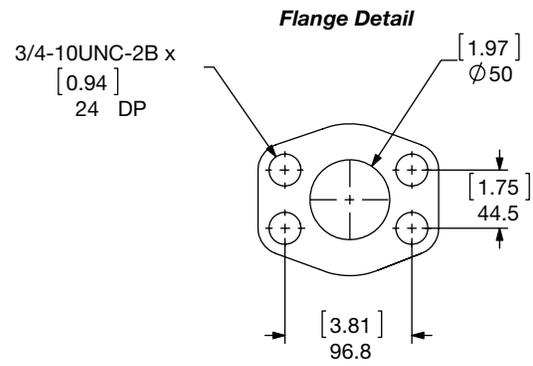
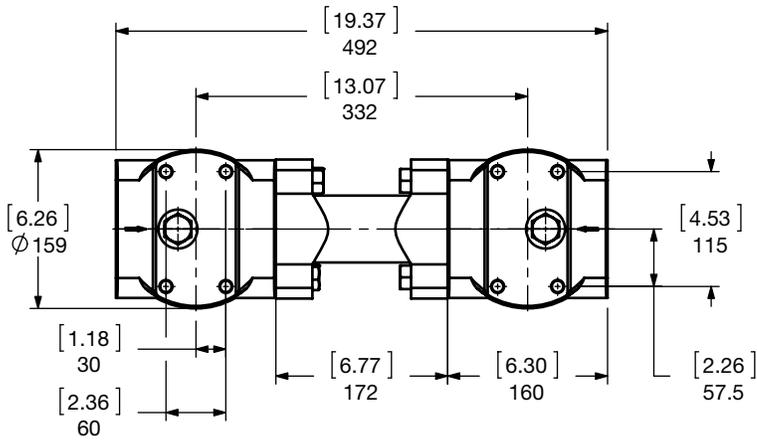


Size - DFFHM	330	660
Weight (lbs.)	139.4	175.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Dimensions DFFHM 1320



Size - DFFHM

1320

Weight (lbs.)

271.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

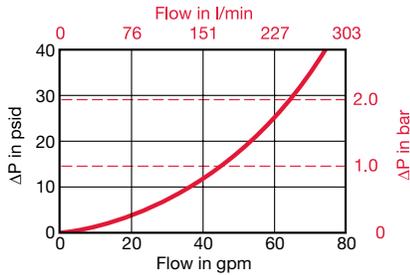
Housing Curve:

Pressure loss through housing is as follows:

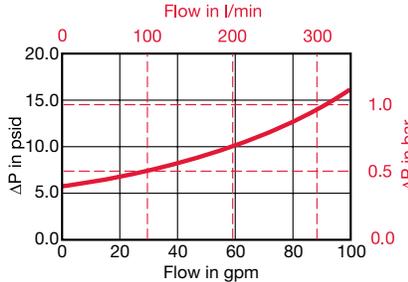
Housing $\Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

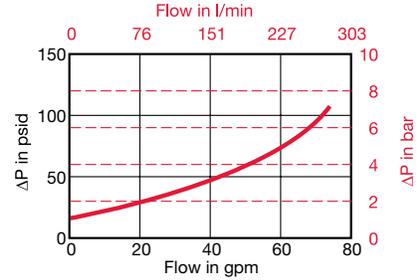
DFFH 160/240/280 Forward Flow



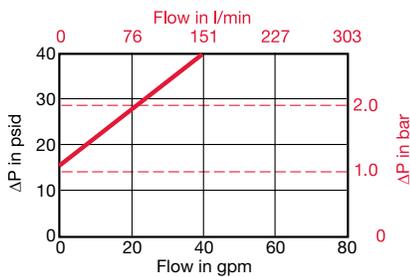
DFFH 330/660/1320 Forward Flow



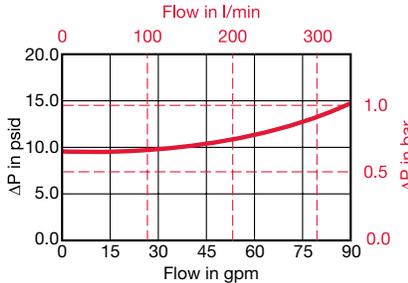
DFFHM 160/240/280 Forward & Reverse Flow



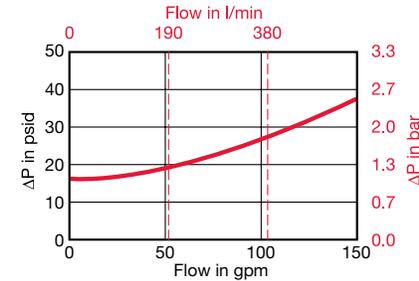
DFFH 160/240/280 Reverse Flow



DFFH 330/660/1320 Reverse Flow



DFFHM 330/660/1320 Forward & Reverse Flow



Element K Factors

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

Optimicron	...D...ON Elements					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031
1320 D XXX ON	0.102	0.053	0.042	0.025	0.019	0.015

Betamicon	...D...BH4HC (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
0160 D XXX BH4HC	0.922	0.571	0.324	0.241
0240 D XXX BH4HC	0.582	0.373	0.214	0.159
0280 D XXX BH4HC	0.313	0.187	0.099	0.088
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049
1320 D XXX BH4HC	0.088	0.055	0.033	0.022

Wire Mesh	...D...W/HC Elements	
Size	25, 50, 74, 100, 149, 200 μm	
0160 D XXX W/HC	0.035	
0240 D XXX W/HC	0.023	
0280 D XXX W/HC	0.020	
0330 D XXX W/HC	0.020	
0660 D XXX W/HC	0.008	
1320 D XXX W/HC	0.004	

Metal Fiber	...D...V Elements (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
0160 D XXX V	0.251	0.177	0.123	0.079
0240 D XXX V	0.169	0.137	0.093	0.062
0280 D XXX V	0.126	0.093	0.064	0.041
0330 D XXX V	0.121	0.097	0.065	0.043
0660 D XXX V	0.063	0.050	0.034	0.021
1320 D XXX V	0.032	0.026	0.018	0.012

All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

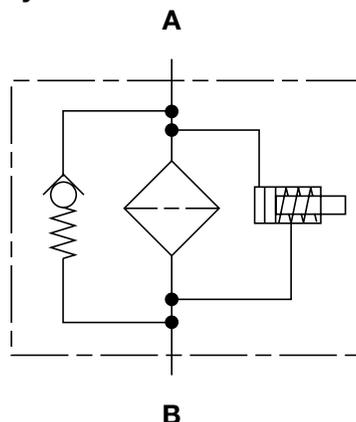
DF...QE Series

Manifold Mount Filters

4568 psi • up to 110 gpm



Hydraulic Symbol



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 or lid/cap 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 located in filter head, so either high or low collapse pressure elements may be used.
- Fatigue pressure rating equals maximum allowable working pressure rating.

Technical Specifications

Mounting Method	4 mounting holes (<i>manifold mount</i>)	
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	
Single piece bowl "1.X"		
Bowl	Steel	
Two piece bowl "2.X"		
Housing	Steel	
Lid/Cap	Steel	
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	100 gpm (378.5 lpm)	
1320	110 gpm (416.4 lpm)	
Housing Pressure Rating	QE	MHE
Max. Allowable Working Pressure	4568 psi (315 bar)	3625 psi (250 bar)
Fatigue Pressure	4568 psi (315 bar) @ 1 mil. cycles	3625 psi (250 bar) @ 100 mil. cycles
Burst Pressure	Contact HYDAC	
Element Collapse Pressure Rating		
BH4HC, V	3045 psid (210 bar)	
ON, W/HC	290 psid (20 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure		
	$\Delta P = 29$ psid (2 bar) -10% (<i>optional</i>)	
	$\Delta P = 72$ psid (5 bar) -10% (<i>standard</i>)	
Bypass Valve Cracking Pressure		
	$\Delta P = 43$ psid (3 bar) +10% (<i>optional</i>)	
	$\Delta P = 87$ psid (6 bar) +10% (<i>standard</i>)	

Applications



Industrial



Railways



Steel / Heavy Industry

Model Code

DF BH/HC 30 Q E 3 B 1 . X /

Filter Type _____
DF

Element Media _____
ON = Optimicron® (Low Collapse) BH/HC = Betamicon® (High Collapse)
V = Metal Fiber W/HC = Wire Mesh

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 1, 3, 5, 10, 15, 20 = ON 3, 5, 10, 20 = V 25, 74, 149 = W/HC

Type of ΔP Clogging Indicator _____
A, B, BM, C, D (Others available upon request)

Type Number _____
1 = Filters with one piece bowls (sizes 30-660)
2 = Filters with two piece bowls (sizes 660-1320)

Modification Number (the latest version is always supplied) _____

Seals _____
(omit = Nitrile rubber (NBR) (standard) V = Fluorocarbon elastomer (FKM) EPR = Ethylene propylene rubber (EPR)

Bypass Valve _____
(omit) = Without Bypass (BH4HC or V elements recommended)
B3 = 43 psid Bypass (optional)
B6 = 87 psid Bypass (standard)

Supplementary Details _____
SO263 = Modification of ON, BH/HC & W/HC elements for Skydrol or HYJET phosphate ester fluids
SO184 = G-1/2 Drain in Bowl Option For Sizes 30 - 280 (standard for sizes 330 - 1320)
W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)
L24, L48, L110, L220 = Lamp for D-type clogging indicator (LXX, XX = voltage)
T100 = Indicator Thermal Lockout, 100°F (C and D indicators only)
SFREE = Element specially designed to minimize electrostatic charge generation
cRUUs = Electrical Indicator with underwriter's recognition

Replacement Element Model Code

0030 D 003 BH4HC /

Size _____
0030, 0060, 0110, 0160, 0240,
0280, 0330, 0660, 1320

Filtration Rating (micron) _____
3, 5, 10, 20 = BH4HC
1, 3, 5, 10, 15, 20 = ON
3, 5, 10, 20 = V
25, 74, 149 = W/HC

Element Media _____
BH4HC, ON, V, W/HC

Seals _____
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

Supplementary Details _____
SO263 = (same as above)
SFREE = (same as above)

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 116 psid (8 bar) available upon request

Type of Indicator _____
A = No indicator, plugged port
B = Pop-up indicator (auto reset)
BM = Pop-up indicator (manual reset)
C = Electric switch - SPDT
D = Electric switch and LED light - SPDT

Modification Number _____

Supplementary Details _____

Seals _____
(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)
EPR = Ethylene propylene rubber (EPR)

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

Underwriters Recognition (VM, VD types C, D, J, and J4 only) _____
cRUUs = Electrical Indicator with underwriter's recognition

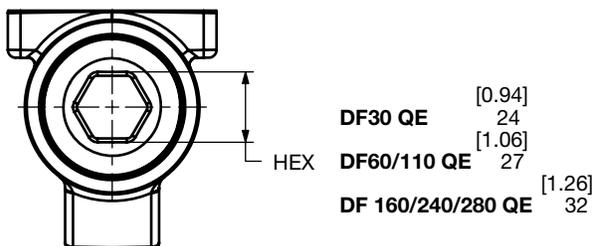
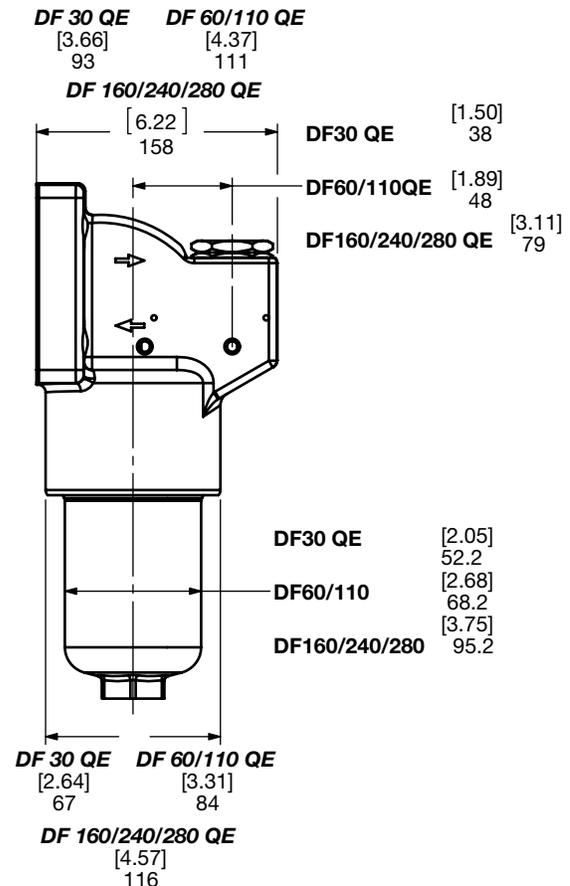
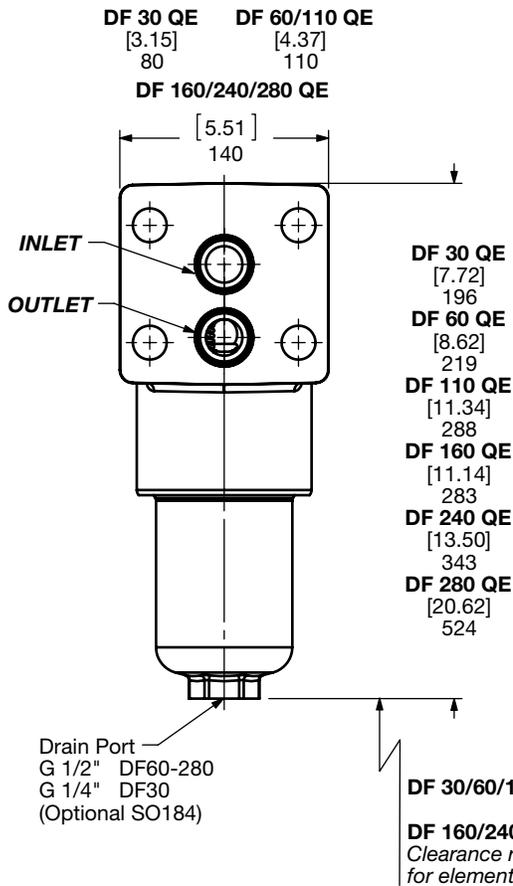
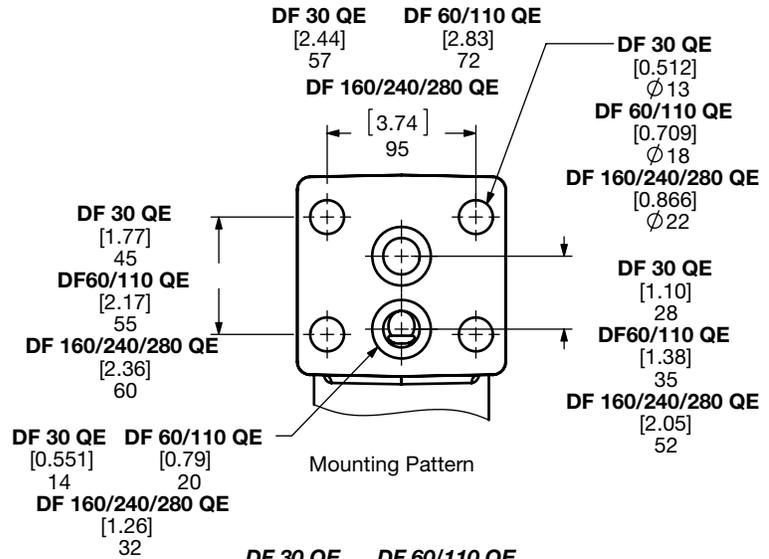
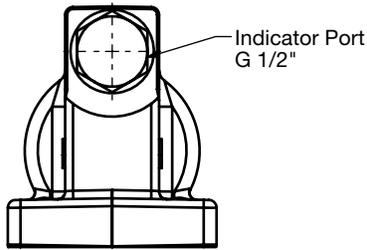
W = "VD..." indicator modified with a brass piston for use with high water based emulsions/solutions (HFA) & (HFC)
(For additional details and options, see Section G - Clogging Indicators.)

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

HIGH PRESSURE FILTERS

Dimensions

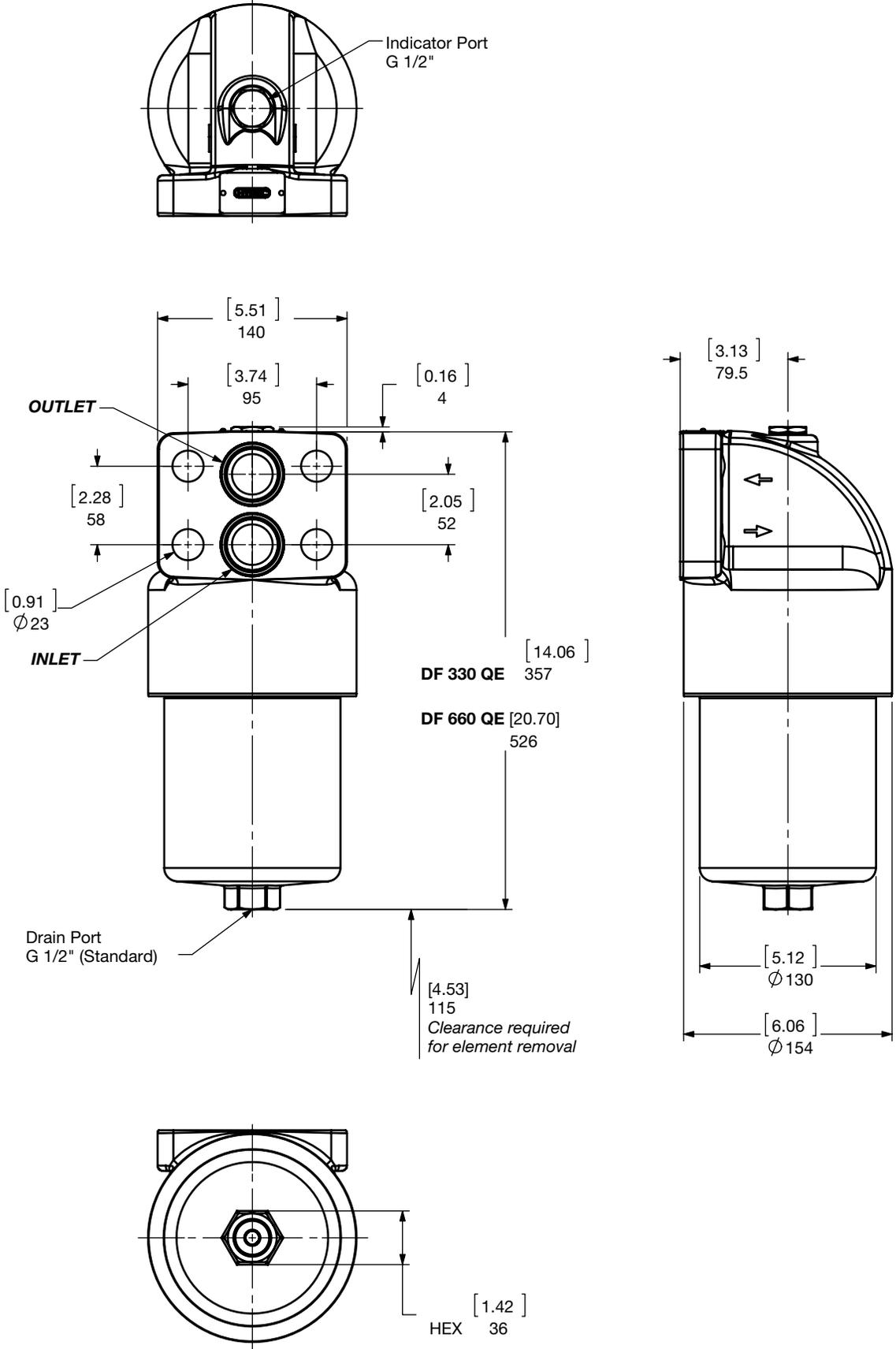
DF 30 – 280 QE 1.X



Size	30	60	110	160	240	280
Weight (lbs.)	6.4	11.5	13.5	21.2	25.6	35.1

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions DF 330 – 660 QE 1.X



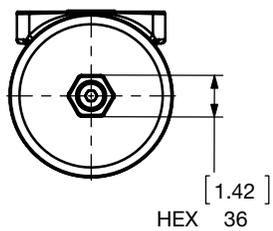
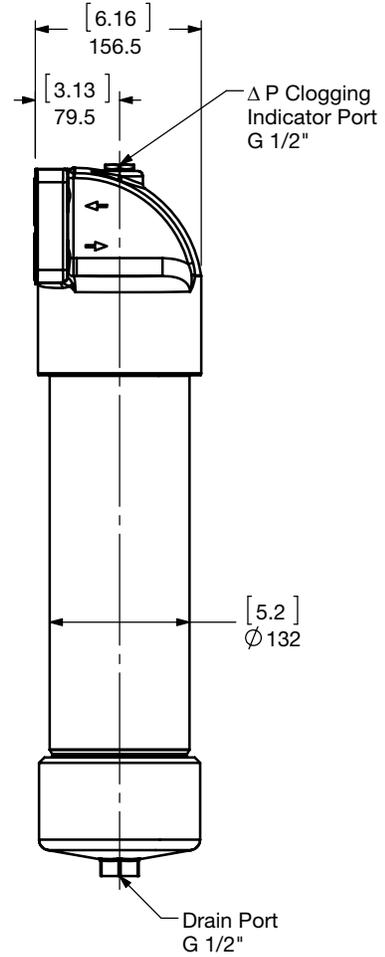
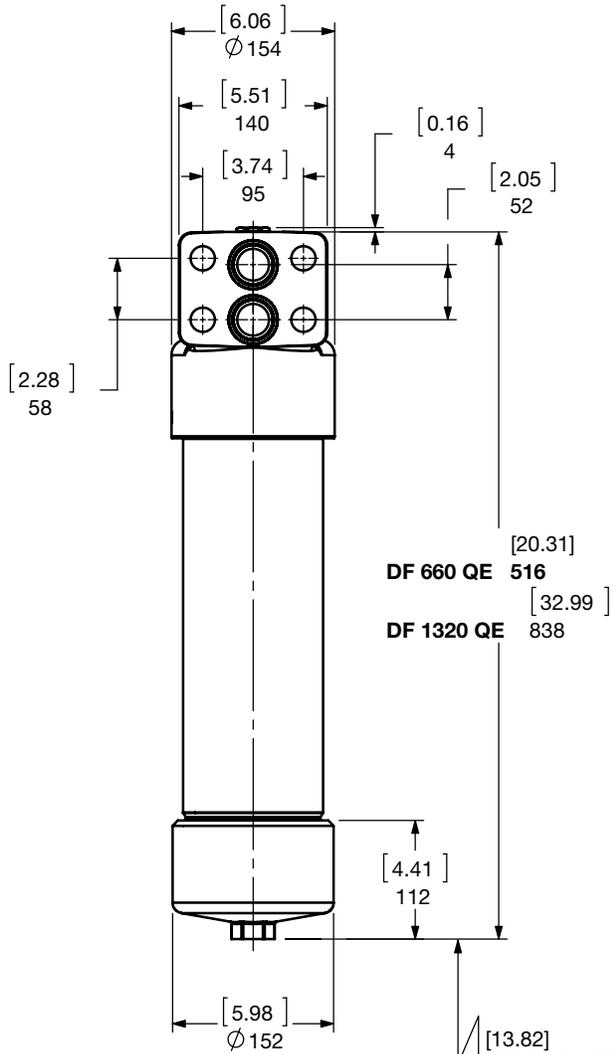
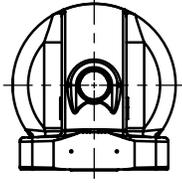
Size	330	660
Weight (lbs.)	50.5	75.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Dimensions

DF 660 – 1320 QE 2.X



[13.82] 351 DF 660 QE
 [25.59] 650 DF1320 QE
 Clearance required
 for elemental removal

Size	660	1320
Weight (lbs.)	50.5	75.2

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

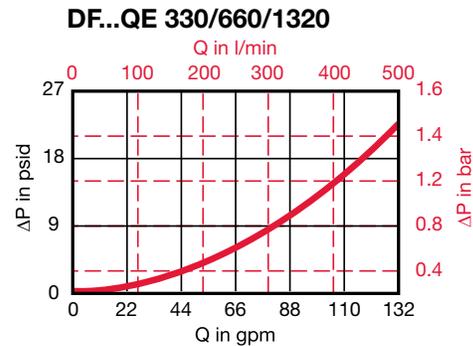
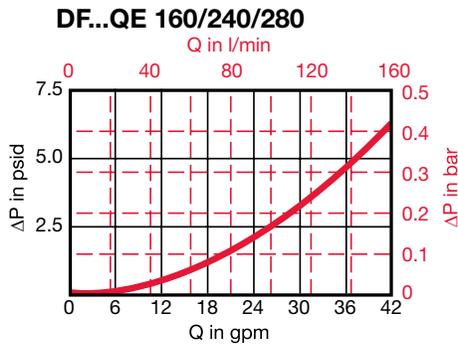
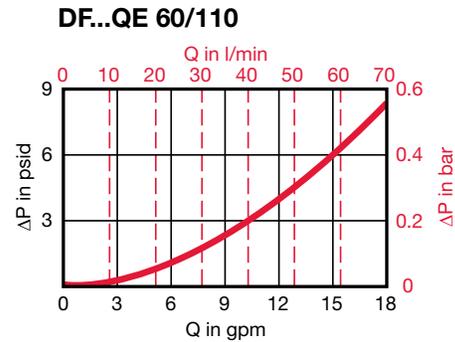
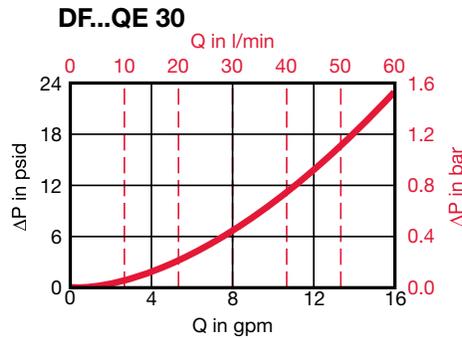
Assembly $\Delta P = \text{Housing } \Delta P + \text{Element } \Delta P$

Housing Curve:

Pressure loss through housing is as follows:

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 HYDAC Filter Assemblies" in Section B - Overview)



Element K Factors

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

Optimicron	...D...ON Elements					
Size	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0030 D XXX ON	4.27	3.507	2.376	1.251	0.768	0.62
0060 D XXX ON	2.936	1.427	1.004	0.664	0.537	0.347
0110 D XXX ON	1.416	0.735	0.527	0.333	0.254	0.164
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031
1320 D XXX ON	0.102	0.053	0.042	0.025	0.019	0.015

Betamicron	...D...BH4HC (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
0030 D XXX BH4HC	5.005	2.782	1.992	1.043
0060 D XXX BH4HC	3.216	1.789	0.993	0.670
0110 D XXX BH4HC	1.394	0.818	0.489	0.307
0160 D XXX BH4HC	0.922	0.571	0.324	0.241
0240 D XXX BH4HC	0.582	0.373	0.214	0.159
0280 D XXX BH4HC	0.313	0.187	0.099	0.088
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049
1320 D XXX BH4HC	0.088	0.055	0.033	0.022

Metal Fiber	...D...V Elements (High Collapse)			
Size	3 μm	5 μm	10 μm	20 μm
0030 D XXX V	1.011	0.740	0.411	0.200
0060 D XXX V	0.877	0.511	0.296	0.183
0110 D XXX V	0.452	0.304	0.182	0.118
0160 D XXX V	0.251	0.177	0.123	0.079
0240 D XXX V	0.169	0.137	0.093	0.062
0280 D XXX V	0.126	0.093	0.064	0.041
0330 D XXX V	0.121	0.097	0.065	0.043
0660 D XXX V	0.063	0.050	0.034	0.021
1320 D XXX V	0.032	0.026	0.018	0.012

Wire Mesh	...D...W/HC Elements
Size	...D...W/HC Elements 25, 50, 74, 100, 149, 200 μm
0030 D XXX W/HC	0.185
0060 D XXX W/HC	0.092
0110 D XXX W/HC	0.050
0160 D XXX W/HC	0.035
0240 D XXX W/HC	0.023
0280 D XXX W/HC	0.020
0330 D XXX W/HC	0.020
0660 D XXX W/HC	0.008
1320 D XXX W/HC	0.004

All Element K Factors in psi / gpm.

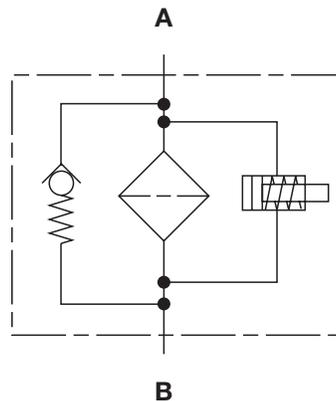
HIGH PRESSURE FILTERS

DFP Series

Manifold Mount Filters
4568 psi • up to 125 gpm



Hydraulic Symbol



Features

- The filter housings are designed to withstand pressure surges as well as high static pressure loads.
- The screw-in bowl or lid/cap 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 (located in filter head) 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. (both ports machined and plugged)
- Fatigue pressure rating equals maximum allowable working pressure rating.

