

# Millistak+® Pod disposable depth filter system

Innovative, High-Performance Pod Filters are Ideal for Primary and Secondary Clarification in Lab, Pilot and Process-scale Applications

Millistak+® depth filter media is offered in a scalable, disposable format: the Pod Filter System. Accommodating applications from lab to pilot to process-scale, the Pod format offers greater flexibility because of its unique modular and 100% disposable design.

The Millistak+® Pod system is ideal for a wide variety of primary and secondary clarification applications, including cell cultures, yeast and *E. coli* lysates post centrifuge, *E. coli* refolds, media, vaccines, plasma proteins and sera.

Millistak+® Pod filters are available in three distinct series of media grades in order to meet your specific application needs. Millistak+® DE, CE and HC media deliver optimal performance through a gradient density matrix, as well as positive surface charge properties.



## Benefits

- Low hold-up volume for greater product yield
- Broad range of media types offered in single and multi-layer products
- Millistak+® HC dual-action media improves prefiltration and compresses clarification
- Flexible, modular format offers scalability up to 20,000 L
- Patented disposable design eliminates need for housing, CIP or cleaning validation
- Self-contained Pod filters protect operators from exposure to biohazards
- Robust construction is easy to use and set up
- Smaller footprint facilitates use in tight spaces

## Easy to Use

With the compact, modular design of our Millistak+® Pod system, you can increase productivity and shorten cycle times from bench to manufacturing scale.

Installation and setup of the Pod system is simple and straightforward. The unique design of the disposable adapters and disposable manifolds makes it easy to connect the Pod filters to the rest of the unit operations in the process. The self-contained and disposable nature of the system protects operators from exposure to biohazards and eliminates maintenance as well as cleaning validation requirements.

## Configurations

- µPod® filter – 23 cm<sup>2</sup>
- Lab-scale Pod filters – 0.027 m<sup>2</sup> and 0.054 m<sup>2</sup>
- Process-scale Pod filters:
  - Millistak+® DE and CE media – 0.11 m<sup>2</sup>, 0.77 m<sup>2</sup> and 1.4 m<sup>2</sup>
  - Millistak+® HC media – 0.11 m<sup>2</sup>, 0.55 m<sup>2</sup> and 1.1 m<sup>2</sup>
- Process-scale Pod holder – accepts from five to 10 process-scale Pod filters per rack. Up to three racks can be stacked for process flexibility.
- Pilot-scale Pod holder – accommodates up to two process-scale Pod filters for configurations from 0.11 m<sup>2</sup> to 2.8 m<sup>2</sup>, depending on media type. An optional accessory kit expands capacity to five process-scale Pod filters.
- Disposable adapter – connects Pod filters to process piping, creating a disposable flow path.
- Disposable diverter plate – enables two media grades to be processed on a single rack.
- Millistak+® bulk packaging – optimizes transport and reception processes as well as reduces waste.

## Millistak+® Depth Filter Media

Available in three media series, the proven filtration performance of Millistak+® filter media in the Pod format provides greater flexibility and reduced cycle times. Millistak+® Pod filters incorporate multiple graded-density layers and adsorptive, positively charged filter media. Composed of select grade cellulose fiber and diatomaceous earth, the Millistak+® DE series not only improves the manufacturing process, but also increases contaminant holding. The Millistak+® CE series consists of single-layer media with cellulose fibers that are suitable for coarse filtration applications.

