Stax™

DISPOSABLE DEPTH FILTER SYSTEMS

A versatile, disposable depth filter platform

Stax™ capsules utilizing Seitz high-performance depth filter media and the patented SUPRAdisc™ II module design, are well suited for demanding prefiltration and clarification biopharmaceutical applications. This ready-to-use platform is an efficient tool to streamline your process filtration applications. Stax disposable depth filter capsules increase process efficiencies and address the needs for simplicity, speed, and intuitive operation. Optimized with a small footprint design, the Stax platform makes for an easy to handle and operate process step. Scalable in size and performance to meet lab, pilot and process needs, our Stax disposable capsules enable greater flexibility and ease of use than traditional depth filter technology. With three interchangeable capsule sizes ranging from 0.25 to 2.00 m^2 (2.70 to 21.50 ft^2), Stax capsules permit incremental increases in process fluid volume and filter area through the use of this modular design.

Simple, intuitive operation

Placed into one of the three differently-sized chassis, our single-use Stax capsules do not require the use of stainless steel housings which require costly cleaning and cleaning validation. Stax system chassis are designed for assembly and use by a single operator and provide a disposable platform in which the operator can load, operate and unload in an ergonomically designed vertical orientation. The ability to operate with two different media grades in one chassis (serial filtration) helps improve the flexibility and economy of operating the Stax platform. Integrating our Allegro™ platforms into a comprehensive single-use system will help enhance the overall benefits of implementing a single-use strategy and the Stax platform.

Fig 1. Stax disposable depth filter system.

Flexible process design

The Stax platform has been designed to accommodate multiple processing options. Whether you want to process:

- Bottom up
- Top down
- Bottom in/bottom out
- In series

Using our manifold kits provides flexibility in your process design. Appropriate for use in primary and secondary filtration steps, as well as post-precipitation clarification, in applications such as:

- Mammalian cell cultures
- Yeast
- *E. coli* lysates and refolds
- Vaccines
- Blood plasma proteins and serum
- Media

Our Stax capsules are available in a wide array of pharmaceutical-grade Seitz depth filter media. Supported through comprehensive validation guides, Seitz depth filter media meets the necessary pharmaceutical standards for:

- Quality
- Lot-to-lot consistency
- Manufacturing control
- Low extractable content
- Low endotoxin content

Fig 2. Five-high Stax chassis with a single module.

Features and benefits

Features	Benefits
Low hold-up volume	Greater product recovery and lower post-use rinse volume requirements than traditional modules and housings. Post-use blow down in forward or reverse flow direction are possible.
Linear scalability	Flexibility and confidence in process success from < 1 to 20 000+ L. Scalable through our entire (Supracap™ 50 and Supracap 100 capsules) as well as traditional SUPRAdisc I and SUPRAdisc II modules.
Reduced risk	The Stax capsules are based upon the design of our SUPRAdisc II modules, which provides benefits in process stability due to mechanical robustness.
No housings	Easy to use and manipulate while reducing operator safety issues.
Disposable	Reduces need for cleaning and cleaning validation.
Encapsulated design	Reduces operator exposure to potential biohazards.
Intuitive operation	Reduces operator training and increases time to acceptance.
Small footprint	Enables use in close proximity to other equipment and reduces cost to install.

Providing linear and seamless scalabilty

Scalability

Enabling technologies such as the Stax system must be supported with complementary products and equipment that provide seamless linear scalability in filtration performance from bench to process. For this reason we have developed a complete line of scaled-down disposable capsules utilizing the same design principle, flow path, and filter media as the Stax capsules.

Fig 3. Small, medium, and large Stax capsules.

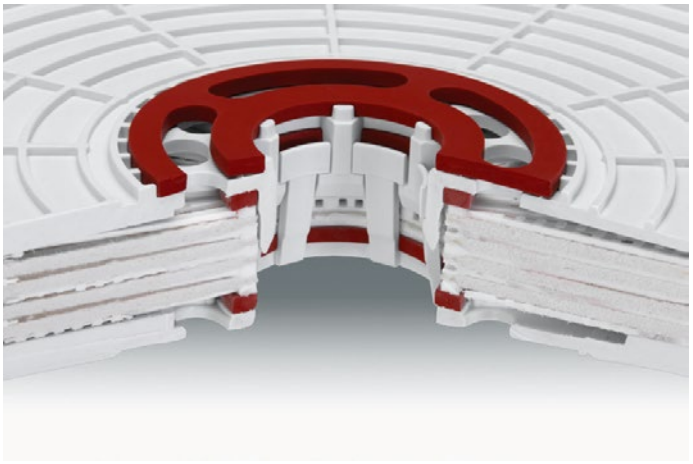

Fig 4. Stax capsule cross-section.