Technical Specifications

Mounting Method	<i>(manifold mount)</i>	
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 (660-1320)	Steel	
Cap/Lid (660-1320)	Low Carbon Steel	
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 (680 lpm)	
Housing Pressure Rating		
Max. Allowable Working Pressure	4568 psi (315 bar)	
Fatigue Pressure	4568 psi (315 bar) @ 1 million 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		
BH4HC, V	3045 psid (210 bar)	
ON, W/HC	290 psid (17 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
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

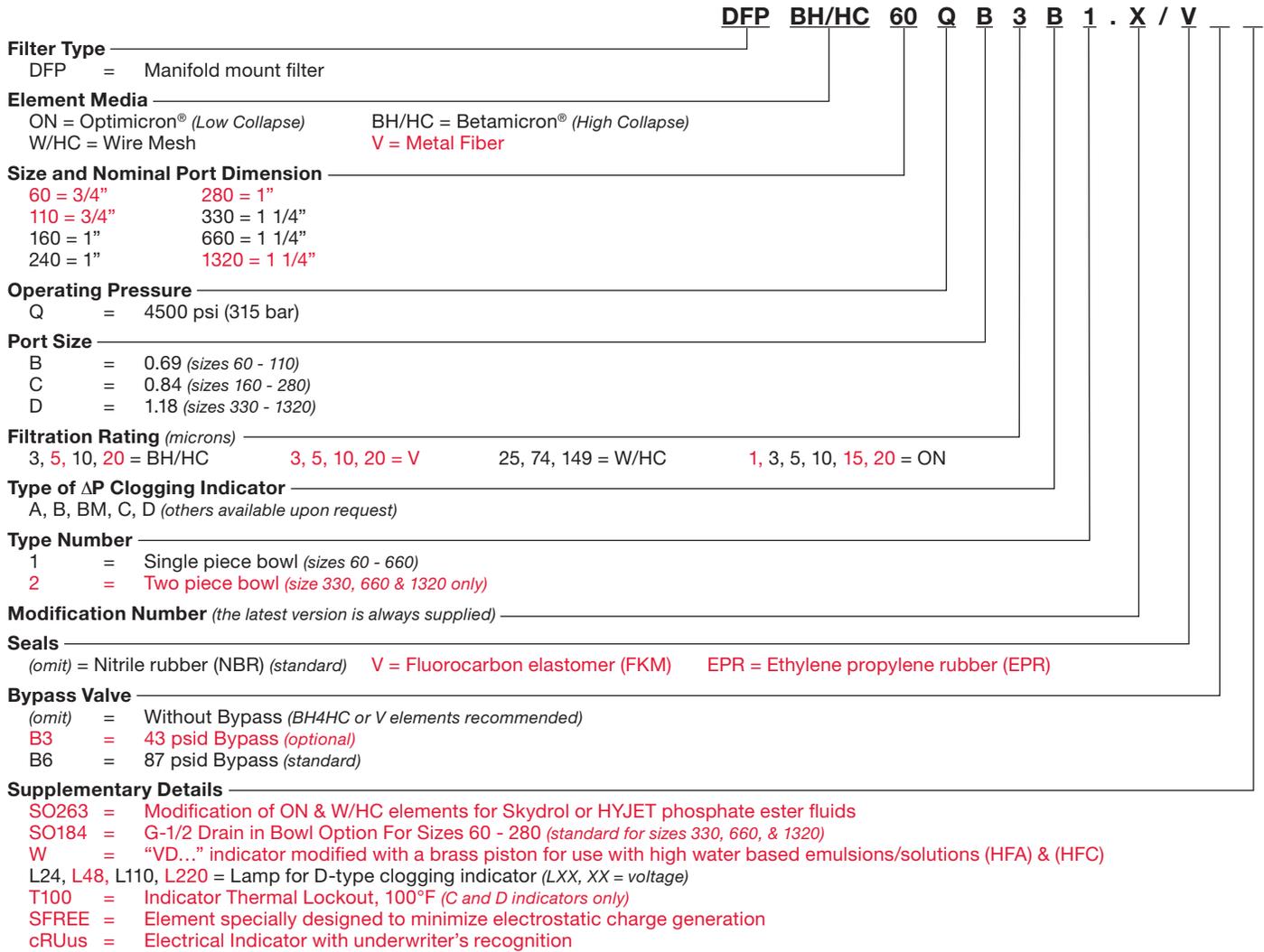


Railways

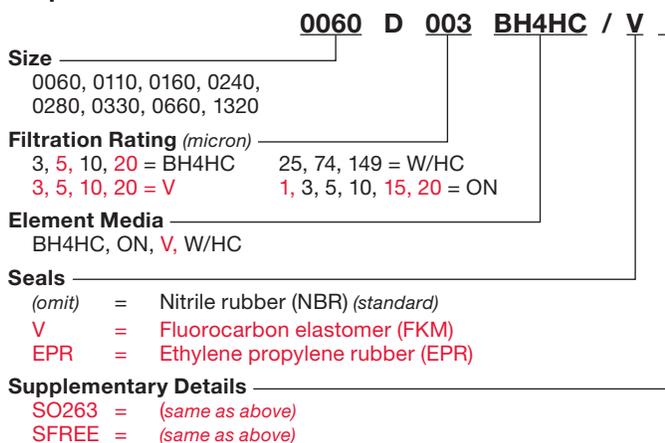


Steel / Heavy Industry

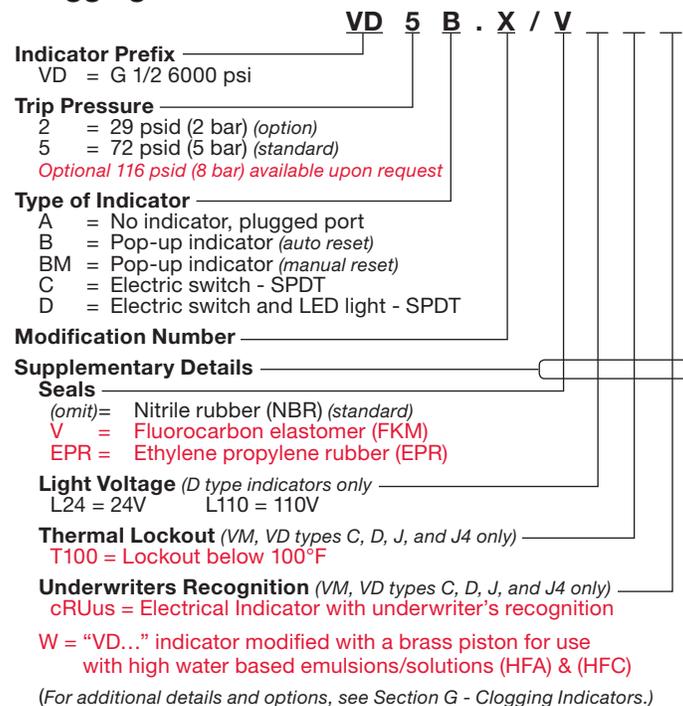
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

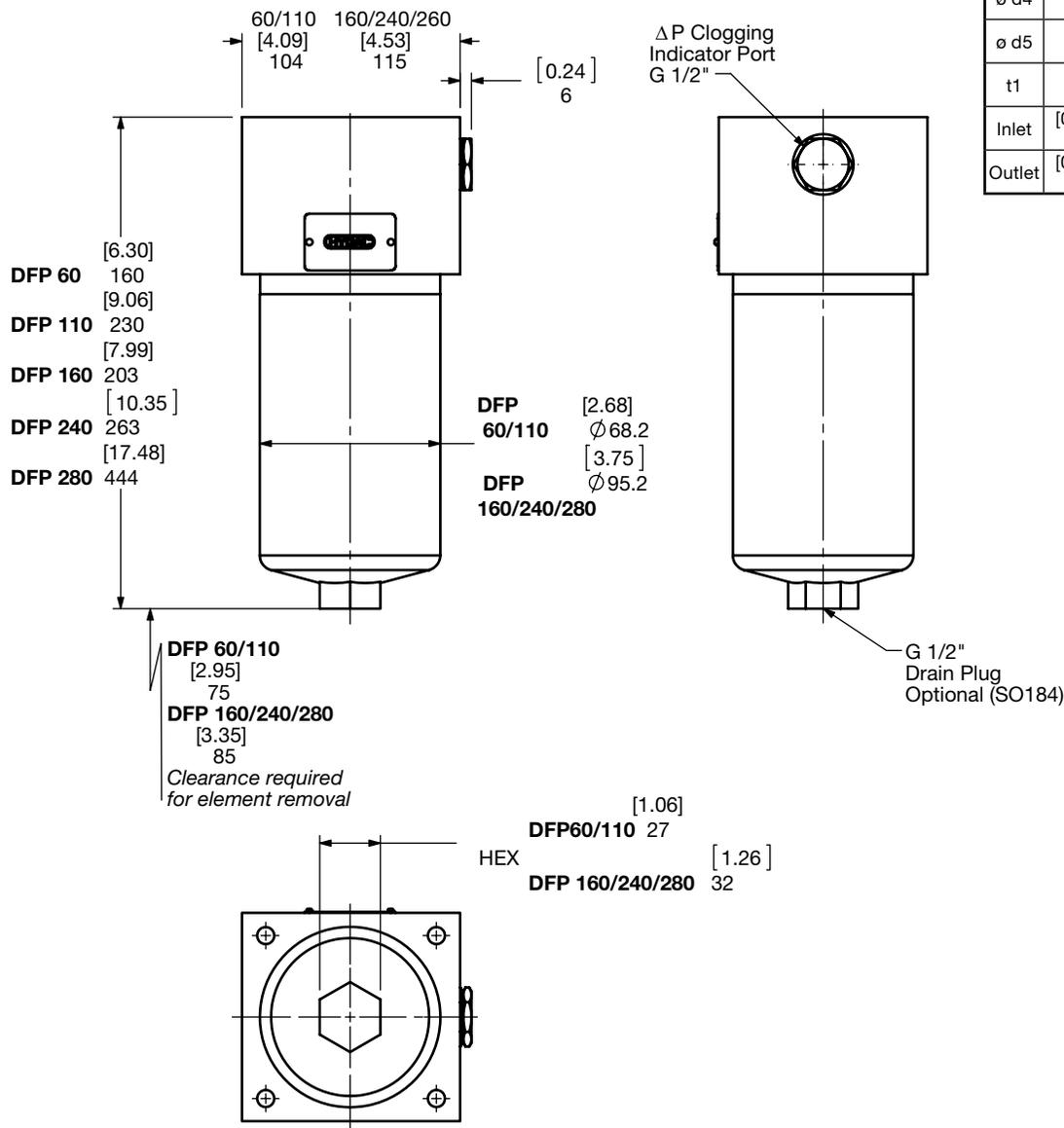
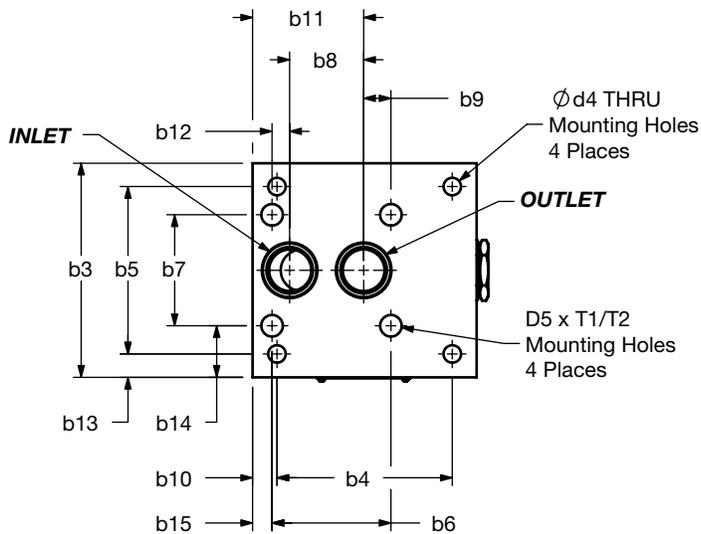


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

HIGH PRESSURE FILTERS

Dimensions

DFP 60 – 280...1.X

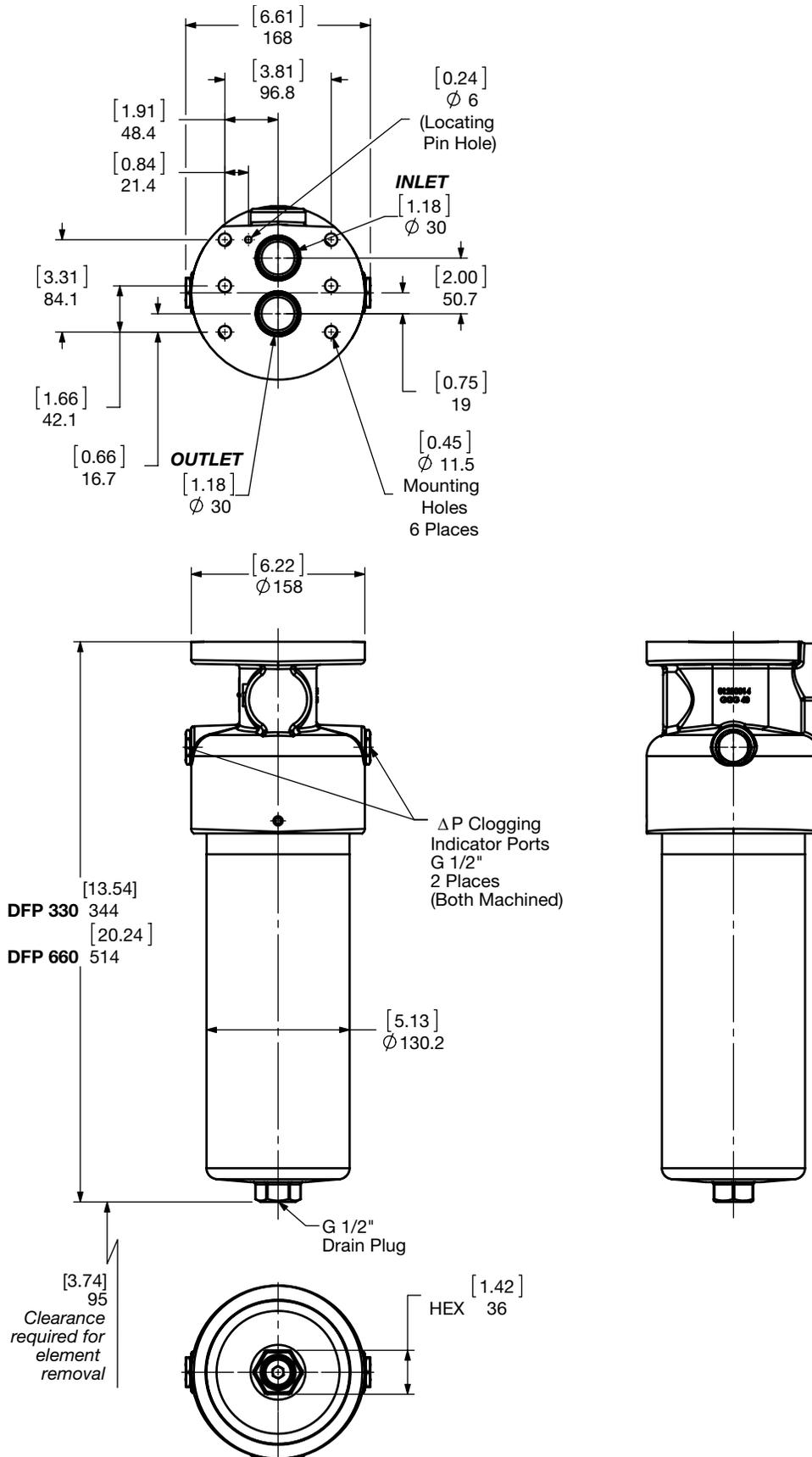


	60 / 110	160 / 240 / 280
B3	[3.15] 80	[4.33] 110
B4	[3.50] 89	[3.54] 90
B5	[1.25] 31.8	[3.39] 86
B6	-	[2.40] 61
B7	-	[2.24] 57
B8	[1.24] 31.6	[1.50] 38
B9	-	[0.55] 14
B10	[0.30] 7.5	[0.49] 12.5
B11	[2.20] 55.9	[2.26] 57.5
B12	-	[0.35] 9
B13	[0.95] 24.1	[0.47] 12
B14	-	[1.04] 26.5
B15	-	[0.41] 10.5
$\phi d4$	[0.33] 8.5	[0.35] 9
$\phi d5$	-	7/16-14UNC-2B
t1	-	[0.51] 13
Inlet	[0.639] 17.5	0.843" 21.4
Outlet	[0.689] 17.5	[0.843] 21.4

Size	60	110	160	240	280
Weight (lbs.)	11.3	13.3	20.1	23	32.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Dimensions DFP 330/660...1.X



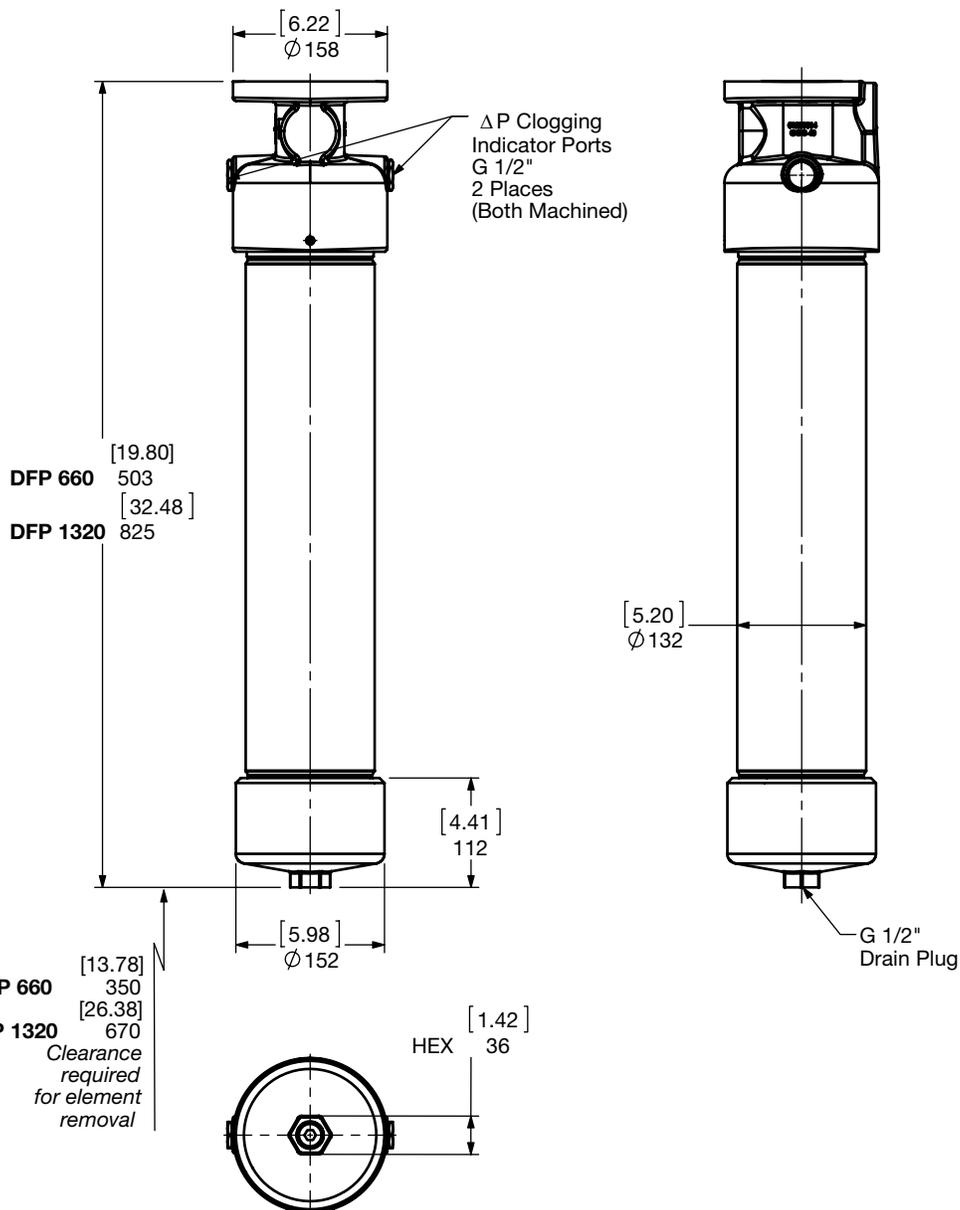
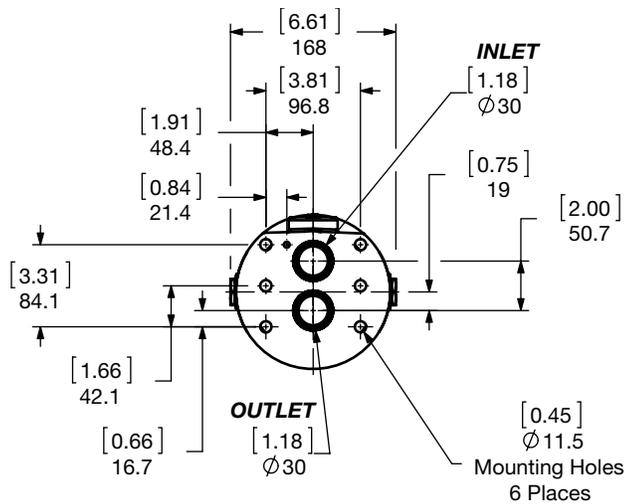
Size	330	660
Weight (lbs.)	46.3	64

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Dimensions

DFP 660 & 1320...2.X



Size	660	1320
Weight (lbs.)	64	103.9

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

Sizing Information

Total pressure loss through the filter is as follows:

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

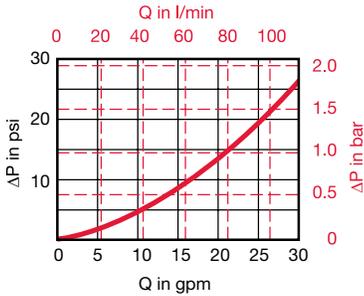
Housing Curve:

Pressure loss through housing is as follows:

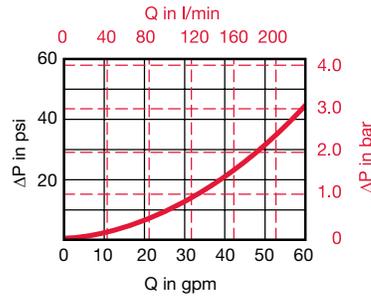
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

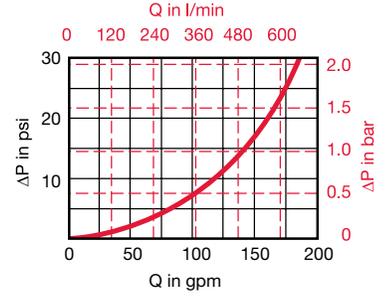
DFP 60/110 Housing



DFP 160/240/280 Housing



DFP 330/660/1320 Housing



Element K Factors

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

(From Tables Below)

Optimicron	...D...ON (Optimicron Pressure Elements)					
	1 μm	3 μm	5 μm	10 μm	15 μm	20 μm
0060 D XXX ON	2.936	1.427	1.004	0.664	0.537	0.347
0110 D XXX ON	1.416	0.735	0.527	0.333	0.254	0.164
0160 D XXX ON	1.015	0.604	0.423	0.225	0.204	0.175
0240 D XXX ON	0.631	0.379	0.293	0.175	0.134	0.115
0280 D XXX ON	0.304	0.185	0.15	0.082	0.075	0.064
0330 D XXX ON	0.452	0.23	0.185	0.135	0.085	0.067
0660 D XXX ON	0.207	0.106	0.086	0.051	0.039	0.031
1320 D XXX ON	0.102	0.053	0.042	0.025	0.019	0.015

Betamicon	...D...BH4HC (Betamicon High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0060 D XXX BH4HC	3.216	1.789	0.993	0.670
0110 D XXX BH4HC	1.394	0.818	0.489	0.307
0160 D XXX BH4HC	0.922	0.571	0.324	0.241
0240 D XXX BH4HC	0.582	0.373	0.214	0.159
0280 D XXX BH4HC	0.313	0.187	0.099	0.088
0330 D XXX BH4HC	0.423	0.247	0.154	0.110
0660 D XXX BH4HC	0.181	0.104	0.055	0.049
1320 D XXX BH4HC	0.088	0.055	0.033	0.022

Wire Mesh	...D...W/HC Elements	
	...D...W/HC Elements 25, 50, 74, 100, 149, 200 μm	
0060 D XXX W/HC	0.092	
0110 D XXX W/HC	0.050	
0160 D XXX W/HC	0.035	
0240 D XXX W/HC	0.023	
0280 D XXX W/HC	0.020	
0330 D XXX W/HC	0.020	
0660 D XXX W/HC	0.008	
1320 D XXX W/HC	0.004	

Metal Fiber	...D...V Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0060 D XXX V	0.877	0.511	0.296	0.183
0110 D XXX V	0.452	0.304	0.182	0.118
0160 D XXX V	0.251	0.177	0.123	0.079
0240 D XXX V	0.169	0.137	0.093	0.062
0280 D XXX V	0.126	0.093	0.064	0.041
0330 D XXX V	0.121	0.097	0.065	0.043
0660 D XXX V	0.063	0.050	0.034	0.021
1320 D XXX V	0.032	0.026	0.018	0.012

All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

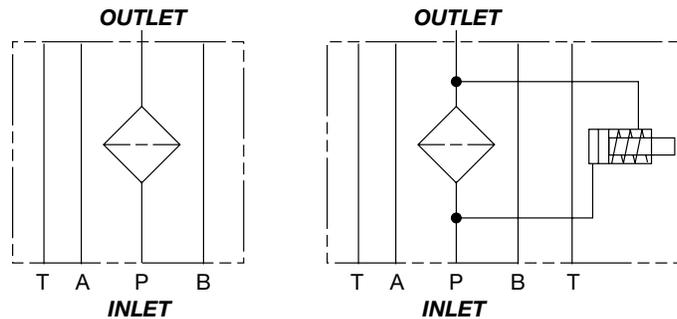
DFZ Series

Modular Stacking Filters

4568 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
- Filter does not contain a bypass valve. Only available with non bypass, high collapse elements required.

Technical Specifications

Mounting Method	4 mounting holes (<i>manifold mount</i>)	
Port Connection		
30	ø.25"	ANSI DO3/A6 DIN 24340 / Cetop R35
60/110	ø.44"	ANSI DO5/A10 DIN 24340 / Cetop R35
Flow Direction	Inlet: Side	Outlet: Side
Construction Materials		
Head, Bowl	Steel	
Flow Capacity		
30	6 gpm (23 lpm)	
60/110	10 gpm (38 lpm)	
Housing Pressure Rating		
Max. Allowable Working Pressure	4568 psi (315 bar)	
Fatigue Pressure	30	4568 psi (315 bar) @ 250,000 cycles
	60/110	4568 psi (315 bar) @ 1 million cycles
Burst Pressure	> 18,270 psi (1260 bar)	
Element Collapse Pressure Rating		
BH4HC, V	3045 psid (210 bar)	
Fluid Temperature Range	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.	
Indicator Trip Pressure		
ΔP	= 116 psid (8 bar) -10% (standard)	

Applications



Agricultural



Automotive



Construction



Industrial



Power Generation

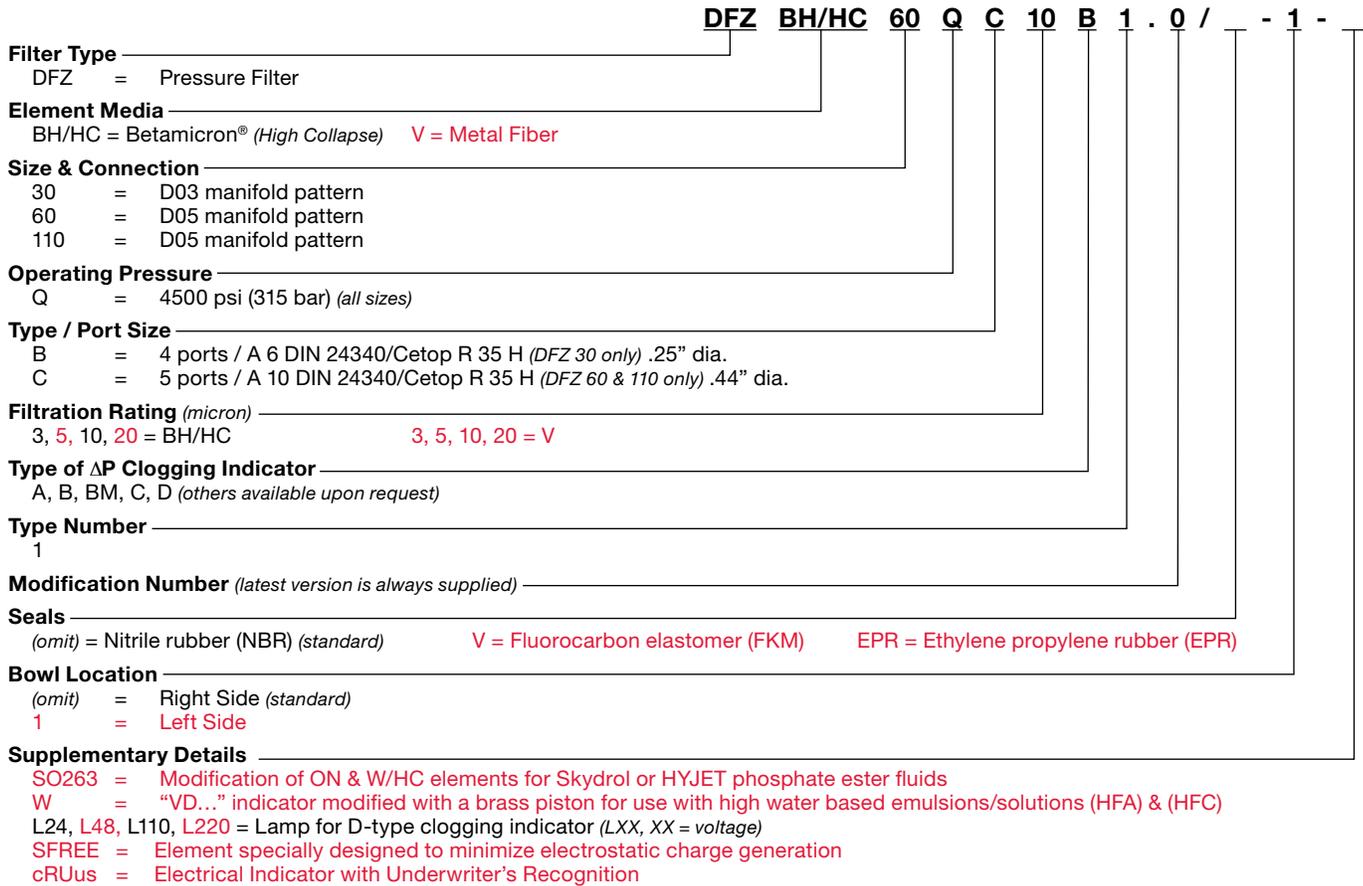


Railways

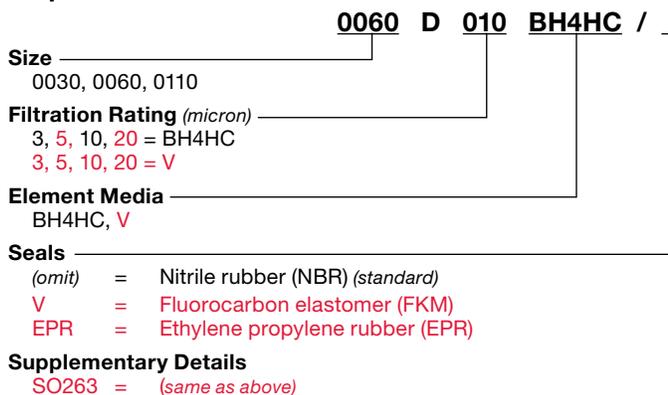


Steel / Heavy Industry

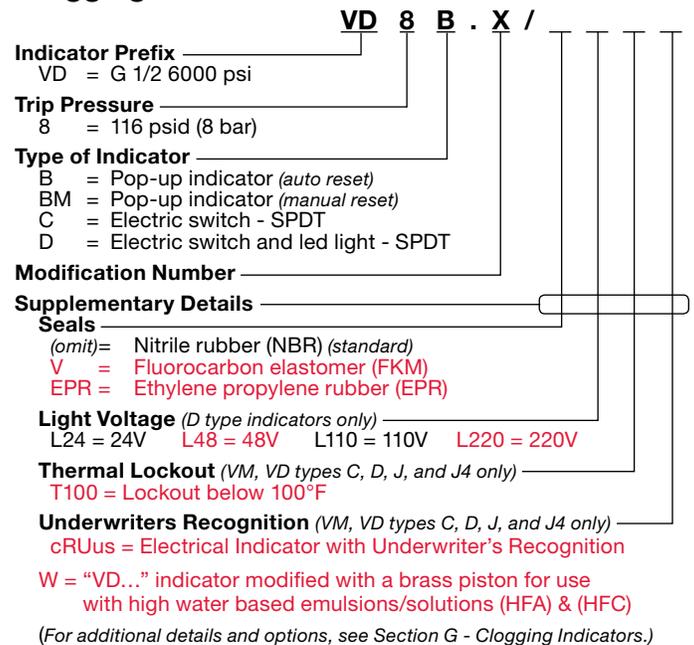
Model Code



Replacement Element Model Code



Clogging Indicator Model Code

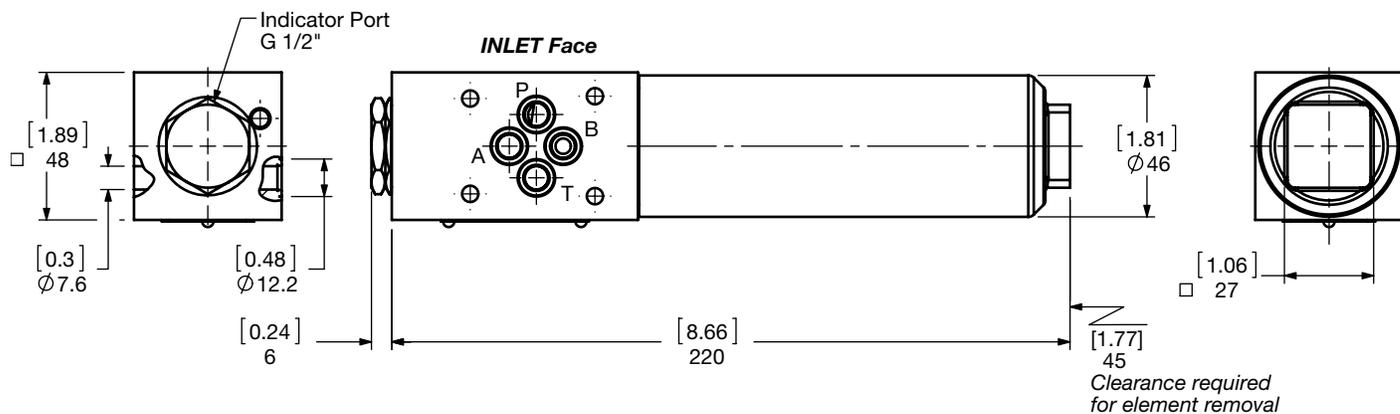


Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

HIGH PRESSURE FILTERS

Dimensions
DF 30 Z

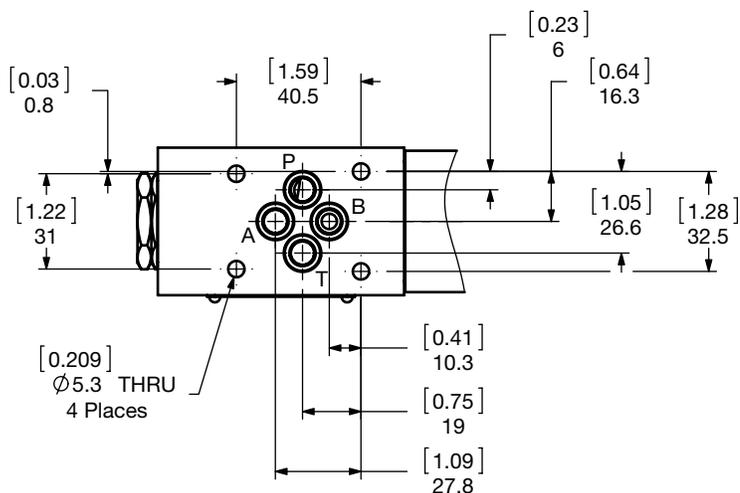
(Right Hand Version) - (optional)



(Left Hand Version) - (optional)



