

Mustang™ Q

MEMBRANE CHROMATOGRAPHY

For capture or impurity removal from screening to large scale applications, Mustang™ membrane chromatography products are ready-to-use chromatography membrane adsorbers with bed volumes ranging from approximately 1 mL to 5 L. They are designed for capturing targeted molecules, or for the removal of impurities in bioprocesses from laboratory to manufacturing scale.

These ion exchange supports are polyethersulfone (PES)-based membranes, with 0.8 µm pore size, and a cross-linked polymeric coating of quaternary amine functional groups. They provide high dynamic binding capacity, especially for large molecules.

The multi-layer membrane construction is held at constant thickness/bed depth, from the laboratory scale to the largest industrial process-scale capsule.

The range is complemented by AcroPrep™ 96-well plates with Mustang membranes, to allow a quick screening of conditions before scaling up using the 1 mL capsule. Mustang Q membrane products are available as single-use or reusable capsules.

They are manufactured to ISO 9001 standards and meet the USP <88> biological reactivity tests, *in vivo*, in accordance with requirements for Class VI-50°C plastics.

Mustang Q membrane products:

- Reduce process times by using high volumetric flow rates and not requiring cleaning-in-place (CIP) when used as single-use.
- Improve process economics through increased throughput and reduced buffer consumption.
- Enhance process flexibility through a small operation footprint.
- Facilitate productivity increase by linking units in parallel or series.



Fig 1. Mustang Q membrane chromatography product formats.

Benefits

- **High binding efficiency** – Mustang Q capsules exhibit high capacities per volume with high flow rates at low pressure drops, allowing binding of charged biomolecules in a single pass.
- **Speed** – high flow rates enable the processing of large volumes. Mustang capsules typically operate at 10 membrane volumes (MV)/min flow rates (50 L/min for an XT5000 module), making membrane chromatography 20 to 50 times faster than conventional chromatography sorbents.
- **Scalability and flexibility** – our range of capsule sizes accommodates various volumes and capacities required in biopharmaceutical processing, from process development to full-scale manufacturing. Depending on the type, capsules can be single-use or reused after cleaning.
- **Convenience** – ready-to-use capsules eliminate need for packing/unpacking. If used as single-use, there are no cleaning or cross-contamination issues.
- **Lower cost of operation** – membrane capsules offer lower operating and capital investment costs than conventional columns that require packing.
- **Reduced buffer consumption** – small capsule footprint requires significantly less buffer.
- **Easy scale up** – each Mustang Q membrane capsule is made of the same 16-layer membrane bed height to maintain scalability for dynamic binding capacity.

Applications

- Adeno-associated virus (AAV) full capsid enrichment.
- Lentivirus (LV) purification.
- Plasmid DNA purification.
- Adenovirus purification.
- Baculovirus purification.
- Influenza viruses purification for vaccine manufacturing.
- mRNA purification.
- Contaminant removal for DNA, virus, host cell proteins and endotoxin when used as a polishing step. (e.g., rec proteins, monoclonal antibodies [mAbs] processes from CHO, *E. coli*).
- Large molecule purification (e.g., factor VIII, IgM).
- Oligonucleotide purification.
- Column guard to enhance selectivity of subsequent chromatography steps (e.g., before a protein A column).

Product description

- **AcroPrep Advance multiwell plate with Mustang Q membrane for screening and optimization** – these 96-well plates are equipped with four layers of Mustang Q membrane, equivalent to 14 μ L of membrane per well, and can be used either manually or connected to an automated system, e.g., Freedom EVO Platform (Tecan Group). The design decreases the risk of cross-contamination and reduces hold-up volume (3 to 5 μ L).
- **Mustang Q XT Acrodisc™ units for easy scale-up or scale-down of purification processes** – these units consist of 16 layers of Mustang Q membrane in a capsule of approximately 1 mL bed volume. Binding capacity is \sim 70 mg/mL BSA membrane volume (\sim 60 mg per unit).
- **Single-use product range: Mustang Q CLM05, CL3 and NP capsules** – these capsules, from 10 to 780 mL bed volume, can be autoclaved or sanitized before use.
- **Reusable product range: Mustang Q XT capsules** – these capsules, available in 5, 40, 140, 450 and 5000 mL bed volumes, cover a flow range from 3 to 3000 L/h. They can be easily cleaned using 1 M NaOH, and assembled in parallel or in series.
- A stand assembly designed to hold up to three Mustang Q XT5000 capsules of 5 L membrane volume is also available.

