Steam-in-place hollow fiber cartridges

CROSS FLOW FILTRATION

Cytiva steam-in-place (SIP) cartridges are specifically designed for pharmaceutical manufacturing operations (Fig 1). The cartridges are based on high-quality membranes and fit into stainless steel housings for convenient operation during the steaming cycle. SIP cartridges are available in three standard styles denoted SMO, STM, and MSM.

The polysulfone cartridge units have the strength and integrity to withstand the rigors of steam-in-place operations. All cartridges have an open face configuration for quick, yet thorough, steam penetration of the membranes. The SMO and STM versions are based on a unit diameter of 7.6 cm (3 in), whereas MSM units have a nominal diameter of 10 cm (4 in). For leak-proof sanitary closure within the housing, SMO and MSM cartridges have a single O-ring seal at each end, whereas STM units have end caps at each face that neck down to a double O-ring seal. SIP cartridges are available in both ultrafiltration (UF) and microfiltration (MF) pore sizes, each with a choice of 30 and 60 cm path lengths. All cartridge components are USP XXIV Biologicals Test for Plastics Class VI tested.

Key benefits of SIP hollow fiber cartridges:

- Strong polysulfone cartridge units
- Leak-proof sanitary closure
- Available in UF and MF pore sizes

All housing assemblies are of 316L stainless steel (SS) and have a sanitary construction. The standard O-ring material is silicone. Both end fitting and permeate ports are 1.5 in sanitary Tri-Clamp™ configuration, allowing for quick and easy connection to steam and process piping.

Fig 1. SIP cartridges have the strength and integrity to withstand the rigors of SIP operations.

A number of accessories are available for steam-in-place cartridges. To learn more about which type of cartridge is best for your application, contact your Cytiva salesperson.

The outstanding performance of Cytiva membrane products is based upon proprietary expertise in spinning hollow fiber membranes with excellent morphology. This method renders our UF membranes free of macrovoids and the pinhole defects commonly associated with the characteristic structure of conventional flat-sheet membranes and other hollow fiber filter cartridges. Cytiva microfiltration membranes are high-quality, bubble point testable membranes.
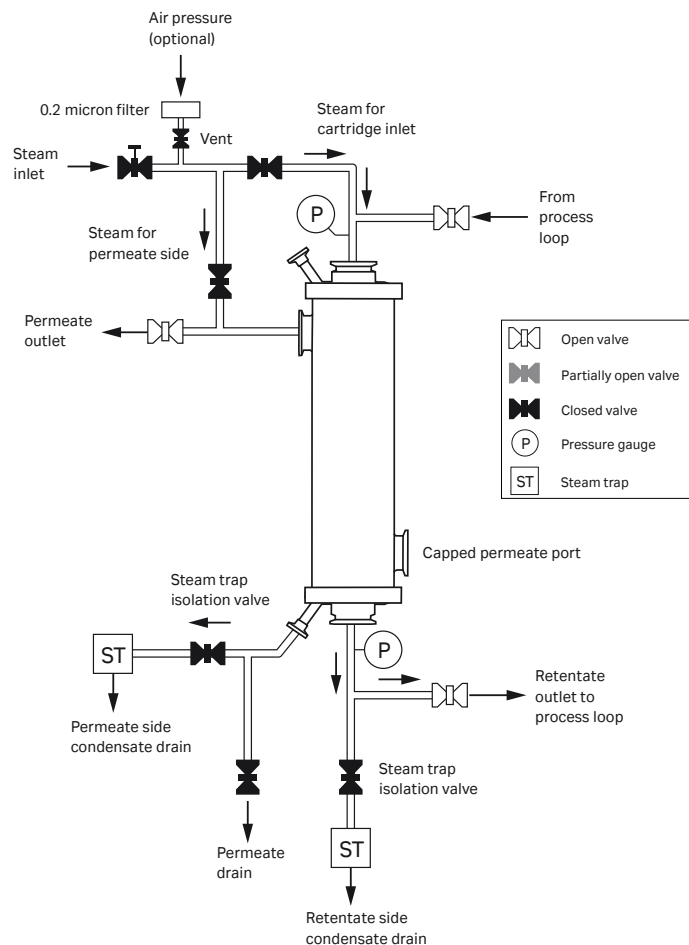
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Cartridge housing assembly

In operation, the housing should be piped in a vertical orientation (Fig 2 to 4). It is recommended to steam the complete unit and housing assembly for 30 min at 121°C to 123°C and 1 barg (15 psig). Steam should be delivered to both sides of the membrane for full steam penetration and to minimize the pressure differential, delta P, across the membrane during the steam sterilization cycle. A 0.5 in sanitary clamp port is positioned on the low point of the housing shell to enable complete removal of condensate (Fig 5).