D03 Pattern

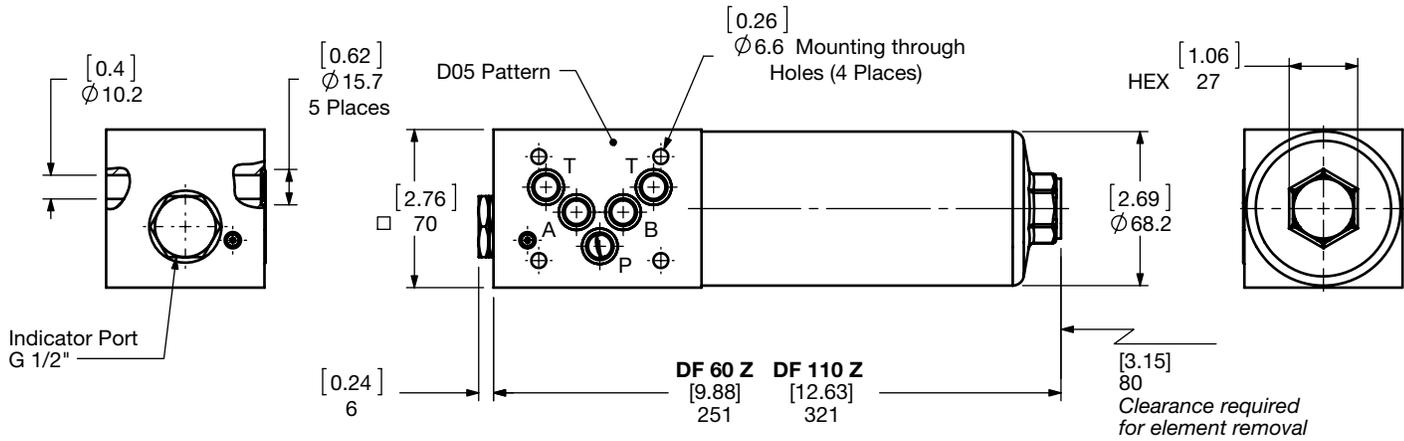


Size	30
Weight (lbs.)	5.3

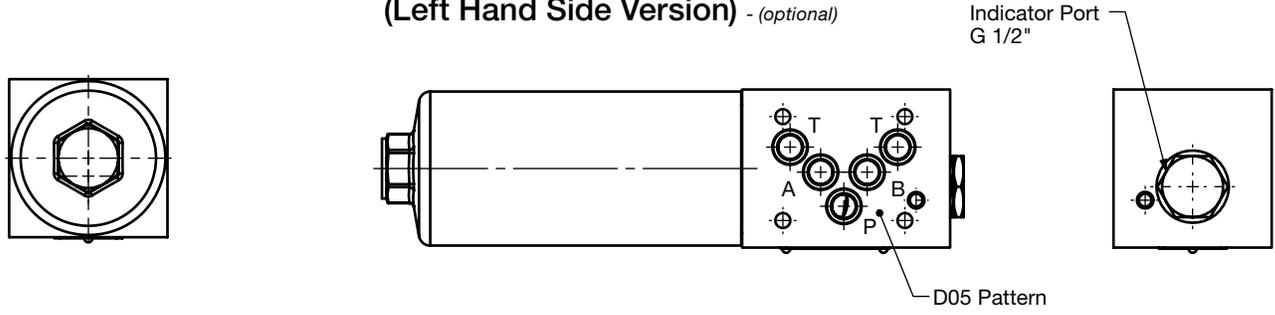
Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions DF 60 / 110 Z

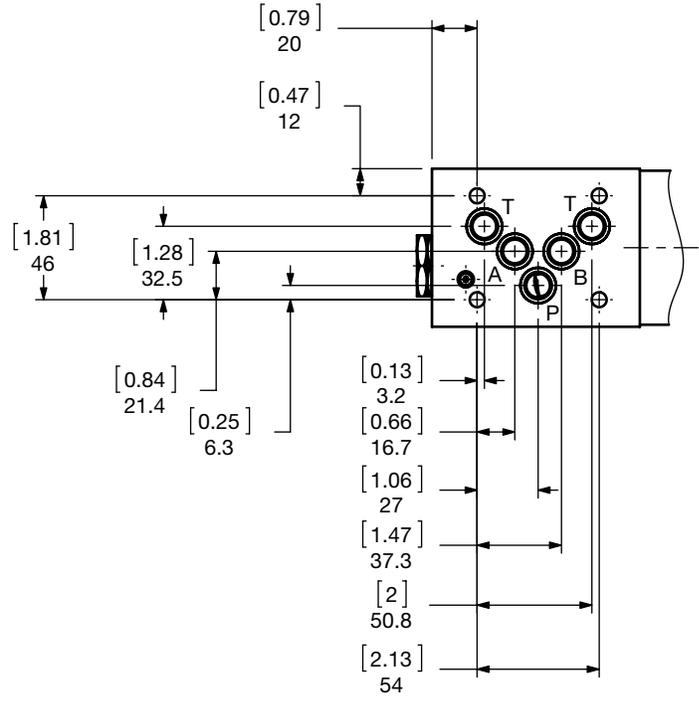
(Right Hand Side Version) - (standard)



(Left Hand Side Version) - (optional)



D05 Pattern



Size	60	110
Weight (lbs.)	13.1	15

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

Sizing Information

Total pressure loss through the filter is as follows:

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

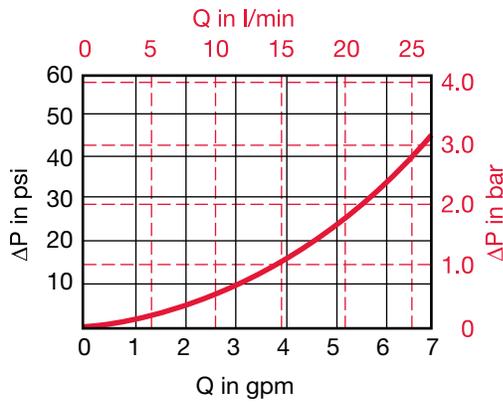
Housing Curve:

Pressure loss through housing is as follows:

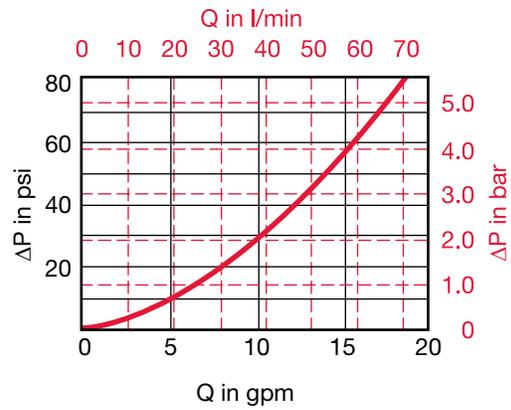
$$\text{Housing } \Delta P = \text{Housing Curve } \Delta P \times \frac{\text{Actual Specific Gravity}}{0.86}$$

Adjustments must be made for viscosity & specific gravity of the fluid to be used! (see "Sizing HYDAC Filter Assemblies" in Section B - Overview)

DFZ 30 Housing



DFZ 60 / 110 Housing



Element K Factors

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

(From Tables Below)

Betamicon	...D...BH4HC Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0030 D XXX BH4HC	5.005	2.782	1.992	1.043
0060 D XXX BH4HC	3.216	1.789	0.993	0.670
0110 D XXX BH4HC	1.394	0.818	0.489	0.307

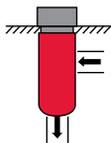
Metal Fiber	...D...V Elements (High Collapse)			
	3 μm	5 μm	10 μm	20 μm
0030 D XXX V	1.011	0.740	0.411	0.200
0060 D XXX V	0.877	0.511	0.296	0.183
0110 D XXX V	0.452	0.304	0.182	0.118

All Element K Factors in psi / gpm.

HIGH PRESSURE FILTERS

CF Series

Manifold Cartridge Filters
3000 psi • up to 25 gpm

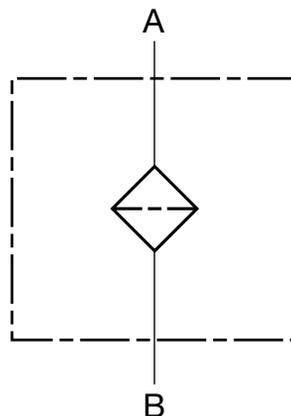


CFxx20



CFxx45

Hydraulic Symbol



Features

- Made of aluminum for light weight and low cost.
- Made to dispose of when fully clogged.
- Low price - market competitive.

Technical Specifications

Port Connections	CF20	SAE-16 Modified Cavity
	CF45	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. Allowable Working Pressure:	3000 psi (207 bar)	
Proof Pressure:	4500 psi (310 bar)	
Element Performance Rating		
MM, W	290 psid (20 bar)	
Fluid Temperature Range		
	-22°F to 250°F (-30°C to 121°C) Consult HYDAC for applications operating below -22°F (-30°C)	
Fluid Compatibility		
Compatible with all hydrocarbon based, synthetic, water glycol, oil/water emulsion, and high water based fluids when the appropriate seals are selected.		

Applications



Agricultural



Construction



Industrial



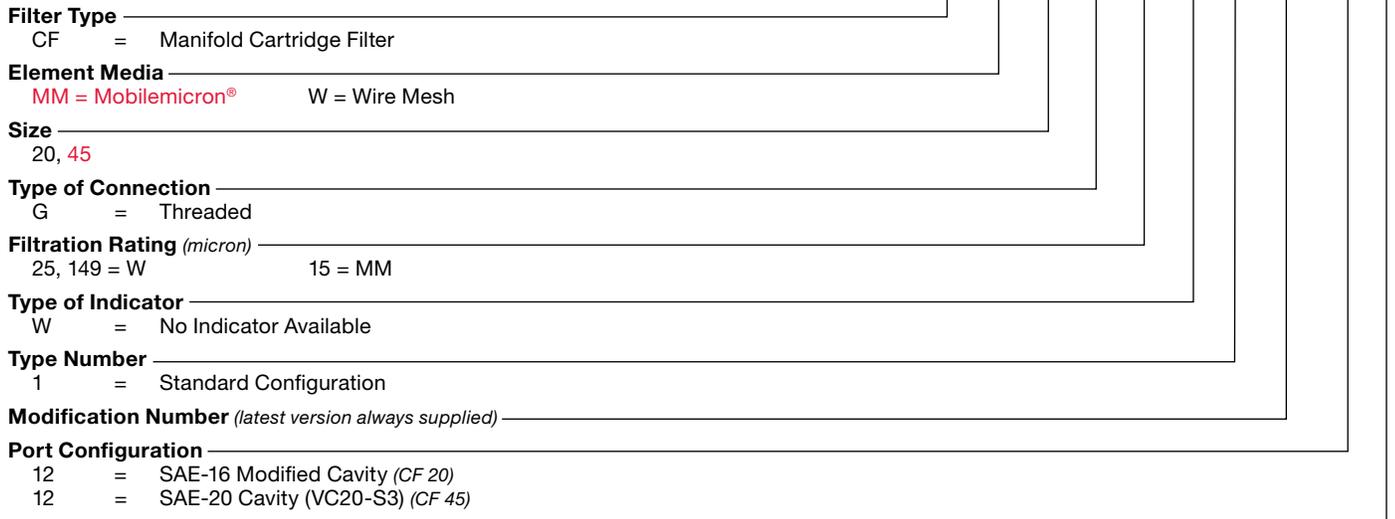
Commercial
Municipal



Railways

Model Code

CF W 20 G 25 W 1 . 0 / 12



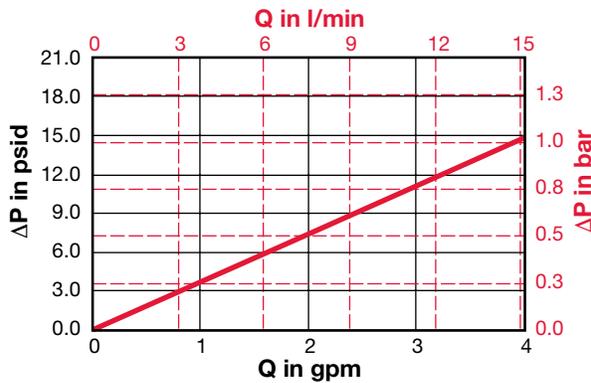
Seals

- (omit) = Nitrile rubber (NBR) (standard)
- V = Fluorocarbon elastomer (FKM)

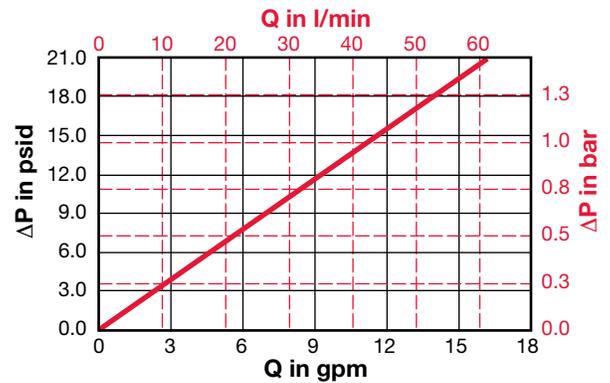
Model Codes Containing RED are non-stock items — Minimum quantities may apply — Contact HYDAC for information and availability

Pressure Drop Curves

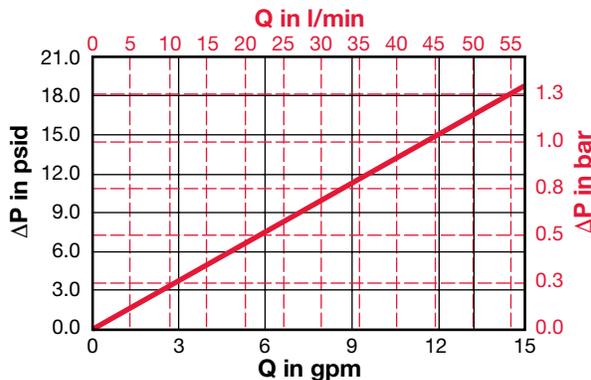
CFMM20G15W1.0/12



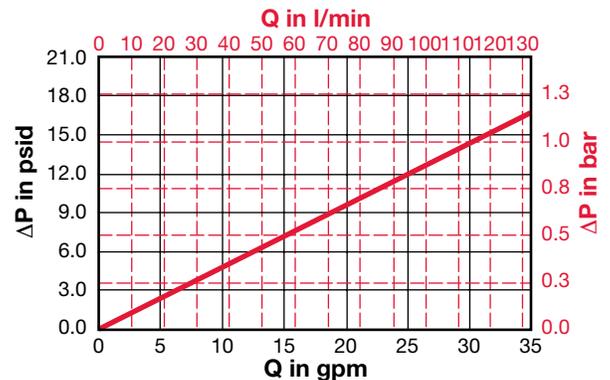
CFW20G25/149W1.0/12



CFMM45G15W1.0/12

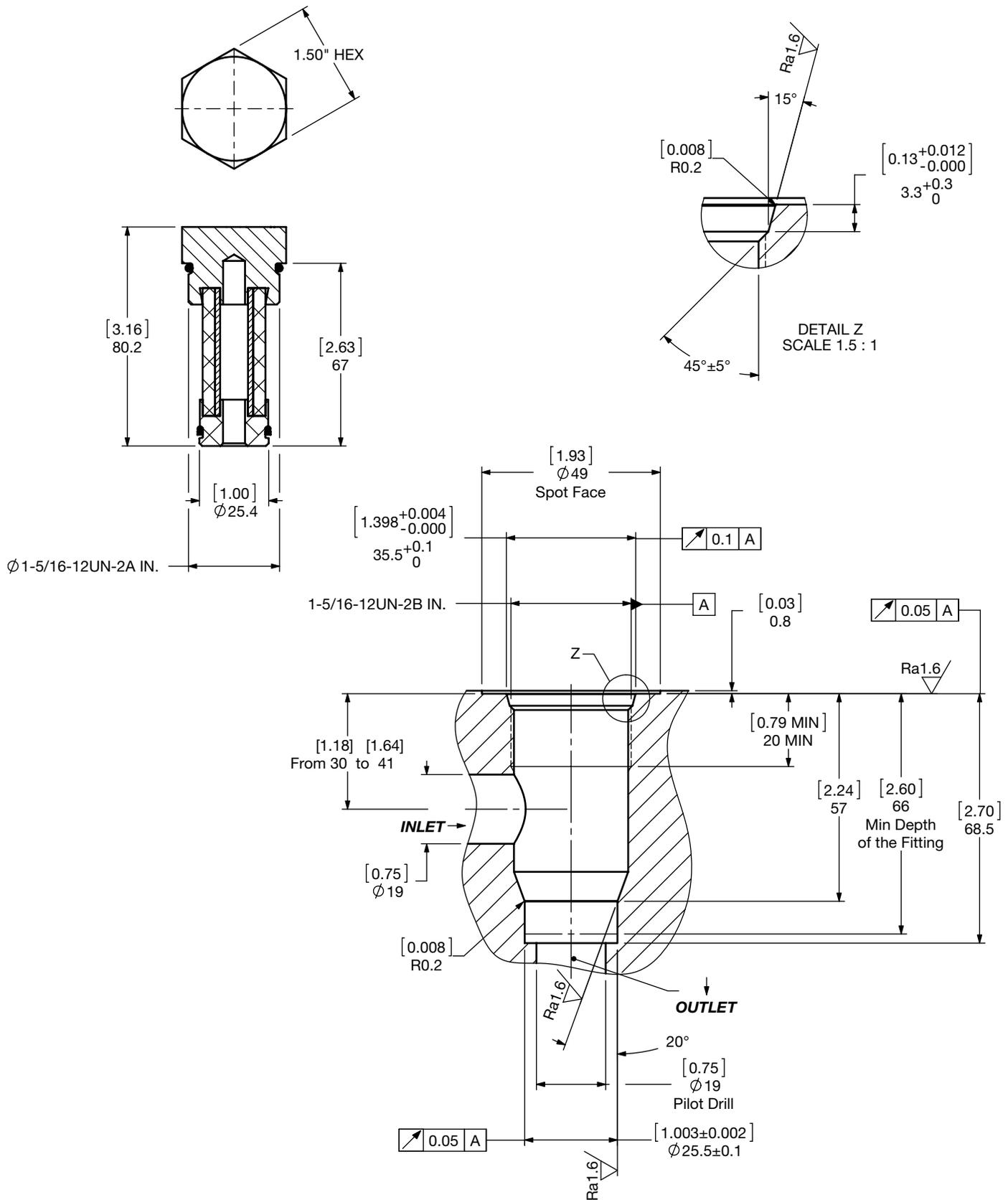


CFW45G25/149W1.0/12



HIGH PRESSURE FILTERS

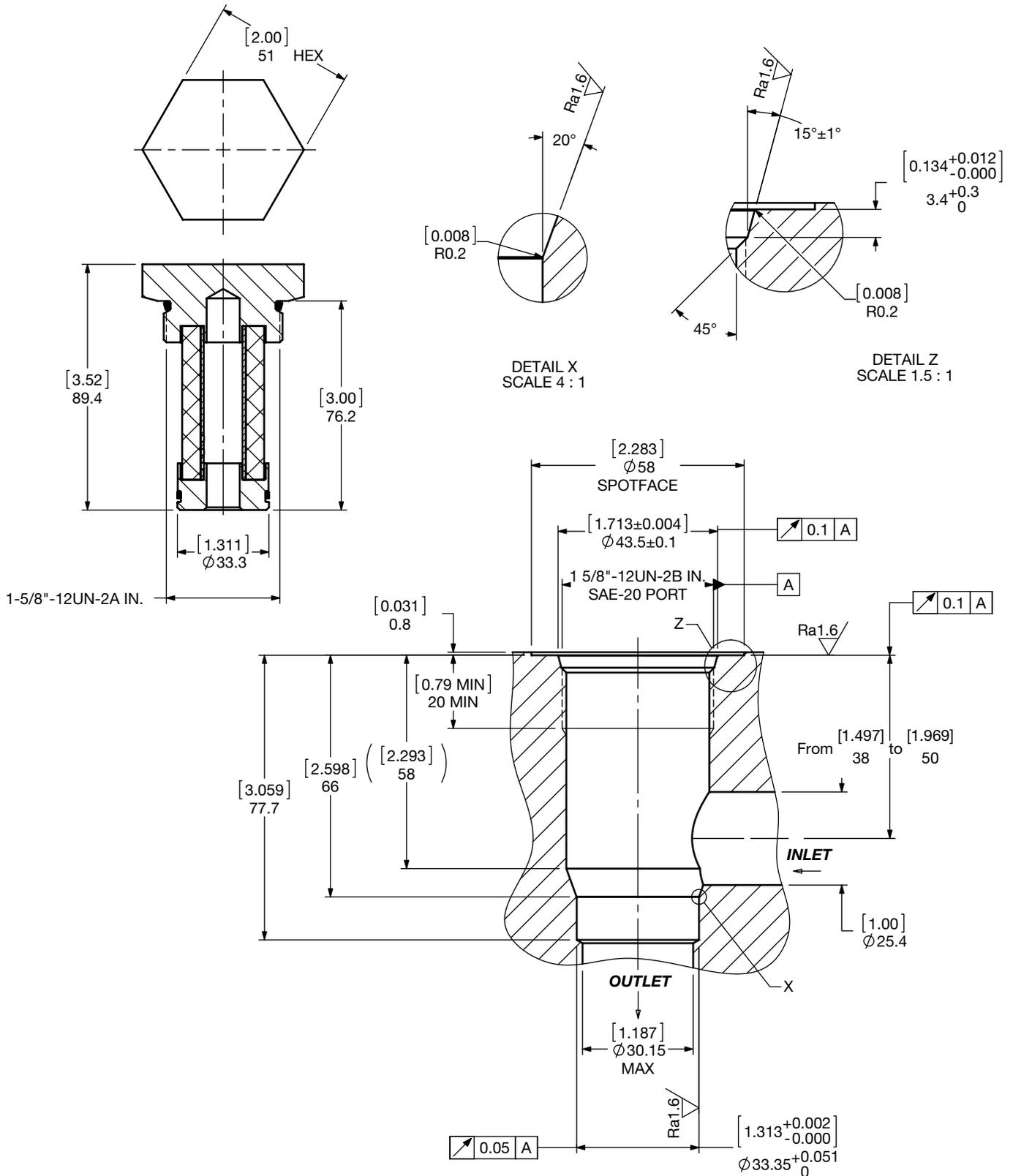
Dimensions
CFxx20



Size	20
Weight (lbs.)	0.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

Dimensions CFxx45



Size	45
Weight (lbs.)	0.5

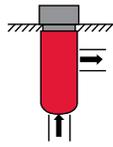
Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element. For complete dimensions please contact HYDAC to request a certified print.

HIGH PRESSURE FILTERS

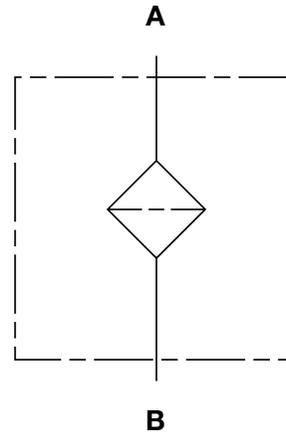
CP-C16 Series

Circuit Protector Manifold Cartridge Filters

3000 psi • up to 12 gpm



Hydraulic Symbol



Features

- Simple cost effective 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 backup protection when upstream pressure filters go into bypass or if element damage occurs.
- Two (2) different element options: 10 micron, and 141 micron allow filter to be tailored to individual application needs.
- Suitable for petroleum based fluids.
- Flow Path - inside to outside.

Technical Specifications

Mounting Method	C16-2 Cavity (SAE-16 Threaded Port)	
Flow Direction	Inlet: Bottom	Outlet: Side
Construction Materials	Steel	
Flow Capacity	12 gpm (45 lpm)	
Housing Pressure Rating	Max. Allowable Working Pressure 3000 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	14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility	Compatible with all petroleum oils rated for use with Nitrile rubber (NBR) seals.	

Applications



Agricultural



Automotive



Construction

Model Code

CP-C16 W 40 G 10 W 1 . 0 / 12

Filter Type

CP-C16 = Circuit Protector
(Common Cavity No. C16-2)

Element Media

W = Wire Mesh

Size

40

Inline Port

G = 1" Male Thread 1 5/16-12UN-2A (SAE-16)

Filtration Rating (micron)

10 = 10 micron
141 = 141 micron

Bypass Indicator

W = No indicator Port

Type Number

1 = Standard Configuration

Modification Number

Port Configuration

12

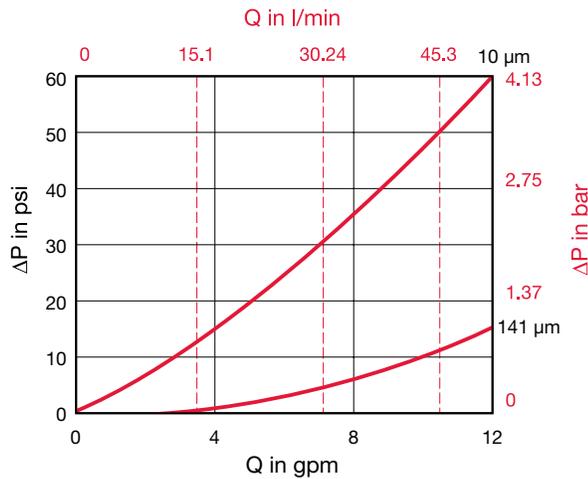
Seals

(omit) = Nitrile rubber (NBR) (standard)
V = Fluorocarbon elastomer (FKM)

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

Pressure Drop Curves

Based on testing conducted with 150 SUS fluid at 105°F.



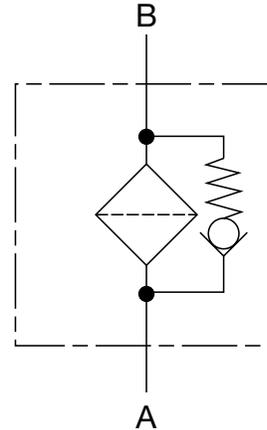
HIGH PRESSURE FILTERS

CP-SAE Series

Circuit Protector Manifold Cartridge Filters
6090 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 backup protection when upstream pressure filters go into bypass or if element damage occurs.
- CP-SAE provides operations protection through supply of a bypass 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.
- Flow Path - inside to outside.

Applications



Agricultural



Automotive



Construction

Technical Specifications

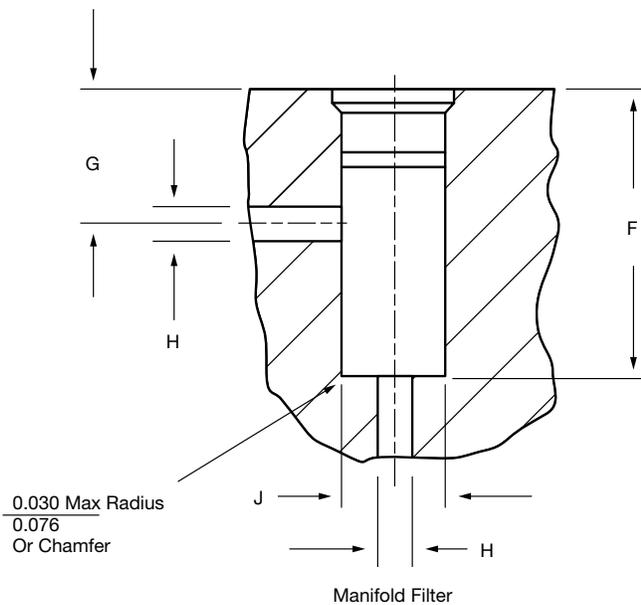
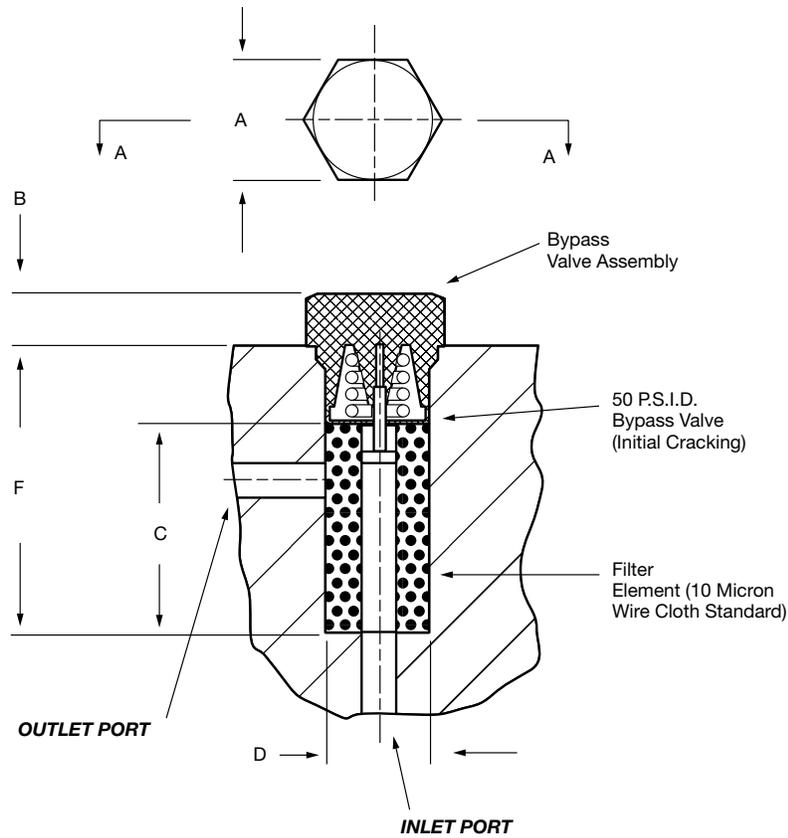
Mounting Method	
CP-SAE-15	SAE-10 Port (5/8")
CP-SAE-40	SAE-16 Port (1")
CP-SAE-120	SAE-24 Port (1 1/2")
Flow Direction	Inlet: Bottom Outlet: Side
Construction Materials	
CP-SAE-15	Carbon steel
CP-SAE-40	Carbon steel
CP-SAE-120	Stainless steel
Flow Capacity	
CP-SAE-15	4 gpm (15 lpm)
CP-SAE-40	12 gpm (45 lpm)
CP-SAE-120	30 gpm (113 lpm)
Housing Pressure Rating	
Max. Allowable Working Pressure	6090 psi (420 bar)
Fatigue Pressure	Contact HYDAC Office
Burst Pressure	Contact HYDAC Office
Element Collapse Pressure Rating	
W	100 psid (6.9 bar)
Fluid Temperature Range 14°F to 212°F (-10°C to 100°C) Consult HYDAC for applications operating below 14°F (-10°C)	
Fluid Compatibility Compatible with all petroleum oils rated for use with Nitrile rubber (NBR) 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

HIGH PRESSURE FILTERS

Dimensions
CP-SAE



Model	A	B	C	D	E SAE O-Ring Port	F	G	H	J	Torque	
										Alu.	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

Size	15, 40, 120
Weight (lbs.)	1.5

Dimensions shown are [inches] millimeters for general information and overall envelope size only. Weights listed include element.
For complete dimensions please contact HYDAC to request a certified print.

G Clogging Indicators

Early warning pressure devices protect the hydraulic circuit from contamination, alerting the operator that the filter element is near capacity and must be changed. The clogging indicator is typically set to trip at 1-bar (14 psid) below the filter bypass setting, to allow the operator sufficient time for element change-out. Available in visual, combo electrical/visual, as well as an extensive list of other options and certifications. A comprehensive offering of clogging indicators ensures that any application can be accommodated.

Clogging Indicators Sections

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ATEX Indicators	
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Return line	G36
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FILTER CLOGGING INDICATORS

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 ingress 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.

Special Indicators

Mobile indicators

These indicators have been developed for special applications and are fitted with AMP, Deutsch and Junior Power Timer plugs.

ATEX indicators

These indicators are used in potentially explosive locations and are subject to the ATEX Equipment Directive 94/9/EC and the ATEX Operator Directive 1999/92/EC.



UL and CSA indicators

Indicators which are exported to the USA and Canada often require classification according to current UL and CSA standards. The UL and CSA symbols are found on many products, particularly in the field of electrical engineering.



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 $100^{\circ}\text{F} \pm 5^{\circ}$ (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.

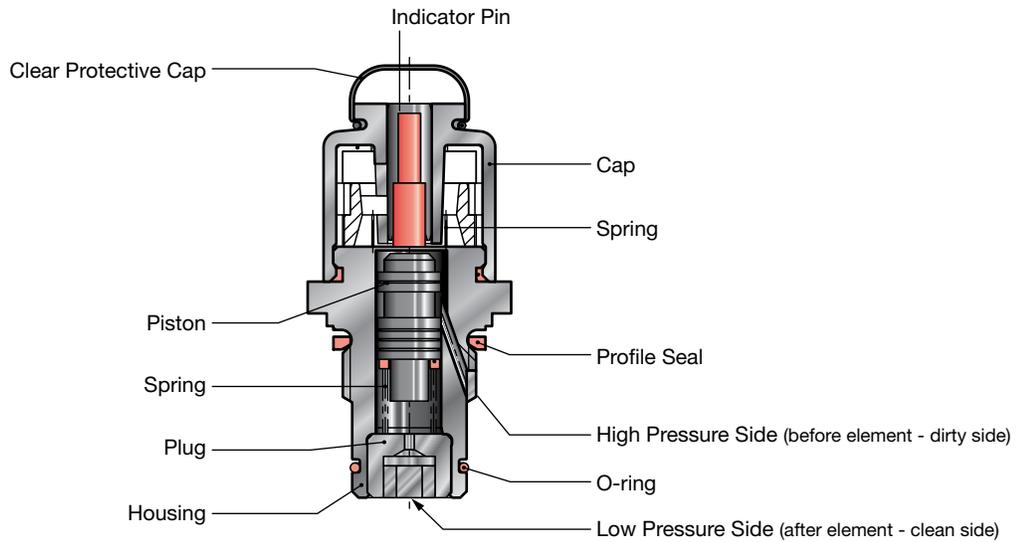
Note: Certain indicators have a red/ yellow/ green display in addition to, or instead of, the pop-up indicator pin.

