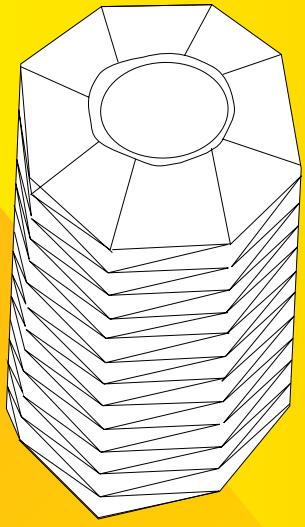
3M Science. Applied to Life.™

3M Purification Inc.

Compound radial pleats. Applied to minimizing your footprint.



The 3M™ High Flow Filter System is a result of 3M Purification's extensive filtration experience applied to delivering high flow filter technology in a compact design. For those customers who want filtration efficiency and a small footprint, 3M High Flow filter system may be the right filtration solution.

High performance media in an innovative design.

Figure 1: 3M™ High Flow single round filter system

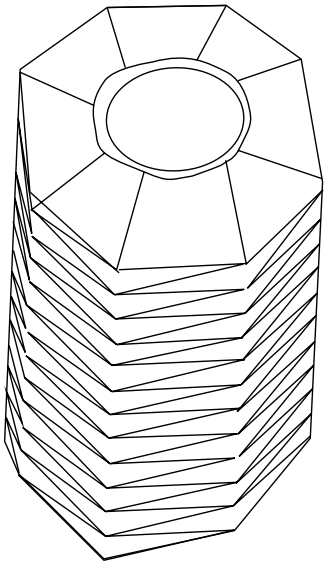


Figure 2: 3M compound radial pleat design

High flow capability

The 3M™ High Flow filter system is designed to accommodate flow rates of up to 500 gallons per minute (gpm) in a single 60" length filter cartridge. The result? Fewer filter elements to maintain your process flow requirements. In fact, 3M High Flow filter systems require as few as one-tenth the number of elements as conventional 2.5" outer diameter (OD) filter cartridges (see Figure 4).

3M High efficiency filter media in a compound radial Pleat structure

3M innovation is at the heart of the 3M High Flow filter. A compound radial pleat design (see Figure 2) helps maximize the usable surface area of each filter. Blown microfiber forms the basis of the filter media, which is manufactured to tightly-controlled fiber diameter specifications, producing a media with absolute-rated particle retention characteristics. The 3M Purification manufacturing process embosses the media to produce a more uniform pleat pattern, which, in turn, allows greater utilization of the media by evenly distributing the process fluid throughout the entire filter structure. This results in consistent particle retention in a compact, space-saving design. 3M High Flow cartridge's polypropylene end caps, outer sleeve, and core protect the pleat structure integrity and provide a robust filter construction.

Compact system design

Fewer required filter cartridges combined with an outside-to-inside flow path reduces the size of housing required for your application. The 3M High Flow filter housing takes up as little as one-half the size of conventional 2.5" OD filter cartridge housings for a given flow rate. The result is lower capital investment costs and a compact footprint that saves valuable plant space (see Figure 4).

Ease of use with twist-to-lock

The 3M™ High Flow filter system is designed with ease-of-use in mind. From a user-friendly, ergonomically designed handle that makes cartridge installation and removal easier without the use of special tools or other hardware, to a "twist-to-lock" cartridge seating mechanism that provides a positive seal, the 3M High Flow filter system facilitates easy operation and maintenance of your filter system.

3M™ High Flow HFM series filters for organic and/or biological contaminants

The High Flow HFM series filters utilize a 3M microfiber media specifically designed for use in process fluid applications containing organic and/or biological contaminants. The media design helps prevent premature blinding of the filter outer surface, promoting fuller utilization of the media, resulting in an optimum combination of particle removal efficiency and contaminant holding capability.

Industries	Applications
Municipal Water **General Industrial** **Oil & Gas** **Chemicals & Petrochemicals** **Food & Beverage** **Electronics**	• Pre-RO Water • Process Waters (Cooling, Quenching) • Wastewater & Reclaimed Waters • Injection & Produced Waters • Boiler Condensate • Amine Sweetening • Catalyst Protection/Recovery • Machine Coolants
Features	**Benefits**
High Flow Capability per Cartridge (vs. conventional 2.5" diameter cartridges)	Fewer cartridges required, resulting in: • Reduced cartridge handling & disposal • Reduced filter change-out time • Less individual cartridge seal points, reducing chance of fluid bypass
Compound Radial Pleat Design using 3M Blown Microfiber Polypropylene Media	• High filter loading capacity • Reproducible filter effluent quality throughout life of filter • Broad chemical compatibility
Compact System Design	• Smaller housing minimizes capital expense requirements • Reduces system footprint
Easy to Use	• No special tools or hardware required for filter change-out • "Twist-to-lock" cartridge seating mechanism provides positive seal • Ergonomic designed handle facilitates cartridge installation and removal
FDA CFR-21 Listed Material	• Compatible in applications requiring direct food contact in food and beverage processing

Figure 3: 3M™ High Flow filter cartridge design features

Ease of use
An ergonomically designed handle facilitates fast and easy insertion and removal without the use of special tools. Cartridges are simply inserted over a built-in guide tube.

Polypropylene construction
Provides wide range of compatibility with various fluids.

Compound radial pleat design
Maximizes usable surface area per cartridge

High flow
3-inch core permits up to 500 gpm through a single cartridge (60” length). Seating mechanism uses a “twist to lock” design to provide a positive seal.