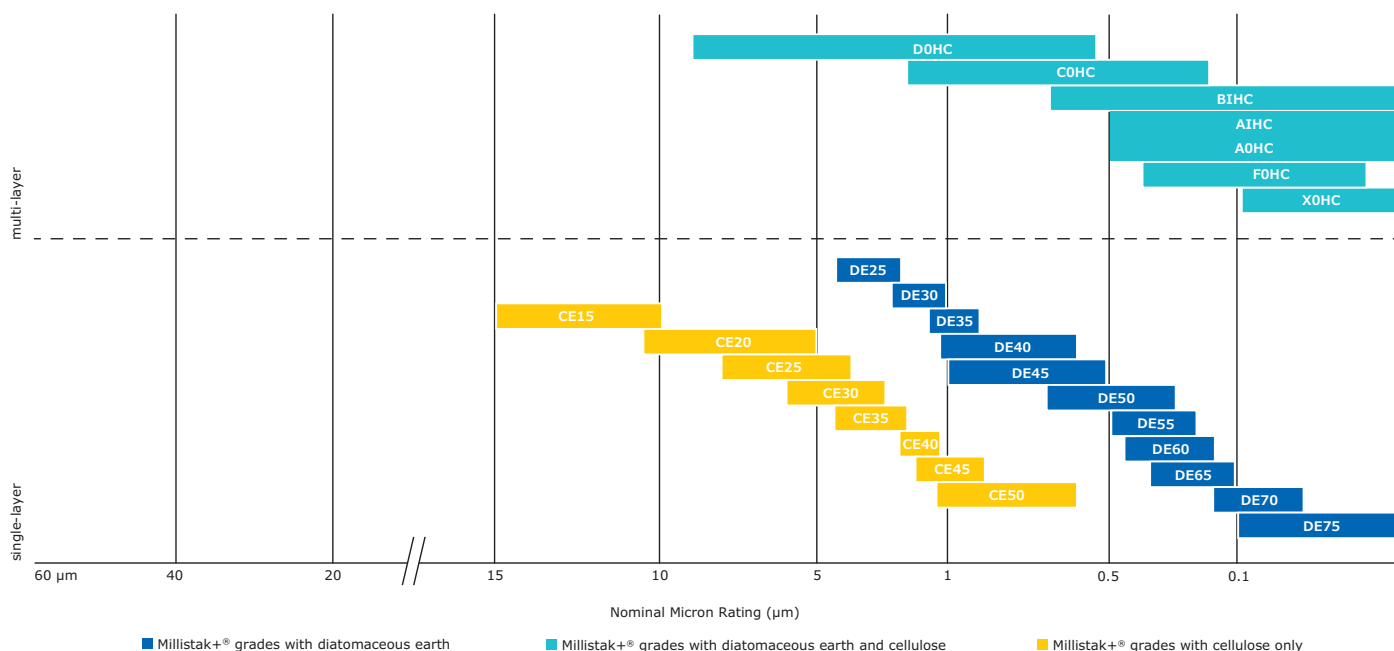
The Millistak+® HC series improves productivity by combining multiple media grades into one device, enabling compression of multiple filtration stages downstream of the bioreactor.

## Bulk Packaging

To improve sustainability of the packaging and shipping of filter products, we have developed a bulk pack solution for Millistak+® HC multi-layer process-scale Pod filters with the aim to optimize transport and reception processes as well as to reduce waste. Bulk packaging configuration includes 27 Pods in 3 boxes with 9 Pods per layer on 1 pallet.

### The key benefits are:

- 24% reduction in corrugated packaging waste to recycle or dispose
- 94% reduction of paper documentation
- 12% decrease in number of deliveries, which will further reduce energy use and emissions
- 70% reduction in operator time to open and manage the product and packaging