FILTER CLOGGING INDICATORS

General Indicator Type Drawings:

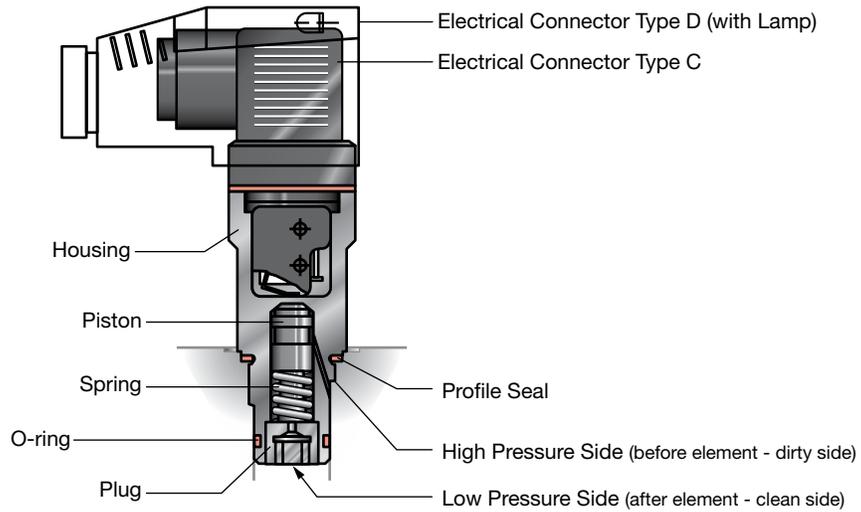
TYPE 1 Differential Pressure

Visual Indicator (BM)



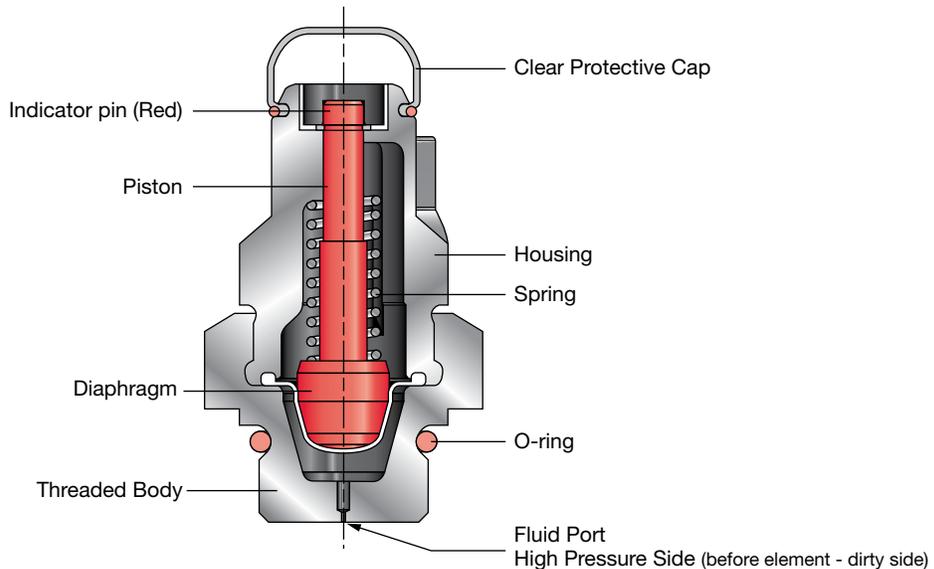
TYPE 2 Differential Pressure

Electric Indicator (C or D)



TYPE 3 Static Pressure

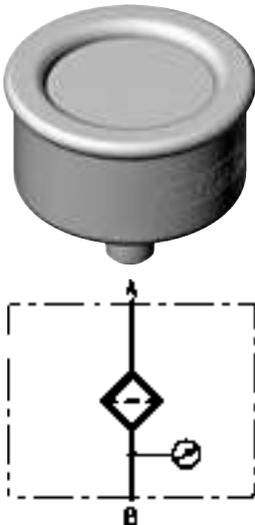
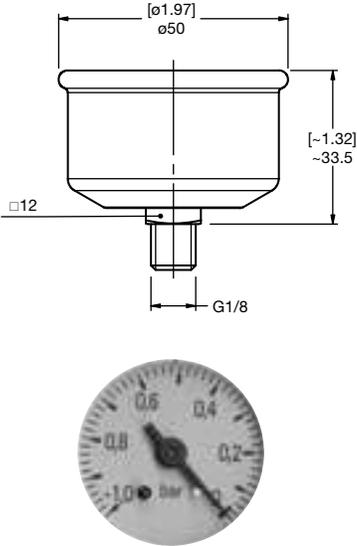
Visual Indicator (B)



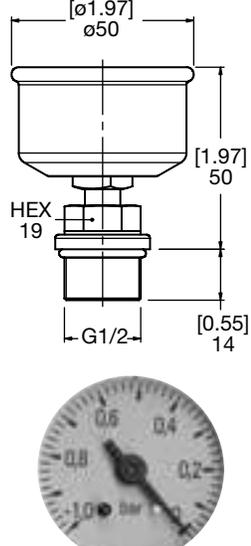
FILTER CLOGGING INDICATORS

Specifications of Vacuum Indicators

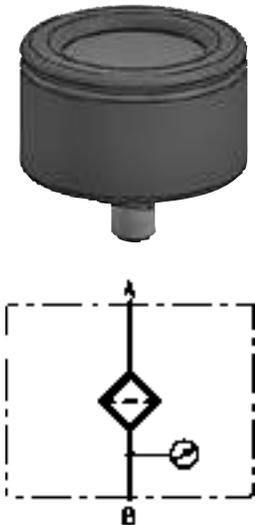
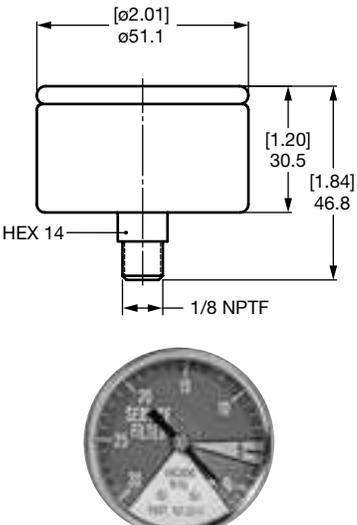
VMF x UE.x

	Type of indication	Visual-analog, scale indication	
	Weight	0.12 lbs (54 g)	
	Trip Pressure / Range	-14.5 psi to 0 psi (-1 bar to 0 bar)	
	Permitt. operating pressure	-10.2 psi to 0 psi (-0.7 to 0 bar) continuous	
	Permitt. temperature range	-4°F to 140°F (-20°C to 60°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
	Order example	VMF 1 UE.0	

VR x UE.x

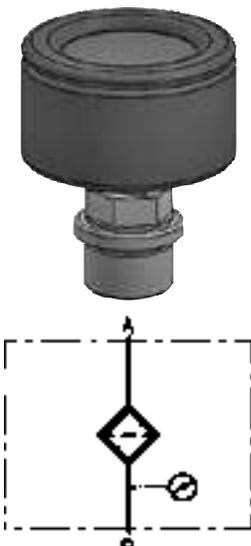
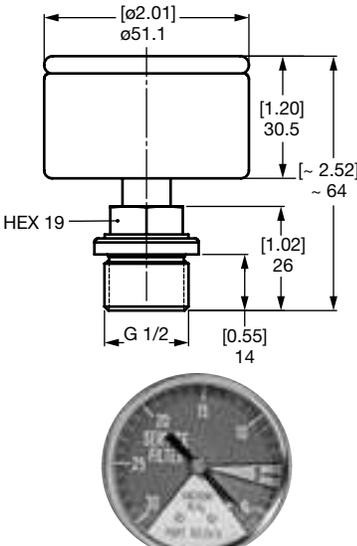
	Type of indication	Visual-analog, scale indication	
	Weight	0.28 lbs (125 g)	
	Trip Pressure / Range	-14.5 psi to 0 psi (-1 bar to 0 bar)	
	Permitt. operating pressure	-10.2 psi to 0 psi (-0.7 to 0 bar) continuous	
	Permitt. temperature range	-4°F to 140°F (-20°C to 60°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
	Order example	VR 1 UE.0	

VMF 0.2 UE.x /3

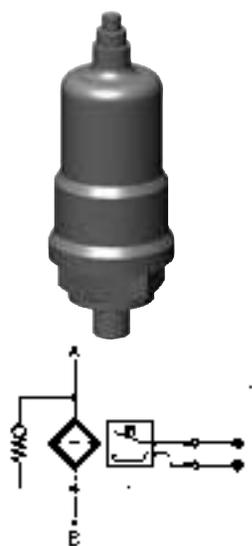
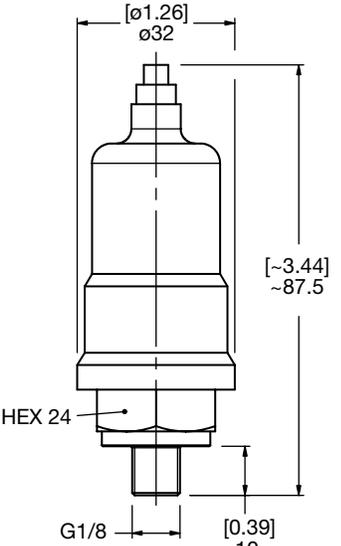
	Type of indication	Visual-analog, scale indication	
	Weight	0.18 lbs (80 g)	
	Trip Pressure / Range	use w/3 psi (0.2 bar) bypass valve	
	Permitt. operating pressure	-30 inHg to 0 inHg	
	Permitt. temperature range	-40°F to 200°F (-40°C to 93°C)	
	Thread	1/8" NPTF	
	Max. torque	-	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
	Order example	VMF0.2UE.0/3	

Specifications of Vacuum Indicators

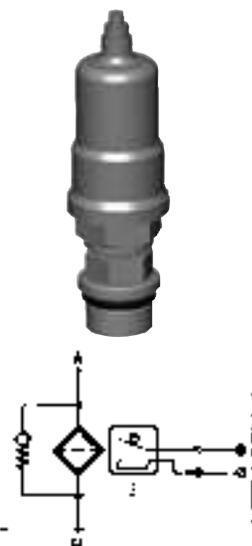
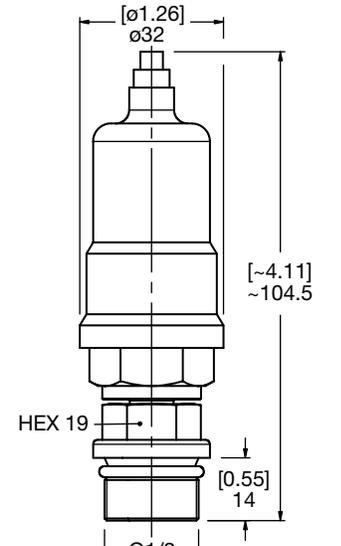
VR 0.2 UE.x

	Type of indication	Visual-analog, scale indication	
	Weight	0.28 lbs (125 g)	
	Trip Pressure / Range	use w/3 psi (0.2 bar) bypass valve	
	Permitt. operating pressure	-30 inHg to 0 inHg	
	Permitt. temperature range	-22°F to 200°F (-30°C to 93°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
Order example	VR 0.2 UE.0		

VMF x UF.x

	Type of indication	Electrical switch	
	Weight	0.37 lbs (170 g)	
	Trip Pressure / Range	-2.9 psi ±1.5 psi (-0.2 bar ±0.1 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/O contact	
	Max. switching voltage	48 V	
	Electrical connection	threaded connection	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
Switching capacity	ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~		
Protection class to DIN 40050	IP 65, terminals IP 00		
Order example	VMF 0.2 UF.0		

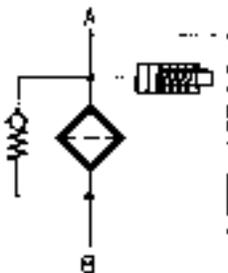
VR x UF.x

	Type of indication	Electrical switch	
	Weight	0.37 lbs (170 g)	
	Trip Pressure / Range	-2.9 psi ±1.5 psi (-0.2 bar ±0.1 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	N/O contact	
	Max. switching voltage	48 V	
	Electrical connection	threaded connection	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
Switching capacity	ohmic 2.5 A at 24 V = ohmic 2.5 A at 42 V ~		
Protection class to DIN 40050	IP 65, terminals IP 00		
Order example	VR 0.2 UF.0		

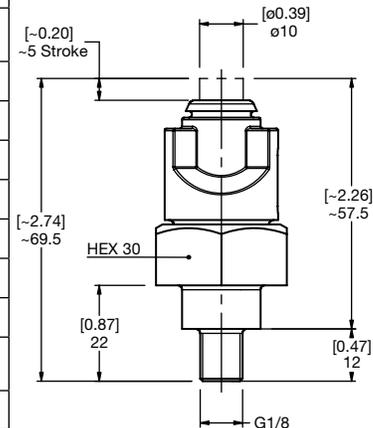
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

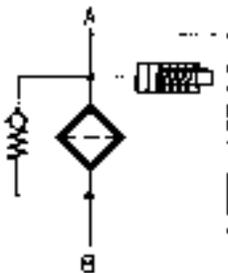
VMF x B.x



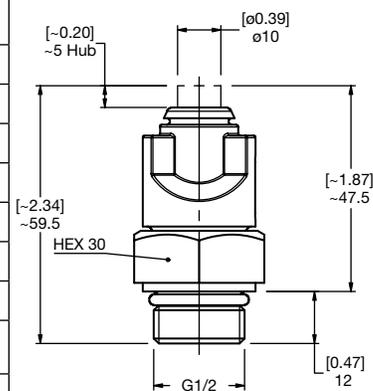
Type of indication	Visual, red pin
Weight	0.19 lbs (84 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VMF 2 B.1



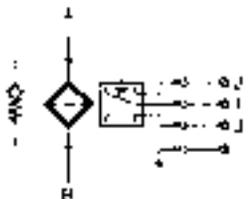
VR x B.x



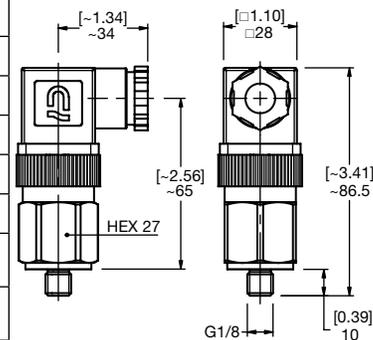
Type of indication	visual, red pin
Weight	0.10 lbs (44 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 B.1



VMF x C.x



Type of indication	Electrical switch
Weight	0.60 lbs (270 g)
Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	230 V
Electrical connection	Male connection M20 Female connector to DIN 43650
Max. switching voltage at resistive load	250 W = 300 VA ~
Switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VMF 2 C.1



Specifications of Static Indicators

VR x C.x

	Type of indication	Electrical switch	
	Weight	0.75 lbs (340 g)	
	Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	250 W = 300 VA ~	
	Switching capacity	Ohmic 6 A at 24 V Ohmic 0.03 to 6 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VR 2 C.1	

VMF x D.x /-L...

	Type of indication	Visual indicator & electrical switch	
	Weight	0.66 lbs (300 g)	
	Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	24, 48, 115, 230 V (<i>depending on the type of light insert</i>)	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	250 W = 300 VA ~	
	Switching capacity	Ohmic 6 A at 230 V = Ohmic 0.03 to 6 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VMF 2 D.1 /-L24	

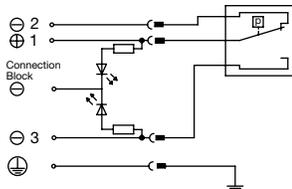
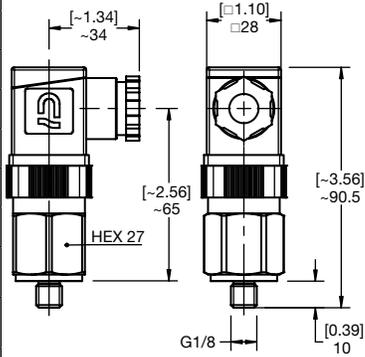
VR x D.x /-L...

	Type of indication	Visual indicator & electrical switch	
	Weight	0.79 lbs (360 g)	
	Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	24, 48, 115, 230 V (<i>depending on the type of light insert</i>)	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	250 W = 300 VA ~	
	Switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VR 2 D.1 /-L110	

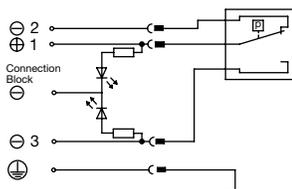
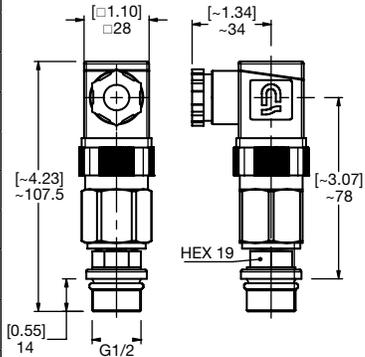
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

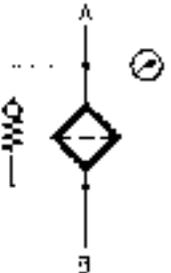
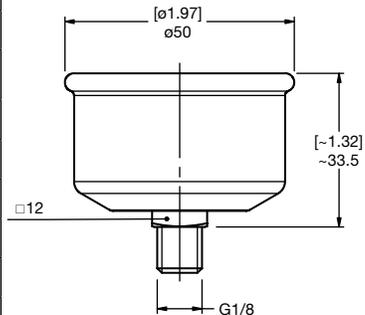
VMF x D.x /-LED

 	Type of indication	Visual indicator & electrical switch	
	Weight	0.66 lbs (300 g)	
	Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/O contact	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	250 W = 300 VA ~	
	Switching capacity	Ohmic 6 A at 24 V =	
	Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)	
	Order example	VMF 2 D.1 /-LED	

VR x D.x /-LED

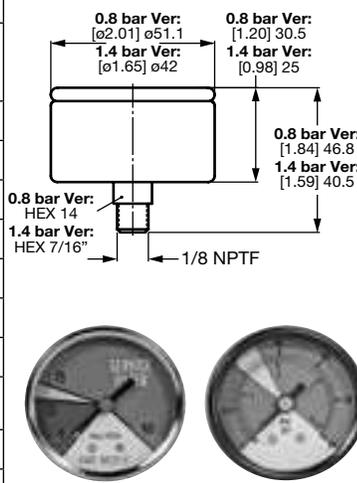
 	Type of indication	Visual indicator & electrical switch	
	Weight	0.79 lbs (360 g)	
	Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	N/O contact	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	250 W = 300 VA ~	
	Switching capacity	Ohmic 6 A at 24 V =	
	Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)	
	Order example	VR 2 D.1 /-LED	

VMF x E.x

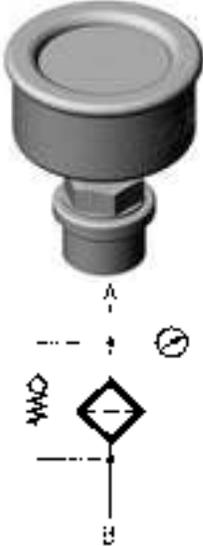
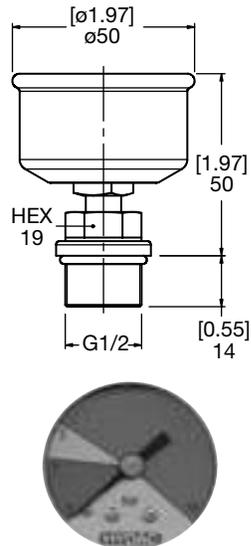
 	Type of indication	Visual-analog, scale indication	 
	Weight	0.12 lbs (54 g)	
	Trip Pressure / Range	0 psi to 145 psi (0 bar to 10 bar)	
	Permitt. operating pressure	102 psi (7 bar) continuous	
	Permitt. temperature range	-4°F to 140°F (-20°C to 60°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
	Order example	VMF 2 E.0	

Specifications of Static Indicators

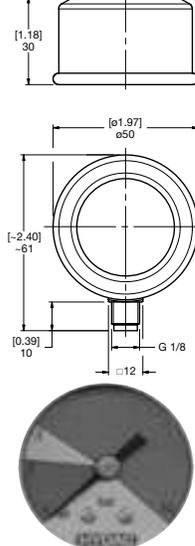
VMF x E.x /-3

	Type of indication	Visual-analog, scale indication	
	Weight	0.22 lbs (98 g)	
	Trip Pressure / Range	Green Range: 0-12 / 0-20 psi Yellow Range: 12-15 / 20-25 psi Red Range: 15-60 / 25-60 psi	
	Permitt. operating pressure	60 psi (4 bar)	
	Permitt. temperature range	-40°F to 200°F (-40°C to 93°C)	
	Thread	1/8" NPTF	
	Max. torque	-	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
	Order example	VMF 0.8 E.1 /-3; VMF 1.4 E.1 /-3	

VR x E.x

	Type of indication	Visual-analog, scale indication	
	Weight	0.28 lbs (125 g)	
	Trip Pressure / Range	0 psi to 145 psi (0 bar to 10 bar)	
	Permitt. operating pressure	102 psi (7 bar) continuous	
	Permitt. temperature range	-4°F to 140°F (-20°C to 60°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Order example	VR 2 E.0	

VMF x ES.x

	Type of indication	Visual-analog, scale indication	
	Weight	0.12 lbs (54 g)	
	Trip Pressure / Range	0 psi to 145 psi (0 bar to 10 bar)	
	Permitt. operating pressure	102 psi (7 bar) continuous	
	Permitt. temperature range	-4°F to 140°F (-20°C to 60°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Order example	VMF 2 ES.0	

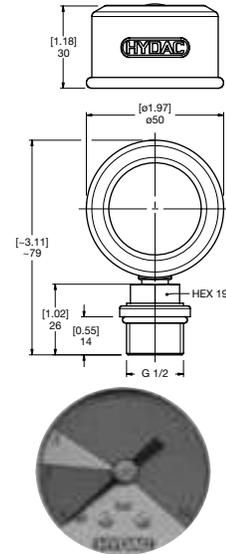
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

VR x ES.x



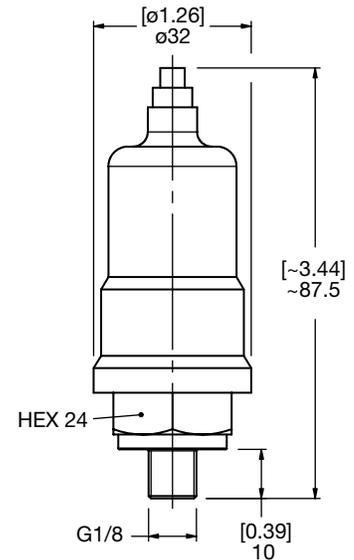
Type of indication	Visual-analog, scale indication
Weight	0.28 lbs (125 g)
Trip Pressure / Range	0 psi to 145 psi (0 bar to 10 bar)
Permitt. operating pressure	102 psi (7 bar) continuous
Permitt. temperature range	-4°F to 140°F (-20°C to 60°C)
Thread	G 1/2
Max. torque	22 Lbf-ft (30 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 ES.0



VMF x F.x



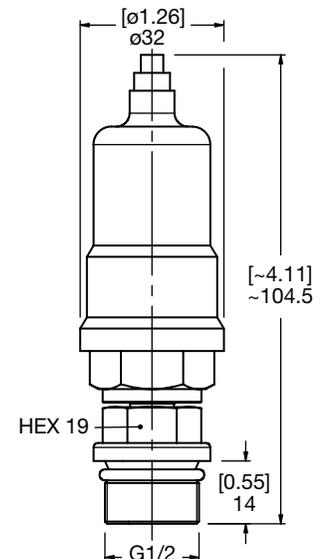
Type of indication	Electrical switch
Weight	0.15 lbs (70 g)
Trip Pressure / Range	29 psi ±4.4 psi (2 bar ±0.3 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/O contact (N/C as an option)
Max. switching voltage	42 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	Ohmic 2.5 A at 24 V = Ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VMF 2 F.0



VR x F.x

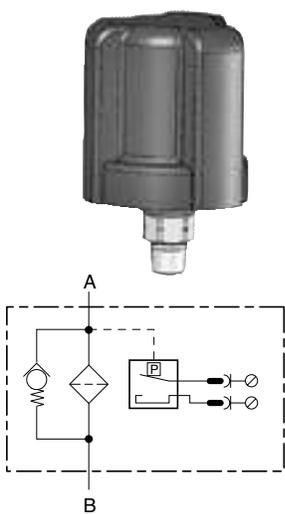
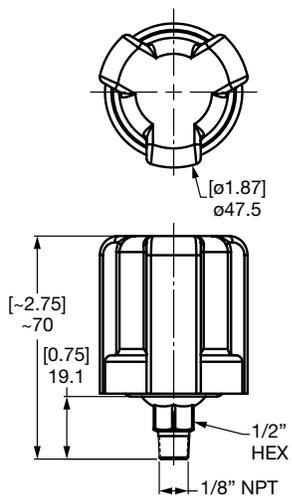


Type of indication	Electrical switch
Weight	0.29 lbs (130 g)
Trip Pressure / Range	29 psi ±4.4 psi (2 bar ±0.3 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	22 Lbf-ft (30 Nm)
Switching type	N/O contact (N/C as an option)
Max. switching voltage	42 V
Electrical connection	threaded connection
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	Ohmic 2.5 A at 24 V = Ohmic 2.5 A at 42 V ~
Protection class to DIN 40050	IP 65, terminals IP 00
Order example	VR 2 F.0

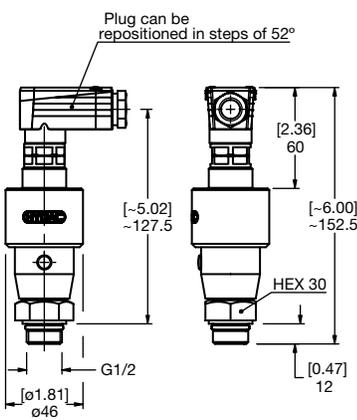


Specifications of Static Indicators

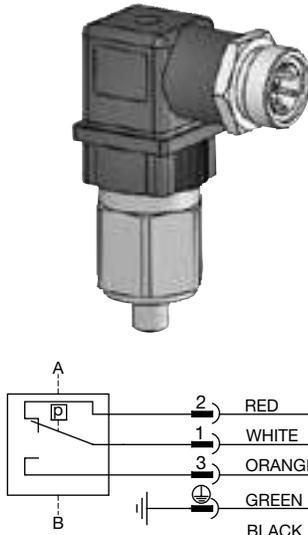
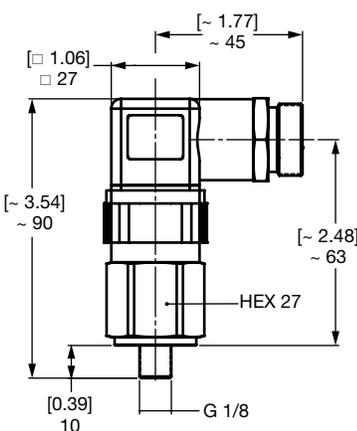
VMF x G.x /-3

	Type of indication	Electrical switch	
	Weight	0.18 lbs (82 g)	
	Trip Pressure / Range	20 psi ±3 psi (1.4 bar ±0.2 Bar)	
	Permitt. operating pressure	250 psi (17 bar)	
	Permitt. temperature range	-40°F to 250°F (-40°C to 121°C)	
	Thread	1/8" NPT	
	Max. torque	-	
	Switching type	N/O - SPDT	
	Max. switching voltage	240 VDC and 240 VAC	
	Electrical connection	2x #8-32 screw terminals	
	Max. switching voltage at resistive load	24 VDC	
	Switching capacity	Ohmic 4 A at 24 V = Ohmic 1 A at 120 V ~	
Protection class to DIN 40050	Terminals IP 00		
Order example	VMF 1.4 G.0 /3		

VR x GC.x

	Type of indication	Electronic / Analog (4-20 mA or 1-10 V) 1 electrical switching contact at 75% and at 100% of pressure setting Analog signal up to 20% of pressure setting constant 4mA or 1 V	
	Weight	0.75 lbs (340 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%)	
	Permitt. operating pressure	102 psi (7 bar)	
	Permitt. temperature range	-22°F to 176°F (-30°C to 80°C)	
	Thread	G 1/2	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/C or N/O, electronic, PNP positive switching (factory setting)	
	Max. switching voltage	Operating voltage 20-30 V DC	
	Electrical connection	7 pole plug to DIN 43651, PG 11	
	Max. switching voltage at resistive load	12 W	
	Switching capacity	Ohmic 0.4 A at 30 V =	
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)		
Order example	VR 2 GC.0 /-LED-SQ-123		

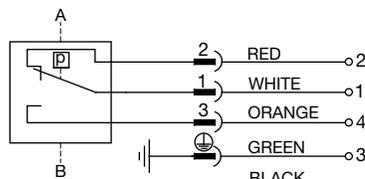
VMF x J.x

	Type of indication	Electrical switch	
	Weight	0.66 lbs (300 g)	
	Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/C or N/O (change-over contacts)	
	Max. switching voltage	230 V	
	Electrical connection	7/8" Mini connector (5 PIN); Female connector to DIN 43650	
	Max. switching voltage at resistive load	250 W = 300 VA ~	
	Switching capacity	Ohmic 6 A at 24 V = Ohmic 0.03 to 6 A at max. 230 V ~	
Protection class to DIN 40050	IP 65 (only if the connector is wired and fitted correctly)		
Order example	VMF 2 J.1		

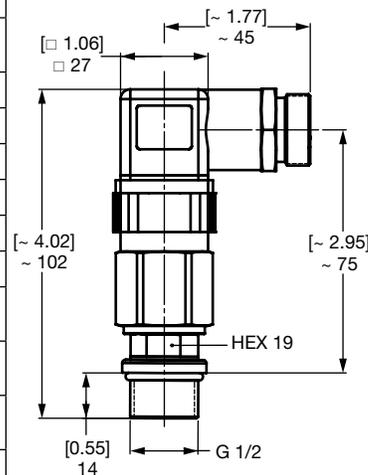
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

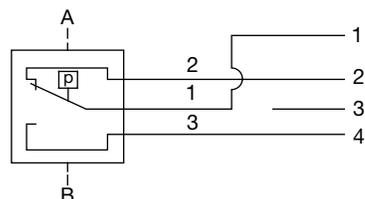
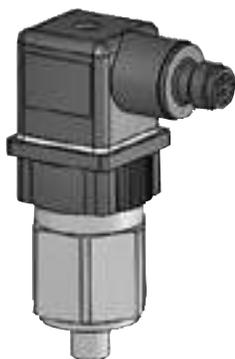
VR x J.x



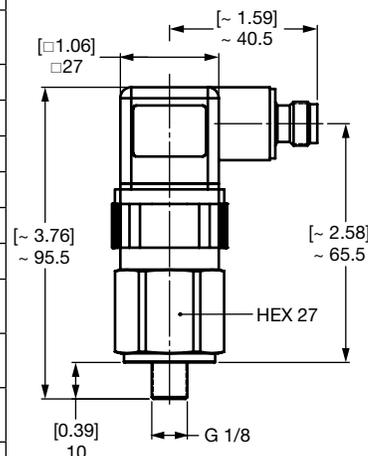
Type of indication	Electrical switch
Weight	0.82 lbs (370 g)
Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)
Thread	G 1/2
Max. torque	22 Lbf-ft (30 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	230 V
Electrical connection	7/8" Mini connector (5 PIN); Female connector to DIN 43650
Max. switching voltage at resistive load	250 W = 300 VA ~
Switching capacity	Ohmic 6 A at 24 V Ohmic 0.03 to 6 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VR 2 J.1



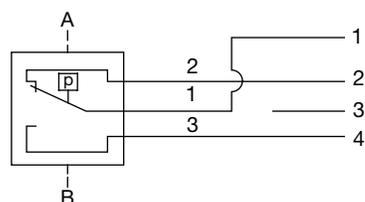
VMF x J4.x



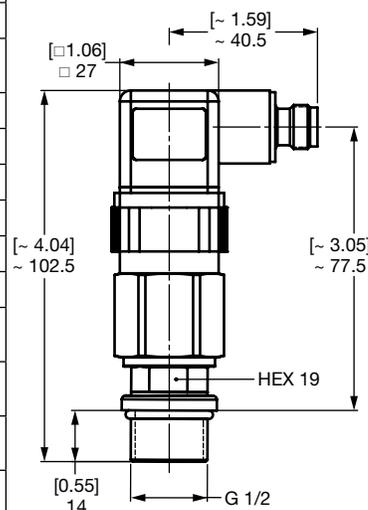
Type of indication	Electrical switch
Weight	0.60 lbs (270 g)
Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)
Thread	G1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	230V
Electrical connection	12mm (Micro) connector (4 PIN); Female connector to DIN 43650
Max. switching voltage at resistive load	250W= 300VA~
Switching capacity	Ohmic 6A at 24V= Ohmic 0.03 to 6A at max. 230V~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VMF 2 J4.1