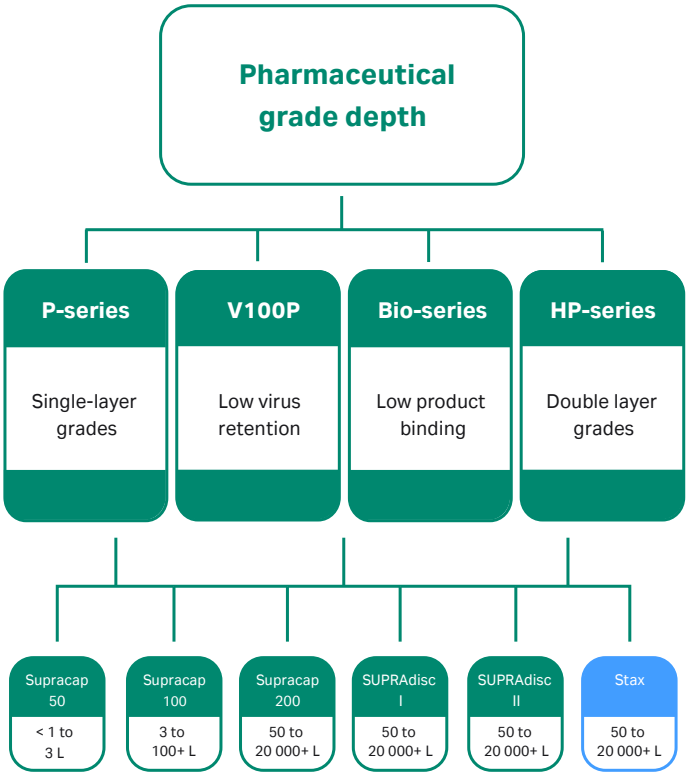

Fig 5. Scalability – depth filter sheet media format.

Fig 6. Supracap capsule.

Scalability

Supracap 50 capsules (< 1 to 3 L)	
Capsule	22 cm² (0.024 ft²) of EFA[1]
Supracap 100 capsules (3 to > 100 L)	
5 in. capsules	0.05 m² (0.54 ft²) SL[2] EFA 0.025 m² (0.27 ft²) DL[3] EFA
10 in. capsules	0.1 m² (1.08 ft²) SL EFA 0.05 m² (0.54 ft²) DL EFA
20 in. capsules	0.2 m² (2.15 ft²) SL EFA 0.1 m² (1.08 ft²) DL EFA
30 in. capsules	0.3 m² (3.23 ft²) SL EFA 0.15 m² (1.61 ft²) DL EFA
Stax capsules (50 to > 20 000 L)	
Small capsules	0.5 m² (5.38 ft²) SL EFA 0.25 m² (2.70 ft²) DL EFA
Medium capsules	1.0 m² (10.8 ft²) SL EFA 0.5 m² (5.38 ft²) DL EFA
Large capsules	2.0 m² (21.5 ft²) SL EFA 1.0 m² (10.8 ft²) DL EFA

[1] EFA = Effective filtration area
[2] SL = Single layer Seitz depth filter media such as P-series and BIO-series
[3] DL = Double layer Seitz depth filter media such as HP-series

Fig 7. Supracap 50, Supracap 100, and Stax capsules.

Fig 8. SUPRAdisc II module.

Reduced risk

Benefiting from our SUPRAdisc II mechanically robust module design, the Stax capsules provide stable filtration results batch to batch. Through the use of interlocking and welded dual drainage plates, this module design is able to provide the structural integrity necessary for:

- Unobstructed process flow
- Consistent filtration results
- Minimized risk to filter media ruptures due to reverse pressure
- Minimized risk of damage due to shipping and handling

Seitz depth filter media available in Stax capsules

P-series

Seitz P-series depth filter sheets were developed to meet the requirements of the biological and pharmaceutical industries. Manufactured with stringent in-process control methods, they help to assure consistent filtration quality, a high purity of filter medium, and alignment with the requirements of the pharmaceutical industry.