## Typical Extractables

	Millistak+® Single-Layer Pods (CE & DE Media)	Millistak+® HC Media (non X0HC/F0HC)	Millistak+® X0HC/F0HC Media
Conductivity	1.52 – 1.94 $\mu\text{S}/\text{cm}$ post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 5 L/ft <sup>2</sup> (50 L/m <sup>2</sup> ) of media surface area	3.64 – 10.5 $\mu\text{S}/\text{cm}$ post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 10 L/ft <sup>2</sup> (100 L/m <sup>2</sup> ) of media surface area	19.34 – 53.2 $\mu\text{S}/\text{cm}$ (X0HC) and 21.4 – 42.7 $\mu\text{S}/\text{cm}$ (F0HC) post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 10 L/ft <sup>2</sup> (100 L/m <sup>2</sup> ) of media surface area
NVR Gravimetric Extractables	Not Tested	420 – 750 mg/ft <sup>2</sup> (process-scale) and 630 – 1251 mg/m <sup>2</sup> (lab-scale) per 24 hour static soak in pure water (type 1 DI water) post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 10 L/ft <sup>2</sup> (100 L/m <sup>2</sup> ) of media surface area	Not Tested
TOC	910 – 1800 ppb post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 5 L/ft <sup>2</sup> (50 L/m <sup>2</sup> ) of media surface area	720 – 4600 ppb post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 10 L/ft <sup>2</sup> (100 L/m <sup>2</sup> ) of media surface area	1200 – 2800 ppb (X0HC) and 460 – 3200 ppb (F0HC) post autoclave (1 cycle of 60 minutes at 123 °C) and pure water flush of 10 L/ft <sup>2</sup> (100 L/m <sup>2</sup> ) of media surface area
Metals	Per 24-hour static soak in 10 liters pure water post autoclave (1 cycle of 30 minutes at 123 °C) and pure water flush of 10 liters per ft <sup>2</sup> (100 L/m <sup>2</sup> ) of surface area. Values based on worse case data from both process-scale and lab-scale pod devices.		

Metal (mg/ft <sup>2</sup> Media)	DE Series	CE Series	CR Series	HC Series (A1HC, C0HC, D0HC)	X0HC Series	F0HC Series
Aluminum	≤ 0.026	≤ 0.059	≤ 0.033	≤ 0.010	≤ 0.084	≤ 0.049
Arsenic	≤ 0.003	≤ 0.000	≤ 0.001	≤ 0.010	≤ 0.009	≤ 0.004
Calcium	≤ 2.15	≤ 5.74	≤ 1.505	≤ 1.78	≤ 9.598	≤ 2.96
Chromium	≤ 0.010	≤ 0.000	≤ 0.032	≤ 0.010	≤ 0.001	≤ 0.000
Cobalt	≤ 0.000	≤ 0.000	≤ 0.001	≤ 0.010	≤ 0.001	≤ 0.001
Copper	≤ 0.003	≤ 0.000	≤ 0.035	≤ 0.010	≤ 0.009	≤ 0.015
Iron	≤ 0.000	≤ 0.000	≤ 0.041	≤ 0.010	≤ 0.000	BDL
Lead	≤ 0.000	≤ 0.000	≤ 0.001	≤ 0.010	≤ 0.000	BDL
Magnesium	≤ 1.70	≤ 2.87	≤ 1.129	≤ 0.655	≤ 3.91	≤ 1.16
Manganese	≤ 0.010	≤ 0.001	≤ 0.624	≤ 0.120	≤ 0.425	≤ 0.181
Mercury	≤ 0.000	≤ 0.000	≤ 0.001	≤ 0.010	≤ 0.000	BDL
Nickel	≤ 0.001	≤ 0.000	≤ 0.005	≤ 0.010	≤ 0.000	≤ 0.020
Potassium	≤ 0.872	≤ 1.036	≤ 0.380	≤ 0.084	≤ 0.817	≤ 0.439
Sodium	≤ 11.517	≤ 9.913	≤ 17.513	≤ 2.74	≤ 14.022	≤ 17.313
Titanium	≤ 0.000	≤ 0.000	≤ 0.012	≤ 0.010	≤ 0.013	BDL
Zinc	≤ 0.002	≤ 0.003	≤ 0.046	≤ 0.010	≤ 0.046	≤ 0.052