VR x J4.x

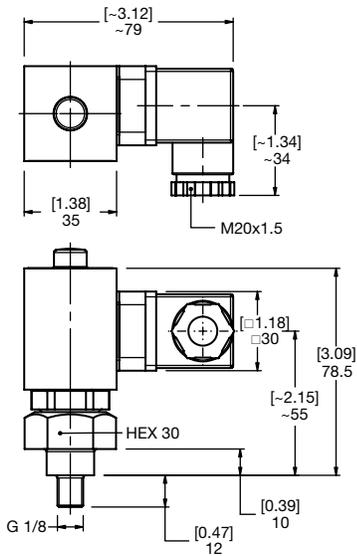


Type of indication	Electrical switch
Weight	0.75 lbs (340 g)
Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar) 73 psi -7.3 psi (5 bar -0.5 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)
Thread	G1/2
Max. torque	22 Lbf-ft (30 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	230V
Electrical connection	12mm (Micro) connector (4 PIN); Female connector to DIN 43650
Max. switching voltage at resistive load	250W= 300VA~
Switching capacity	Ohmic 6A at 24V= Ohmic 0.03 to 6A at max. 230V~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VR 2 J4.1

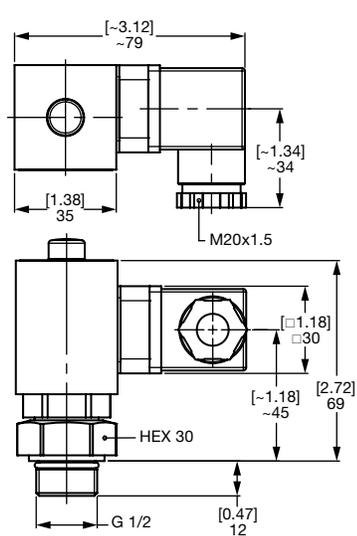


Specifications of Static Indicators

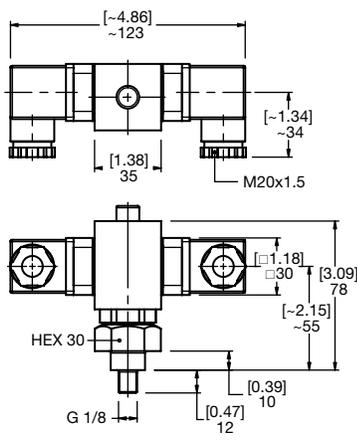
VMF x LE.x

	Type of indication	Visual (red pin) & electrical switch (100% activation)	
	Weight	0.26 lbs (120 g)	
	Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)	
	Permitt. operating pressure	102 psi (7 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	115 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VMF 2 LE.1	

VR x LE.x

	Type of indication	Visual (red pin) & electrical switch (100% activation)	
	Weight	0.32 lbs (143 g)	
	Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)	
	Permitt. operating pressure	102 psi (7 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	115 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VR 2 LE.1	

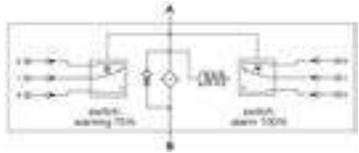
VMF x LZ.x

	Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)	
	Weight	0.51 lbs (230 g)	
	Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)	
	Permitt. operating pressure	102 psi (7 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/8	
	Max. torque	11 Lbf-ft (15 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	115 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VMF 2 LZ.1	

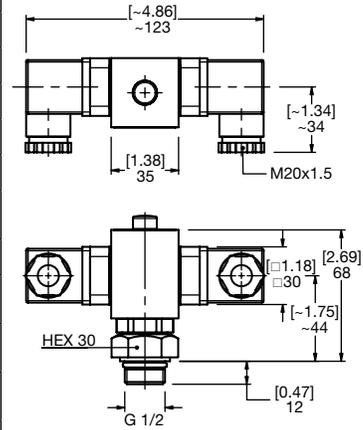
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

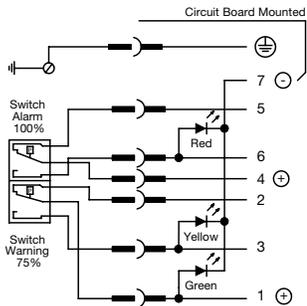
VR x LZ.x



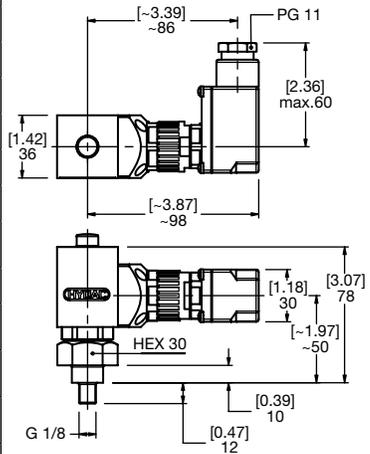
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)
Weight	0.42 lbs (190 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	14°F to 212°F (-10°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)
Max. switching voltage	115 V
Electrical connection	Male connection M20 Female connector to DIN 43650
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VR 2 LZ.1



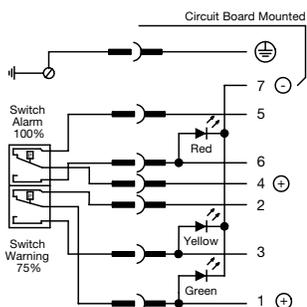
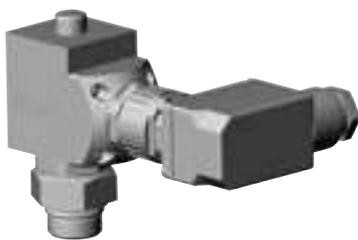
VMF x LZ.x /-DB



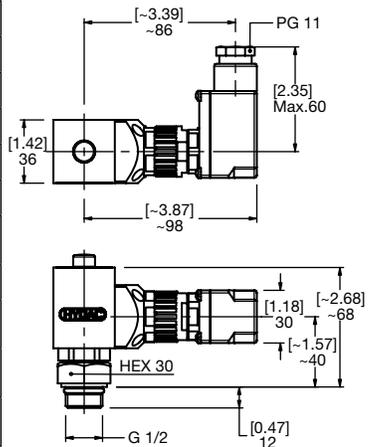
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation). 3 LEDs (grn=power, yel=75%, red=100%)
Weight	0.37 lbs (170 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VMF 2 LZ.1 /-DB



VR x LZ.x /-DB

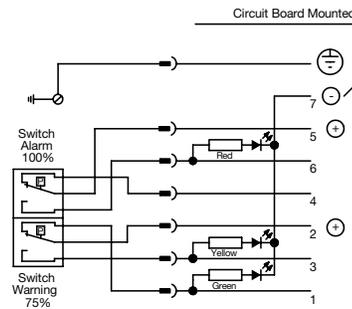
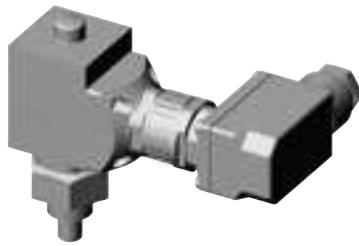


Type of indication	Visual (red pin) & electrical switch (75% & 100% activation). 3 LEDs (grn=power, yel=75%, red=100%)
Weight	0.42 lbs (190 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VR 2 LZ.1 /-DB

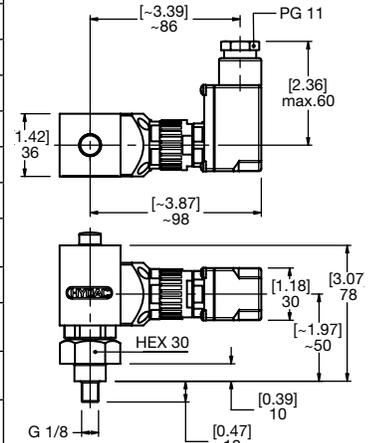


Specifications of Static Indicators

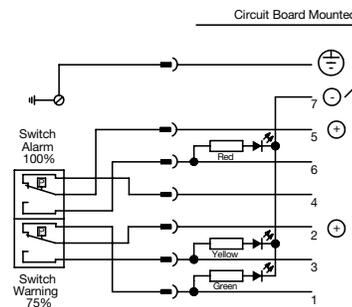
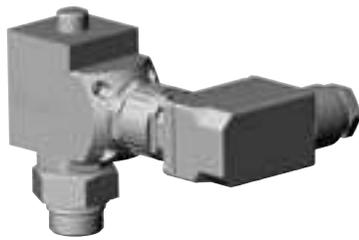
VMF x LZ.x /-CN



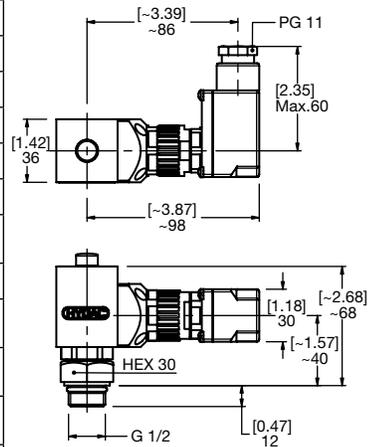
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation). 3 LEDs (grn=pwr, yel=75%, red=100%)
Weight	0.37 lbs (170 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VMF 2 LZ.1 /-CN



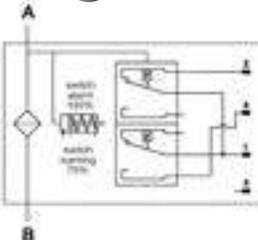
VR x LZ.x /-CN



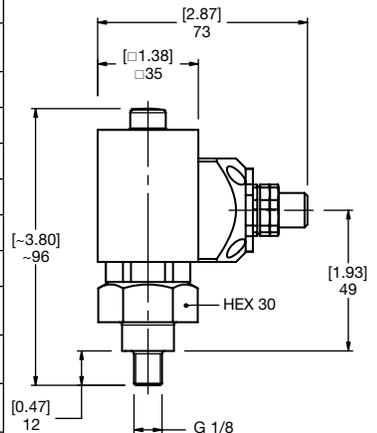
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation). 3 LEDs (grn=pwr, yel=75%, red=100%)
Weight	0.42 lbs (190 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)
Max. switching voltage	24 V
Electrical connection	Male connection PG 11 Female connector to DIN 43651
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VR 2 LZ.1 /-CN



VMF x LZ.x /-BO



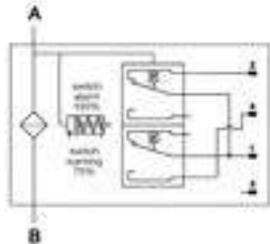
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)
Weight	0.26 lbs (120 g)
Trip Pressure / Range	29 psi (or 36 psi) -10% 2 bar (or 2.5 bar) -10%
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	14°F to 212°F (-10°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VMF 2 LZ.1 /-BO



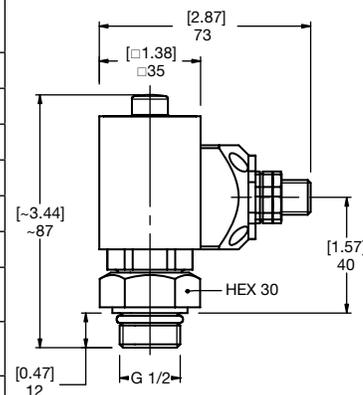
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

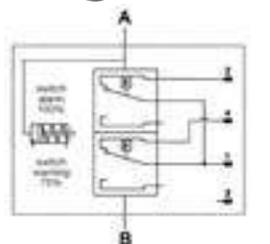
VR x LZ.x /-BO



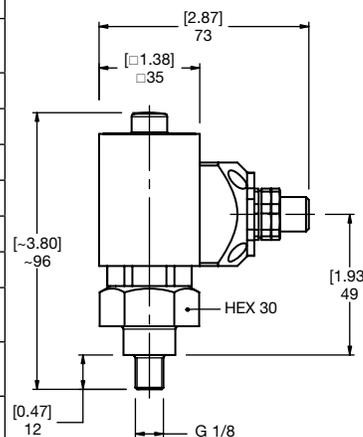
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)
Weight	0.32 lbs (145 g)
Trip Pressure / Range	29 psi (or 36 psi) -10% 2 bar (or 2.5 bar) -10%
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	14°F to 212°F (-10°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/O (75%) N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.1 /-BO



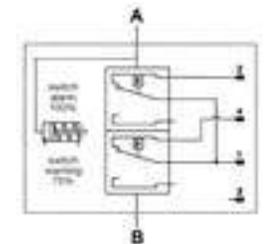
VMF x LZ.x /-AV



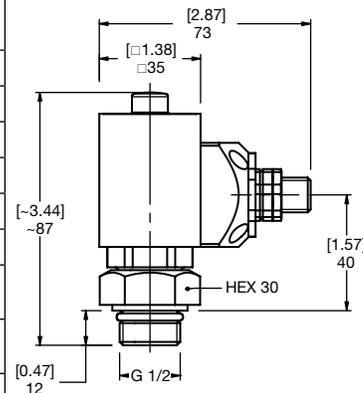
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)
Weight	0.26 lbs (120 g)
Trip Pressure / Range	29 psi (or 36 psi) -10% 2 bar (or 2.5 bar) -10%
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	14°F to 212°F (-10°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C (75% and 100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VMF 2 LZ.1 /-AV



VR x LZ.x /-AV



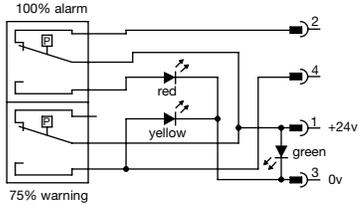
Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)
Weight	0.32 lbs (145 g)
Trip Pressure / Range	29 psi (or 36 psi) -10% 2 bar (or 2.5 bar) -10%
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	14°F to 212°F (-10°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C (75% and 100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.1 /-AV



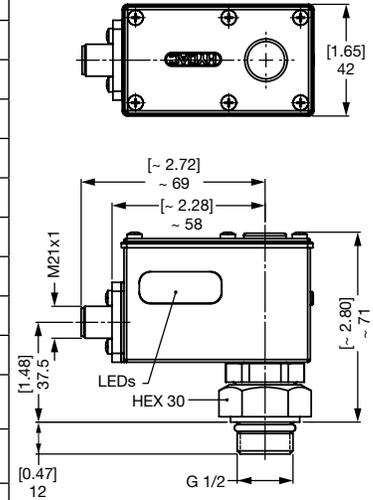
FILTER CLOGGING INDICATORS

Specifications of Static Indicators

VR x LZ.x /-BO-LED



Type of indication	Electrical switch (75% & 100% activation). 3 LEDs (grn=pwr, yel=75%, red=100%)
Weight	0.45 lbs (205 g)
Trip Pressure / Range	36 psi -10% (2.5 bar -10%)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	14°F to 212°F (-10°C to 100°C)
Thread	G 1/2
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/O (75%), N/C (100%)
Max. switching voltage	24 V
Electrical connection	Male connection M12 x 1
Max. switching voltage at resistive load	15 W = max. 15 VA ~
Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~
Protection class to DIN 40050	IP 65
Order example	VR 2 LZ.1 /-BO-LED

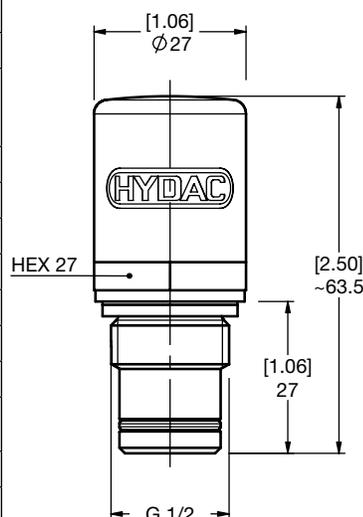


Specifications of Differential Pressure Indicators

VM x B.x



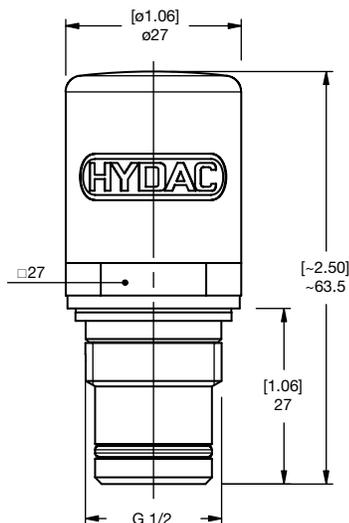
Type of indication	Visual, red/green band automatic reset
Weight	0.12 lbs (55 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	3000 psi (210 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	24 Lbf-ft (33 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VM 5 B.1



VD x B.x



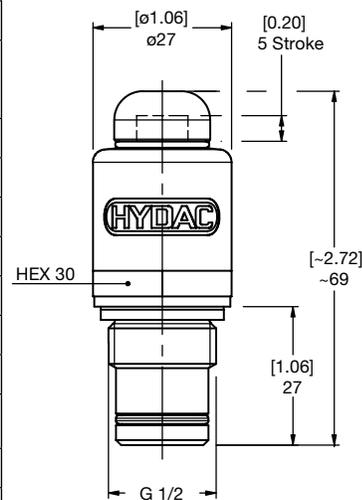
Type of indication	Visual, red/green band automatic reset
Weight	0.24 lbs (110 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	6000 psi 420 bar
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	74 Lbf-ft (100 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VD 5 B.1



VM x BM.x



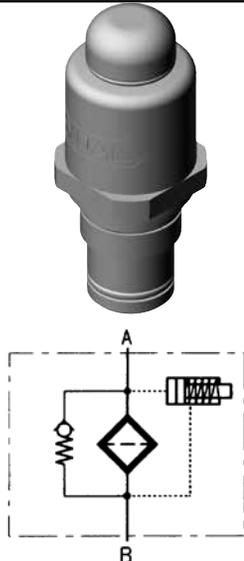
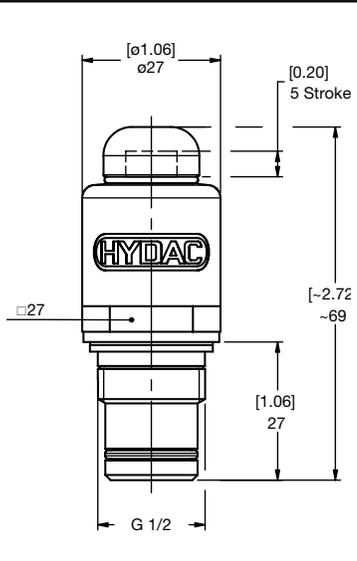
Type of indication	Visual, red/green band manual reset
Weight	0.12 lbs (55 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	3000 psi (210 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	24 Lbf-ft (33 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VM 5 BM.1



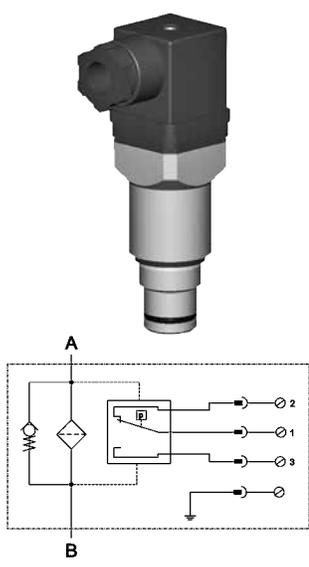
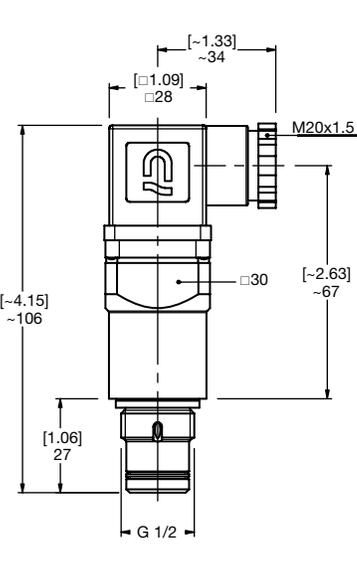
FILTER CLOGGING INDICATORS

Specifications of Differential Pressure Indicators

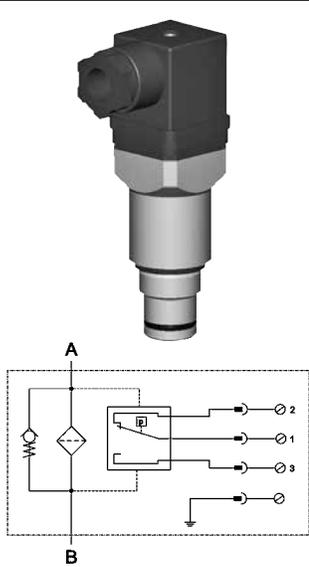
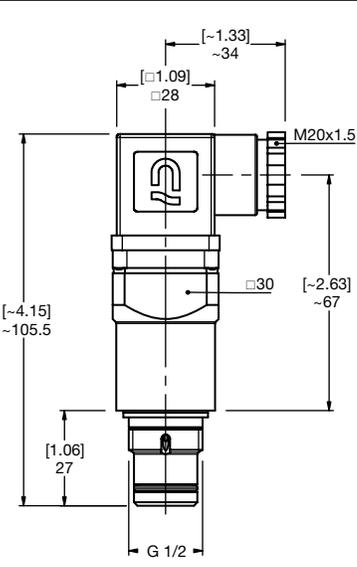
VD x BM.x

	Type of indication	Visual, red/green band manual reset	
	Weight	0.24 lbs (110 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi $\pm 10\%$ (8 bar $\pm 10\%$)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	-	
	Max. switching voltage	-	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	-	
	Order example	VD 5 BM.1	

VM x C.x

	Type of indication	Electrical switch	
	Weight	0.26 lbs (120 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi $\pm 10\%$ (8 bar $\pm 10\%$)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity*	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VM 5 C.0	

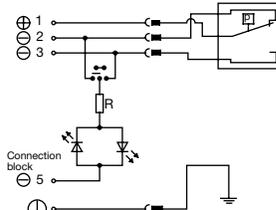
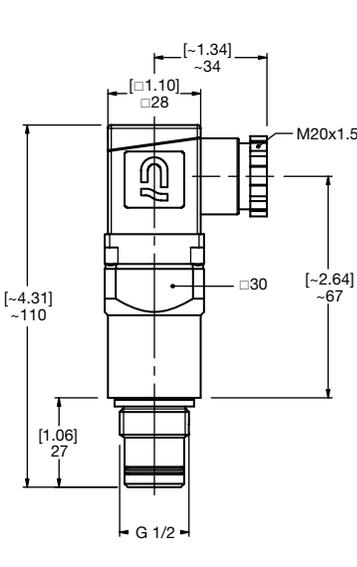
VD x C.x

	Type of indication	Electrical switch	
	Weight	0.49 lbs (220 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi $\pm 10\%$ (8 bar $\pm 10\%$)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity*	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 C.0	

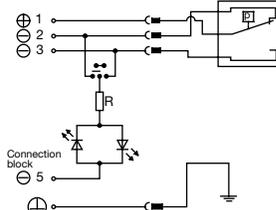
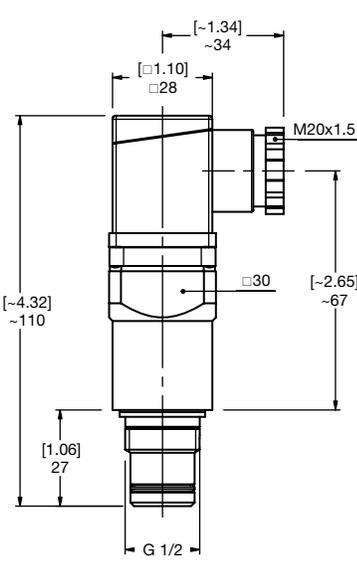
*Required amperage > 20 mA; for lower amperages, order "-SO135" indicators (see Supplementary Details in the Model Code).

Specifications of Differential Pressure Indicators

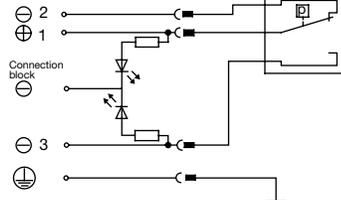
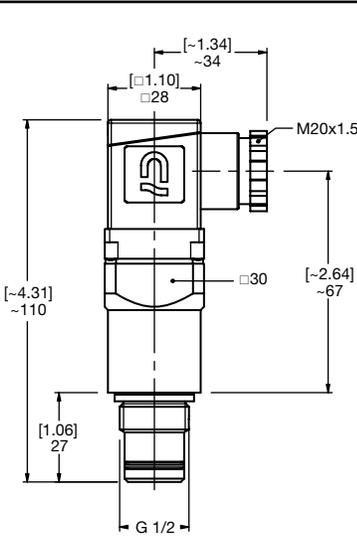
VM x D.x/-L...

 	Type of indication	Visual indicator & electrical switch	
	Weight	0.33 lbs (150 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	24, 48, 115, 230 V (<i>depending on the type of light insert</i>)	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity*	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VM 5 D.0 /-L24	

VD x D.x/-L...

 	Type of indication	Visual indicator & electrical switch	
	Weight	0.55 lbs (250 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	24, 48, 115, 230 V (<i>depending on the type of light insert</i>)	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity*	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 D.0 /-L24	

VM x D.x/-LED

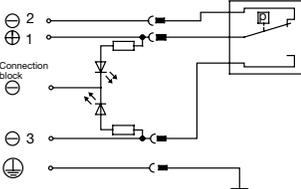
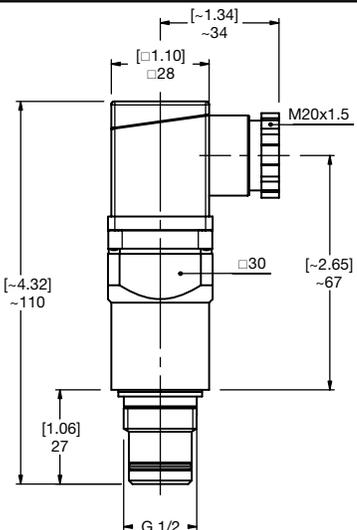
 	Type of indication	Visual indicator & electrical switch	
	Weight	0.33 lbs (150 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity*	Ohmic 3 A at 24 V =	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VM 5 D.0 /-LED	

*Required amperage > 20 mA; for lower amperages, order "-SO135" indicators (see Supplementary Details in the Model Code).

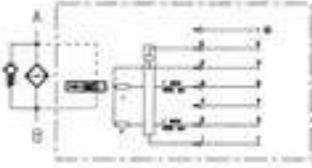
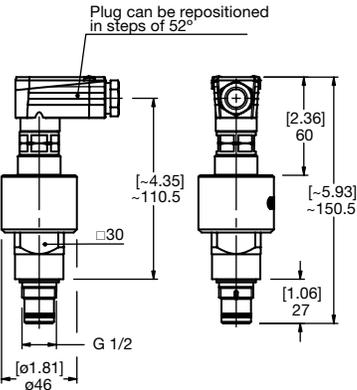
FILTER CLOGGING INDICATORS

Specifications of Differential Pressure Indicators

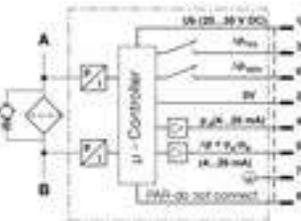
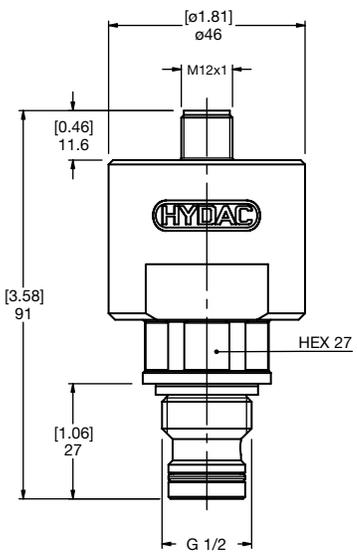
VD x D.x/-LED

 	Type of indication	Visual indicator & electrical switch		
	Weight	0.55 lbs (250 g)		
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)		
	Permitt. operating pressure	6000 psi (420 bar)		
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)		
	Thread	G 1/2		
	Max. torque	74 Lbf-ft (100 Nm)		
	Switching type	N/C or N/O (<i>change-over contacts</i>)		
	Max. switching voltage	24 V		
	Electrical connection	Male connection M20 Female connector to DIN 43650		
	Max. switching voltage at resistive load	60 W = 100 VA ~		
	Switching capacity*	Ohmic 3 A at 24 V =		
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)		
Order example	VD 5 D.0 /-LED			

VD x GC.x

 	Type of indication	Electronic / Analog (4-20 mA or 1-10 V) 1 switch contact at 75% and at 100% trip pressure		
	Weight	0.88 lbs (400 g)		
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)		
	Permitt. operating pressure	6000 psi (420 bar)		
	Permitt. temperature range	-22°F to 176°F (-30°C to 80°C)		
	Thread	G 1/2		
	Max. torque	74 Lbf-ft (100 Nm)		
	Switching type	N/C or N/O, electronic PNP positive switching (<i>factory setting</i>)		
	Max. switching voltage	Operating voltage 20-30 V DC		
	Electrical connection	7 pole plug to DIN 43650, PG 11		
	Max. switching voltage at resistive load	12 W		
	Switching capacity	Ohmic 0.4 A at 30 V =		
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)		
Order example	VD 5 GC.0 /-LED-SQ-123			

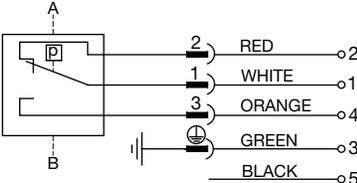
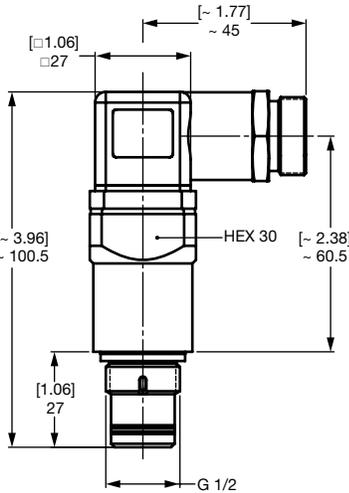
VL x GW.x

 	Type of indication	Electronic / Analog, (4-20 mA) 1 switch contact at 75% and at 100% trip pressure			
	Weight	0.35 lbs (157 g)			
	Pressure setting (100%)	29 psi ±5% (2 bar ±5%)		44 psi ±5% (3 bar ±5%)	73 psi ±5% (5 bar ±5%)
	Indication range Δp	0 - 73 psi (0 - 5 bar)		0 - 73 psi (0 - 5 bar)	0 - 116 psi (0 - 8 bar)
	Indication range (p before filter)	363 psi (25 bar)			
	Switching type (<i>output Δp</i>)	El. switch, PNP positive switching N/C or N/O contacts (<i>factory set.</i>)			
	Output load	400 mA			
	Max. switching operating voltage	20 - 30V DC			
	Analog outputs (p before filter & Δp)	4 - 20 mA (max. load resistance 600Ω)			
	Electrical connection	M12x1/8 pole			
	Protection class to DIN 40050	IP 65			
	Permitt. operating pressure	25 bar			
	Permitt. temperature range	-40°F to 185°F (-40°C to 85°C)			
	Thread	G 1/2			
	Max. torque	24 Lbf-ft (33 Nm)			
Order example	VL 5 GW.0 /-V-123				

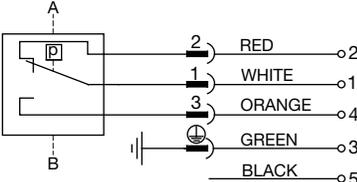
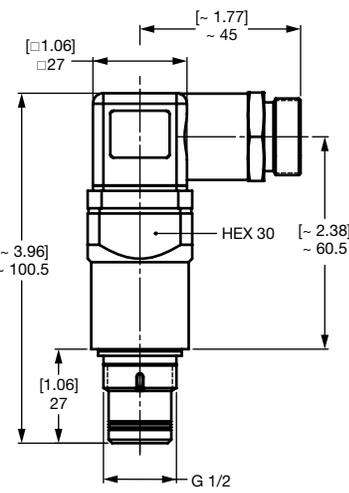
*Required amperage > 20 mA; for lower amperages, order "-SO135" indicators (see Supplementary Details in the Model Code).