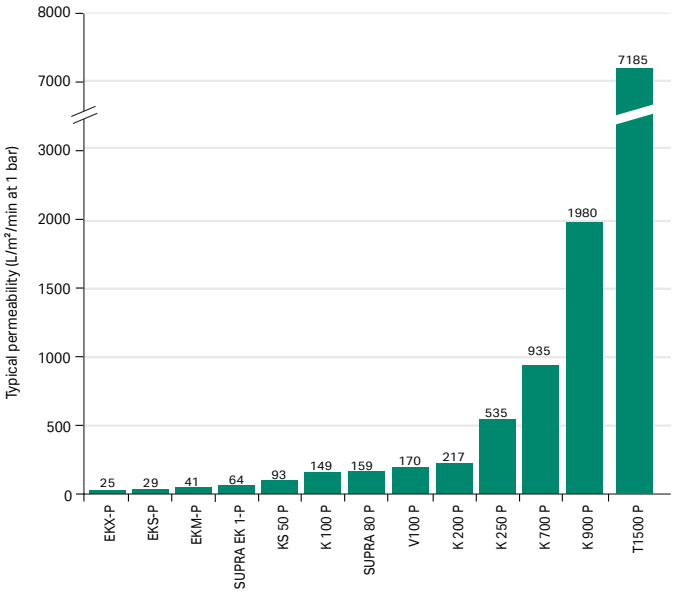

Fig 9. Permeability at 1 bar (14.5 psi) – P-series.

Fig 10. Pilot-scale chassis with Stax capsules.

Fig 11. Seitz depth filter sheet media.

HP-series

Seitz HP-series depth filter sheets are comprised of two distinct layers of Seitz P-series depth filter sheets; a coarser layer upstream followed by a finer layer downstream. These depth filter sheets have been designed for use in low viability, high solids containing applications. As small shifts in process conditions can cause dramatic differences in filtration requirements, the flexibility of combining any combination of P-series media in an HP format allows for improved process optimization.

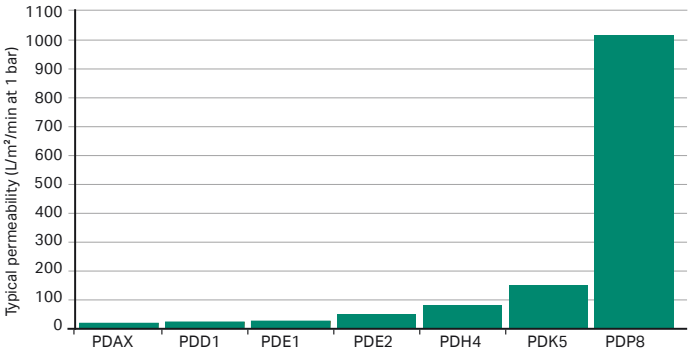

Fig 12. Permeability: HP-series. Test performed with water at 20°C and a differential pressure of 1 bard (14 psid).

Bio-series

Seitz Bio-series depth filter sheets are specially developed from highly purified natural and modified cellulose fibers and contain no inorganic materials such as diatomaceous earth (DE), perlite, or glass fibers. The lack of these inorganic substances significantly reduces the levels of ash and heavy metal extractables.

Stax CF modules

Containing Seitz P-series sheets, Stax CF modules are configured with increased spacing to accommodate fluids with a high solids loading and are ideal for the retention of diatomaceous earth and activated carbon.

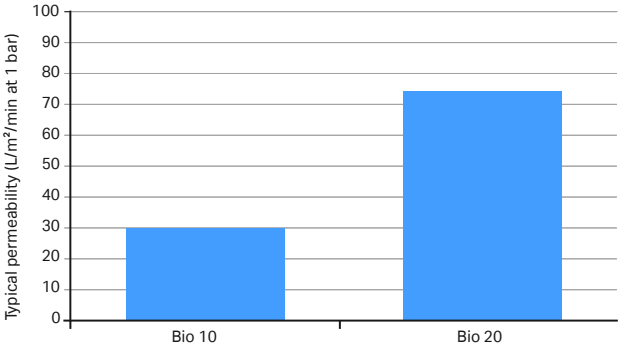

Fig 13. Permeability: Bio-series.