Cytiva provides a SIP protocol to enable procedures that support the rigors of a full validation and to maximize the cartridge lifetime.
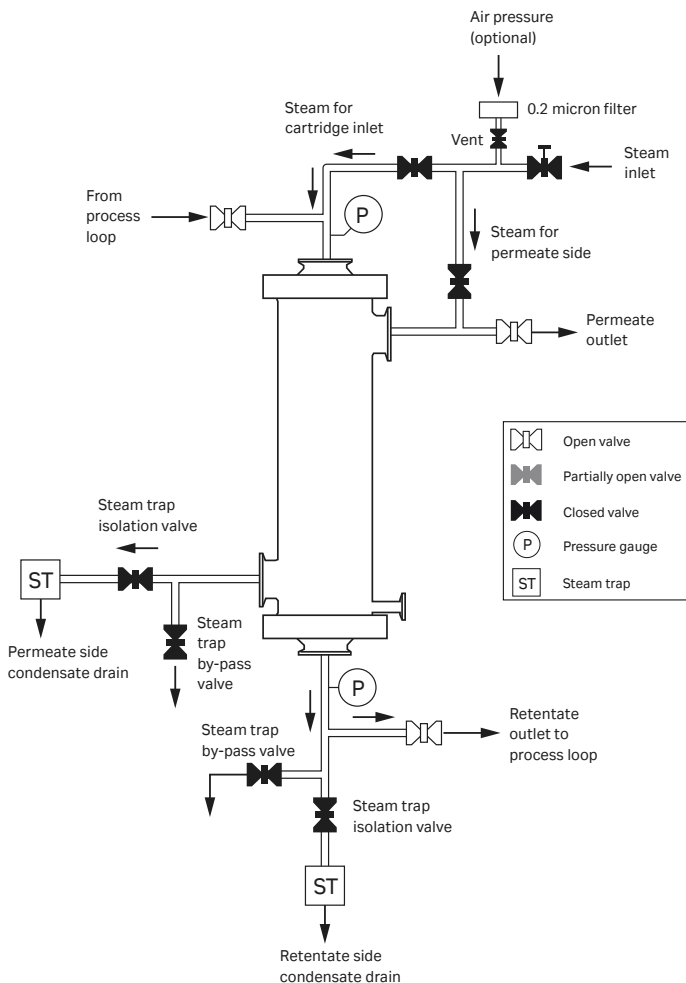
Applications