Specifications of Differential Pressure Indicators

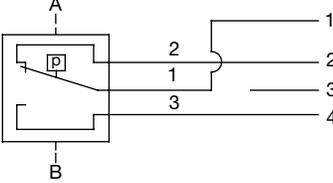
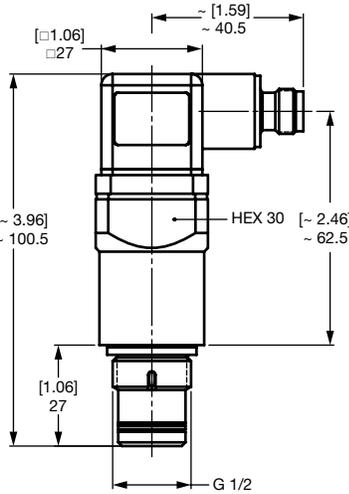
VM x J.x

 	Type of indication	Electrical switch	
	Weight	0.33 lbs (150 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230V	
	Electrical connection	7/8" (Mini) connector (5 PIN); Female connector to DIN 43650	
	Max. switching voltage at resistive load	60W= 100VA~	
	Switching capacity	Ohmic 3A at 24V= Ohmic 0.03 to 5A at max. 230V~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VM 5 J.1	

VD x J.x

 	Type of indication	Electrical switch	
	Weight	0.55 lbs (250 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230V	
	Electrical connection	7/8" (Mini) connector (5 PIN); Female connector to DIN 43650	
	Max. switching voltage at resistive load	60W= 100VA~	
	Switching capacity	Ohmic 3A at 24V= Ohmic 0.03 to 5A at max. 230V~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 J.1	

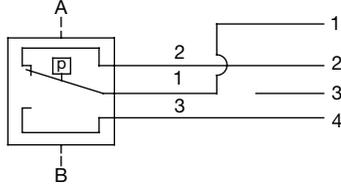
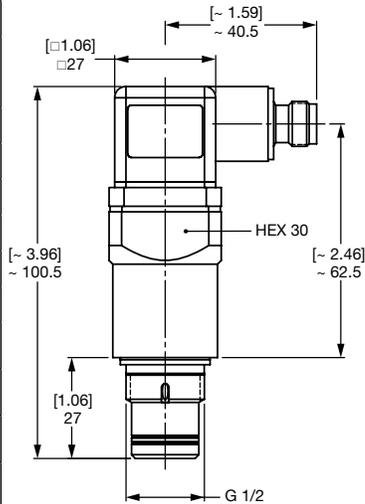
VM x J4.x

 	Type of indication	Electrical switch	
	Weight	0.26 lbs (120 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230V	
	Electrical connection	12mm (Micro) connector (4 PIN); Female connector to DIN 43650	
	Max. switching voltage at resistive load	60W= 100VA~	
	Switching capacity	Ohmic 3A at 24V= Ohmic 0.03 to 5A at max. 230V~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VM 5 J4.1	

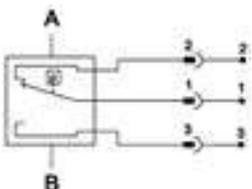
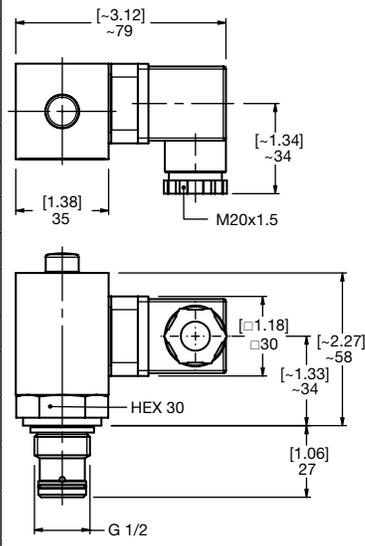
FILTER CLOGGING INDICATORS

Specifications of Differential Pressure Indicators

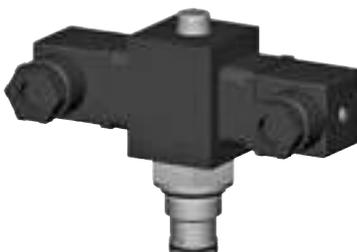
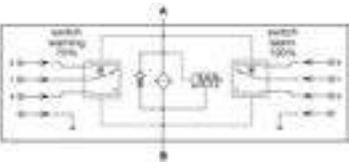
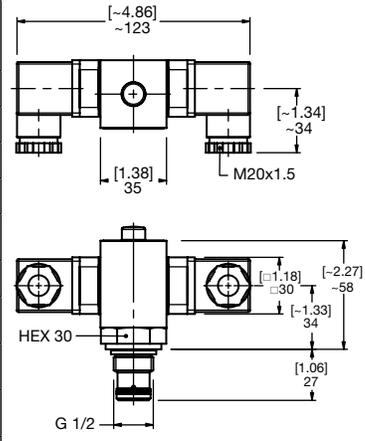
VD x J4.x

 	Type of indication	Electrical switch	
	Weight	0.49 lbs (220 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-13°F to 185°F (-25°C to 85°C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	230V	
	Electrical connection	12mm (Micro) connector (4 PIN); Female connector to DIN 43650	
	Max. switching voltage at resistive load	60W= 100VA~	
	Switching capacity	Ohmic 3A at 24V= Ohmic 0.03 to 5A at max. 230V~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 J4.1	

VD x LE.x

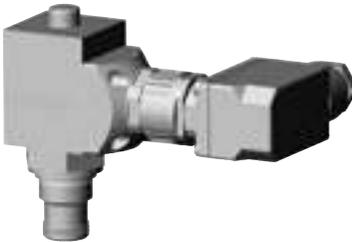
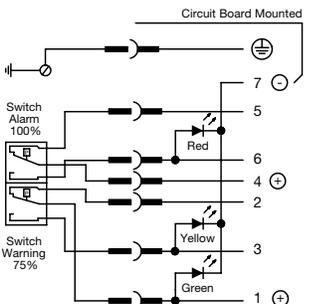
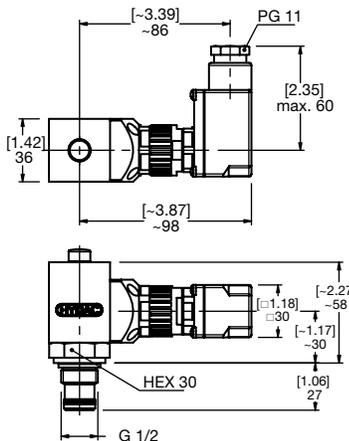
 	Type of indication	Visual (red pin) & electrical switch (100% activation)	
	Weight	0.44 lbs (198 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	115 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 LE.1	

VD x LZ.x

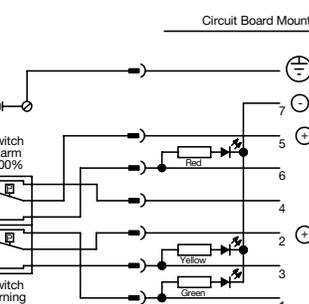
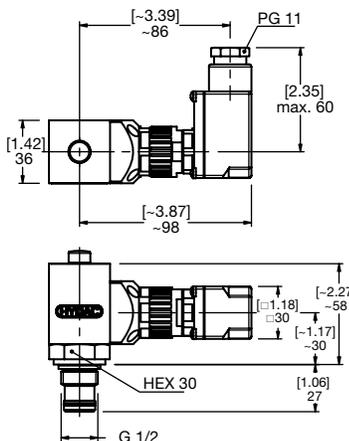
 	Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)	
	Weight	0.53 lbs (240 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	115 V	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 LZ.1	

Specifications of Differential Pressure Indicators

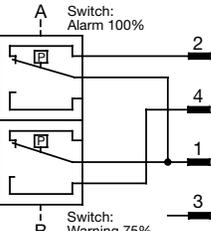
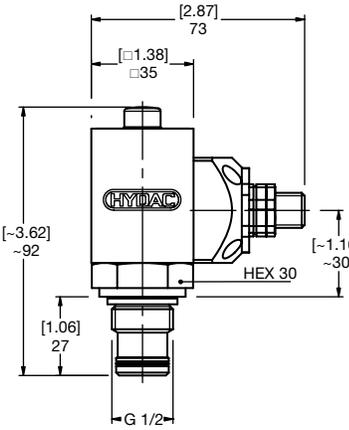
VD x LZ.x /-DB

 	Type of indication	Visual (red pin) & electrical switch (75% & 100% activation). 3 LEDs (grn=pwr, yel=75%, red=100%)	
	Weight	0.54 lbs (245 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection PG 11 Female connector to DIN 43651	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 LZ.1 /-DB	

VD x LZ.x /-CN

 	Type of indication	Visual (red pin) & electrical switch (75% & 100% activation). 3 LEDs (grn=pwr, yel=75%, red=100%)	
	Weight	0.54 lbs (245 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/C or N/O contacts, Reed contacts (<i>change-over contacts</i>)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection PG 11 Female connector to DIN 43651	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 LZ.1 /-CN	

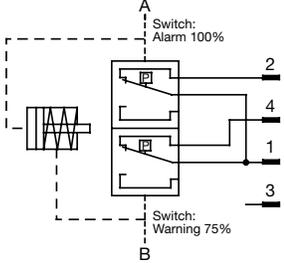
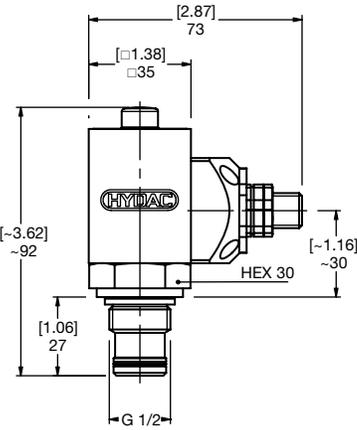
VD x LZ.x /-BO

 	Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)	
	Weight	0.43 lbs (197 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/O (75%), N/C (100%)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M12 x1	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65	
	Order example	VD 5 LZ.1 /-BO	

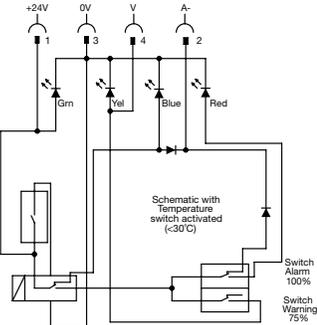
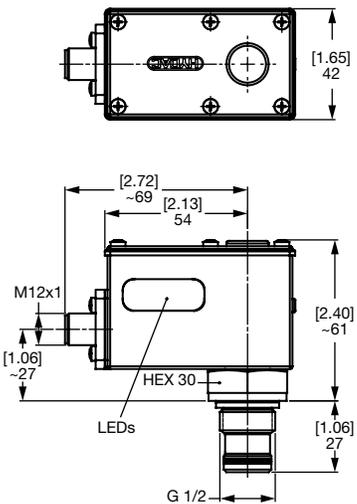
FILTER CLOGGING INDICATORS

Specifications of Differential Pressure Indicators

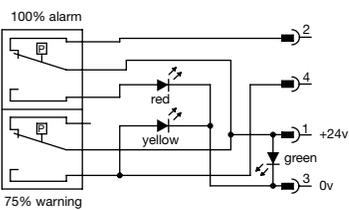
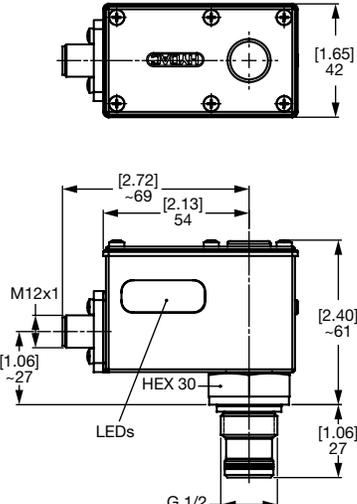
VD x LZ.x /-AV

 	Type of indication	Visual (red pin) & electrical switch (75% & 100% activation)	
	Weight	0.43 lbs (197 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/C (75% and 100%)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M12 x1	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65	
Order example	VD 5 LZ.1 /-AV		

VD x LZ.x /-D4C

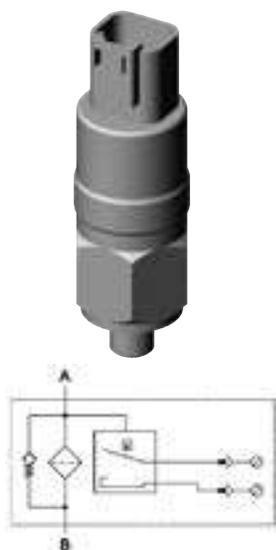
 	Type of indication	Electrical switch (75% & 100% activation) w/30°C thermal lockout. 4 LEDs (grn=pwr, blue= below 86°F, yel=75%, red=100%)	
	Weight	0.56 lbs (256 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/O (75%), N/C (100%)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M12 x1	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65	
Order example	VD 5 LZ.1 /-D4C		

VD x LZ.x /-BO-LED

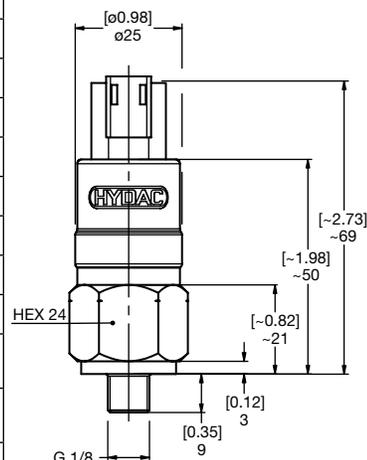
 	Type of indication	Electrical switch (75% & 100% activation). 3 LEDs (grn=pwr, yel=75%, red=100%)	
	Weight	0.55 lbs (250 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi -10% (8 bar -10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	14°F to 212°F (-10°C to 100°C)	
	Thread	G 1/2	
	Max. torque	37 Lbf-ft (50 Nm)	
	Switching type	N/O (75%), N/C (100%)	
	Max. switching voltage	24 V	
	Electrical connection	Male connection M12 x1	
	Max. switching voltage at resistive load	15 W = max. 15 VA ~	
	Switching capacity	Ohmic 1 A at 15 V = Ohmic 1 A at 15 V ~	
	Protection class to DIN 40050	IP 65	
Order example	VD 5 LZ.1 /-BO-LED		

Specifications of Return Line Mobile Indicators

VMF x FD.x



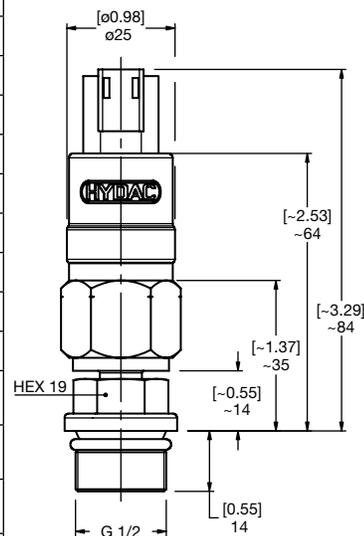
Type of indication	Electrical switch
Weight	0.15 lbs (70 g)
Trip Pressure / Range	29 psi \pm 4.4 psi (2 bar \pm 0.3 bar)
Permitt. operating pressure	160 psi (11 bar) continuous
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/O or N/C
Max. switching voltage	42 V
Electrical connection	Deutsch DT 04-2P
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	Ohmic 2.5 A at 24 V = Ohmic 1 A at 220 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VMF 2 FD.0 /-2M0



VR x FD.x



Type of indication	Electrical switch
Weight	0.20 lbs (90 g)
Trip Pressure / Range	29 psi \pm 4.4 psi (2 bar \pm 0.3 bar)
Permitt. operating pressure	160 psi (11 bar) continuous
Permitt. temperature range	-22°F to 212°F (-30 C to 100°C)
Thread	G 1/2
Max. torque	22 Lbf-ft (30 Nm)
Switching type	N/O or N/C
Max. switching voltage	42 V
Electrical connection	Deutsch DT 04-2P
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	Ohmic 2.5 A at 24 V = Ohmic 1 A at 220 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VR 2 FD.0 /-2M0



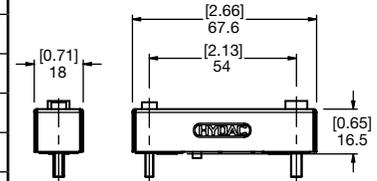
FILTER CLOGGING INDICATORS

Specifications of Differential Pressure Mobile Indicators

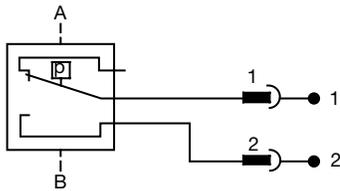
VL x BF.x



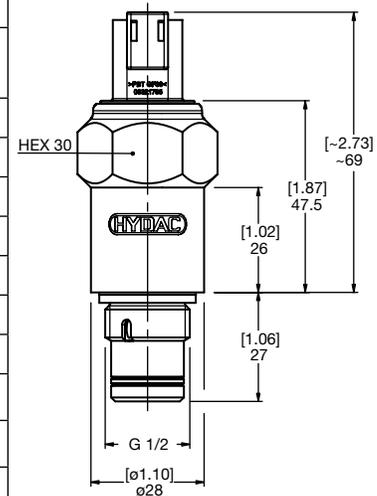
Type of indication	Visual
Weight	0.06 lbs (25 g)
Trip Pressure / Range	14.5 psi -10% (1 bar -10%) 36 psi -10% (2.5 bar -10%)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	14°F to 176°F (-10°C to 80°C)
Thread	M3; M4
Max. torque	0.1 Lbf-ft (0.6 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VL 2.5 BF.0



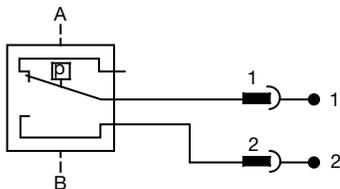
VM x CD.x



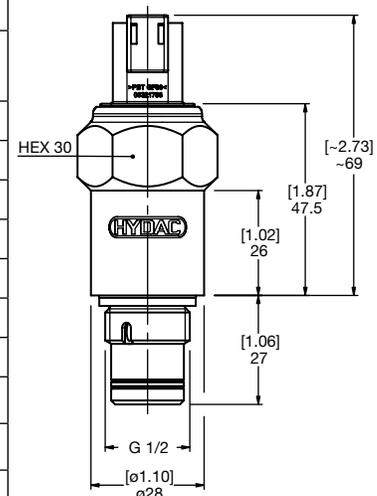
Type of indication	Electrical switch
Weight	0.22 lbs (100 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	3000 psi (210 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	24 Lbf-ft (33 Nm)
Switching type	N/O or N/C
Max. switching voltage	48 V
Electrical connection	-
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VM 5 CD.0 /-2M0



VD x CD.x

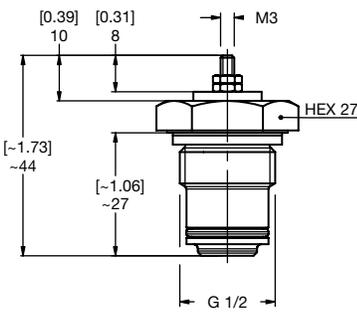


Type of indication	Electrical switch
Weight	0.43 lbs (195 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	6000 psi (420 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	74 Lbf-ft (100 Nm)
Switching type	N/O or N/C
Max. switching voltage	48 V
Electrical connection	-
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	Ohmic 3 A at 24 V = Ohmic 0.03 to 5 A at max. 230 V ~
Protection class to DIN 40050	IP 67 (only if the connector is wired and fitted correctly)
Order example	VD 5 CD.0 /-2M0

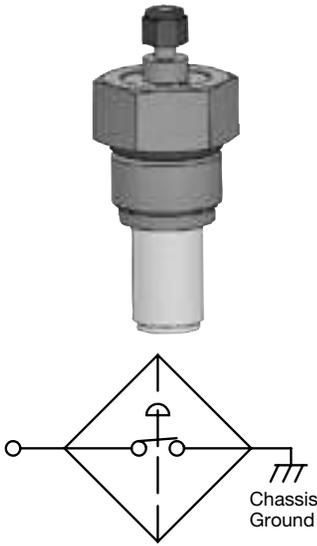
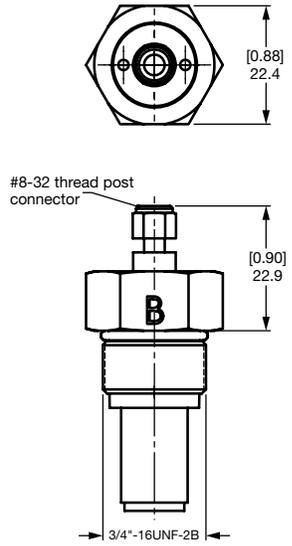


Specifications of Differential Pressure Mobile Indicators

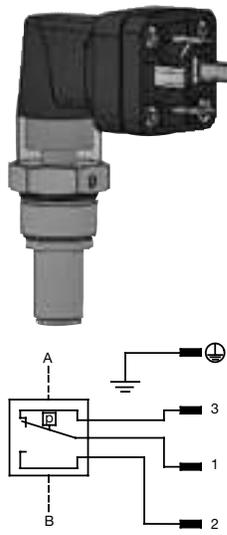
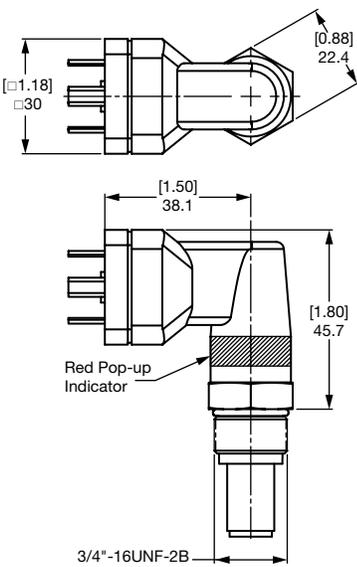
VM x M.x

	Type of indication	Single pole (<i>ground switching</i>)	
	Weight	0.07 lbs (31 g)	
	Trip Pressure / Range	29 psi $\pm 15\%$ (2 bar $\pm 15\%$)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/O or N/C	
	Max. switching voltage	24V	
	Electrical connection	-	
	Max. switching voltage at resistive load	-	
	Switching capacity	-	
	Protection class to DIN 40050	Terminals IP00	
	Order example	VM 2 M.0	

B...CMF*

	Type of indication	Single pole (<i>ground switching</i>)	
	Weight	0.05 lbs (24 g)	
	Trip Pressure / Range	44 psi +6 psi (3 bar +0.4 bar)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	22°F to 200°F (-30°C to 93°C)	
	Thread	SAE-8 differential port	
	Max. torque	-	
	Switching type	N/O	
	Max. switching voltage	-	
	Electrical connection	#8 - 32 threaded post	
	Max. switching voltage at resistive load	-	
Switching capacity	ohmic 200MA at 36VDC		
Protection class to DIN 40050	Terminals IP00		
Order example	B3420CMF.0		

B...LEMF*

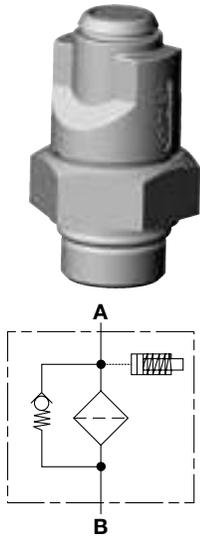
	Type of indication	Visual indicator & electric switch	
	Weight	0.18 lbs (80 g)	
	Trip Pressure / Range	44 psi +6 psi (3 bar +0.4 bar)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	22°F to 200°F (-30°C to 93°C)	
	Thread	SAE-8 differential port	
	Max. torque	-	
	Switching type	N/O or N/C (<i>change-over contacts</i>)	
	Max. switching voltage	-	
	Electrical connection	Female connector to DIN 43650	
	Max. switching voltage at resistive load	-	
	Switching capacity	ohmic 5A at 125/250VAC, 5A at 24VDC	
	Protection class to DIN 40050	IP60	
Order example	B3420LEMF.0		

*This clogging indicator is for use with the MF/MFD/MFDS Series only.

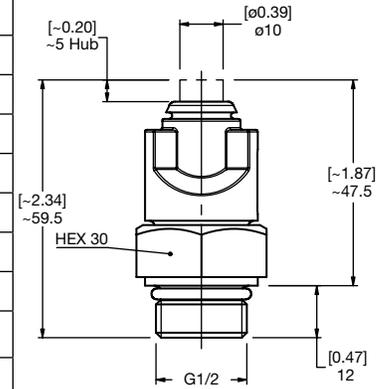
FILTER CLOGGING INDICATORS

Specifications of Return Line Indicators in accordance with ATEX Directive

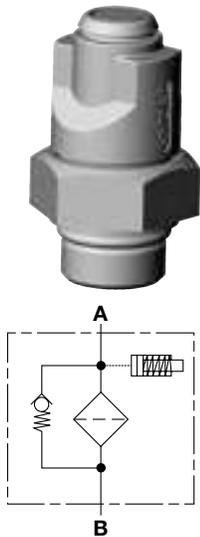
VR x B.x (ATEX) Can be used on aluminium filters up to Zone 1



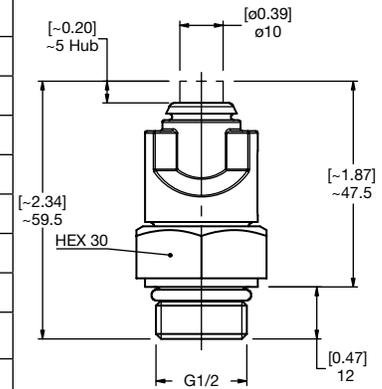
Type of indication	Visual, red pin
Weight	0.10 lbs (44 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	11Lbf-ft (15 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 B.0 /-2GC



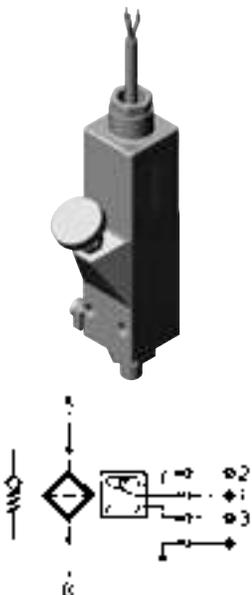
VR x B.x (ATEX) Can be used on steel/cast iron filters up to Zone 1



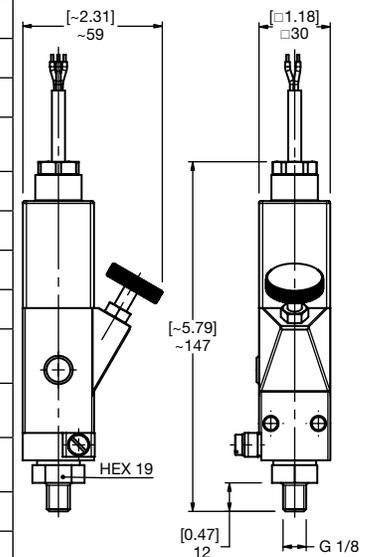
Type of indication	Visual, red pin
Weight	0.10 lbs (44 g)
Trip Pressure / Range	29 psi -2.9 psi (2 bar -0.2 bar)
Permitt. operating pressure	102 psi (7 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	11Lbf-ft (15 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VR 2 B.0 /-2GC-SO174



VMF x C.x /-Ex2G

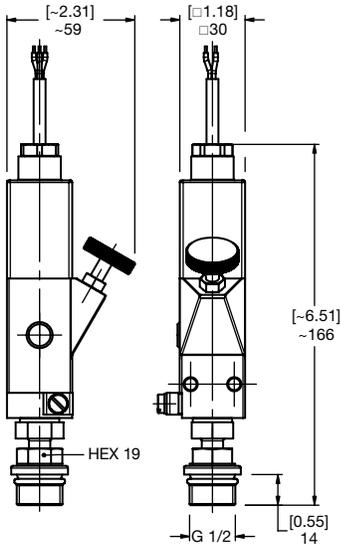


Type of indication	Electrical switch
Weight	0.91 lbs (415 g)
Trip Pressure / Range	29 psi ±7.3 psi (2 bar ±0.5 bar)
Permitt. operating pressure	2901 psi (200 bar)
Permitt. temperature range	-4°F to 158°F (-20°C to 70°C) (T6) -4°F to 176°F (-20°C to 80°C) (T5)
Thread	G 1/8
Max. torque	11 Lbf-ft (15 Nm)
Switching type	N/C or N/O (change-over contacts)
Max. switching voltage	250 V
Electrical connection	Cable connection PG 9 Cable length 2 m
Max. switching voltage at resistive load	62.5 W = 250 VA ~
Switching capacity	Ohmic 0.25 A at 250 V = Ohmic 1 A at 250 V ~
Protection class to DIN 40050	IP 65
ATEX designation	II 2G EEx d IIC T6 / T5
Order example	VMF 2 C.0 /-Ex2G

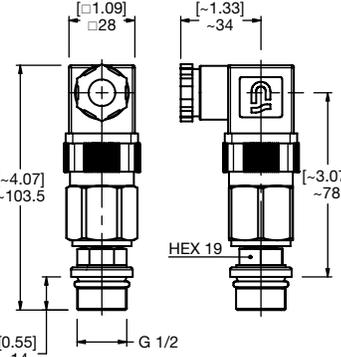


Specifications of Return Line Indicators in accordance with ATEX Directive

VR x C.x /-Ex2G

	Type of indication	Electrical switch	
	Weight	1.04 lbs (470 g)	
	Trip Pressure / Range	29 psi ±7.3 psi (2 bar ±0.5 bar)	
	Permitt. operating pressure	2900 psi (200 bar)	
	Permitt. temperature range	-4°F to 158°F (-20°C to 70°C) (T6) -4°F to 176°F (-20°C to 80°C) (T5)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	250 V	
	Electrical connection	Cable connection PG 9 Cable length 2 m	
	Max. switching voltage at resistive load	62.5 W = 250 VA ~	
	Switching capacity	Ohmic 0.25 A at 250 V = Ohmic 1 A at 250 V ~	
	Protection class to DIN 40050	IP 65	
	ATEX designation	⚡ II 2G EEx d IIC T6 / T5	
Order example	VR 2 C.0 /-Ex2G		

VR x C.x (ATEX) Can be used on filters up to Zone 1*

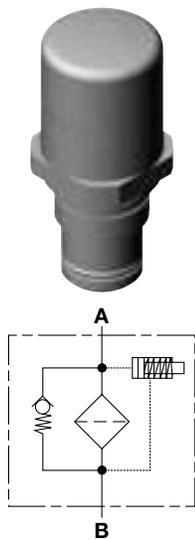
	Type of indication	Electrical switch	
	Weight	0.75 lbs (340 g)	
	Trip Pressure / Range	29 psi ±4.4 psi (2 bar ±0.3 bar)	
	Permitt. operating pressure	580 psi (40 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	22 Lbf-ft (30 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	*	
	Electrical connection	Male connection M20 Female connector to DIN 43650	
	Max. switching voltage at resistive load	*	
	Switching capacity	*	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VR 2 C.1 /-2GBC	

*The clogging indicator is simple electrical operating equipment according to DIN EN 60079-14 and may only be used in intrinsically safe circuits (*supplied with manufacturer's declaration and operating instructions*).