Table 1. Specifications of the Mustang Q product range

	AcroPrep Advance multiwell plate with Mustang Q membrane	Mustang Q XT Acrodisc unit	Mustang Q membrane capsules						
			Single-use	Single-use	Reusable	Reusable	Reusable	Reusable	Reusable
			CLM05, CL3 [†] NT6, NT7 [†]	NP6, NP7, NP8 [†] NT6, NT7 [†]	Mustang Q XT5	Mustang Q XT40	Mustang Q XT140	Mustang Q XT450	Mustang Q XT5000
Membrane volume	14 µL/well	0.86 mL	10, 60 mL	260, 520, 780, mL	5 mL	40 mL	140 mL	450 mL	5 L
Number of layers	4	16	16	16	16	16	16	16	16
Maximum differential pressure	N/A	1 barg (15 psig) at 10 mL/min							
Maximum operating pressure	N/A	4 barg (60 psig)	4 barg (59.5 psig) at 38°C	4 barg (59.5 psig) at 38°C	5 barg (75 psig) [‡] at 38°C	3 barg (43.5 psig) at 38°C	3 barg (43.5 psig) at 38°C	3 barg (43.5 psig) at 38°C	3 barg (43.5 psig) at 38°C
Geometry/ frontal surface area	0.25 cm ² flat sheet	25 mm i.d. 4.90 cm ² flat sheet	44, 264 cm ² pleated	1144, 2288, 3432 cm ² pleated	22 cm ² flat sheet	236 cm ² Ultiplead cartridge	616 cm ² Ultiplead cartridge	2121 cm ² Ultiplead cartridge	2.2 m ² Ultiplead cartridge
Connections	N/A	Luer lock	38 mm (1½ in.) sanitary flange	38 mm (1½ in.) sanitary flange	Female M6 thread	12.7 mm (½ in.) sanitary flange	12.7 mm (½ in.) sanitary flange	12.7 mm (½ in.) sanitary flange	38 mm (1½ in.) sanitary flange
CIP	N/A	1 M NaOH	1 M NaOH for one cycle only, or autoclavable at 121°C, 30 min, one cycle only	1 M NaOH for one cycle only, or autoclavable at 121°C, 30 min, one cycle only	1 M NaOH	1 M NaOH	1 M NaOH	1 M NaOH	1 M NaOH

[†] CL capsules = Novasip™ capsules with Mustang Q membrane, NP capsules = Kleenpak™ Nova capsules with Mustang Q membrane.

[‡] NT = T-style inlet/outlet format.

[‡] 13.5 barg (196 psig) when used with the XT jacket.