3M™ High Flow system vs. conventional 2.5” filter systems comparison basis:

- 40” length cartridges
- Fluid viscosity: 1 cps
- **Flow rates per cartridge:**
  - 3M™ High Flow cartridge: 350 gpm
  - 2.5” outer diameter (OD) conventional pleated cartridge: 20 gpm
  - 2.5” outer diameter (OD) conventional depth cartridge: 15 gpm

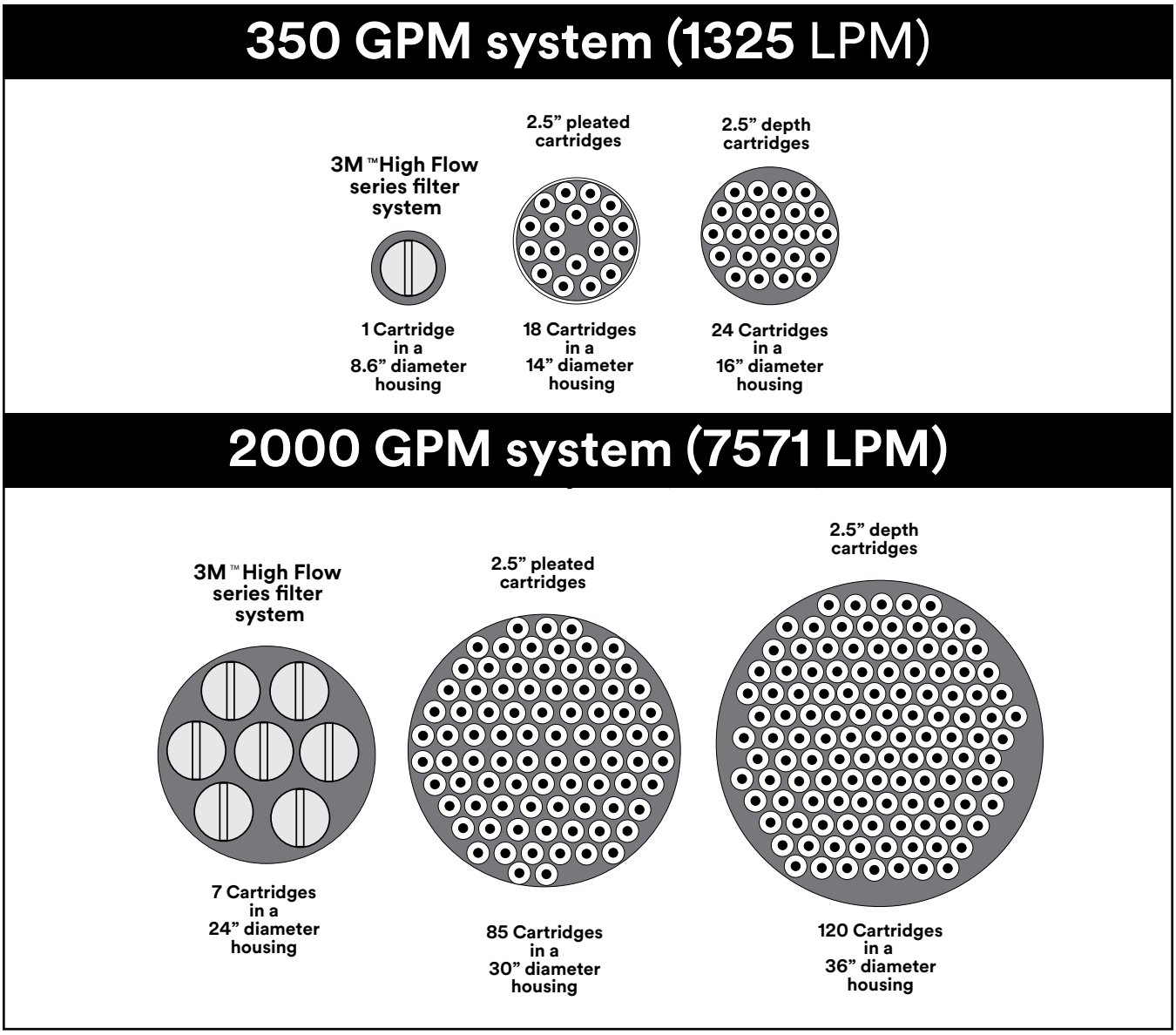


Figure 4 – Comparison of required filter cartridges & housing footprint

The Bottom line:

- The 3M High Flow system requires 90% fewer cartridges as conventional 2.5” OD cartridge systems for a given flow rate
- 3M High Flow series filter housings are 33% to 50% smaller than filter housings for conventional 2.5” OD cartridges for a given flow rate
- Fewer filters and a user-friendly housing design mean easier and faster filter change-outs

3M™ High Flow Series Filter Specifications

Construction	
Absolute Rating (microns)	HF Series: 1, 2, 5, 10, 15, 25, 40, 70 HFM Series: 5, 10,20, 70* *5 micron nominal
Filter Media, Center Core, End Caps, Outer Sleeve	Polypropylene
Sealing O-ring options	Nitrile, ethylene propylene rubber (EPR), silicone, fluorocarbon
O-Ring Size/End Cap Connection	338 (Special Thread Design) 3.0” (76.2 mm)
Cartridge Dimensions	
Inside Diameter (nominal)	3.0" (76.2 mm)
Outside Diameter (nominal)	6.5" (165 mm)
Length (nominal)	10” (254 mm) 40" (1016 mm) 60” (1524 mm)
Operating Conditions	
Maximum Recommended Flow Rate in Water (@70° F)	85 gpm (19.3 m3/hr) – 10” Length 350 gpm (79.5 m3/hr) – 40” Length 500 gpm (113.6 m3/hr) – 60” Length
Maximum Continuous Operating Temperature	160 °F (71 °C)
Maximum Hot Water Sanitization Temperature	194 °F (90 °C)
Maximum Forward Differential Pressure	50 psid @ 68°F (3.4 bar @ 20°C)
Recommended Change-out Differential Pressure	35 psid @ 68°F (2.4 bar @ 20°C)
Clean Pressure Drop	See Figure 5
Regulatory	
FDA CFR-21 Listed Materials of Construction	

3M™ High Flow system filter housings

3M™ High Flow system filter housings are specifically designed to deliver all of the system's benefits in a compact footprint in your production site. Housings are available in standard designs, as well as customizable configurations to suit your specific needs. All standard 3M High Flow series filter housings for use with the 40-inch & 60-inch length cartridges are designed, manufactured, tested, and code-stamped in accordance with ASME Section VIII, Division 1. The external surfaces of the stainless steel housing versions are glass bead blasted for a consistent, easy care finish, while the external surfaces of the carbon steel housing versions are painted.