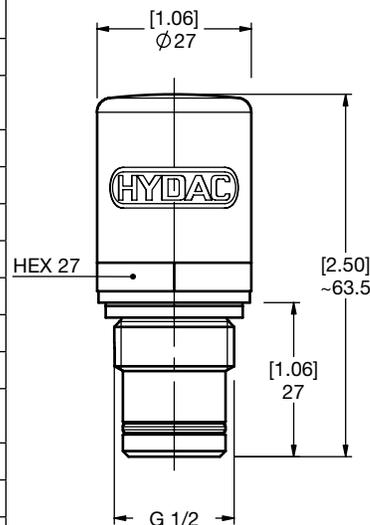
FILTER CLOGGING INDICATORS

Specifications of Differential Pressure Indicators in accordance with ATEX Directive

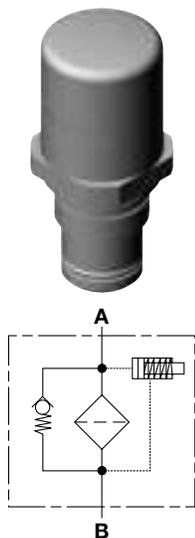
VM x B.x (ATEX) Can be used on aluminium filters up to Zone 1



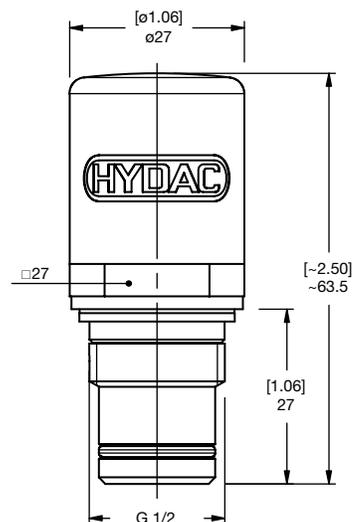
Type of indication	Visual, red/green band Automatic reset
Weight	0.24 lbs (110 g)
Trip Pressure / Range	73 psi - 10% (5 bar -10%) 116 psi ± 10% (8 bar ±10%)
Permitt. operating pressure	3000 psi (210 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	24 Lbf-ft (33 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VM 5 B.1 /-2GC



VD x B.x (ATEX) Can be used on filters up to Zone 1



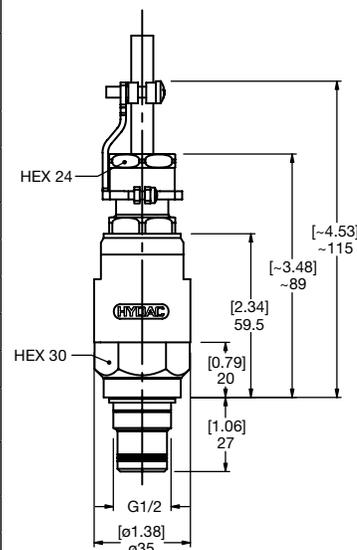
Type of indication	Visual, red/green band Automatic reset
Weight	0.24 lbs (110 g)
Trip Pressure / Range	73 psi - 10% (5 bar -10%) 116 psi ± 10% (8 bar ±10%)
Permitt. operating pressure	6000 psi (420 bar)
Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)
Thread	G 1/2
Max. torque	74 Lbf-ft (100 Nm)
Switching type	-
Max. switching voltage	-
Electrical connection	-
Max. switching voltage at resistive load	-
Switching capacity	-
Protection class to DIN 40050	-
Order example	VD 5 B.1 /-2GC



VD x C.x /-2GEXDIIC

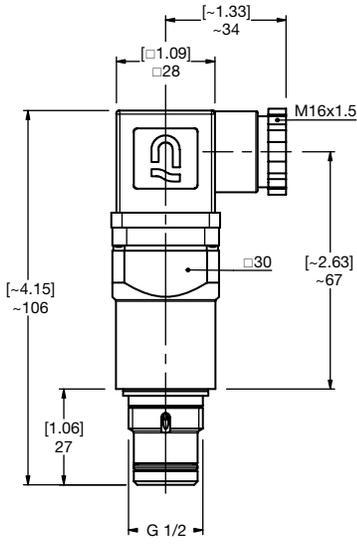


Type of indication	Electrical switch
Weight	1.32 lbs (600 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	6000 psi (420 bar)
Permitt. temperature range	-4°F to 140°F (-20°C to 60°C) setting (media temp. max. 75° C)
Thread	G 1/2
Max. torque	74 Lbf-ft (100 Nm)
Switching type	Change-over
Max. switching voltage	250 V
Electrical connection	Cable connection
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	ohmic 3 A at 24 V = ohmic 0.03 A to 5 A at 250 V ~
Protection class to DIN 40050	IP 66
ATEX designation	Ⓔ II 2G Ex d IIC T6
Order example	VD 2 C.1 /-2GEXDIIC

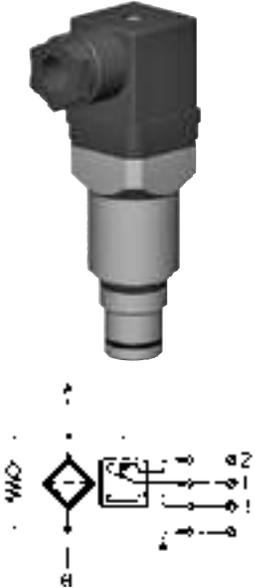
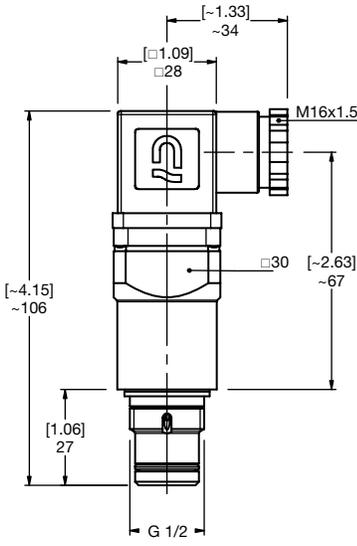


Specifications of Differential Pressure Indicators in accordance with ATEX Directive

VM x C.x (ATEX) Can be used on aluminium filters up to Zone 1

	Type of indication	Electrical switch	
	Weight	0.26 lbs (120 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	*	
	Electrical connection	Male connection M16 Female connector to DIN 43650	
	Max. switching voltage at resistive load	*	
	Switching capacity	*	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VM 5 C.0 /-2GBC-SO135	

VD x C.x (ATEX) Can be used on filters up to Zone 1*

	Type of indication	Electrical switch	
	Weight	0.49 lbs (220 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-22°F to 212°F (-30°C to 100°C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	N/C or N/O (<i>change-over contacts</i>)	
	Max. switching voltage	*	
	Electrical connection	Male connection M16 Female connector to DIN 43650	
	Max. switching voltage at resistive load	*	
	Switching capacity	*	
	Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)	
	Order example	VD 5 C.0 /-2GBC-SO135	

*The clogging indicator is simple electrical operating equipment according to DIN EN 60079-14 and may only be used in intrinsically safe circuits (*supplied with manufacturer's declaration and operating instructions*).

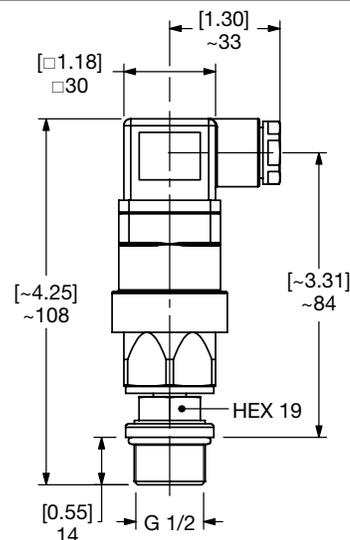
FILTER CLOGGING INDICATORS

Specifications of Return Line Indicators with UL or CSA approval

VR x C.x (CSA)



Type of indication	Electrical switch
Weight	0.75 lbs (340 g)
Trip Pressure / Range	29 psi -4.4 psi (2 bar -0.3 bar)
Permitt. operating pressure	580 psi (40 bar)
Permitt. temperature range	23°F to 248°F (-5°C to 120°C)
Thread	G 1/2
Max. torque	22 Lbf-ft (30 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	230 V
Electrical connection	Male connection PG 9 Female connector to DIN 43650
Max. switching voltage at resistive load	250 W = 300 VA ~
Switching capacity	Ohmic 4 A at 24 V Ohmic 0.3 to 4 A at max. 230 V ~
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VR 2 C.0 /-CSA

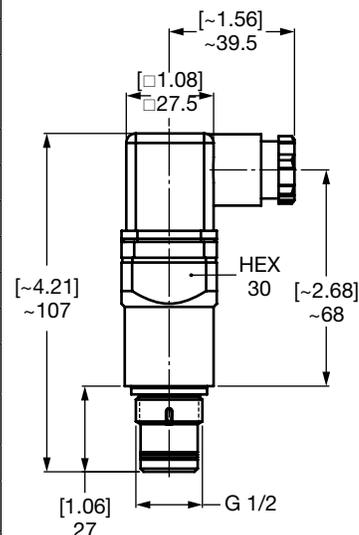


Specifications of Differential Pressure Indicators with UL or CSA approval

VM x C.x (UL, Standard 508)



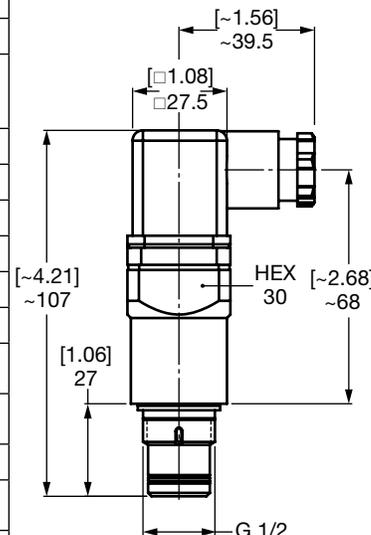
Type of indication	Electrical switch
Weight	0.26 lbs (120 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	3000 psi (210 bar)
Permitt. temperature range	-22°F to 176°F (-30°C to 80°C)
Thread	G 1/2
Max. torque	24 Lbf-ft (33 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	115 V
Electrical connection	Male connection PG 11 Female connector to DIN 43650
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	ohmic 3 A at 24 V =
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VM 5 C.0 /-CRUUS



VD x C.x (UL, Standard 508)

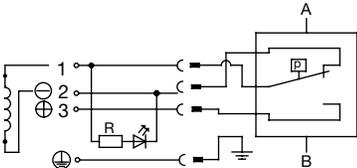
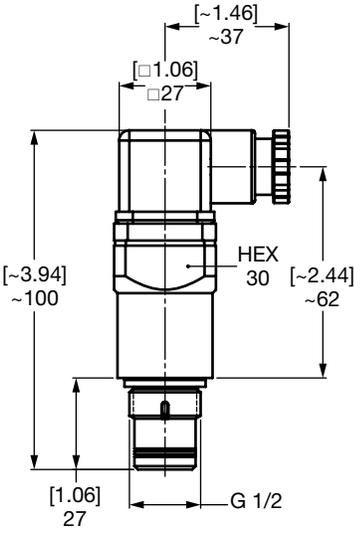


Type of indication	Electrical switch
Weight	0.55 lbs (250 g)
Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)
Permitt. operating pressure	6000 psi (420 bar)
Permitt. temperature range	-22°F to 176°F (-30°C to 80°C)
Thread	G 1/2
Max. torque	74 Lbf-ft (100 Nm)
Switching type	N/C or N/O (<i>change-over contacts</i>)
Max. switching voltage	115 V
Electrical connection	Male connection PG 11 Female connector to DIN 43650
Max. switching voltage at resistive load	60 W = 100 VA ~
Switching capacity	ohmic 3 A at 24 V =
Protection class to DIN 40050	IP 65 (<i>only if the connector is wired and fitted correctly</i>)
Order example	VD 5 C.0 /-CRUUS

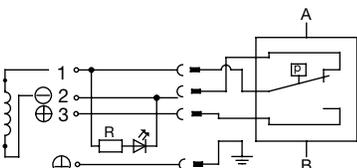
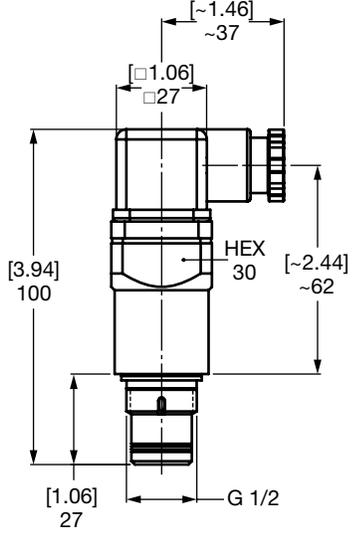


Specifications of Differential Pressure Indicators with UL or CSA approval

VM x D.x /-L... (UL, Standard 508)

 	Type of indication	Electrical switch	
	Weight	0.26 lbs (120 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	3000 psi (210 bar)	
	Permitt. fluid temperature	-13°F to 176°F (-25°C to 80°C)	
	Thread	G 1/2	
	Max. torque	24 Lbf-ft (33 Nm)	
	Switching type	N/O	
	Max. switching voltage	24, 110 V <i>(depending on the type of light insert)</i>	
	Electrical connection	Male connection PG 11 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity	ohmic 3 A at 24 V =	
	Protection class to DIN 40050	IP 65 <i>(only if the connector is wired and fitted correctly)</i>	
	Order example	VM 5 D.0 /-L24-CRUUS	

VD x D.x /-L... (UL, Standard 508)

 	Type of indication	Electrical switch	
	Weight	0.49 lbs (220 g)	
	Trip Pressure / Range	29 psi -10% (2 bar -10%) 73 psi -10% (5 bar -10%) 116 psi ±10% (8 bar ±10%)	
	Permitt. operating pressure	6000 psi (420 bar)	
	Permitt. temperature range	-13° F to 176° F (-25° C to 80° C)	
	Thread	G 1/2	
	Max. torque	74 Lbf-ft (100 Nm)	
	Switching type	N/O	
	Max. switching voltage	24, 110 V <i>(depending on the type of light insert)</i>	
	Electrical connection	Male connection PG 11 Female connector to DIN 43650	
	Max. switching voltage at resistive load	60 W = 100 VA ~	
	Switching capacity	ohmic 3 A at 24 V =	
	Protection class to DIN 40050	IP 65 <i>(only if the connector is wired and fitted correctly)</i>	
	Order example	VD 5 D.0 /-L24-CRUUS	

FILTER CLOGGING INDICATORS

Model Code: Standard Clogging Indicators

VR 2 D . X /-V-L24

Category

- VMF = Return line (*static*) indicator; connection G 1/8
- VR = Return line (*static*) indicator; connection G 1/2
- VM = Differential pressure indicator; up to 3000 psi (210 bar) operating pressure
- VD = Differential pressure indicator; up to 6000 psi (420 bar) operating pressure
- VL = Differential pressure indicator; up to 360 psi (25 bar) operating pressure

Pressure setting

- 1 = 15 psi (1 bar) (*optional, for use in 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, on DFDK & DFZ filters*)

Type

- B = Visual pop-up with automatic reset
- BF = Visual, mobile applications
- BM = Visual pop-up with manual reset
- C = Electrical switch
- CD = Electrical switch with Deutsch plug (*DT 04-2P*)
- D = Electric switch and Visual (*light - 24 VDC, 110 VAC*)
- E = Pressure gauge, horizontal (*static only*)
- ES = Pressure gauge, vertical
- F = Pressure switch, mobile applications
- FD = Pressure switch with Deutsch plug (*DT 04-2P*), mobile applications
- GC = Electronic analog (*4-20 mA or 1-10 V*) / pressure switch 75% and 100% trips (*VD & VR only*)
- GW = Electronic analog (*4-20 mA or 1-10 V*) / pressure switch 75% and 100% trips & bypass monitoring (*VL only*)
- J = Electric switch - Brad Harrison 5-pin mini connector
- J4 = Electric switch - Brad Harrison 4-pin micro connector
- LE = Electric pressure switch / visual pop-up button with 100% switching contact
- LEM = Electric pressure switch / visual pop-up button with 100% switching contact and M12x1 plug, mobile applications
- LZ = Electric pressure switch / visual pop-up button with 75% and 100% switching contact
- M = Electrical, ground switching
- UE = Vacuum pressure gauge, horizontal
- UF = Vacuum switch

Modification Number

- X = The latest version is always supplied

Supplementary Details

- T100 = Lockout below 100°F (VM, VD – types C, D, J and J4 only)
- 30C = Cold start suppression of switching outputs up to 30°C ±5°C
(*only for C, D, LZ indicators; DC voltage supply only – max. 24 Volt; C and D indicators only for VD and VM; on D and LZ indicators, contacts must be wired N/O only*)
- L... = Light with corresponding voltage (*24, 48, 110, 230 Volt*)] only for type “D”
- LED = 2 LEDs up to 24 Volt
- OE = N/C function
- SO135 = Indicator suitable for PLC controls (*Gold-Crosspoint contacts*)
- W = Suitable for oil/water emulsions (HFA, HFC)
- V = Fluorocarbon elastomer (FKM), suitable for phosphate esters (HFD-R) and biodegradable oils (*must be specified for type “GW”*)
Nitrile (NBR) is standard. Ethylene propylene (EPDM, code EPR) available upon request.
- 2M0 = Two contacts (*male*), 2-pin Deutsch connector, no connector cable
- 2M20 = Two contacts (*male*), 2-pin Deutsch connector, 200 mm connector cable

Supplementary Details for “GC” type

- SP = Analog signal: output 1-10 V] if SP or SQ are not specified “current sink” model supplied
- SQ = Analog signal: output 4-20 mA (*current source*)]
- 113 = N/O function - pressure peak suppression up to 10 sec.
Cold start suppression of switching outputs
(*PNP technique, positive switching*) up to 25°C] **Must be specified!**
Others on request
- 123 = N/C function - pressure peak suppression up to 10 sec.
Cold start suppression of switching outputs
(*PNP technique positive switching*) up to 25°C]
- 30C = Cold start suppression of switching outputs up to 30°C (*other temperatures on request*)
- LED = 3 LED's (*green, yellow, red*) in terminal box
- PF = Floating switching outputs (due to relay in the plug)

Supplementary Details to “GW” type

- 113 = N/O function - pressure peak suppression up to 10 sec.
Cold start suppression of switching outputs
(*PNP technique positive switching*) up to 25°C] **Must be specified!**
Others on request
- 123 = N/C function - pressure peak suppression up to 10 sec.
Cold start suppression of switching outputs
(*PNP technique positive switching*) up to 25°C]

Supplementary Details for “LZ” type

- AV = Plug and connector to AUDI, VW specification
- BO = Plug and connector to BMW, Opel, Ford specification
- BO-LED= Same as BO, but with progressive LED strip
- CN = Electrical connection, 1 connector DIN 43651 with 3 LEDs (to CNOMO specification NF E 48-700)
- DB = Electrical connection, 1 connector to DIN 43651 with 3 LEDs (to Daimler-Benz and BMW specification)
- D4C = Plug and connector to Daimler-Chrysler specification with cold start suppression 30 °C

Supplementary Details to “ATEX” type

- 2GC = For visual indicator type “B” with ATEX certificate
- 2GBC = For electrical indicator type “C” with ATEX certificate (the switch used in the indicator is a passive component according to EN 50020 and can therefore be used in intrinsically safe circuits as simple apparatus in accordance with EN 60079-14)
- 2GEXDIIC = For electrical indicator suitable for use in Zone 1 (Category 2), gas atmosphere, Category d (Flameproof Enclosure), Explosive subdivision IIC to ATEX directive
- EX2G = Ex-protection type for the return line indicator type “C”

Supplementary Details for “UL” and “CSA” approval

- cRUus = For electrical differential indicator type “C” and “D” with UL Underwriter’s Recognition
- CSA = For electrical return line indicator type “C” with CSA approval

Notes: 1. Old style indicators for filters HF2P / HF3P / HF4P - pre 2008 (Example **Model Code: B2210BHF**), contact HYDAC for further information.

2. VMF indicators of type B, LE, LZ, and C I-EX2G, must include “V” at the end of the Model Code if Fluorocarbon elastomer (FKM) seals are required. All other VMF indicators come with Fluorocarbon elastomer (FKM) seals as a standard (no Supplementary Detail required).

FILTER CLOGGING INDICATORS

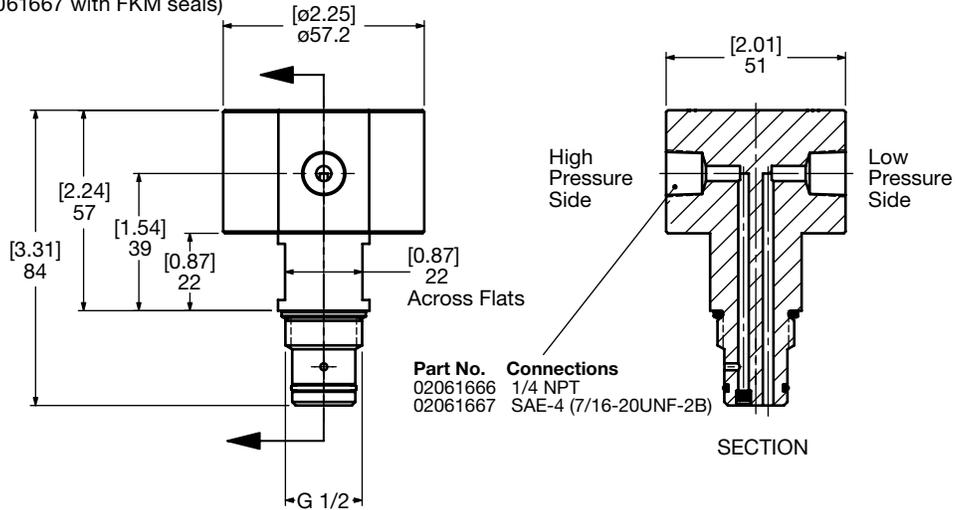
Dual Indicator / Gauge Blocks

Dual Gauge Block - G 1/2 Differential Indicator Port to SAE-4 or 1/4 NPT Ports

(Part No. 02061666 & 02061667 with FKM seals)

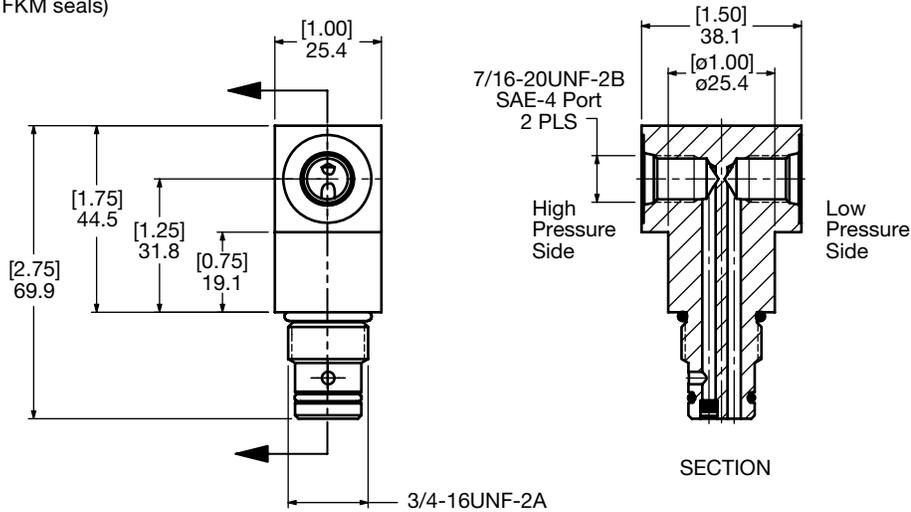
Remote-mount Applications:

- Use Part No. 02061666 / 02061667 / 319004 in filter head
- Use Part No. 02080588 / 318740 in remote location
- Keep pipe run below 10 ft.



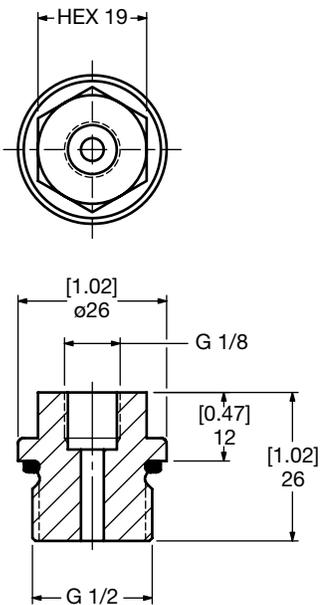
Dual Gauge Block - 3/4-16UNF-2A Differential Indicator Port to SAE-4 Ports

(Part No. 02059931 with FKM seals)



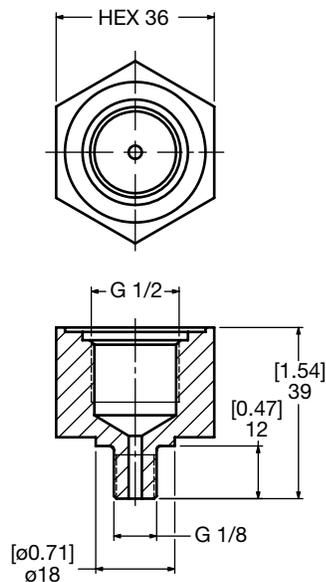
Adapter - Static - G 1/2" to G 1/8"

(Part No. 319004 w/NBR seal)



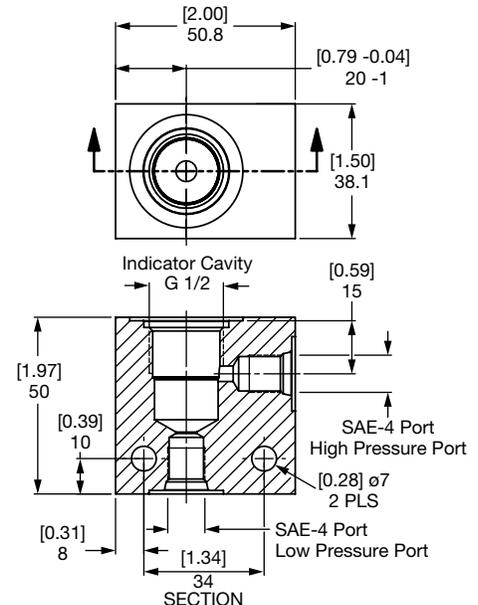
Adapter - Static - G 1/8" to G 1/2"

(Part No. 318740)



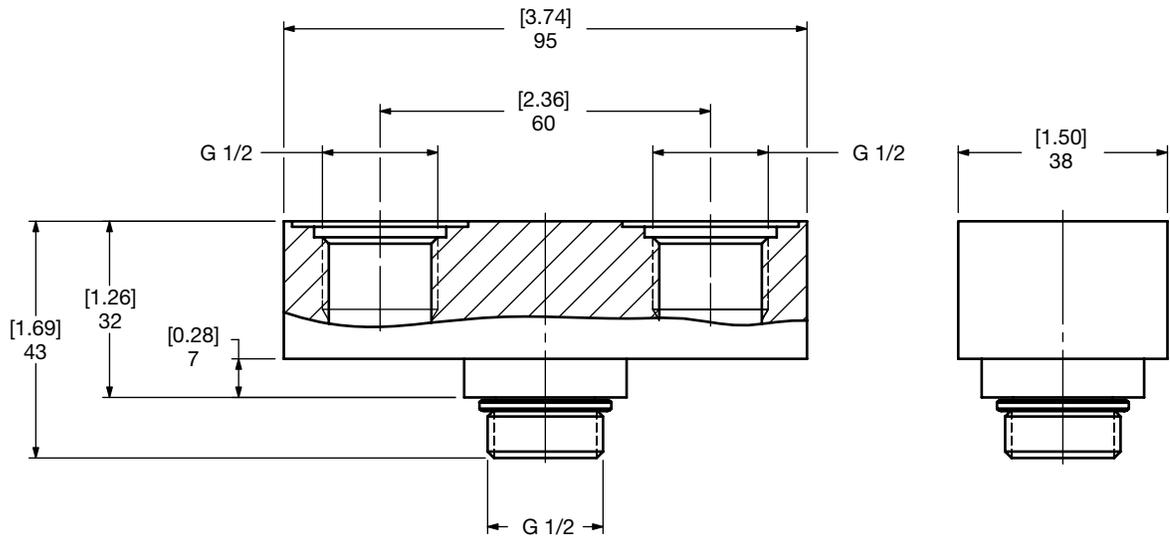
Pipe Connection Block - SAE-4 Ports to G1/2 Differential Indicator Port

(Part No. 02080588)

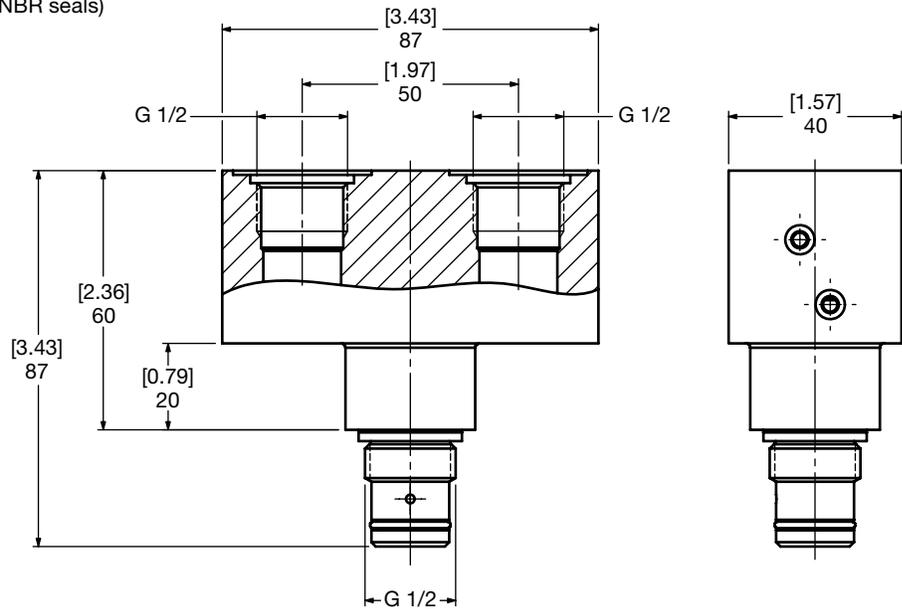


Note: Can be used as a test block

Dual Indicator Block- Static - G 1/2 port to 2 x G 1/2 ports
(Part No. 00318741 with NBR seal)



Dual Indicator Block- Differential - G 1/2 Indicator Port to 2 x G 1/2 Indicator Ports
(Part No. 00318732 with NBR seals)

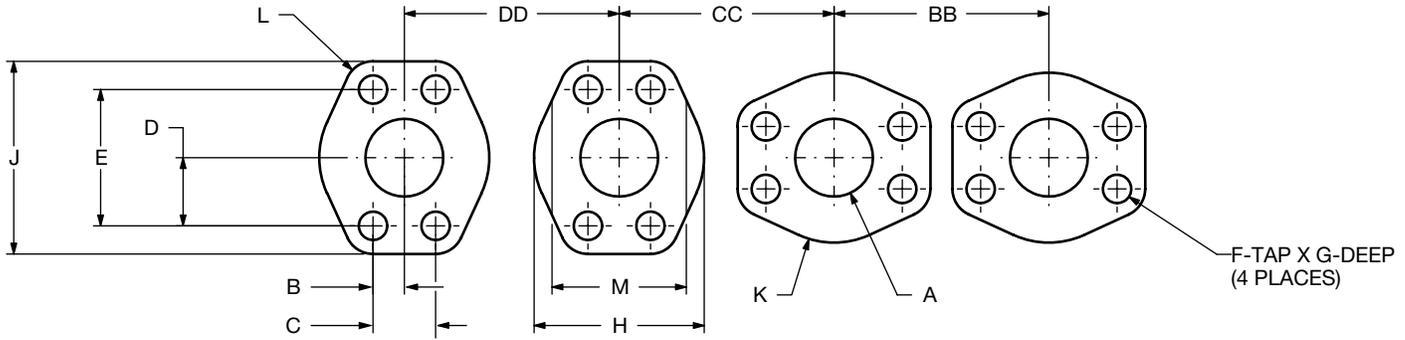


H Appendix – Flange Details

APPENDIX – FLANGE DETAILS

SAE Code 61 & 62

Flange Details



SAE 4 Bolt Flange Port Dimension: Code 61

SIZE CODE	MAX PRESS	A DIA. MAX	B ±0.01	C ±0.01	D ±0.01	E ±0.01	F UNC-2B	G MIN.	H ±0.01	J ±0.03	K RAD	L RAD	M MIN.	BB Min.	CC MIN.	DD MIN.
8	5000	0.5 12.7	9 0.34	17.48 0.688	19 0.75	38.10 1.5	5/16-18	24 0.94	46 1.81	54 2.12	23 0.91	8 0.31	33 1.31	56 2.22	52 2.06	49 1.91
12	5000	0.75 19.05	11 0.437	22.23 0.875	24 0.94	47.63 1.875	3/8-16	22 0.88	52 2.06	65 2.56	26 1.03	9 0.34	41 1.62	68 2.66	61 2.41	55 2.16
16	5000	1.00 25.4	13 0.52	26.19 1.031	26 1.03	52.37 2.062	3/8-16	22 0.88	59 2.31	70 2.75	29 1.16	9 0.34	48 1.88	72 2.84	67 2.62	61 2.41
20	4000	1.25 31.75	15 0.59	30.18 1.188	29 1.16	58.72 2.312	7/16-14	28 1.12	73 2.88	79 3.12	37 1.44	10 0.41	54 2.12	82 3.22	78 3.09	75 2.97
24	3000	1.5 38.1	18 0.70	35.71 1.406	35 1.38	69.85 2.75	1/2-13	27 1.06	83 3.25	94 3.69	41 1.62	12 0.47	64 2.50	96 3.78	90 3.56	85 3.34
32	3000	2.00 50.8	21 0.84	42.88 1.688	39 1.53	77.77 3.062	1/2-13	27 1.06	97 3.81	102 4.00	49 1.91	12 0.47	76 3.00	104 4.09	102 4.00	99 3.91
40	2500	2.5 63.5	25 1.00	50.8 2.00	44 1.75	88.90 3.50	1/2-13	30 1.19	109 4.28	114 4.500	54 2.14	13 0.50	89 3.50	117 4.59	114 4.50	111 4.38
48	2000	3.00 76.2	31 1.22	61.93 2.438	53 2.09	106.38 4.188	5/8-11	30 1.19	131 5.16	135 5.31	66 2.58	14 0.56	106 4.19	137 5.41	136 5.34	133 5.25
56	500	3.5 88.9	35 1.38	69.85 2.75	60 2.38	120.65 4.75	5/8-11	33 1.31	140 5.50	152 6.00	70 2.75	16 0.62	119 4.69	155 6.09	148 5.84	142 5.59
64	500	4.00 101.6	39 1.53	77.77 3.062	65 2.56	130.18 5.125	5/8-11	30 1.19	152 6.00	162 6.38	76 3.00	16 0.62	132 5.19	164 6.47	160 6.28	155 6.09
80	500	5.00 127	46 1.81	92.08 3.625	76.2 3.00	152.40 6.00	5/8-11	33 1.31	181 7.12	184 7.25	90 3.56	16 0.62	157 6.19	186 7.34	185 7.28	183 7.22

