

For precision filtration of fluids



Paper type solvent filter



Cartridge type solvent filter



In-line filter

Features:

- ▶ Higher efficiency and precision than the filtration with conventional SUS powder filters.
- ▶ Uniform fiber diameter of 1 μm . Minimized deviation in particle size.
- ▶ Only 50 μm thickness. Minuscule inner volume.
- ▶ Fibers connected at multi-points providing sufficient robustness in the thin configuration.
- ▶ Faster filtration with 90 % void. Lower fluid resistance. Reduced clogging. Longer service life.
- ▶ For small particles down to 0.1 μm diameter.
- ▶ Flexible. Possible to be bent.
- ▶ Suitable for polymer filtration and supercritical fluid chromatography (SFC).

■ Comparison of Stainless Steel Filters: Sintered Powder vs Sintered Fiber

Generally filters play an important role in versatile fields of fluidic filtration. Specifically, in liquid chromatography, filters are indispensable, improving the service life and stability of the analyzer and systems, and affecting the analysis data. Filters in HPLC systems, for example, will be used to remove micro particles contained in solvents, discharged out of pumps, mixed in samples and pushed out of columns. Filters in column plugs will also prevent packing materials from running out of columns.

>> Drawbacks of Conventional Filters:

The most commonly used filters at present are sintered stainless steel powder filters which, however, cannot comply with the increasing demands in micro HPLC applications for higher filtration capability with minimized volume and dimensions. Shown below is the microscopic photo of a sintered 10 μm diameter powder filter to be used as a solvent filter, proving a wide deviation in powder diameter from some ten micro meters through one hundred and some tens micro meter and uneven distribution of pore size. With the lower void rate shown in the photo, fluid resistance will increase greatly, as the filter pore size get smaller. The sintered powder filters consisting of powder particles connected with one another at contact points will be easily broken if the thickness of the filters has to be reduced. The filters will need one through two mm thickness minimum.

Drawbacks:

- 1) Owing to the restriction in minimum thickness available, the filter volume cannot be reduced to such a level as to fulfill the requirements in micro HPLC applications.
- 2) The filters with lower void rate will be clogged in a shorter time, when the pore sizes get smaller.
- 3) The volume of the filters made of powder cannot be diminished drastically. The pore size cannot be smaller than one through two μm .

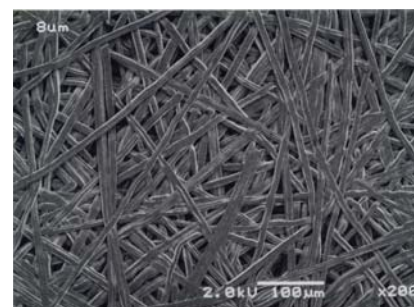
>> Sintered Stainless Steel Fiber Filters in Paper Form:

The sintered fiber filters in paper form will comply with the requirements which the sintered powder filters cannot realize (See the microscopic photo lower right). The filters with surface treatment will provide an efficient filtration, even with the pore size of 0.2 μm or smaller.

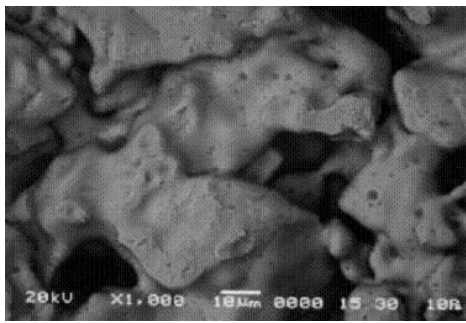
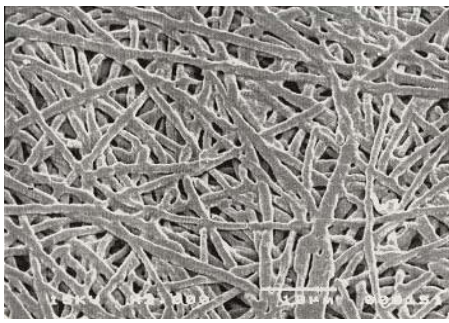
Advantages of Sintered Fiber Filters:

- 1) Micro pore with ultra fine fiber of 1 μm diameter.
- 2) Uniform pore size with uniform fiber diameter.
- 3) Higher physical strength with fibers connected at multi points.
- 4) Higher flexibility. Possible to be bent.