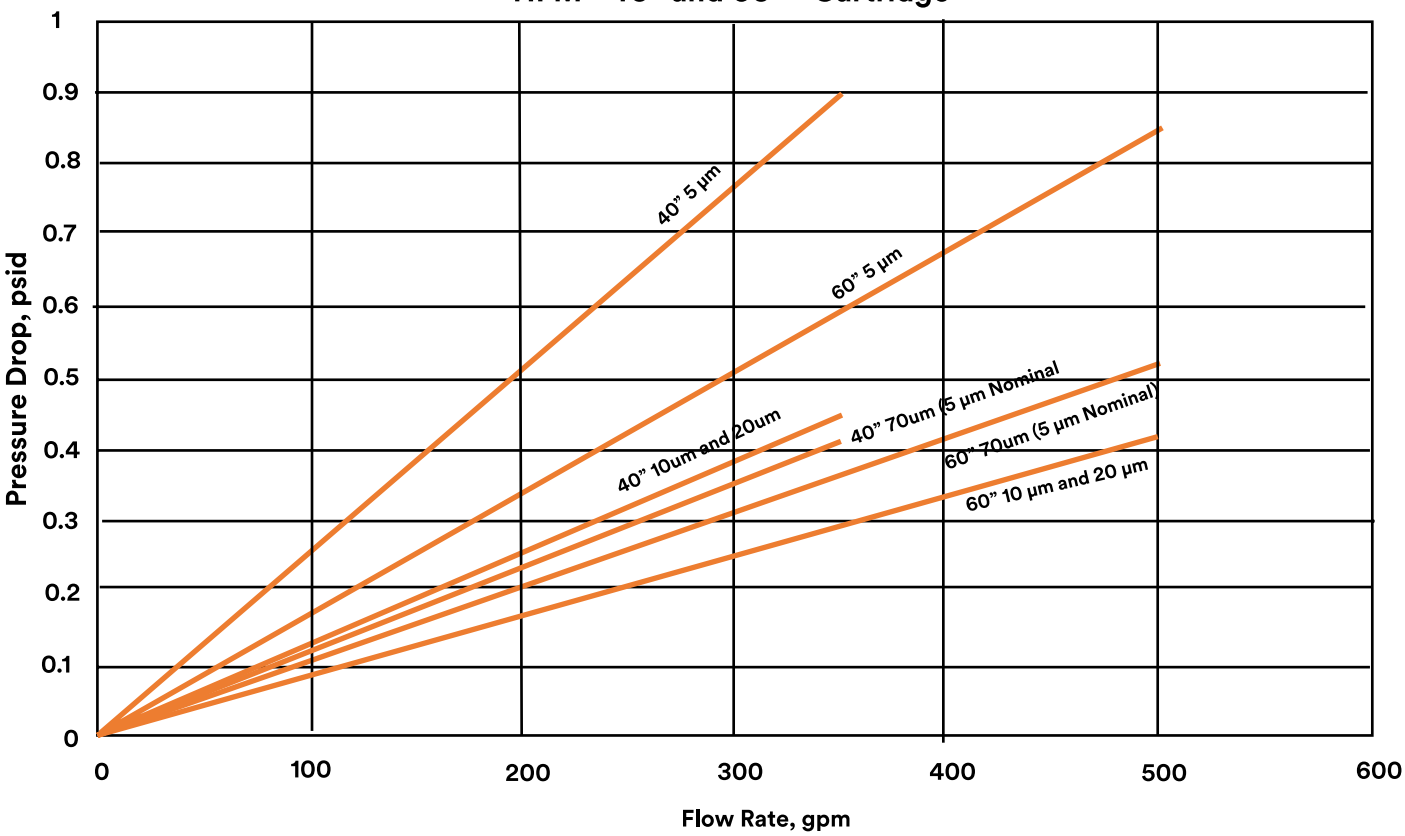
3M High Flow series filter housings are available in a variety of standard sizes to accommodate from 1 to 19 3M High Flow filter cartridges in both 40-inch and 60-inch lengths in horizontal configurations. Other High Flow housing sizes and configurations are also available upon request.

The outside-to-inside flow pattern of the 3M High Flow system translates into a simpler filter housing design and operation. Alternative inside-to-outside flow designs require the use of a bulky support plate for cartridge sealing. This support plate must be removed for cartridge installation and removal, often times though the use of special tools. The 3M High Flow housing features a centerpost design for cartridge support, requiring no support plates or special tools, providing a user-friendly cartridge installation and removal process.

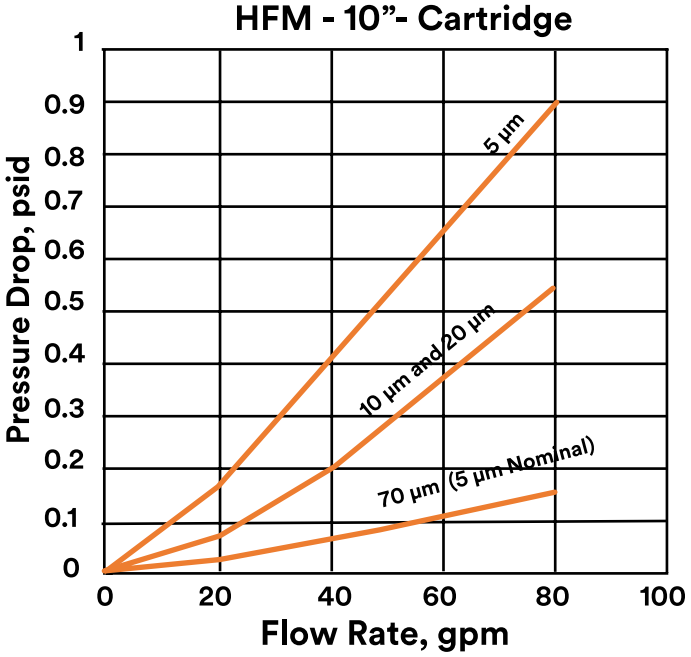
3M High Flow series filter housings come with a choice of two standard inlet and outlet connection size options. The "MAX" option uses inlet and outlet connections sized for the maximum design flow through the High Flow cartridges (350 gpm for 40-inch, 500 gpm for 60-inch). For applications where operation at less than 50% of the maximum design flow is preferred (e.g. those having a higher inlet solids level, or where optimizing filter life is a priority), the "STD" option, which uses smaller inlet & outlet connections, may be chosen.