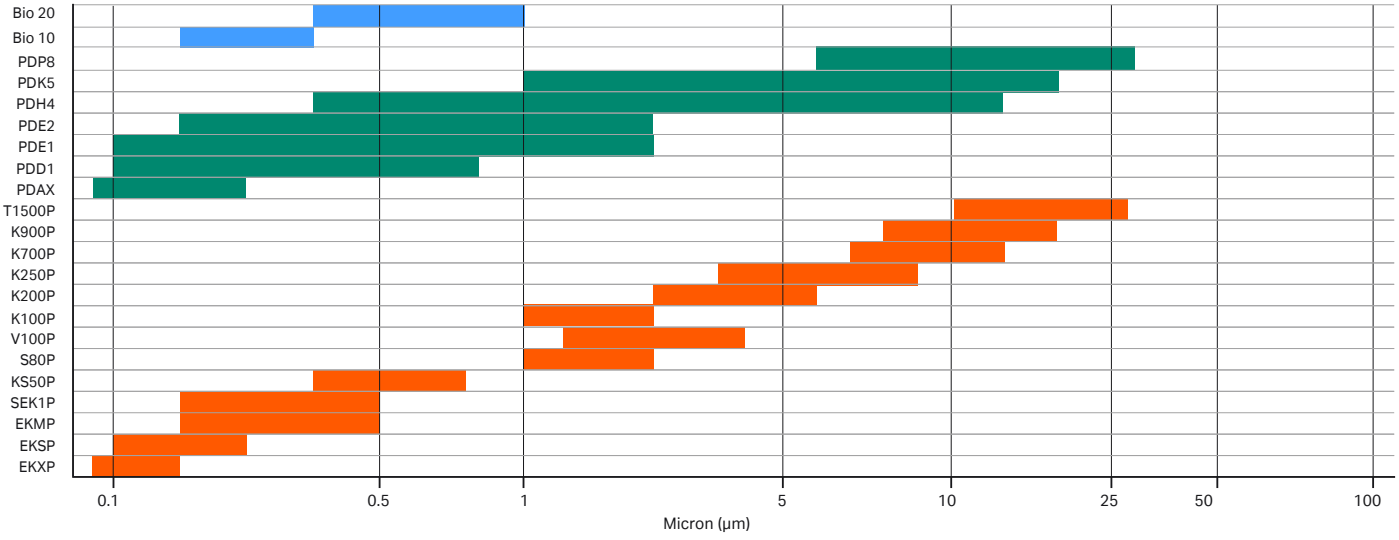

Fig 14. Nominal retention rating of Seitz P-series, HP-series, and Bio-series depth filter sheet media.

Technical information

Filter area

Capsule size	Effective filter area	
	Single layer media	Double layer media
Small	0.5 m² (5.38 ft²)	0.25 m² (2.70 ft²)
Medium	1.0 m² (10.8 ft²)	0.5 m² (5.38 ft²)
Large	2.0 m² (21.5 ft²)	1.0 m² (10.8 ft²)

Capsule dimensions

Capsule size	Capsule footprint size	
	Diameter	Height
Small	442 mm (17.4 in.)	58.5 mm (2.3 in.)
Medium	442 mm (17.4 in.)	80.8 mm (3.2 in.)
Large	442 mm (17.4 in.)	128.8 mm (5.1 in.)

Capsule weight [5]

Capsule size	Weight	
	Dry	Wet (post blow down)
Small	3.45 to 3.80 kg	4.80 to 5.25 kg
Medium	4.90 to 5.30 kg	7.60 to 8.00 kg
Large	7.00 to 8.20 kg	12.70 to 13.60 kg

[5] Including internal module

Void volume

Component	Void volume [6]
Small capsule	1.1 L
Medium capsule	1.6 L
Large capsule	2.6 L

[6] Void volume is defined as the amount of liquid to fill the entire component with the cartridges installed in the capsules

Maximum operating pressure

3.5 bar (50 psi) at 25°C

1.0 bar (14.3 psi) at 60°C

Note: all pressure specifications are for capsules correctly installed into Stax chassis

Maximum differential pressure

2.4 bar (35 psi) at 25°C – forward direction

Maximum operating temperature

60°C

Inlet and outlet dimensions

50.8 mm (2 in.) tri-clamp or 38.1 mm (1½ in.) tri-clamp

Autoclave capability/limits

2 autoclave cycles: 60 min at 125°C

Post use autoclave sterilization

60 min at 121°C
(applies to entire Stax system – capsules and chassis together)

Sanitization

Hot water sanitization	80°C at 1 bar (14.5 psi) for 60 min
Post-use caustic treatment	1 M NaOH at 3.5 bar (50 psi) for 60 min at 25°C

Traceability

Capsule product code laser engraved with the following:

Internal sales order number

Serial number

Fig 15. Five-high process chassis without/with capsules.