BDL = Below Detectable Limits



**Small scale:**  
HC, DE, CE: 23 cm<sup>2</sup>



**Lab scale:**  
HC, DE, CE:  
0.027 - 0.054 m<sup>2</sup>



**Pilot scale:**  
HC: 0.11 – 5.5 m<sup>2</sup>  
DE or CE: 0.11 - 7 m<sup>2</sup>



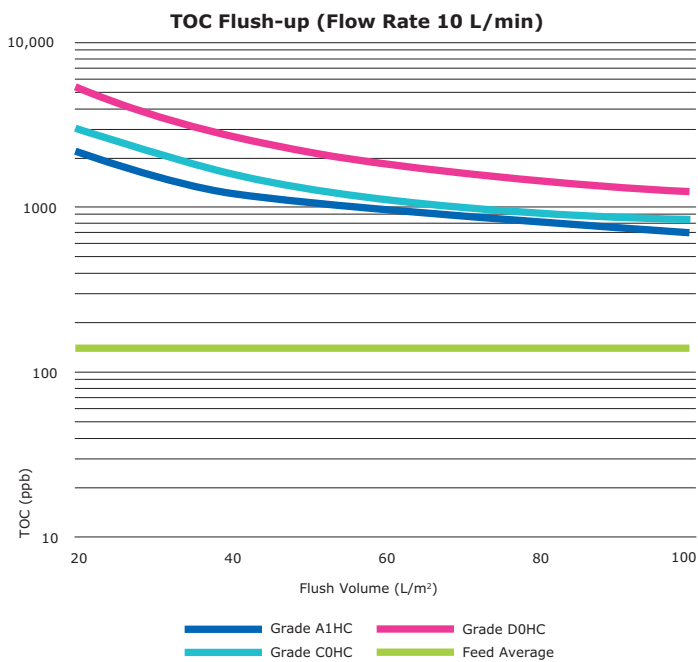
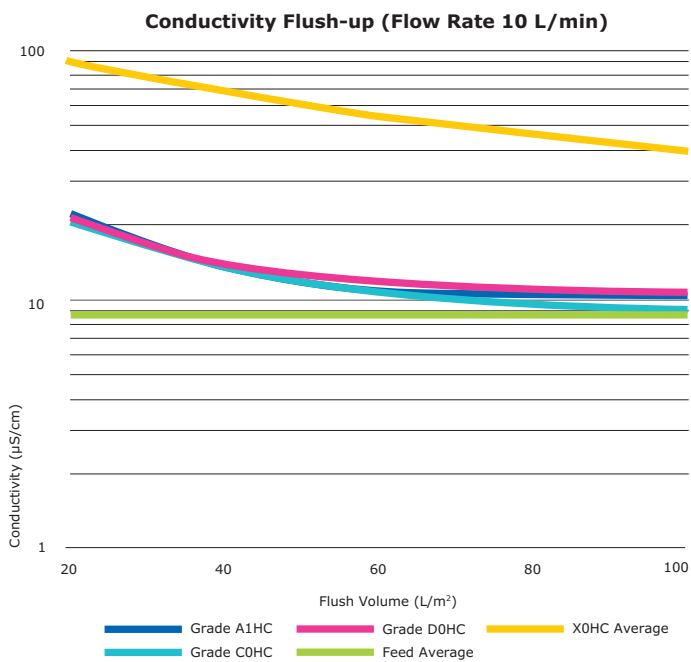
**Process scale:**  
HC: 5.5 – 33 m<sup>2</sup>  
DE or CE: 7 - 42 m<sup>2</sup>