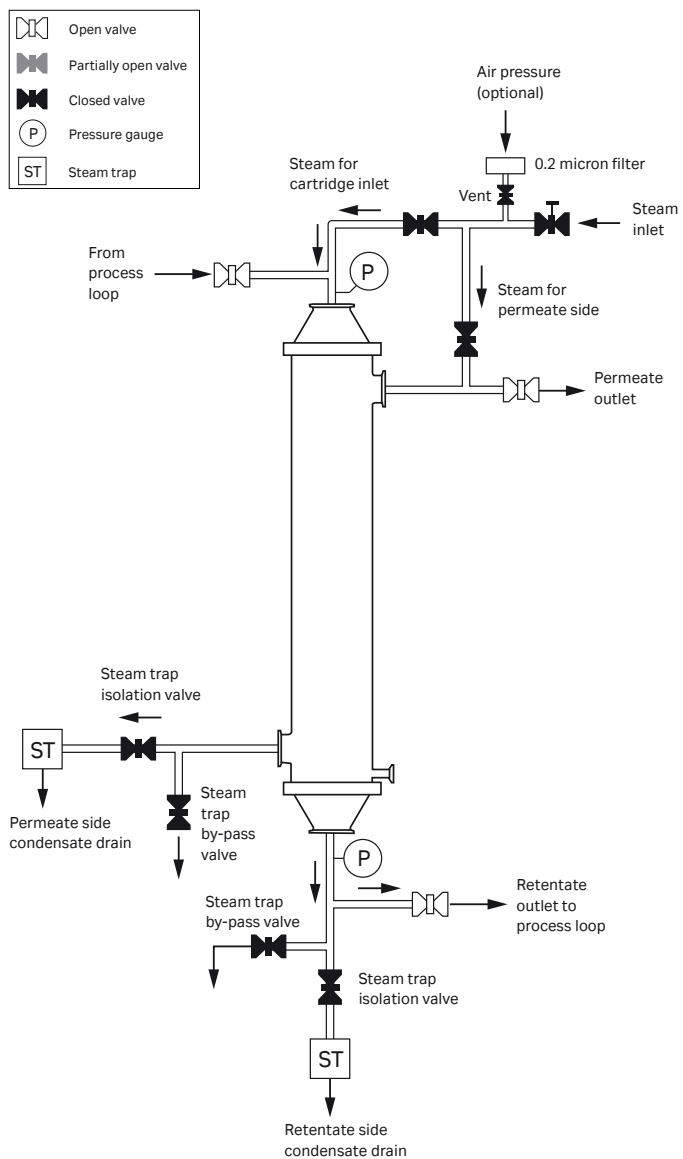Typical applications for SIP cartridges include:

- Cell harvesting and clarification
- Clarification of lysates
- Purification of liposomes, viruses
- Concentration, diafiltration, and purification of monoclonal antibodies, plasmids, proteins, viruses, vaccines, colloids, plasma, and drug delivery emulsions
- Removal of suspended solids, viruses, bacteria, pyrogens
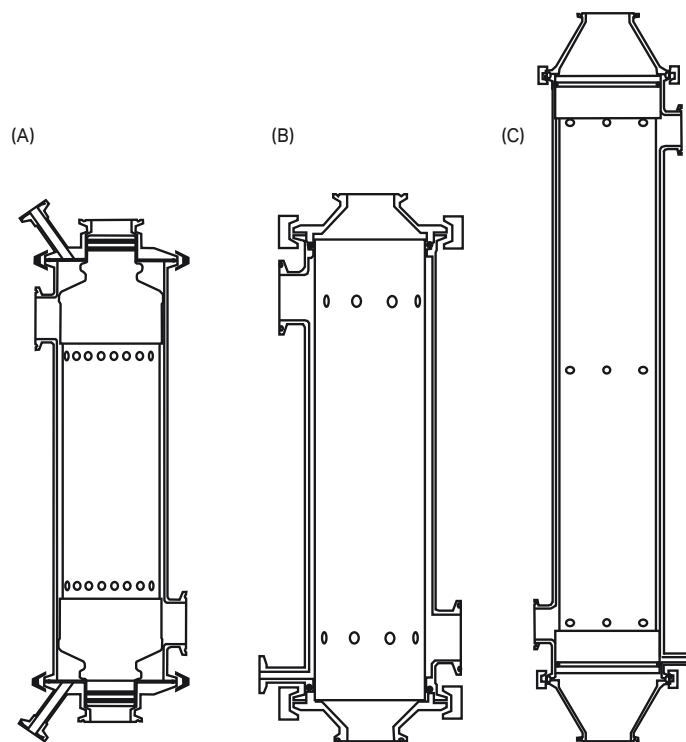- Continuous buffer exchange
- Continuous cell culture perfusion

Fig 2. STM valve arrangement (process mode).

Fig 3. SMO valve arrangement (process mode).

Fig 4. MSM valve arrangement (process mode).

Fig 5. Cross sections of (A) an STM cartridge, (B) an SMO cartridge, and of (C) an MSM cartridge.