Capsule material of construction

Capsule shell	Glass-filled polypropylene
Manifold assemblies	Glass-filled polypropylene
Internal module	Polypropylene
Gasket	Silicone
Depth filter media	See specific filter media data sheet

Chassis dimensions

Chassis model	Footprint size		
	Height	Length	Width
SXLSC02	1018 mm (40.0 in.)	516 mm (20.3 in.)	516 mm (20.3 in.)
SXLSC02W	1025 mm (40.4 in.)	552 mm (21.7 in.)	560 mm (22.0 in.)
SXPSC05P	1241 mm (48.9 in.)	610 mm (24.0 in.)	610 mm (24.0 in.)
SXPSC05W	1312 mm (51.6 in.)	1150 mm (45.3 in.)	800 mm (31.5 in.)
SXPSC10P	1864 mm (73.4 in.)	610 mm (24.0 in.)	610 mm (24.0 in.)
SXPSC10W	1935 mm (76.2 in.)	1150 mm (45.3 in.)	800 mm (31.5 in.)

Chassis weights

Chassis model	Weight
SXLSC02	75 kg
SXLSC02W	78 kg
SXPSC05P	190 kg
SXPSC05W	192 kg
SXPSC10P	238 kg
SXPSC10W	240 kg

Fig 16. Stax manifold kit, product code SXBBM400SP.

Capacity – maximum number of capsules (one stage per chassis only)

Chassis model	Small capsule	Medium capsule	Large capsule
SXLSC02*	4	3	2
SXPSC05*	10	7	5
SXPSC10*	22	16	10
SXPSC05W	1312 mm (51.6 in.)	1150 mm (45.3 in.)	800 mm (31.5 in.)
SXPSC10P	1864 mm (73.4 in.)	610 mm (24.0 in.)	610 mm (24.0 in.)
SXPSC10W	1935 mm (76.2 in.)	1150 mm (45.3 in.)	800 mm (31.5 in.)

- The table above indicates the total number of capsules in various sizes that each chassis size can accommodate, when using one stage per chassis. Multiple filtration stages in one chassis will reduce the maximum number of capsules per chassis.
- It is also possible to make combinations of different sized capsules to achieve the exact filtration area required to the nearest 0.25 m^2 (2.70 ft^2) for double layer media or 0.5 m^2 (5.38 ft^2) for single layer media.
- It is also possible to operate any of the three chassis with as few as 1 of the smallest capsules.

Capacities – filter area

Chassis model	Filtration area
SXLSC02* (single layer media)	0.5 to 4 m^2 (5.38 to 43.10 ft^2)
SXLSC02* (double layer media)	0.25 to 2 m^2 (2.70 to 21.50 ft^2)
SXPSC05* (single layer media)	0.5 to 10 m^2 (5.38 to 107.60 ft^2)
SXPSC05* (double layer media)	0.25 to 5 m^2 (2.70 to 53.80 ft^2)
SXPSC10* (single layer media)	0.5 to 20 m^2 (5.38 to 215.30 ft^2)
SXPSC10* (double layer media)	0.25 to 10 m^2 (2.70 to 107.60 ft^2)

Chassis materials of construction

304/1.4301 stainless steel 1.2 µm / 64 µin Ra (typical) electro-polish

- Conforms to Pressure Equipment Directive – Category 1/Module A (SXLSC02 is sound engineering practice)
- Outside scope of ASME VIII Div 1
- Complies with Universal Building Code (1997) – Zone 4/importance factor 1.25 (SXPSC05P or SXPSC10P only)

* Placeholder for either a P or no letter (without casters) or a W (with casters)

Stax capsule single layer

Product code: SX [ ] **4** [ ] **SP**

Code	Nominal height
S	58 mm (2.3 in.)
M	81 mm (3.2 in.)
L	129 mm (5.1 in.)

Code	Media grade
PEKX	EKXP
PEKS	EKSP
PEKM	EKMP
PEK1	SEKP
P050	KS50P
P080	SUPRA 80P
P100	K100P
P200	K200P
P250	K250P
P700	K700P
P900	K900P
P1500	T1500P
B010	BIO10
B020	BIO20
V100	V100P

Code	Number of filter layers
04	4 (height code S only)
08	8 (height code M only)
16	16 (height code L only)

Stax capsule double layer

Product code: SX [ ] **4** [ ] **SP**

Code	Nominal height
S	58 mm (2.3 in.)
M	81 mm (3.2 in.)
L	129 mm (5.1 in.)