Figure 6: 3M™ High flow housing

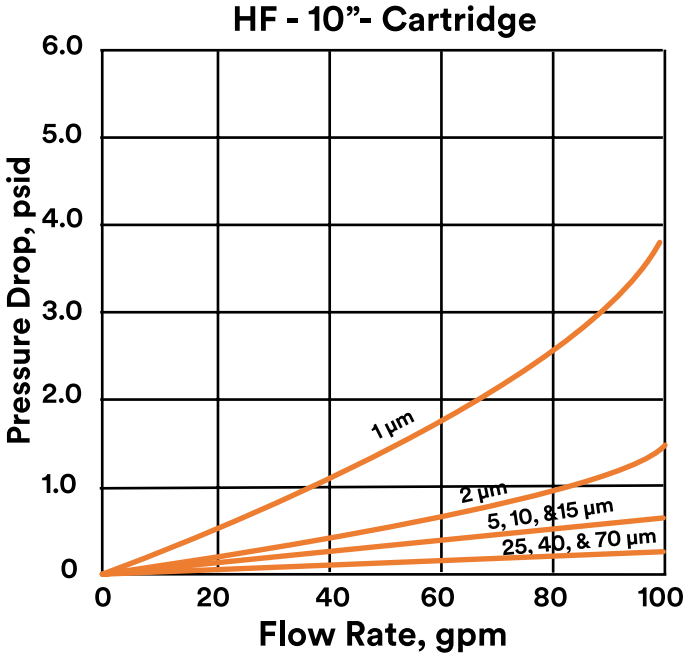
HFM - 40” and 60” - Cartridge



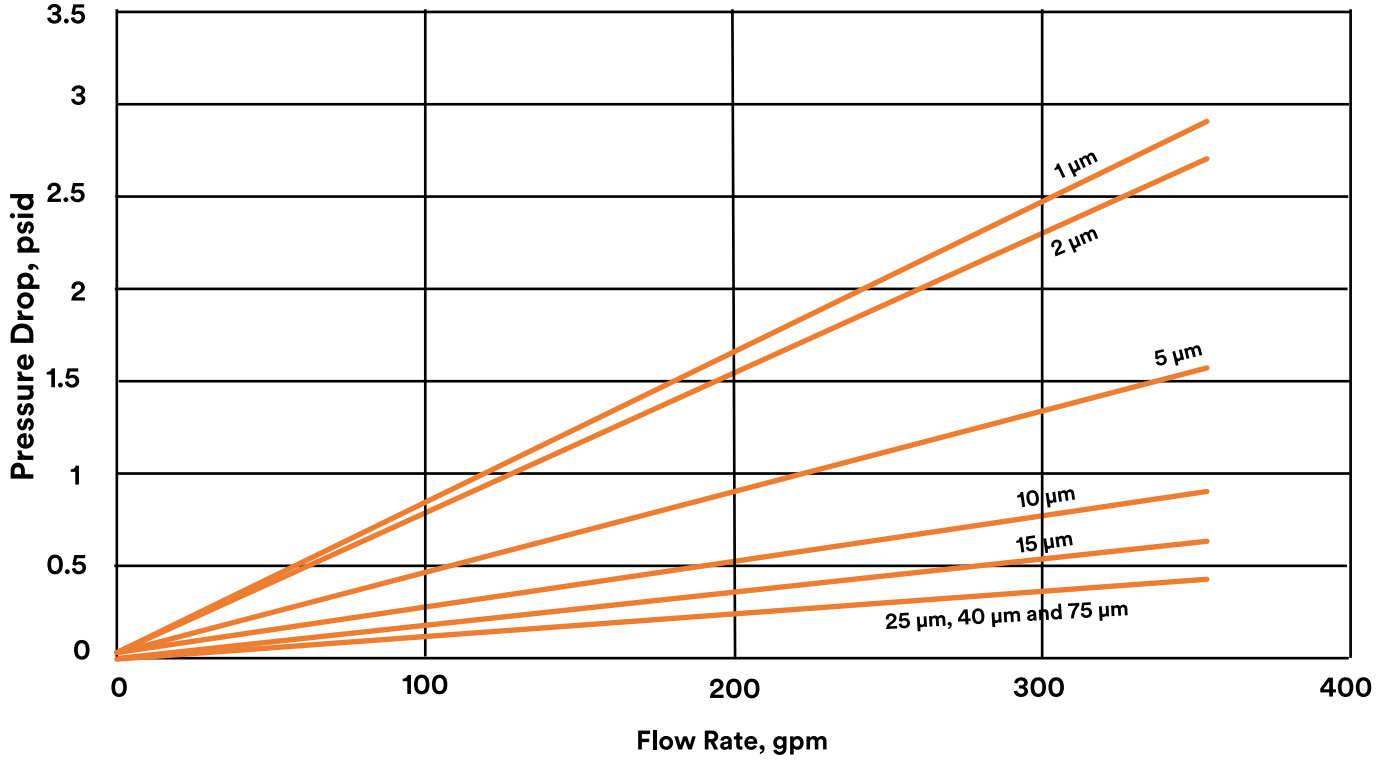
HFM - 10”- Cartridge



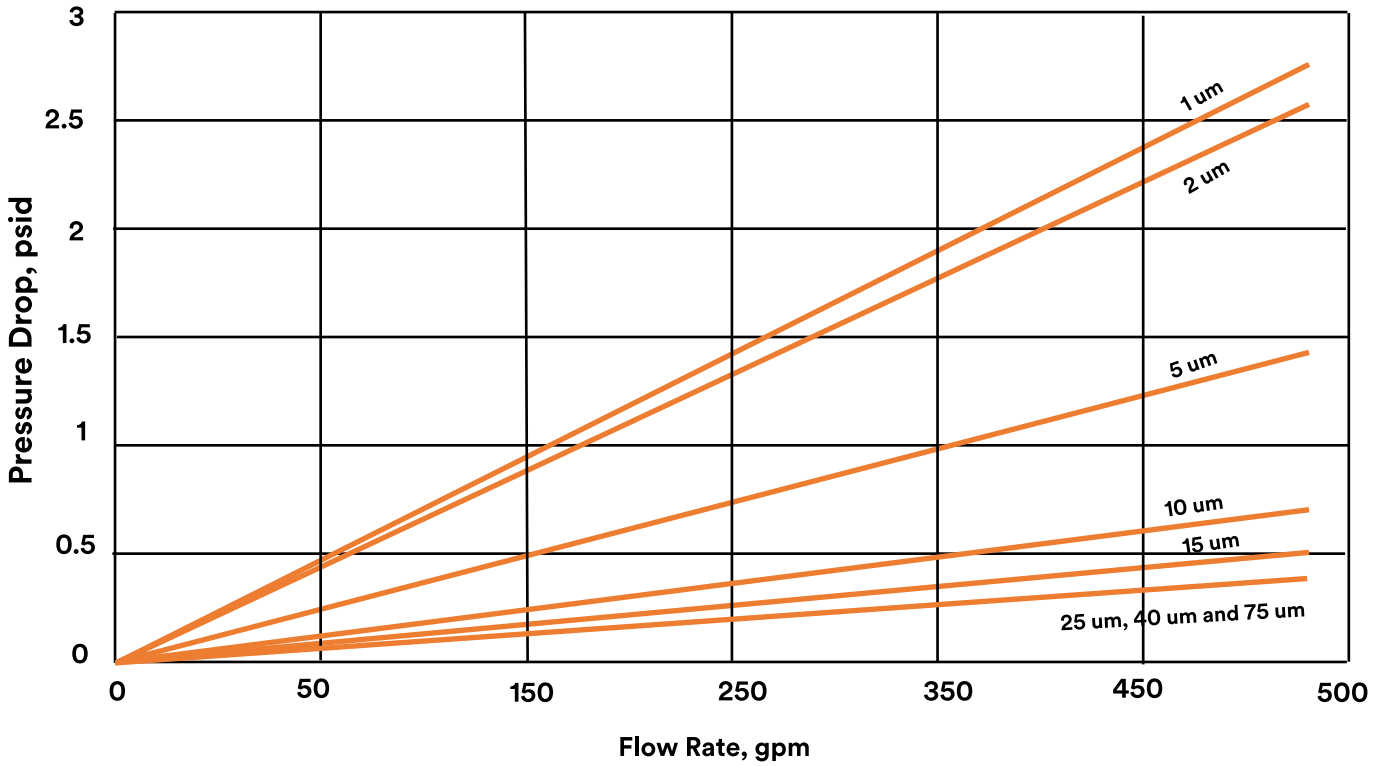
HF - 10”- Cartridge



HF 40” Clean Pressure Drop



HF 60” Clean Pressure Drop



3M™ High Flow System Filter Housings	
Features	**Benefits**
High Flow Capability per Cartridge (vs. conventional 2.5" diameter cartridges)	Allows for use of smaller diameter housing reducing capital expense and system footprint requirements. Fewer cartridges required, resulting in: • Reduced cartridge handling & disposal • Reduced filter change-out time • Less individual cartridge seal points reducing chance of fluid bypass
Robust Cartridge Centerpost Support Design	• Eliminates need for bulky support plates and tools. • Facilitates cartridge installation & removal.
Unique Diamond Pleated Cartridge Sealing Mechanism ("Twist to Lock" into Plug Base Closure)	• Allows for verification of proper cartridge seating, reducing chance of fluid bypass

Industry-specific high flow housing designs

Oil & gas service:

Specially designed 3M High Flow Series housings are available upon request in designs to accommodate requirements typically found in oil & gas applications, including:

- Corrosion allowances
- Higher pressure ratings
- Swing bolt closure design
- Non-destructive examination
- NACE (National Association of Corrosion Engineers) Compliance
- Post weld heat treatment

Food & beverage service:

Specially designed 3M High Flow series filter housings are available upon request to meet the standards of various food & beverage applications. Options include:

- 316L Stainless steel Construction
- Internal/external mechanical polish or electropolished Surfaces
- Sanitary flange connections (for inlet, outlet, bleed & drain ports)
- United States FDA CFR-21 compliant materials

10-inch housing:

ASME code and non-code housing designs are available to accommodate the 10-inch High Flow cartridge. This allows the user to take advantage of the benefits of the High Flow cartridge design (high efficiency filter media, "twist to lock" positive seating mechanism). These versions, capable of maximum flow rates of 85 gpm per cartridge, are great choices for lower process flow applications (such as point-of-use).

3M™ High Flow series filter housing specifications

Housing Cartridge Length	10”	40”	60”
Standard Designs (# of Cartridges)	1	1, 3, 5, 7, 12, 19	
Specifications	ASME Code & Non Code	ASME Code	
Materials of Construction	304 SS (Code) 316L SS (Non Code)	Carbon Steel* 304 Stainless Steel* 316L Stainless Steel	
Orientation	Vertical	Horizontal**	
Cover	Hinged Cover w/Swing Bolts (Code)	Hinged Cover w/Swing Bolts (Horizontal)	
	Band Clamp (Non Code)		
Design Pressure & Temperature	150 psi @ 250°F		
Other	Vent, Drain, & Gauge Ports included		

* Available in multi-cartridge models only
** Vertical configurations available - consult factory

3M™ High Flow housing specifications (for 40"L High Flow cartridges)