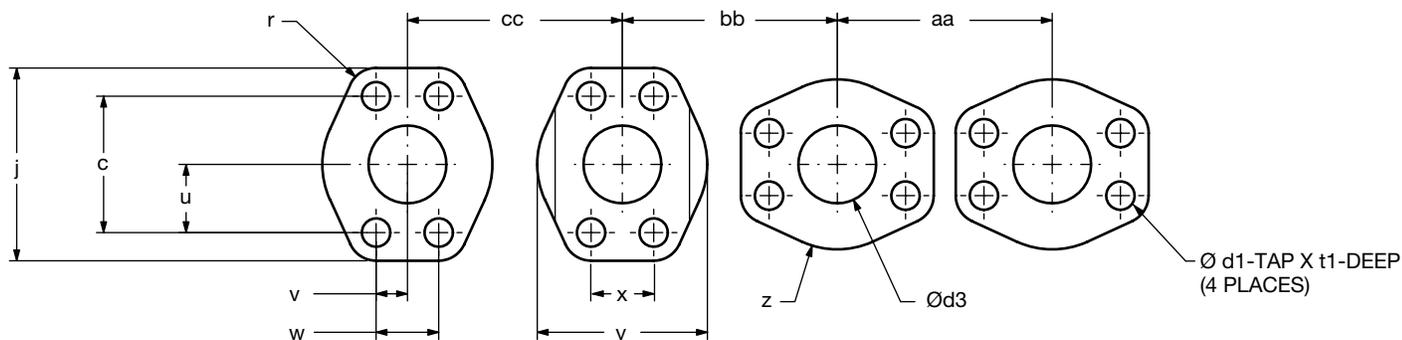
SAE 4 Bolt Flange Port Dimension: Code 62

SIZE CODE	MAX PRESS	A DIA. MAX	B ±0.01	C ±0.01	D ±0.01	E ±0.01	F UNC-2B	G MIN.	H ±0.01	J ±0.03	K RAD	L RAD	M MIN.	BB Min.	CC MIN.	DD MIN.
8	6000	0.5 12.7	9 0.359	18.24 0.718	20 0.80	40.49 1.594	5/16-18	21 0.81	48 1.88	56 2.22	24 0.94	8 0.31	38 1.50	59 2.34	56 2.22	53 2.09
12	6000	0.75 19.05	12 0.469	23.80 0.937	25 1.00	50.8 2.00	3/8-16	24 0.94	60 2.38	71 2.81	30 1.19	10 0.41	48 1.88	75 2.94	70 2.75	66 2.59
16	6000	1.00 25.4	14 0.55	27.76 1.093	28 1.12	57.15 2.250	7/16-14	27 1.06	70 2.75	81 3.19	35 1.38	12 0.47	54 2.12	84 3.31	80 3.16	75 2.97
20	6000	1.25 31.75	16 0.62	31.75 1.250	33 1.31	66.68 2.625	1/2-13	25 1.00	78 3.06	95 3.75	39 1.53	14 0.56	60 2.38	99 3.88	90 3.56	83 3.25
24	6000	1.5 38.1	18 0.72	36.50 1.437	40 1.56	79.38 3.125	5/8-11	35 1.38	95 3.75	113 4.44	48 1.88	17 0.66	70 2.75	116 4.56	108 4.25	101 3.97
32	6000	2.00 50.8	22 0.88	44.45 1.750	49 1.91	96.82 3.812	3/4-10	38 1.50	114 4.50	133 5.25	57 2.25	18 0.72	86 3.38	137 5.38	128 5.03	120 4.72
40*	6000	2.5 63.5	29.36 1.156	58.72 2.312	62 2.437	123.83 4.875	7/8-9	46 1.81	149.09 5.87	174.49 6.87	75 2.94	25 1.00	111 4.38	178 7.00	166 6.54	155 6.09
48*	6000	3.00 76.2	35.71 1.406	71.43 2.812	76 3.00	152.40 6.00	1 1/8-7	59 2.31	177.8 7	215.9 8.5	89 3.50	32 1.25	137 5.38	219 8.62	201 7.92	183 7.22

*Not SAE-Standard

SAE - DN

Flange Details



ISO 6162 Bolt Flange Port Dimension: 25-350 Bar Series

Size DN	Max Press. Bar (psi)	Ød3	v	w	u	c	Ød1	t1	y	j	z	r	x	aa	bb	cc
13	350 (5000)	(0.50) 12.7	(0.34) 8.75	(0.69) 17.5	(0.75) 19.05	(1.50) 38.1	M8 x 1.25	(0.49) 12.5	(1.81) 46	(2.13) 54	(0.91) 23	(0.31) 8	(1.30) 33	(2.20) 56	(2.05) 52	(1.93) 49
19	350 (5000)	(0.75) 19.1	(0.44) 11.15	(0.88) 22.3	(0.94) 23.8	(1.87) 47.6	M10 x 1.50	(0.65) 16.5	(2.05) 52	(2.56) 65	(1.02) 26	(0.35) 9	(1.61) 41	(2.68) 68	(2.40) 61	(2.17) 55
25	350 (5000)	(0.96) 25.4	(0.52) 13.1	(1.03) 26.2	(1.03) 26.2	(2.06) 52.4	M10 x 1.50	(0.57) 14.5	(2.32) 59	(2.76) 70	(1.14) 29	(0.35) 9	(1.89) 48	(2.83) 72	(2.64) 67	(2.40) 61
32	250 (4000)	(1.25) 31.8	(0.59) 15.1	(1.19) 30.2	(1.16) 29.35	(2.31) 58.7	M10 x 1.5	(0.65) 16.5	(2.87) 73	(3.11) 79	(1.46) 37	(0.39) 10	(2.13) 54	(3.23) 82	(3.07) 78	(2.95) 75
38	200 (3000)	(1.50) 38.1	(0.70) 17.85	(1.41) 35.7	(1.38) 34.95	(2.75) 69.9	M12 x 1.75	(0.77) 19.5	(3.27) 83	(3.7) 94	(1.61) 41	(0.47) 12	(2.52) 64	(3.78) 96	(3.54) 90	(3.35) 85
51	200 (3000)	(2.00) 50.8	(0.84) 21.45	(1.69) 42.9	(1.53) 38.9	(3.06) 77.8	M12 x 1.75	(0.77) 19.5	(3.82) 97	(4.02) 102	(1.93) 49	(0.47) 12	(2.99) 76	(4.09) 104	(4.02) 102	(3.90) 99
64	160 (2500)	(2.50) 63.5	(1.00) 25.4	(2.00) 50.8	(1.75) 44.45	(3.5) 88.9	M12 x 1.75	(0.85) 21.5	(4.29) 109	(4.49) 114	(2.13) 54	(0.51) 13	(3.5) 89	(4.61) 117	(4.49) 114	(4.37) 111
76	100 (2000)	(3.00) 76.2	(1.22) 30.95	(2.44) 61.9	(2.09) 53.2	(4.19) 106.4	M16 x 2.00	(1.12) 28.5	(5.16) 131	(5.31) 135	(2.60) 66	(0.55) 14	(4.17) 106	(5.39) 137	(5.35) 136	(5.24) 133
89	25 (500)	(3.50) 88.9	(1.38) 34.95	(2.75) 69.9	(2.38) 60.35	(4.75) 120.7	M16 x 2.00	(1.12) 28.5	(5.51) 140	(5.98) 152	(2.76) 70	(0.63) 16	(4.69) 119	(6.10) 155	(5.83) 148	(5.59) 142
102	25 (500)	(4.00) 101.6	(1.53) 38.9	(3.06) 77.8	(2.56) 65.1	(5.13) 130.2	M16 x 2.00	(1) 25.5	(5.98) 152	(6.38) 162	(2.36) 76	(0.63) 16	(5.20) 132	(6.46) 164	(6.30) 160	(6.10) 155
127	25 (500)	(5.00) 127	(1.81) 46.05	(3.63) 92.1	(3.00) 76.2	(6.00) 152.4	M16 x 2.00	(1.08) 27.5	(7.13) 181	(7.24) 184	(3.54) 90	(0.63) 16	(5.94) 151	(7.32) 186	(7.28) 185	(7.20) 183

ISO 6162 Bolt Flange Port Dimension: 400 Bar Series

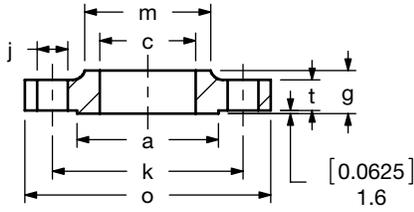
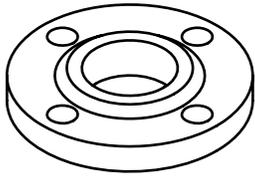
Size DN	Max Press. Bar (psi)	Ød3	v	w	u	c	Ød1	t1	y	j	z	r	x	aa	bb	cc
13	400 (6000)	(0.50) 12.7	(0.36) 9.1	(0.72) 18.2	(0.80) 20.25	(1.59) 40.5	M8 X 1.25	(0.57) 14.5	(1.89) 48	(2.20) 56	(0.94) 24	(0.31) 8	(1.50) 38	(2.32) 59	(2.20) 56	(2.09) 53
19	400 (6000)	(0.75) 19.1	(0.47) 11.9	(0.94) 23.8	(1.00) 25.4	(2.00) 50.8	M10 X 1.50	(0.65) 16.5	(2.36) 60	(2.80) 71	(1.18) 30	(0.39) 10	(1.89) 48	(2.95) 75	(2.76) 70	(2.6) 66
25	400 (6000)	(1.00) 25.4	(0.55) 13.9	(1.09) 27.8	(1.13) 28.6	(2.25) 57.2	M12 X 1.75	(0.85) 21.5	(2.76) 70	(3.19) 81	(1.38) 35	(0.47) 12	(2.13) 54	(3.31) 84	(3.15) 80	(2.95) 75
32	400 (6000)	(1.25) 31.8	(0.63) 15.9	(1.25) 31.8	(1.31) 33.3	(2.62) 66.6	M12 X 1.75	(0.73) 18.5	(3.07) 78	(3.74) 95	(1.54) 39	(0.55) 14	(2.36) 60	(3.9) 99	(3.54) 90	(3.27) 83
38	400 (6000)	(1.50) 38.1	(0.72) 18.25	(1.44) 36.5	(1.56) 39.65	(3.12) 79.3	M16 X 2.00	(0.81) 20.55	(3.74) 95	(4.45) 113	(1.89) 48	(0.67) 17	(2.76) 70	(4.57) 116	(4.25) 108	(3.98) 101
51	400 (6000)	(2.00) 50.8	(0.88) 22.25	(1.75) 44.5	(1.91) 48.4	(3.81) 96.8	M20 X 2.50	(1.32) 33.5	(4.49) 114	(5.24) 133	(2.24) 57	(0.71) 18	(3.39) 86	(5.39) 137	(5.04) 128	(4.72) 120

APPENDIX – FLANGE DETAILS

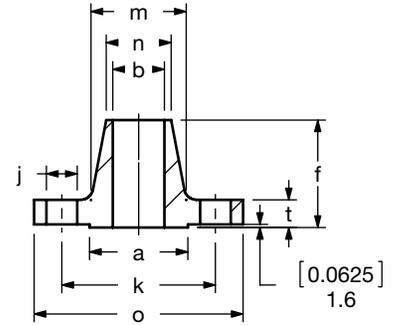
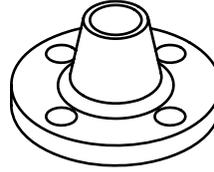
ANSI

Flange Details

Slip On



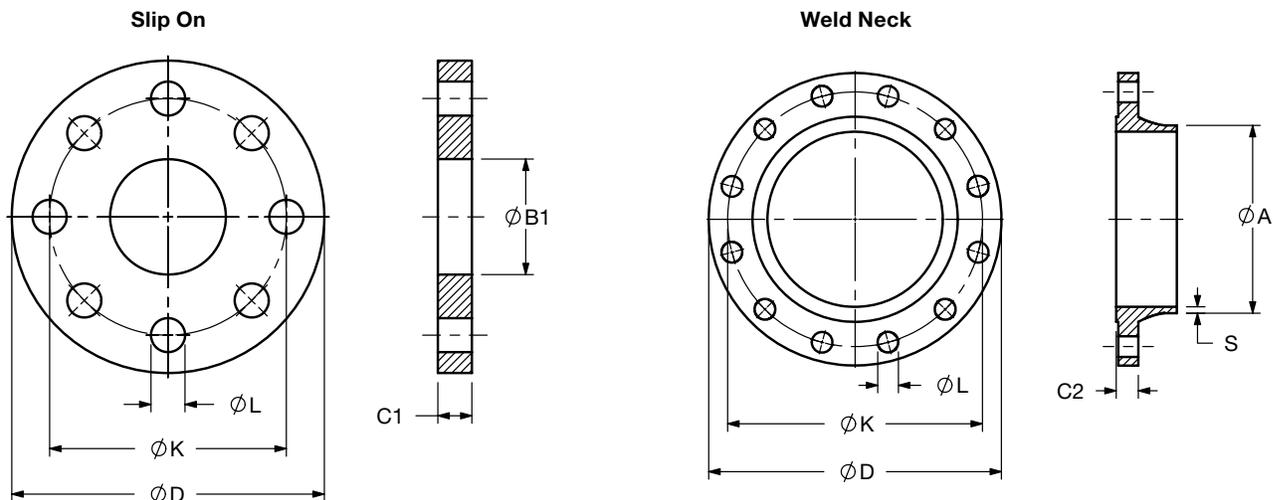
Welding Neck



150 lb. ANSI Flange Port Dimensions

Pipe size	o	t	a	b	c	# of holes	j	k
0.5	(3.50) 88.9	(0.44) 11.1	(1.38) 34.9	(0.62) 15.7	(0.88) 22.35	4	(0.63) 15.88	(2.38) 60.3
0.75	(3.88) 98.4	(0.50) 12.7	(1.69) 42.9	(0.82) 20.8	(1.09) 27.69	4	(0.63) 15.88	(2.75) 69.85
1	(4.25) 107.9	(0.56) 14.29	(2.00) 50.8	(1.05) 26.67	(1.36) 34.5	4	(0.63) 15.88	(3.13) 79.4
1.25	(4.63) 117.5	(0.63) 15.9	(2.50) 63.5	(1.38) 35.05	(1.70) 43.2	4	(0.63) 15.88	(3.50) 88.9
1.5	(5.00) 127	(0.69) 17.5	(2.88) 73	(1.61) 40.9	(1.95) 49.5	4	(0.63) 15.88	(3.88) 98.4
2	(6.00) 152.4	(0.75) 19	(3.63) 92.1	(2.07) 52.6	(2.44) 61.98	4	(0.75) 19	(4.75) 120.6
2.5	(7.00) 177.8	(0.88) 22.2	(4.13) 104.8	(2.47) 62.7	(2.94) 74.7	4	(0.75) 19	(5.50) 139.7
3	(7.50) 190.5	(0.94) 23.8	(5.00) 127	(3.07) 78	(3.57) 90.7	4	(0.75) 19	(6.00) 152.4
3.5	(8.50) 215.9	(0.94) 23.8	(5.50) 139.7	(3.55) 90.17	(4.07) 103.4	8	(0.75) 19	(7.00) 177.8
4	(9.00) 228.6	(0.94) 23.8	(6.19) 157.2	(4.03) 102.4	(4.57) 116.1	8	(0.75) 19	(7.50) 190.5
5	(10.00) 254	(0.94) 23.8	(7.31) 185.7	(5.05) 128.3	(5.66) 143.8	8	(0.88) 22.2	(8.50) 215.9
6	(11.00) 279.4	(1.00) 25.4	(8.50) 215.9	(6.07) 154.2	(6.72) 170.7	8	(0.88) 22.2	(9.50) 241.3
8	(13.50) 342.9	(1.13) 28.6	(10.63) 269.9	(7.98) 202.7	(8.72) 221.5	8	(0.88) 22.2	(11.75) 298.5
10	(16.00) 406.4	(1.19) 30.2	(12.75) 323.8	(10.02) 254.5	(10.88) 276.4	12	(1.00) 25.4	(14.25) 362
12	(19.00) 482.6	(1.25) 31.8	(15.00) 381	(12.00) 304.8	(12.88) 327.2	12	(1.00) 25.4	(17.00) 431.8

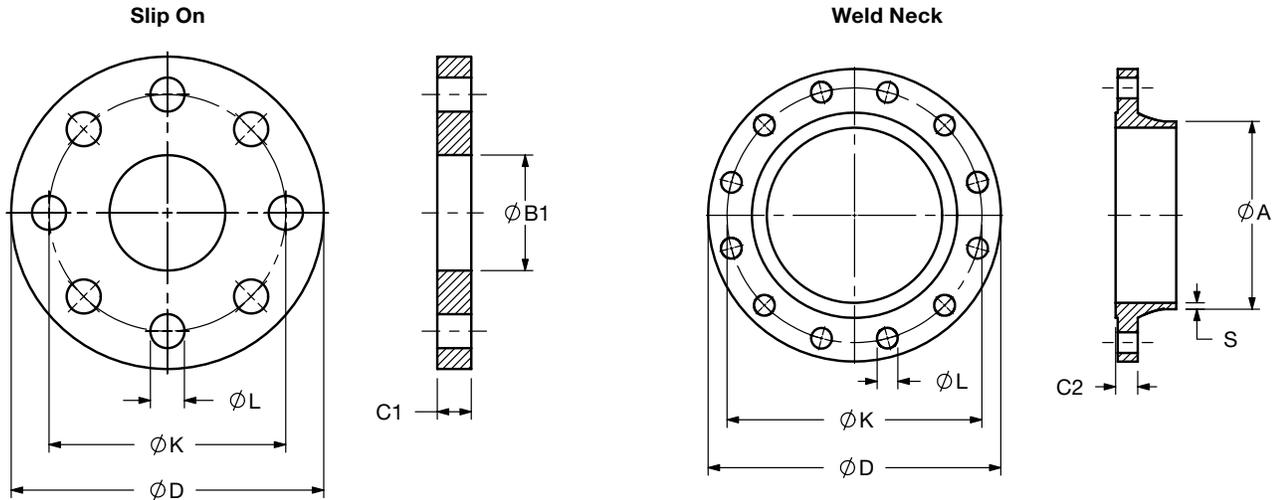
DN Flange DIM PN 16



DN	D	K	L	# OF BOLTS	BOLT SIZE	A	B1	C1	C2	S
10	(3.54) 90	(2.36) 60	(0.55) 14	4	M12	(0.68) 17.2	(0.71) 18	(0.55) 14	(0.63) 16	(0.07) 1.8
15	(3.74) 95	(2.56) 65	(0.55) 14	4	M12	(0.84) 21.3	(0.87) 22	(0.55) 14	(0.63) 16	(0.08) 2
20	(4.13) 105	(2.95) 75	(0.55) 14	4	M12	(1.06) 26.9	(1.08) 27.5	(0.63) 16	(0.71) 18	(0.09) 2.3
25	(4.53) 115	(3.35) 85	(0.55) 14	4	M12	(1.33) 33.7	(1.36) 34.5	(0.63) 16	(0.71) 18	(0.10) 2.6
32	(5.51) 140	(3.94) 100	(0.71) 18	4	M16	(1.67) 42.4	(1.71) 43.5	(0.71) 18	(0.71) 18	(0.10) 2.6
40	(5.91) 150	(4.33) 110	(0.71) 18	4	M16	(1.90) 48.3	(1.95) 49.5	(0.71) 18	(0.71) 18	(0.10) 2.6
50	(6.5) 165	(4.92) 125	(0.71) 18	4	M16	(2.37) 60.3	(2.42) 61.5	(0.79) 20	(0.71) 18	(0.11) 2.9
65	(7.28) 185	(5.71) 145	(0.71) 18	8	M16	(3.00) 76.1	(3.05) 77.5	(0.79) 20	(0.71) 18	(0.11) 2.9
80	(7.87) 200	(6.30) 160	(0.71) 18	8	M16	(3.50) 88.9	(3.56) 90.5	(0.79) 20	(0.79) 20	(0.13) 3.2
100	(8.66) 220	(7.09) 180	(0.71) 18	8	M16	(4.50) 114.3	(4.57) 116	(0.87) 22	(0.79) 20	(0.14) 3.6
125	(9.84) 250	(8.27) 210	(0.71) 18	8	M16	(5.50) 139.7	(5.57) 141.5	(0.87) 22	(0.87) 22	(0.16) 4
150	(11.22) 285	(9.45) 240	(0.87) 22	8	M20	(6.63) 168.3	(6.71) 170.5	(0.94) 24	(0.87) 22	(0.18) 4.5
200	(13.39) 340	(11.61) 295	(0.87) 22	12	M20	(8.63) 219.1	(8.72) 221.5	(1.02) 26	(0.94) 24	(0.25) 6.3
250	(15.94) 405	(13.98) 355	(1.02) 26	12	M24	(10.75) 273	(10.89) 276.5	(1.14) 29	(1.02) 26	(0.25) 6.3
300	(18.11) 460	(16.14) 410	(1.02) 26	12	M24	(12.75) 323.9	(12.89) 327.5	(1.26) 32	(1.10) 28	(0.28) 7.1

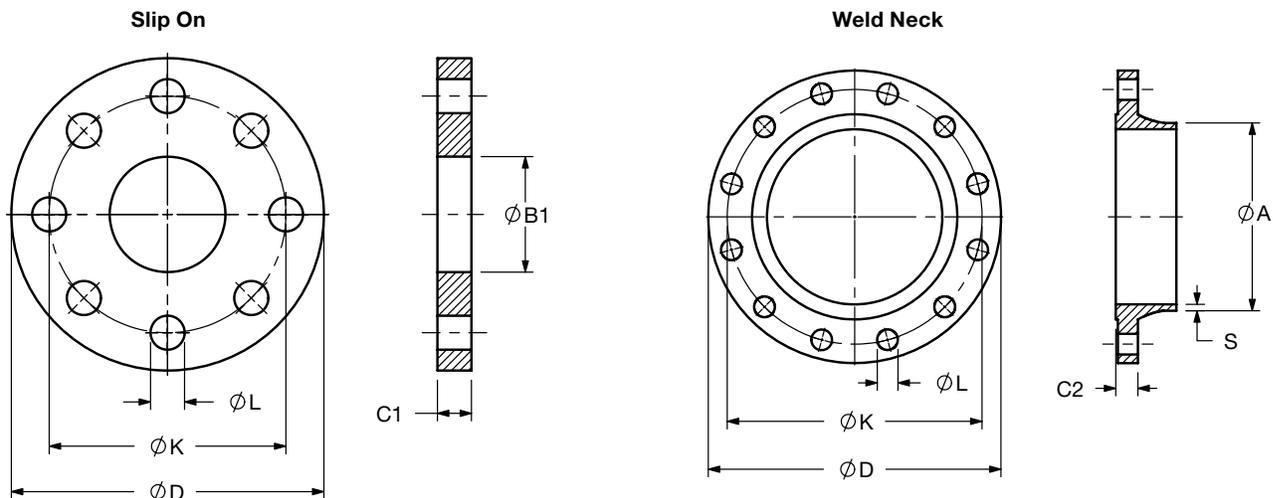
APPENDIX – FLANGE DETAILS

DN Flange DIM PN 25



DN	D	K	L	# OF BOLTS	BOLT SIZE	A	B1	C1	C2	S
10	(3.54) 90	(2.36) 60	(0.55) 14	4	M12	(0.68) 17.2	(0.71) 18	(0.55) 14	(0.63) 16	(0.07) 1.8
15	(3.74) 95	(2.56) 65	(0.55) 14	4	M12	(0.84) 21.3	(0.87) 22	(0.55) 14	(0.63) 16	(0.08) 2
20	(4.13) 10ww5	(2.95) 75	(0.55) 14	4	M12	(1.06) 26.9	(1.08) 27.5	(0.63) 16	(0.71) 18	(0.09) 2.3
25	(4.53) 115	(3.35) 85	(0.55) 14	4	M12	(1.33) 33.7	(1.36) 34.5	(0.63) 16	(0.71) 18	(0.10) 2.6
32	(5.51) 140	(3.94) 100	(0.71) 18	4	M16	(1.67) 42.4	(1.71) 43.5	(0.71) 18	(0.71) 18	(0.10) 2.6
40	(5.91) 150	(4.33) 110	(0.71) 18	4	M16	(1.90) 48.3	(1.95) 49.5	(0.71) 18	(0.71) 18	(0.10) 2.6
50	(6.50) 165	(4.92) 125	(0.71) 18	4	M16	(2.37) 60.3	(2.42) 61.5	(0.79) 20	(0.79) 20	(0.11) 2.9
65	(7.28) 185	(5.71) 145	(0.71) 18	8	M16	(3.00) 76.1	(3.05) 77.5	(0.87) 22	(0.87) 22	(0.11) 2.9
80	(7.87) 200	(6.3) 160	(0.71) 18	8	M16	(3.50) 88.9	(3.56) 90.5	(0.94) 24	(0.94) 24	(0.13) 3.2
100	(9.25) 235	(7.48) 190	(0.87) 22	8	M20	(4.50) 114.3	(4.57) 116	(1.02) 26	(0.94) 24	(0.14) 3.6
125	(10.63) 270	(8.66) 220	(1.02) 26	8	M24	(5.50) 139.7	(5.57) 141.5	(1.10) 28	(1.02) 26	(0.16) 4
150	(11.81) 300	(9.84) 250	(1.02) 26	8	M24	(6.63) 168.3	(6.71) 170.5	(1.18) 30	(1.10) 28	(0.18) 4.5
200	(14.17) 360	(12.2) 310	(1.02) 26	12	M24	(8.63) 219.1	(8.72) 221.5	(1.26) 32	(1.18) 30	(0.25) 6.3
250	(16.73) 425	(14.57) 370	(1.18) 30	12	M27	(10.75) 273	(10.89) 276.5	(1.38) 35	(1.26) 32	(0.28) 7.1
300	(19.09) 485	(16.93) 430	(1.18) 30	16	M27	(12.75) 323.9	(12.89) 327.5	(1.50) 38	(1.34) 34	(0.31) 8

DN Flange DIM PN 40



DN	D	K	L	# OF BOLTS	BOLT SIZE	A	B1	C1	C2	S
10	(3.54) 90	(2.36) 60	(0.55) 14	4	M12	(0.68) 17.2	(0.71) 18	(0.55) 14	(0.63) 16	(0.07) 1.8
15	(3.74) 95	(2.56) 65	(0.55) 14	4	M12	(0.84) 21.3	(0.87) 22	(0.55) 14	(0.63) 16	(0.08) 2
20	(4.13) 105	(2.95) 75	(0.55) 14	4	M12	(1.06) 26.9	(1.08) 27.5	(0.63) 16	(0.71) 18	(0.09) 2.3
25	(4.53) 115	(3.35) 85	(0.55) 14	4	M12	(1.33) 33.7	(1.36) 34.5	(0.63) 16	(0.71) 18	(0.10) 2.6
32	(5.51) 140	(3.94) 100	(0.71) 18	4	M16	(1.67) 42.4	(1.71) 43.5	(0.71) 18	(0.71) 18	(0.10) 2.6
40	(5.91) 150	(4.33) 110	(0.71) 18	4	M16	(1.90) 48.3	(1.95) 49.5	(0.71) 18	(0.71) 18	(0.10) 2.6
50	(6.50) 165	(4.92) 125	(0.71) 18	4	M16	(2.37) 60.3	(2.42) 61.5	(0.79) 20	(0.79) 20	(0.11) 2.9
65	(7.28) 185	(5.71) 145	(0.71) 18	8	M16	(3.00) 76.1	(3.05) 77.5	(0.87) 22	(0.87) 22	(0.11) 2.9
80	(7.87) 200	(6.3) 160	(0.71) 18	8	M16	(3.50) 88.9	(3.56) 90.5	(0.94) 24	(0.94) 24	(0.13) 3.2
100	(9.25) 235	(7.48) 190	(0.87) 22	8	M20	(4.50) 114.3	(4.57) 116	(1.02) 26	(0.94) 24	(0.14) 3.6
125	(10.63) 270	(8.66) 220	(1.02) 26	8	M24	(5.50) 139.7	(5.57) 141.6	(1.10) 28	(1.02) 26	(0.16) 4
150	(11.81) 300	(9.84) 250	(1.02) 26	8	M24	(6.63) 168.3	(6.71) 170.5	(1.18) 30	(1.10) 28	(0.18) 4.5
200	(14.76) 375	(12.60) 320	(1.18) 30	12	M27	(8.63) 219.1	(8.72) 221.5	(1.42) 36	(1.34) 34	(0.25) 6.3
250	(17.72) 450	(15.16) 385	(1.30) 33	12	M30	(10.75) 273	(10.89) 276.5	(1.65) 42	(1.50) 38	(0.28) 7.1
300	(20.28) 515	(17.72) 450	(1.30) 33	16	M30	(12.75) 323.9	(12.89) 327.5	(2.05) 52	(1.65) 42	(0.31) 8



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- Please see our Distributor Website for a list of all QuickShip parts.
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Quick Ship For Filters and Elements

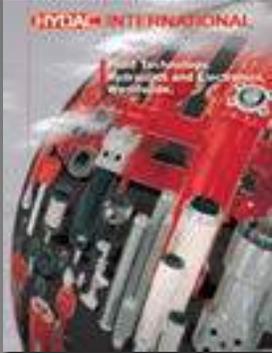
Optimicon	D elements (<i>pressure filters</i>)*	Low Collapse, 10-micron, Nitrile rubber (NBR)
	R elements (<i>return filters</i>)*	B3 bypass, 10-micron, Nitrile rubber (NBR)
Betamicron	D elements (<i>pressure filters</i>)*	High Collapse, 3 & 10-micron, Nitrile rubber (NBR)
Betterfit	Extensive selection - Consult HYDAC	Nitrile rubber (NBR) only
DF Filters	Select model codes - Consult HYDAC	Select elements and indicators
RF Filters	Select model codes - Consult HYDAC	Select elements and indicators
NF Filters	Select model codes - Consult HYDAC	Select elements and indicators
RFM Filters	Select model codes - Consult HYDAC	Select elements and indicators
MFM Filters	Select model codes - Consult HYDAC	Select elements and indicators
DIN Elements	DN Elements (<i>pressure filters</i>)*	Low & High Collapse, 3 & 10-micron, Nitrile rubber (NBR)
	RN Elements (<i>return filters</i>)*	10-micron, Nitrile rubber (NBR)

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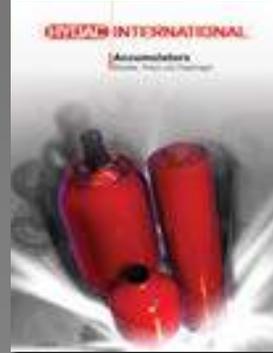
Overview Brochure
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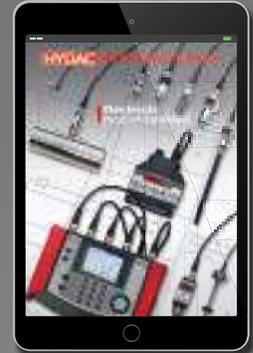
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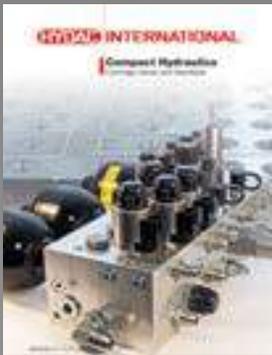
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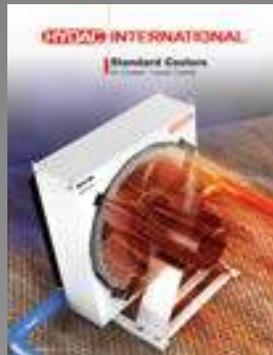
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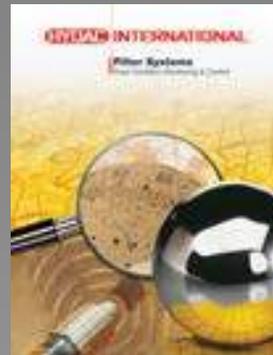
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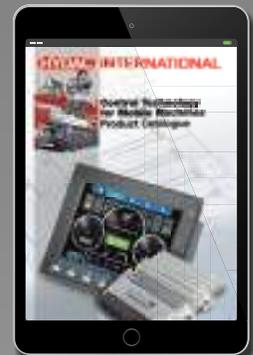
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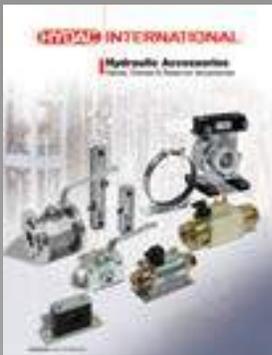
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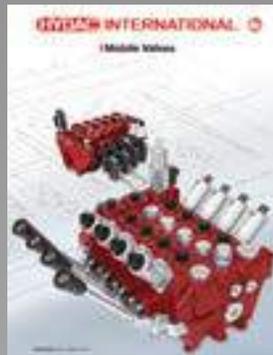
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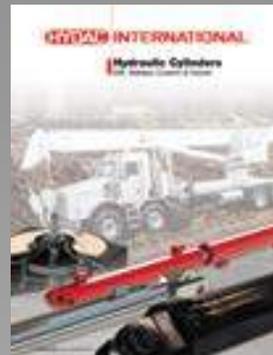
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