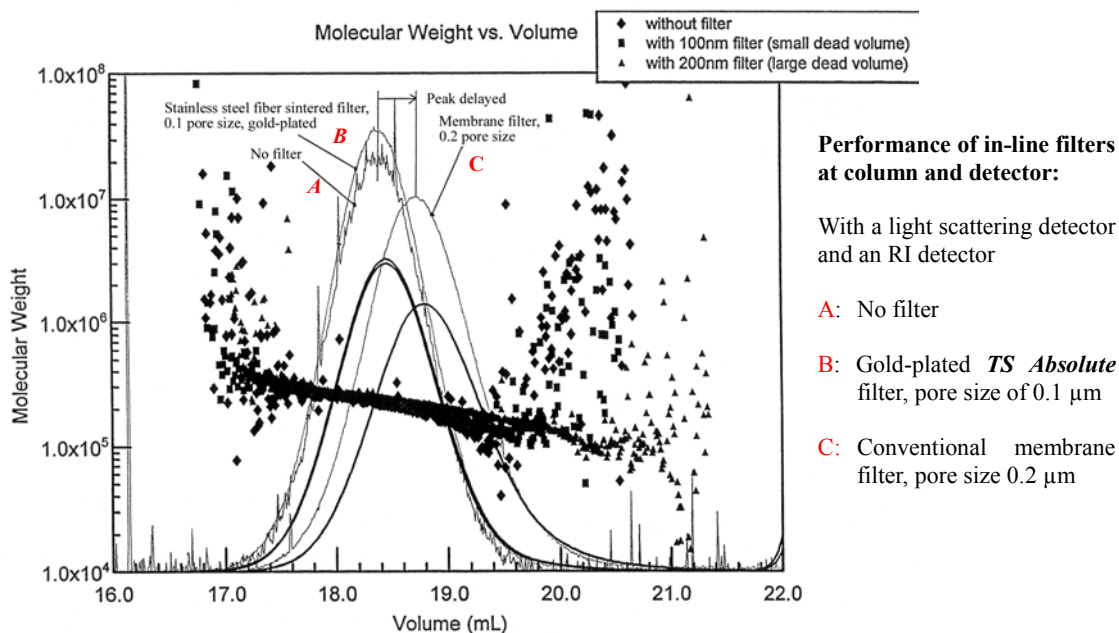
Fiber diameters	1, 2, 4, 8, 12 μm
Filter thickness	50 - 400 μm



■ Comparison of Stainless Steel Filters: Sintered Powder vs. Sintered Fiber

	Sintered Stainless Steel Powder Filter	Sintered Stainless Steel Fiber Filters (TS Absolute)
Pore size	1 μm >> The reduction of the pore will result at larger fluid resistance.	0.1 μm min. (Gold-plated) >> 90 % void rate will provide smaller fluid resistance even with 0.1 μm pore size.
Pore size distribution	Larger deviation on powder particle size distribution and pore sizes 	The uniform fiber diameter of 1 μm will result at smaller deviation on the pore sizes. 
Minimum thickness	1,000 μm >> The filter made of powder particles connected with a single point contact will need a certain level of thickness to maintain the strength.	50 μm >> The filter will provide sufficient strength owing to the fibers connected with one another at multi points.

■ Comparison of Filter Capability in GPC:



Noise reduced with the sintered stainless steel fiber filter or the conventional membrane filter. But the peak got broad and changed the position when the conventional membrane filter was applied. With the sintered stainless steel fiber filter *TS Absolute*, however, the peak stayed at the same position with the same shape thanks to the minimized inner volume of the filter. Since the peak position and the constant shape are critical in GPC, the conventional membrane filter will be less suitable than *TS Absolute* filter for the precise particle filtration to eliminate detector base line noise.

■ **Filter Surface Treatment:**

Gold, silver plating or PTFE coating are available on the filter with fibers connected at multi points and with uniform pore size. Reduction on pore size and improvement on filtration efficiency are realized.