Code	Media grade [7]
PDAX	PDAX
PDD1	PDD1
PDE1	PDE1
PDE2	PDE2
PDH4	PDH4
PDK5	PDK5
PDP8	PDP8
PDK11	PDK11

Code	Number of filter layers
02	4 (height code S only)
04	8 (height code M only)
08	16 (height code L only)

[7] Other combinations of P-series media available.

Stax CF capsules

Product code: SX [ ] **4** [ ] **SP**

Code	Nominal height
L	129 mm (5.1 in.)

Code	Media grade [8]
PEKS	EKSP
PEKM	EKMP
PEK1	SEK1P
P050	KS50P
P080	SUPRA 80P
P100	K100P
P200	K200P
P250	K250P
P700	K700P
P900	K900P
D50P	SUPRAdur 50P

Code	Number of filter layers	Filter area (m^2)	Available cake volume (L)
02	2	0.5	13.2
04	4	1.0	9.9
06	6	1.5	6.8

[8] Other combinations of P-series media available.

Accessories

Stax chassis

Product	Product code
Pilot-scale without casters	SXLSC02
Pilot-scale with casters	SXLSC02W
Five-high process scale without casters	SXPSC05P
Five-high process scale with casters	SXPSC05W
10-high process scale without casters	SXPSC10P
10-high process scale with casters	SXPSC10W

Stax manifold kits

Product	Product code
Stax 1½ in. manifold kit, bottom in bottom out	SXBBM400SP
Stax 2 in. manifold kit, bottom in bottom out	SXBBM400SP
Stax 1½ in. manifold kit, bottom in top out	SXTBM400SP
Stax 2 in. manifold kit, bottom in top out	SXTBM400SP

Stax top mount pipe support

Product	Product code
Pipe support for bottom in, top out configuration	SXTMPS

Provides support to flexible hose connected to distribution manifold during operation in:

- Bottom in top out configuration
- In series process configurations

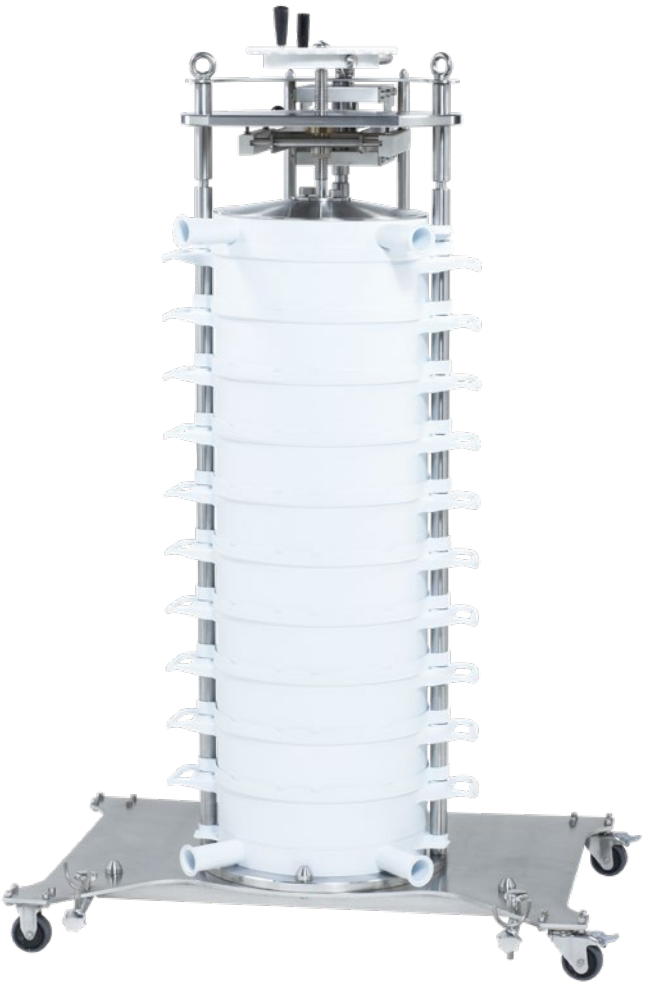

Fig 17. Mount pipe support on 10-high process scale chassis.

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