Housing Model	# of Cartridges	Housing OD (in/cm)	Materials of Construction	STD MODEL		MAX MODEL		Housing Dimensions (Inches/ Centimeters See figure 7)
				Inlet & Outlet Connection Sizes (in./ cm) (ANSI Flanges)	Maximum Flow (gpm/ lpm)	Inlet & Outlet Connection Sizes (in./ cm) (ANSI Flanges)	Maximum Flow (gpm/ lpm)	
1HF40	1	8.625/22	316L Stainless Steel	–	–	4	350/1325	(A) $64^{1/2}$/163.8 (B) 16/40.6 (C) $40^{7/8}$/103.8
3HF40	3	16/41	Carbon steel 304 Stainless Steel 316L Stainless Steel	4	438/1658	6	875/3312	(A) $74^{1/4}$/188.5 (B) $24^{1/2}$/62.2 (C) $51^{3/4}$/131.4
5HF40	5	20/51		6	775/2934	8	1550/5867	(A) $82^{3/4}$/208 (B) $28^{1/2}$/72.4 (C) $55^{1/8}$/140
7HF40	7	24/61		8	1225/4637	10	2450/9274	(A) $87^{7/8}$/223.2 (B) 32/81.3 (C) $64^{7/8}$/164.8
12HF40	12	30/76		10	2100/7949	14	4200/15898	(A) $96^{7/8}$/246 (B) 36/91.4 (C) 72/182.8
19HF40	19	36/91		12	3325/12586	18	6650/25173	(A) $105^{5/8}$/268.3 (B) 36/91.4 (C) $76^{1/8}$/193.3

3M™ High Flow housing specifications (for 60"L High Flow cartridges)

Housing Model	# of Cartridges	Housing OD (in/cm)	Materials of Construction	STD Model		MAX Model		Housing Dimensions (See figure 7)
				Inlet & Outlet Connection Sizes (in./cm) (ANSI Flanges)	Maximum Flow (gpm/ lpm)	Inlet & Outlet Connection Sizes (in./cm) (ANSI Flanges)	Maximum Flow (gpm/ lpm)	
1HF60	1	8.625/22	316L Stainless Steel	–	–	4	500/1893	(A) $84^{1/2}$/214.6 (B) 16/40.6 (C) $41^{7/8}$/106.3
3HF60	3	16/41	Carbon Steel 304 Stainless Steel 316L Sstainless steel	4	750/2839	6	1500/5678	(A) $98^{1/4}$/249.5 (B) $24^{1/2}$/62.2 (C) $51^{7/8}$/141.9
5HF40	5	20/51		6	1225/4637	8	2450/9274	(A) $104^{3/4}$/266 (B) $28^{1/2}$/72.4 (C) $55^{5/8}$/141.3
7HF60	7	24/61		8	1750/6624	10	3500/13249	(A) $109^{5/8}$/278.4 (B) 32/81.3 (C) $64^{7/8}$/164.7
12HF60	12	30/76		10	3000/11356	16	3000/22712	(A) $118^{7/8}$/ 301.9 (B) 36/91.4 (C) $72^{1/2}$/184.1
19HF60	19	36/91		12	4750/17981	20	9500/35961	(A) $127^{5/8}$/324.1 (B) 36/91.4 (C) $76^{5/8}$/194.6

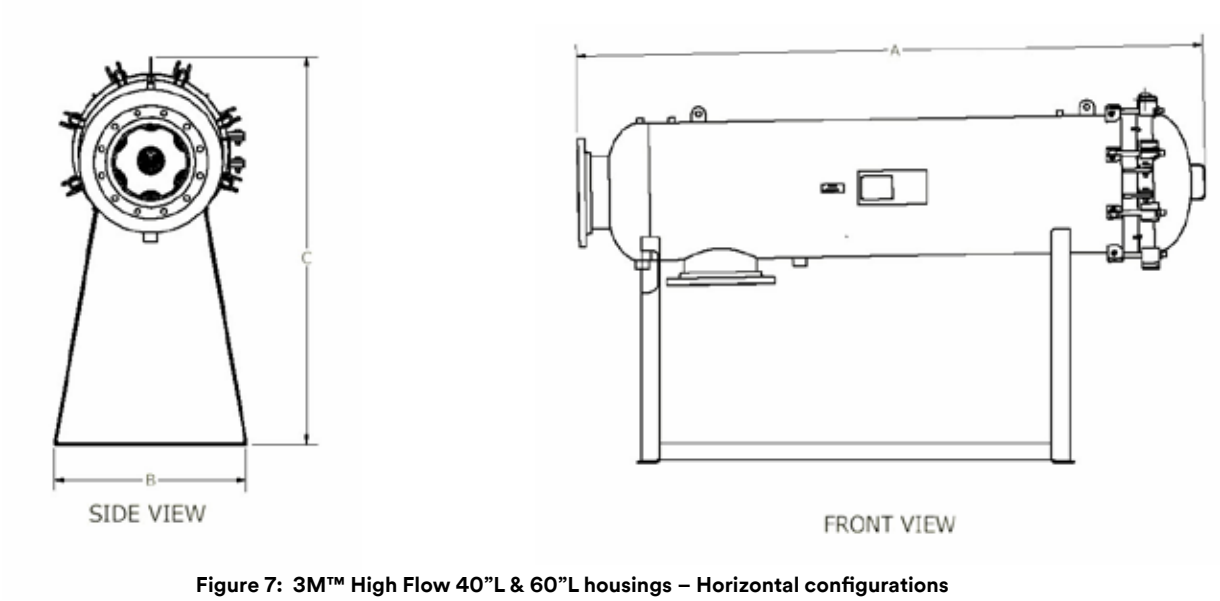
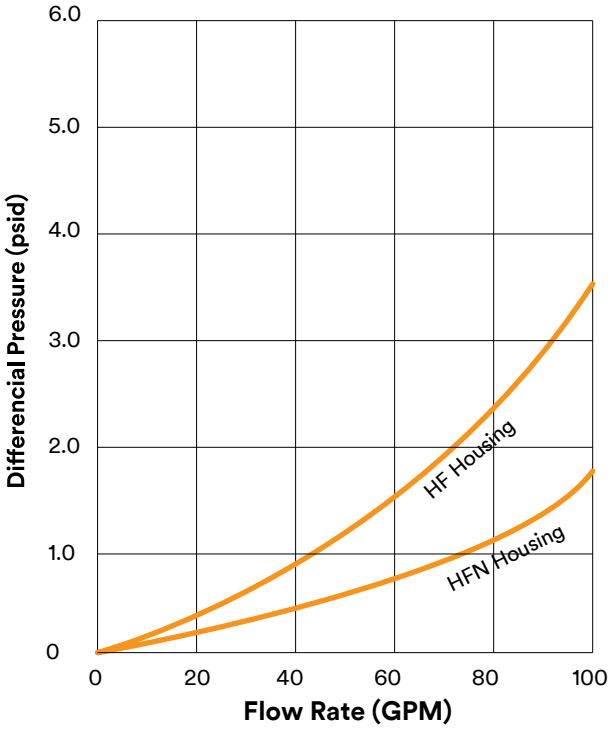
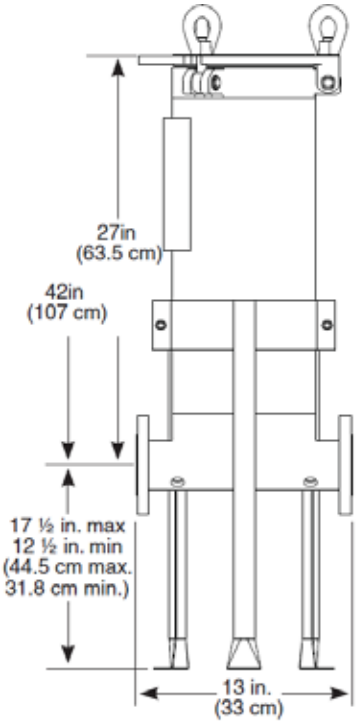