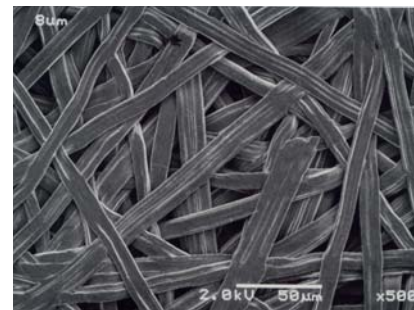
Examples of applications:

< Gold or silver plating >

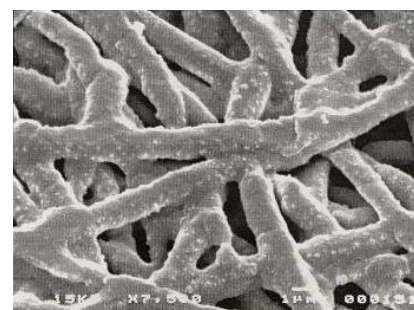
- Ultra micro particle filtration (0.1 μm particles will be caught with the gold plated filter)

< PTFE coating >

- High efficiency in water filtration. Chemically inert filtration.



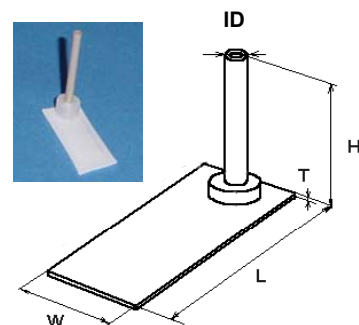
8 μm fiber diameter before plated



After gold plated

■ **Paper type solvent filters:**

Pore size	Dimensions (mm)					Material	Application
	W	L	H	T	ID		
10 μm	15	35	30	1.5	φ 2, 3, 1/8"	PTFE	None-organic



■ **Cartridge type solvent filters:**

Main filter element		Sub filter element		Size (mm)		Application	
Pore size (μm)	Material	Pore size (μm)	Material	Holder OD	Element dia.	Bottle	Solvent
2, 3, 5, 10	SUS316	20, 40	SUS316	φ 15	φ 11	500 mL	Organic
				φ 25	φ 20	3,000 mL	
10	PTFE	200	Carbon fiber	φ 15	φ 11	500 mL	None-organic
				φ 25	φ 20	3,000 mL	

Combinations of main filter element and sub filter element pore sizes:

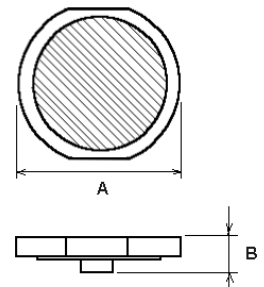
	Main filter element pore size	Sub filter element pore size	Element material
(1)	2 μm 3 μm	20 μm	SUS316
(2)	5 μm 10 μm	40 μm	SUS316
(3)	10 μm	200 μm	Carbon fiber

Contact us for combinations other than the above.

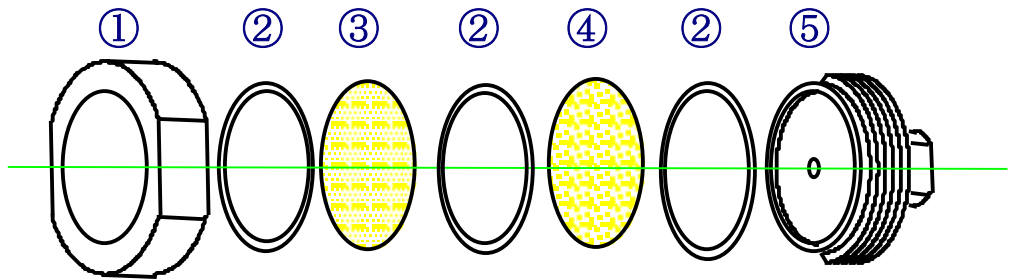


Sintered Stainless Steel Fiber Filters for precision filtration of gas and liquid