Ordering information

STM ultrafiltration cartridges

Model number	Pore size (NMWC)	Fiber i.d. (mm)	Membrane area (m²)	(ft²)	Nominal flow path length (cm)	Code number
UFP-30-E-35STM	30 000	1	0.92	9.9	30	56-4104-13
UFP-100-E-35STM	100 000	1	0.92	9.9	30	56-4104-14
UFP-10-C-55STM	10 000	0.5	3.25	35	60	56-4104-20
UFP-10-E-55STM	10 000	1	2.1	23	60	56-4104-21
UFP-30-C-55STM	30 000	0.5	3.25	35	60	56-4104-22
UFP-50-C-55STM	50 000	0.5	3.25	35	60	56-4104-24
UFP-100-C-55STM	100 000	0.5	3.25	35	60	56-4104-25
UFP-100-E-55STM	100 000	1	2.1	23	60	56-4104-26
UFP-500-E-55STM	500 000	1	2.1	23	60	56-4104-27
UFP-750-C-55STM	750 000	0.5	3.25	35	60	29-0110-48

STM microfiltration cartridges

Model number	Pore size (micron)	Fiber i.d. (mm)	Membrane area (m²)	(ft²)	Nominal flow path length (cm)	Code number
CFP-2-E-35STM	0.2	1	0.92	9.9	30	56-4104-17
CFP-1-E-55STM	0.1	1	2.1	23	60	56-4104-28
CFP-2-E-55STM	0.2	1	2.1	23	60	56-4104-29
CFP-4-E-55STM	0.45	1	2.1	23	60	56-4104-30
CFP-6-D-55STM	0.65	0.75	2.5	27	60	56-4109-25

STM housings and accessories

Model number	Description	Code number
SS-35STM	Housing assembly for 35STM cartridges, 316L SS with 2 gaskets and 2 clamps	56-4106-27
SS-55STM	Housing assembly for 55STM cartridges, 316L SS with 2 gaskets and 2 clamps	56-4106-28
KG4S	0.5 in TC gasket, silicone, pack of 4	56-4109-94
KG12S	1.5 in TC gasket, silicone, pack of 4	56-4109-96
KG24S	3 in TC [schedule 5 pipe] gasket, silicone, pack of 4	11-0005-25
CL4	0.5 in TC quick disconnect clamp, 304 SS	56-4106-65
CL12	1.5 in TC quick disconnect clamp, 304 SS	56-4106-67
CL24	3 in TC [schedule 5 pipe] clamp, 304 SS	56-4106-71
K02ORS	STM O-ring set, silicone, pack of 8	56-4106-90
VPC4	0.5 in TC permeate-side condensate drain or vent valve, 316L SS	56-4105-90

SMO ultrafiltration cartridges

Model number	Pore size (NMWC)	Fiber i.d. (mm)	Membrane area (m²)	(ft²)	Nominal flow path length (cm)	Code number
UFP-750-C-35SMO	750 000	0.5	1.35	14.5	30	29-0318-03
UFP-10-E-55SMO	10 000	1	2.1	23	60	56-4104-38
UFP-30-E-55SMO	30 000	1	2.1	23	60	56-4104-39
UFP-100-E-55SMO	100 000	1	2.1	23	60	56-4104-40
UFP-300-E-55SMO	300 000	1	2.1	23	60	11-0005-83
UFP-500-E-55SMO	500 000	1	2.1	23	60	56-4104-41
UFP-750-C-55SMO	750 000	0.5	3.25	35	60	29-0318-11
UFP-750-E-55SMO	750 000	1	2.1	23	60	28-9782-82

SMO microfiltration cartridges

Model number	Pore size (micron)	Fiber i.d. (mm)	Membrane area (m²)	(ft²)	Nominal flow path length (cm)	Code number
CFP-1-E-35SMO	0.1	1	0.92	9.9	30	56-4104-35
CFP-2-E-35SMO	0.2	1	0.92	9.9	30	56-4104-36
CFP-4-E-35SMO	0.45	1	0.92	9.9	30	56-4104-37
CFP-1-E-55SMO	0.1	1	2.1	23	60	56-4104-42
CFP-2-E-55SMO	0.2	1	2.1	23	60	56-4104-43
CFP-4-E-55SMO	0.45	1	2.1	23	60	56-4104-44