## Millistak+® Pod Filter Specifications

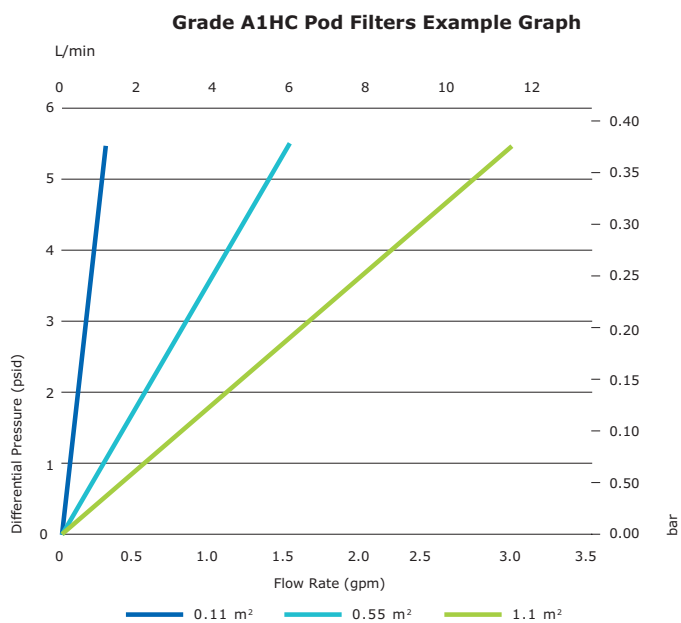
	µPod® Filter	Lab scale Pod Filter		Multi-layer and Single-Layer Process-scale Pod Filter	Multi-layer Process-scale Pod Filter	Single-Layer Process-scale Pod Filter	Multi-layer Process-scale Pod Filter	Single-Layer Process-scale Pod Filter
Surface Area	23 cm²	0.027 m² (0.29 ft²)	0.054 m² (0.58 ft²)	0.11 m² (1.2 ft²)	0.55 m² (5.9 ft²)	0.77 m² (8.3 ft²)	1.1 m² (11.8 ft²)	1.4 m² (15.4 ft²)
Media Grade	HC, CE and DE media	HC, CE and DE media	HC, CE and DE media	HC, CE and DE media	HC media	CE and DE media	HC media	CE and DE media
Materials of Construction								
Filter Media	Cellulose fibers with inorganic filter aid (CE Media contains cellulose only)							
Filter Membrane	Mixed esters of cellulose (grades A1HC and B1HC only)							
Pod Housings	Glass Filled Polypropylene							
Adapters	Glass Filled Polypropylene*							
Gaskets and Plugs	Thermo Plastic Elastomer (TPE)*							
Inlet, Vent and Outlet Connections	Female Luer	Hose Barb		Flat seal				
Pod Dimensions								
Length	3.5 in. (8.9 cm)	8.5 in. (22 cm)		24.2 in. (62 cm)				
Height	2.6 in. (6.6 cm)	5.3 in. (14 cm)		12.5 in. (32 cm)				
Thickness	1.6 in. (4.1 cm)	2.9 in. (7.9 cm)	3.7 in. (9.4 cm)	1.2 in. (3.0 cm)	2.8 in. (7.1 cm)	3.1 in. (7.9 cm)	4.8 in. (12.2 cm)	5.0 in. (12.7 cm)
Maximum Operating Pressure	50 psig (3.5 bar) at ≤ 40 °C	30 psig (2.1 bar) at 25 °C		50 psig (3.5 bar) at 25 °C; 15 psig (1.0 bar) at 80 °C				
Maximum Differential Pressure								
Forward	30 psid (2.1 bar) at 40 °C	30 psid (2.1 bar) at 4 °C; 30 psid (2.1 bar) at 37 °C		30 psid (2.1 bar) at 25 °C; 15 psid (1.0 bar) at 80 °C				
Reverse	15 psid (1.0 bar) at 40 °C	30 psid (2.1 bar) at 37 °C		30 psid (2.1 bar) at 25 °C				
Sterilization	Integrity is maintained after 2 autoclave cycles of 60 minutes at 123 °C			Integrity is maintained after 1 autoclave cycle of 60 minutes at 123 °C				
Indirect Food Additive	All component materials meet the FDA Indirect Food Additive Requirements cited in 21 CFR 177-182.							
Toxicity	All component materials meet the requirements of the current USP <88> Biological Reactivity Test For Class VI Plastics.							
Bacterial Endotoxin	For Media Only: < 0.25 EU/mL as determined by the Limulus Amebocyte Lysate (LAL) test.							
Pressure Equipment Directive 2014/68/EU	Devices and associated holders are designed and manufactured in accordance with the sound engineering practices (SEP) cited in Article 4(3) of 2014/68/EU.*							