Size (mm)	For 500 mL bottle	For 3,000 mL bottle
A	φ 15 mm	φ 25 mm
B	9 mm	9 mm



□ Cartridge type solvent filter structure:



No	Description	For 500 mL bottle		For 3,000 mL bottle	
		Size (mm)			
①	Nut	φ 15 x 6 (w/o threads)		φ 25 x 6 (w/o threads)	
②	Spacer, PTFE	φ 11		φ 20	
③	Main filter element	φ 11		φ 20	
④	Sub filter element	φ 11		φ 20	
⑤	Holder	φ 15		φ 25	

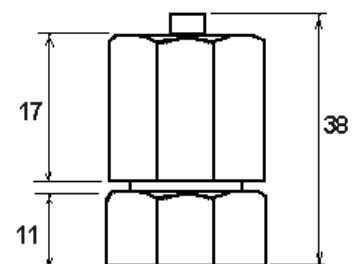
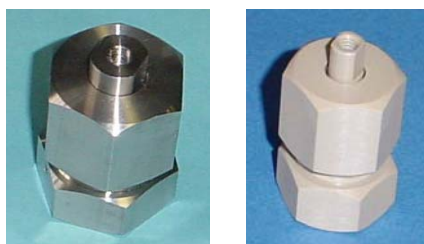
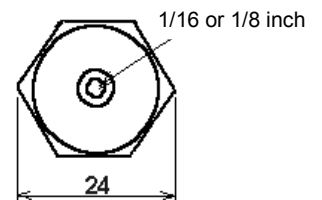
■ In-line filters:

ID (inch)	Pressure resistance (MPa)	Main filter element		Sub filter element		Application Solvent
		Pore size (μm)	Material	Pore size (μm)	Material	
1/16 or 1/8	35	0.1, 0.2, 0.4	SUS316	3, 5, 10, 20, 40	SUS316	Organic
	1	0.8, 1.5, 3, 10	PTFE	200	Carbon fiber	None-organic
	10, 20, 40					
		100, 200				

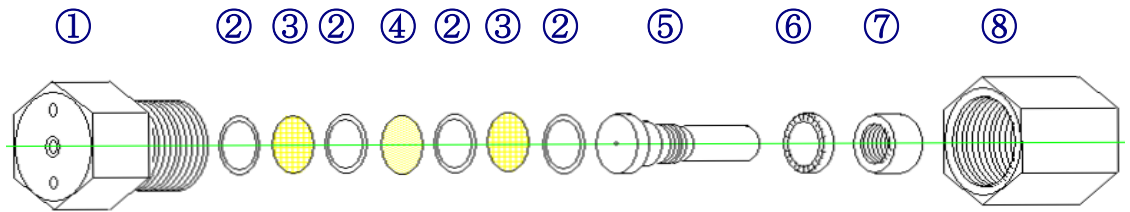
Combination of main filter element and sub filter element:

	Main filter element	Sub filter element	Element material
(1)	0.1, 0.2, 0.4 μm	3 μm	SUS316
(2)	0.8, 1.5 μm	5 μm	
(3)	3, 10 μm	40 μm ^{NB}	
(4)	10, 20, 40, 100, 200 μm	200 μm	Carbon fiber

NB: Sub filter element with 20 μm pore size available.



□ In-Line Filter Structure:



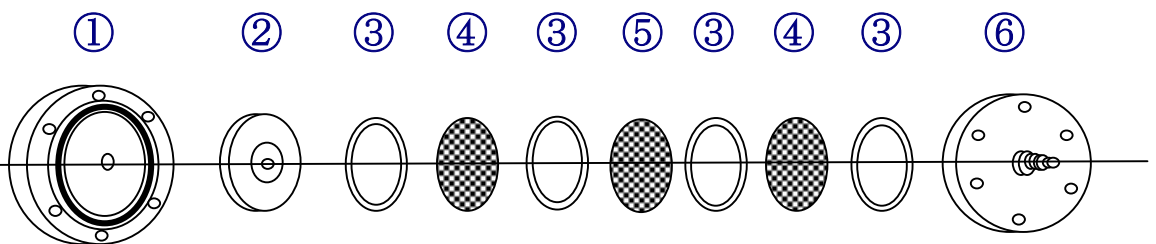
	1/16 inch connection, for organic solvent	1/16 inch connection, for none-organic solvent
No	Description	Description
①	Holder, SUS316, for 1/16 inch solid type fitting	Holder, PEEK, for 1/6 inch solid type fitting
②	Spacer, PEEK, 0.2 μm T, φ 13 mm	Spacer, PEEK, 0.2 μm T, φ 13 mm
③	Sub filter element (10 μm), φ 13 mm	Sub filter element (200 μm), φ 13 mm
④	Main filter element (0.8 μm), φ 13 mm	Main filter element (10 μm), φ 13 mm
⑤	Plug, SUS316, for 1/16 inch solid type fitting	Plug, PEEK, for 1/16 inch solid type fitting
⑥	O-ring (seal), UHMWPE, Perfluoro	
⑦	Nut, small, SUS316	Nut, small, PEEK
⑧	Nut, large, SUS316	Nut, large, PEEK

NB: Contact us for 1/8 inch connection.

■ φ 47 mm In-Line Filters

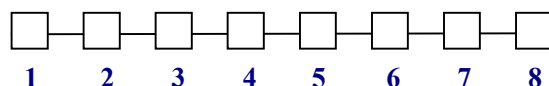
No	Description
①	Holder
②	Seat
③	Spacer
④	Sub filter element
⑤	Main filter element
⑥	Holder
⑦	O-ring (φ 34/46)

Advice pore size requirements.



Part Numbers & Specifications

Part Number



Ex. : I-S-PK-13-00010-0030-0-G

- | | | | |
|---|-------------------------|---|-------------------------------|
| 1 | Type: In-line filter | 5 | Main filter pore size: 0.1 µm |
| 2 | Filter material: SUS316 | 6 | Sub filter pore size: 3 µm |
| 3 | Housing material: PEEK | 7 | Bottle volume: N/A |
| 4 | Filter OD : 13 mm | 8 | Surface plating: Gold plated |

1	Type:	5	Main filter pore size:
	P: Paper type solvent filter C: Cartridge type solvent filter I: In-line filter HI: Spare housing for in-line filter MFC: Spare main filter element for cartridge type solvent filter MFI: Spare main filter element for in-line filter SFC: Spare sub filter element for cartridge type solvent filter SFI: Spare sub filter element for in-line filter SPC: Spare spacer for cartridge type solvent filter SPI: Spare spacer for in-line filter		00010: 0.1 µm 00500: 5 µm 00020: 0.2 µm 00800: 8 µm 00030: 0.3 µm 01000: 10 µm 00040: 0.4 µm 02000: 20 µm 00045: 0.45 µm 03000: 30 µm 00080: 0.8 µm 04000: 40 µm 00100: 1.0 µm 05000: 50 µm 00150: 1.5 µm 10000: 100 µm 00200: 2 µm 20000: 200 µm 00300: 3 µm 0: N/A 00400: 4 µm
2	Main/sub filter materials:	6	Sub filter pore size:
	S: SUS316 P: PTFE C: Carbon fiber 0: N/A		0030: 3 µm 0400: 40 µm 0050: 5 µm 1000: 100 µm 0100: 10 µm 2000: 200 µm 0200: 20 µm 0: N/A
3	Housing materials:	7	Bottle volume (Cartridge type solvent filter only):
	S: SUS316 PK: PEEK 0: N/A		05: 500 mL 0: N/A 30: 3,000 mL
4	Main/sub filter/spacer OD:	8	Surface plating:
	11: 11 mm 25: 25 mm 13: 13 mm 47: 47 mm 20: 20 mm 0: N/A		G: Gold plated S: Silver plated 0: N/A NB: For plating or coating other than the above, please contact us.

NB1: Select main filter, sub filter and spacer with the same OD.

NB2: The configurations and the specifications are subject to change without a prior notice.



Intelligent Cascade Pump, “TS Absolute”

for Micro Flow independent of compressibility of fluid.

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 - Eliminate Dissolved Oxygen with Heater
-
- Automatic removal of bubbles and dissolved gas
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