Figure 7: 3M™ High Flow 40”L & 60”L housings – Horizontal configurations

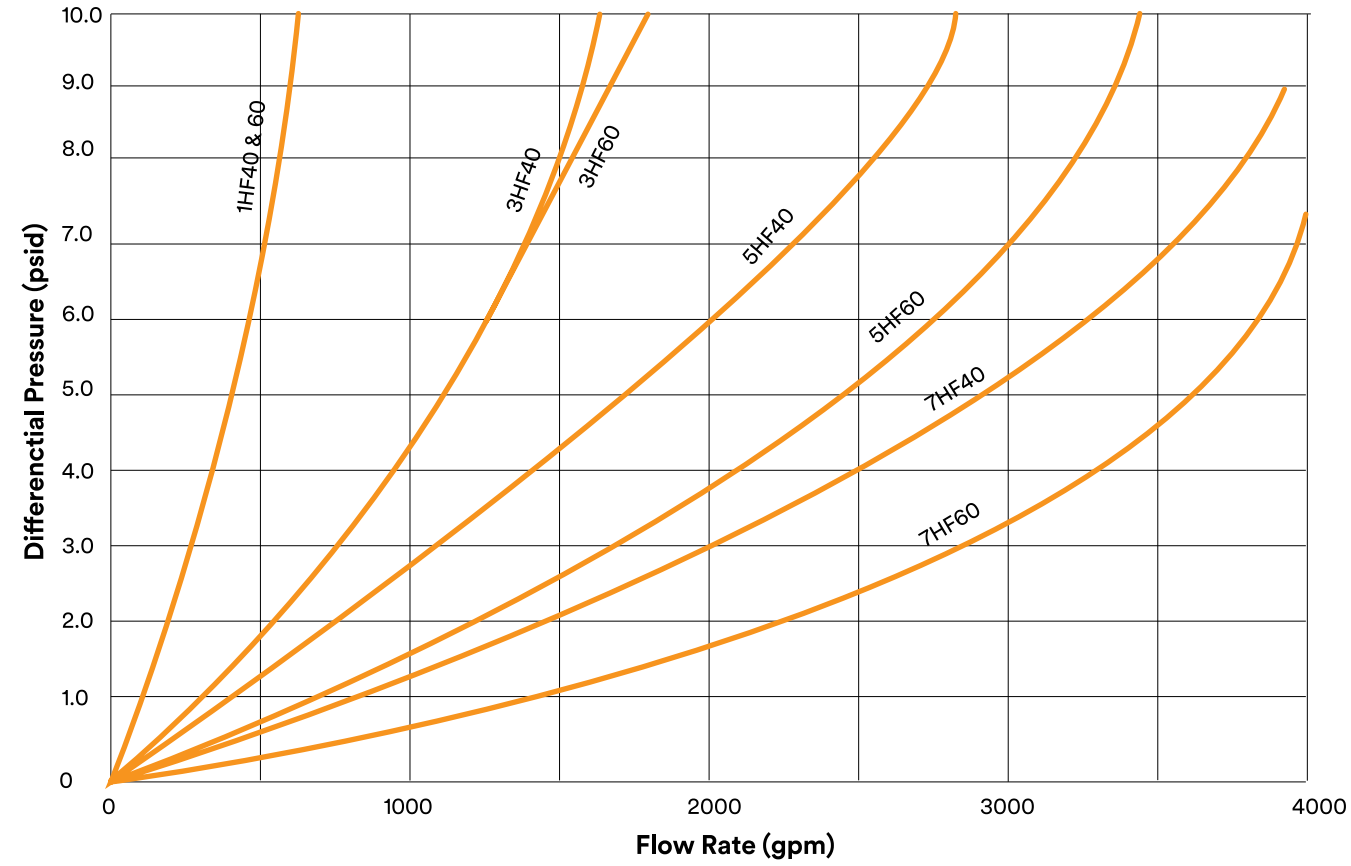
HFN Housing
Non-Code





HF Housing
ASME Code

Figure 8: 3M™ High Flow 10”L Housings – ASME Code and Non-Code Versions*
***Total clean system pressure drop is the sum of the housing pressure drop and the selected element pressure drop for a given flow rate (assumes fluid viscosity of 1 cps).**