\*Process scale only

## Conductivity/ TOC



## Water Permeability



## Water Flow Rates

Millistak+® HC Filter Series			Millistak+® CE Filter Series			Millistak+® DE Filter Series		
Media Type/ Grade	Water Flow Rate L/min/m <sup>2</sup> at 10 psid, 21 °C		Media Type/ Grade	Water Flow Rate L/min/m <sup>2</sup> at 10 psid, 21 °C		Media Type/ Grade	Water Flow Rate L/min/m <sup>2</sup> at 10 psid, 21 °C	
D0HC	CE25	1425.8 – 2619.1	CE15	3054.9 – 5611.5		DE25	1425.8 – 2619.1	
	DE40	454.6 – 835.1	CE20	2082.6 – 3825.5		DE30	974.1 – 1789.3	
C0HC	DE30	974.1 – 1789.3	CE25	1425.8 – 2619.1		DE35	665.5 – 1222.4	
	DE60	99.0 – 181.9	CE30	974.1 – 1789.3		DE40	454.6 – 835.1	
B1HC	DE50	212.2 – 389.8	CE35	665.5 – 1222.4		DE45	310.6 – 570.5	
	DE75	31.6 – 58.0	CE40	454.6 – 835.1		DE50	212.2 – 389.8	
A0HC	DE60	99.0 – 181.9	CE45	310.6 – 570.5		DE55	145.0 – 266.3	
	DE75	31.6 – 58.0	CE50	212.2 – 389.8		DE60	99.0 – 181.9	
F0HC	DE60	99.0 – 181.9				DE65	67.7 – 124.3	
	IM75	39.0 – 54.6				DE70	46.2 – 84.9	
A1HC	DE60	99.0 – 181.9				DE75	31.6 – 58.0	
	DE75	31.6 – 58.0						
X0HC	IM75	39.0 – 54.6						
	IM83	21.2 – 27.7						