SMO housings and accessories

Model number	Description	Code number
SS-35SMO-DP	Housing assembly with drain port for 35SMO cartridges, 316L SS with 2 gaskets and 2 clamps	56-4106-29
SS-55SMO-DP	Housing assembly with drain port for 55SMO cartridges, 316L SS with 2 gaskets and 2 clamps	56-4106-30
KG12S	1.5 in TC gasket, silicone, pack of 4	56-4109-96
KG24S	3 in TC [schedule 5 pipe] gasket, silicone, pack of 4	11-0005-25
CL12	1.5 in TC quick disconnect clamp, 304L SS	56-4106-67
CL24	3 in TC [schedule 5 pipe] clamp, 304L SS	56-4106-71
K03ORS	SMO cartridge O-ring set of 4, silicone	56-4106-91

MSM ultrafiltration cartridges

Model number	Pore size (NMWC)	Fiber i.d. (mm)	Membrane area (m²)	(ft²)	Nominal flow path length (cm)	Code number
UFP-750-C-45MSM	750 000	0.5	3.25	35	30	29-0098-60
UFP-10-C-65MSM	10 000	0.5	5.6	60	60	56-4104-52
UFP-10-E-65MSM	10 000	1	4.2	45	60	56-4104-53
UFP-30-C-65MSM	30 000	0.5	5.6	60	60	56-4104-54
UFP-30-E-65MSM	30 000	1	4.2	45	60	56-4104-55
UFP-100-E-65MSM	100 000	1	4.2	45	60	56-4104-57
UFP-300-E-65MSM	300 000	1	4.2	45	60	56-4111-36
UFP-500-C-65MSM	500 000	0.5	5.6	60	60	11-0005-01
UFP-500-E-65MSM	500 000	1	4.2	45	60	56-4104-58
UFP-750-C-65MSM	750 000	0.5	5.6	60	60	29-0082-51
UFP-750-E-65MSM	750 000	1	4.2	45	60	29-0189-75
UFP-30-C-85MSM	30 000	0.5	11.6	125	110	56-4109-38
UFP-30-E-85MSM	30 000	1	9	95	110	56-4104-63
UFP-500-E-85MSM	500 000	1	9	95	110	56-4104-66
UFP-750-C-85MSM	750 000	0.5	11.6	125	110	29-0082-55

MSM microfiltration cartridges

Model number	Pore size (micron)	Fiber i.d. (mm)	Membrane area (m²)	(ft²)	Nominal flow path length (cm)	Code number
CFP-1-E-65MSM	0.1	1	4.2	45	60	56-4104-59
CFP-2-E-65MSM	0.2	1	4.2	45	60	56-4104-60
CFP-4-E-65MSM	0.45	1	4.2	45	60	56-4104-61

MSM housings and accessories

Model number	Description	Code number
SS-45MSM-DP	Stainless steel housing assembly with drain port and 2-in TC straight adaptors for 45MSM cartridges, 316L SS with 2 gaskets (silicone) and 2 clamps	56-4106-31
SS-65MSM-DP	Stainless steel housing assembly with drain port and 2-in TC straight adaptors for 65MSM cartridges, 316L SS with 2 gaskets (silicone) and 2 clamps	56-4106-32
SS-85MSM-DP	Stainless steel housing assembly with drain port and 2-in TC straight adaptors for 85MSM cartridges, 316L SS with 2 gaskets (silicone) and 2 clamps	56-4106-33
SS-85MSM-EL-DP	Stainless steel housing assembly with drain port and 2.5-in TC elbow adaptors for 85MSM cartridges, 316L SS with 2 gaskets (silicone) and 2 clamps	56-4106-34
CL4	0.5-in TC quick disconnect clamp, 304 SS	56-4106-65
CL12	1.5-in TC quick disconnect clamp, 304 SS	56-4106-67
CL16-LT	2-in toggle clamp, 304 SS	56-4106-70
KG4S	0.5-in TC gasket, silicone, pack of 4	56-4109-94
KG12S	1.5-in TC gasket, silicone, pack of 4	56-4109-96
KG12B	1.5-in TC gasket, Buna-N, pack of 4	56-4109-97
KG16S	2-in TC gasket, silicone, pack of 4	56-4109-98
KG16B	2-in TC gasket, Buna-N, pack of 4	11-0005-24
K05ORS	MSM O-ring set, silicone, pack of 4	56-4106-95
VDM-6SS	Diaphragm valve, 0.75-in TC, 316L SS	56-4105-92
VDM-12SS	Diaphragm valve, 1.5-in TC, 316L SS	56-4105-93

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