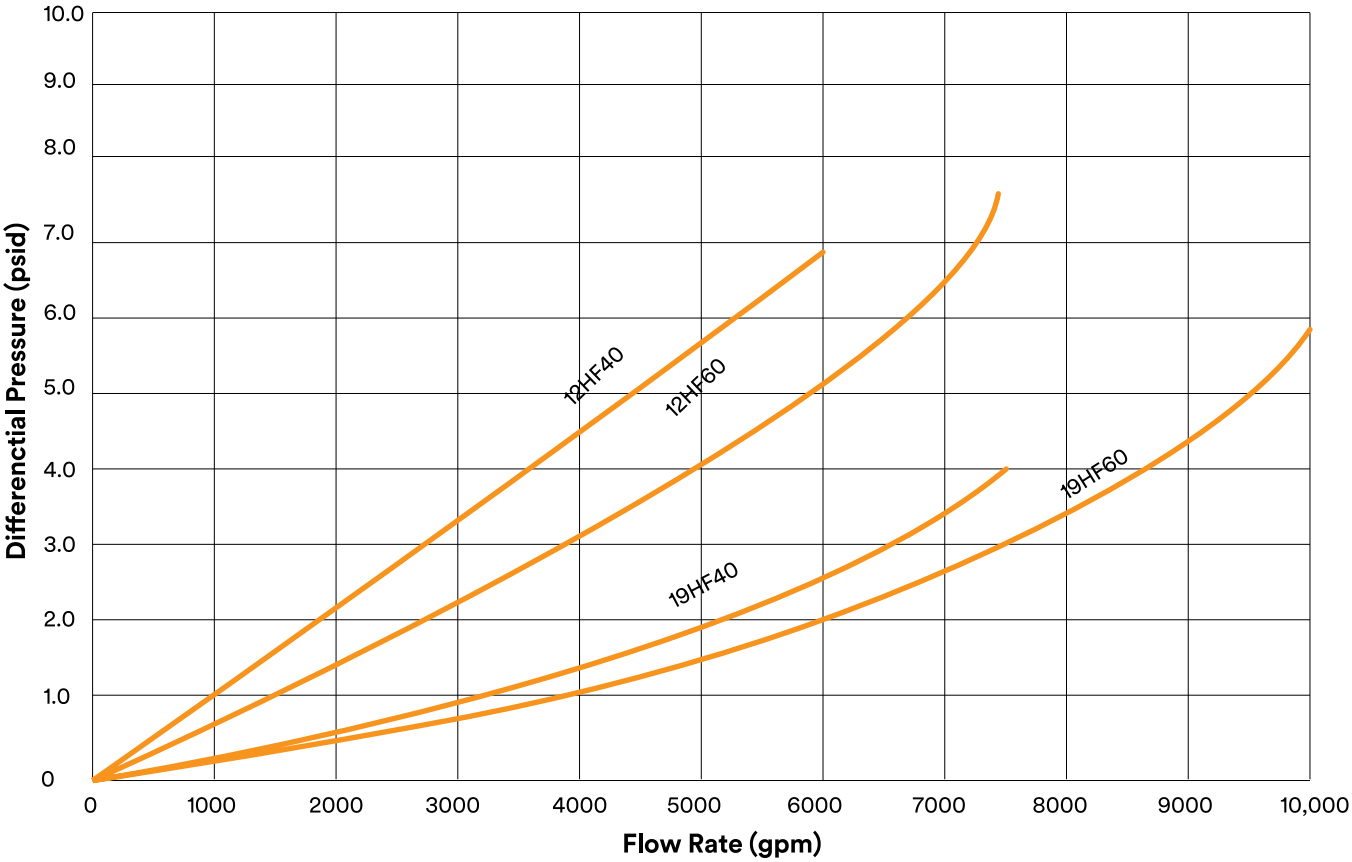


Figure 9: 3M™ High Flow housing (40”L & 60”L) clean pressure drop vs. flow rates*
***Assumes fluid viscosity of 1 cps. Pressure drop for standard housings without filters installed.**

3M™ High Flow cartridges - ordering guide

Model	Cartridge Length	Micron Rating (@ 99.9% PRE)	Micron Rating	O-Ring Material	Packaging
HF - High Flow	10 - 10 inch 40 - 40 inch 60 - 60 inch	PP - Polypropylene	001 - 1µm 002 - 2µm 005 - 5µm 010 - 10µm 015 - 15µm 025 - 25µm 040 - 40µm 070 - 70µm	A - Silicone B - Fluorocrabon C - EPR D - Nitrile	01 - 1 Pack

All HF grades are WQA NSF 61 certified.

Model	Cartridge Length	Micron Rating (@ 99.9% PRE)	Micron Rating	O-Ring Material
HFM - High Flow (High Loft Media)	10 - 10 inch 40 - 40 inch 60 - 60 inch	PP - Polypropylene	A05 - 5 um (Absolute) A10 - 10 um (Absolute) A20 - 20 um (Absolute) *N05 - 5µm (Nominal)	D - Nitrile

*(70µm Absolute)

WQA NSF 61 Certified

3M™ High Flow housings - ordering guide (for 10"L cartridges)

Number of Filter Elements	Model	Cartridge Size	Configuration	Housing Material	Gasket Material (1)
1	HF (code)	10	V = Vertical	B = 304 SS	GD = Nitrile
1	HFN (non code)	10	V = Vertical	C = 316 SS	GD = Nitrile

Notes:
1) All housing models come standard with nitrile cover gasket. Contact factory for other gasket materials.

3M™ High Flow housing - ordering guide (For 40"L & 60"L cartridges)

Number of Filter Elements	Model	Flow Rate Capability	Cartridge Size	Configuration	Housing Material[1]
1 **3** **5** **7** **12** **19**	HF	X = MAX S = STD [2]	40 60	H = Horizontal V = Vertical [3]	A = Carbon Steel [2] B = 304 SS [2] C = 316 SS

Notes:
1) All housing models come standard with nitrile cover gasket. Contact factory for other gasket materials.
2) Not available for single element (1-round) configuration
3) 1HFX40V is standard configuration, other vertical configurations available upon request.

3M™ High Flow series filter cartridges are tested and certified by WQA against NSF/ANSI Standard 61 for material requirements only.

*Those High Flow cartridges listed above with an asterisk are WQA certified.

For more information about the 3M High Flow series system please contact your local Industrial territory sales manager, call 1-800-243-6894, option 4 or visit our website at 3M.com/highflow.

Product Use:

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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