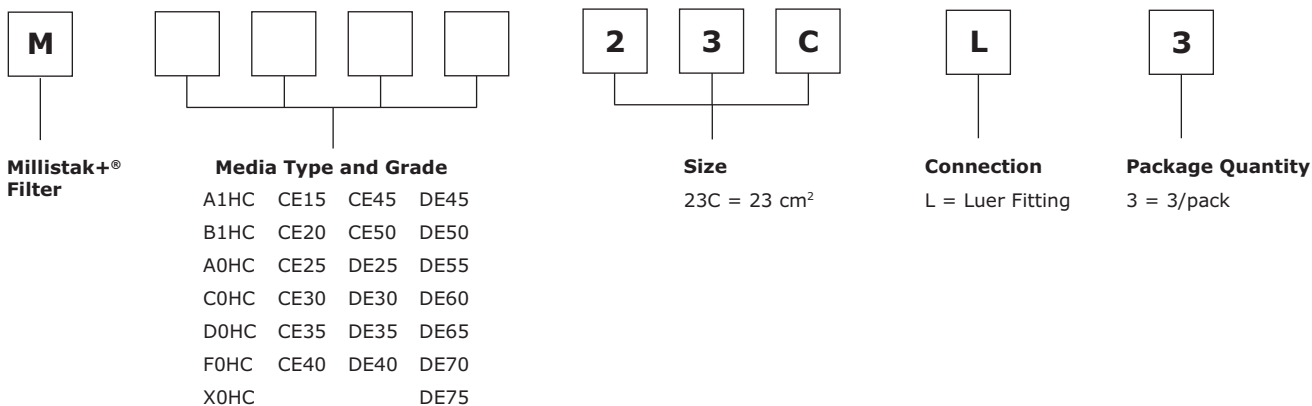
## Choose the Right Media

Media Grade	Application	Characteristics	Media Construction
Single-layer CE	Primary (coarse) clarification	Cellulose fibers	CE15 to 50
Single-layer DE	Primary or secondary clarification	Cellulose fibers + inorganic filter aid	DE25 to 75
Double-layer D0HC	Primary clarification directly out of the bioreactor	A more open CE layer and DE media combination	CE25 + DE40
Double-layer C0HC	Perfusion bioreactor fluid	Two layers of a more open DE media	DE30 + DE60
Double-layer A0HC	Centrate clarification	Two layers of a tighter DE media	DE60 + DE75
Double-layer F0HC	Secondary clarification of pretreated harvest by acid precipitation or flocculation, <i>E. coli</i> and yeast	Two DE layers. Provides sterile filter protection without an RW01 membrane	DE60 + IM75
Double-layer X0HC	Secondary clarification of bioreactor harvests, primarily for cell cultures	Two DE layers. Provides sterile filter protection without an RW01 membrane	IM75 + IM83
Triple-layer A1HC	Post-TFF (Prostak™ system) clarification fluids and primary or secondary clarification	Tightest media combination with an additional membrane layer to protect downstream membrane filters	DE60 + DE75 + RW01
Triple-layer B1HC	Post-centrifuge or settled permeate containing cellular particulate and primary or secondary clarification	A more open first layer with an additional membrane layer to protect downstream membrane filters	DE50 + DE75 + RW01

Note: For clarification of serum, plasma, vaccines, cell culture or other fluids, choice of media grade should be based on small-scale trials. Reference our Clarification Portfolio Guide for additional information.

## Ordering Information

### µPod® Filter

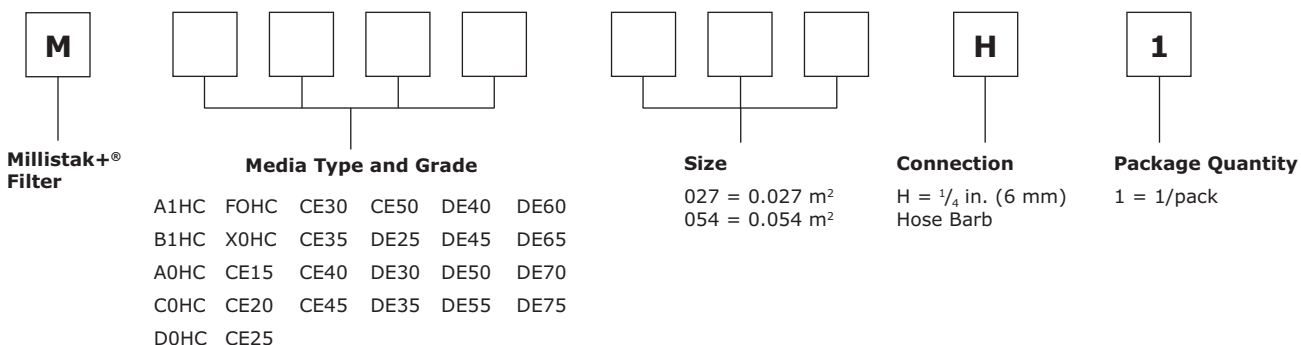


### µPod® Filter Accessories

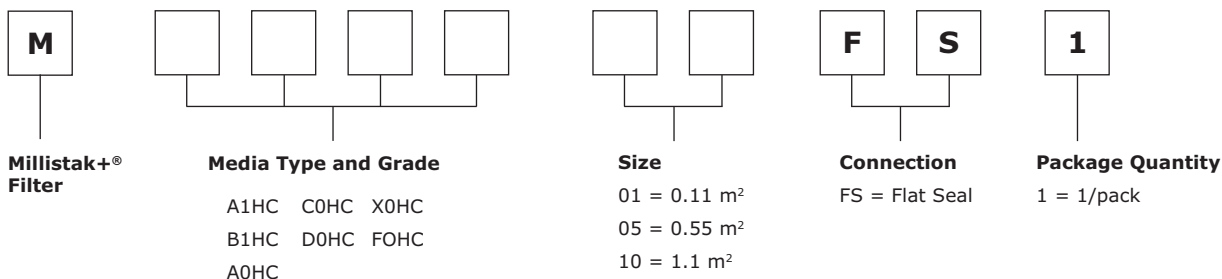
µPod® Tubing Kit Catalogue No. MTUBEKITL1

Gauge 0 – 60 psi and Connection Fittings Catalogue No. XXPXLGAGE

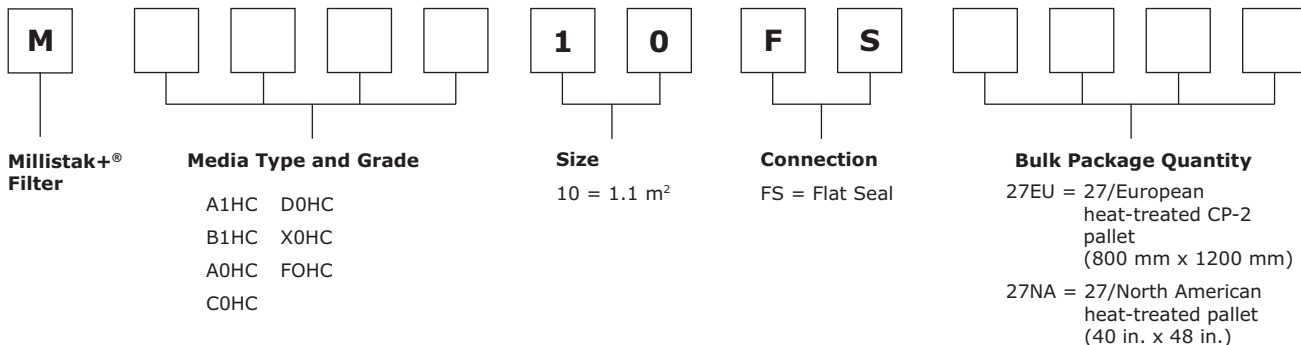
### Lab-scale Pod Filter



### Multi-layer Process-scale Pod Filter

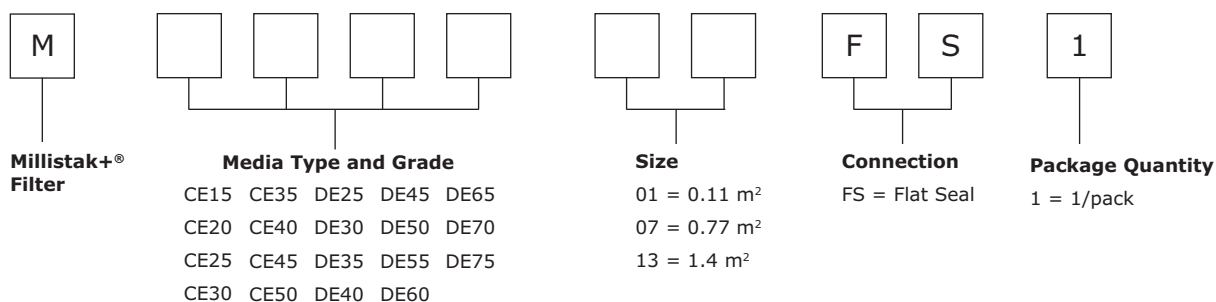


### Multi-layer Process-scale Pod Filter in Bulk Packaging Format



## Ordering Information (continued)

### Single-Layer Process-scale Pod Filter



Process-scale Pods require a pilot or process-scale Pod holder.  
Lab-scale pods and µPod® filters do not require a holder.

Please contact your local sales representative  
for more information.

For additional information,  
[EMDMillipore.com](https://www.emdmillipore.com)

To place an order or receive  
technical assistance, visit  
[EMDMillipore.com/contactPS](https://www.emdmillipore.com/contactPS)

MilliporeSigma  
400 Summit Drive  
Burlington, MA 01803