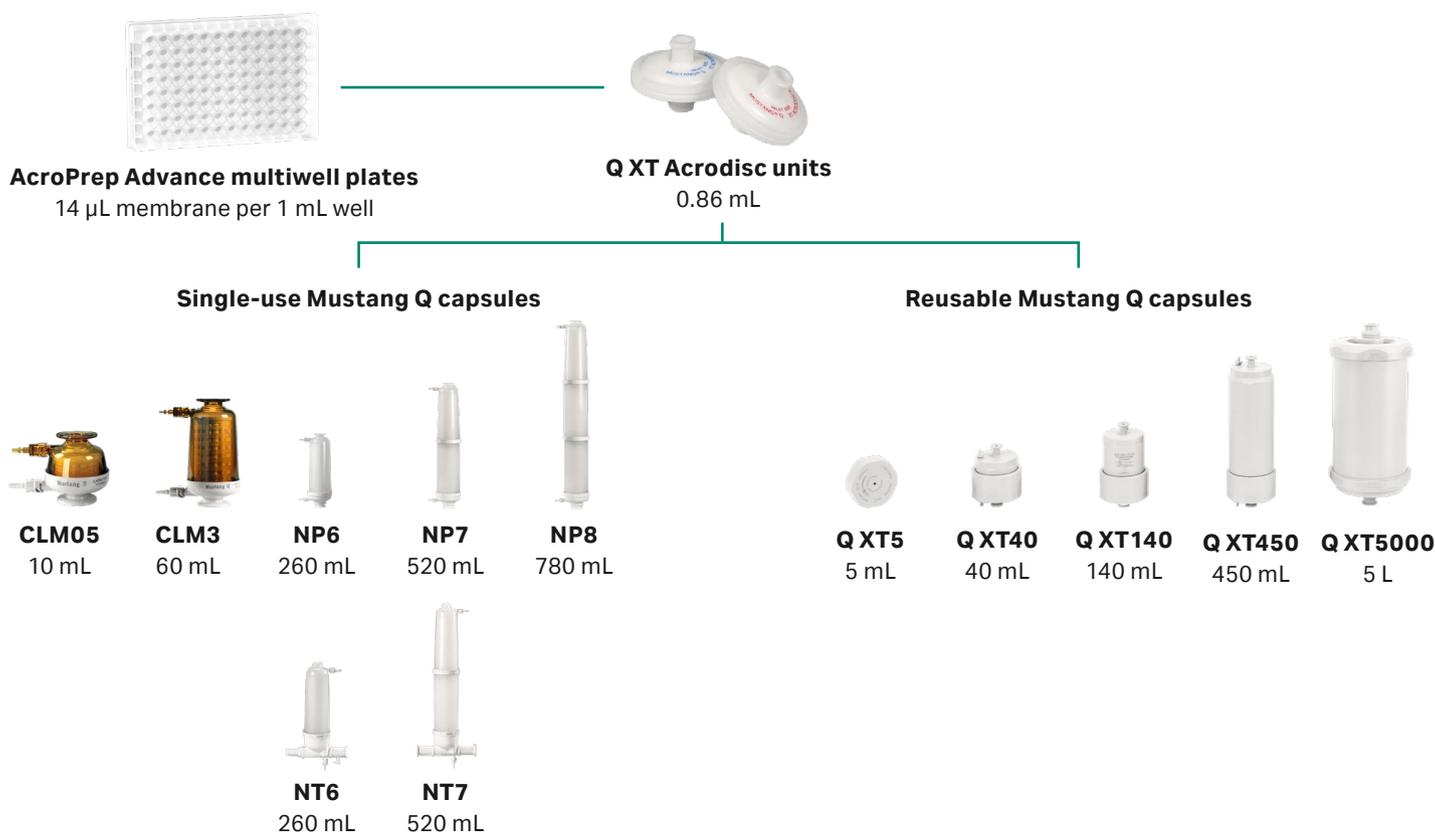


Fig 2. Mustang Q membrane chromatography product range and membrane volumes.

Ordering information

Product	Pkg	Product code
Mustang products		
AcroPrep Advance 96-well plates, Mustang Q membrane, 350 µL	10/pkg	8071
AcroPrep Advance 96-well plates Mustang Q membrane, 1 mL	5/pkg	8171
Mustang Q XT Acrodisc unit	4/pkg	MSTGXT25Q16
Mustang Q XT5 capsule	1/pkg	XT5MSTGQPM6
Mustang Q XT40 capsule	1/pkg	XT40MSTGQP05
Mustang Q XT140 capsule	1/pkg	XT140MSTGQP05
Mustang Q XT450 capsule	1/pkg	XT450MSTGQP05
Mustang Q XT5000 capsule	1/pkg	XT5000MSTGQP1
Mustang Q T-style capsule, 260 mL	1/box	NT6MSTGQP1
Mustang Q T-style capsule, 520 mL	1/box	NT7MSTGQP1
Mustang Q in-line capsule, 10 mL	1/box	CLM05MSTGQP1
Mustang Q in-line capsule, 60 mL	1/box	CL3MSTGQP1
Mustang Q in-line capsule, 260 mL	1/box	NP6MSTGQP1
Mustang Q in-line capsule, 520 mL	1/box	NP7MSTGQP1
Mustang Q in-line capsule, 780 mL	1/box	NP8MSTGQP1

Mustang Q XT5000 stand and lifting handle assembly

Stand base unit (lower section)	1/pkg	XT5000B100
Top (upper) section	1/pkg	XT5000T100
Lifting handle	1/pkg	XT5000H100

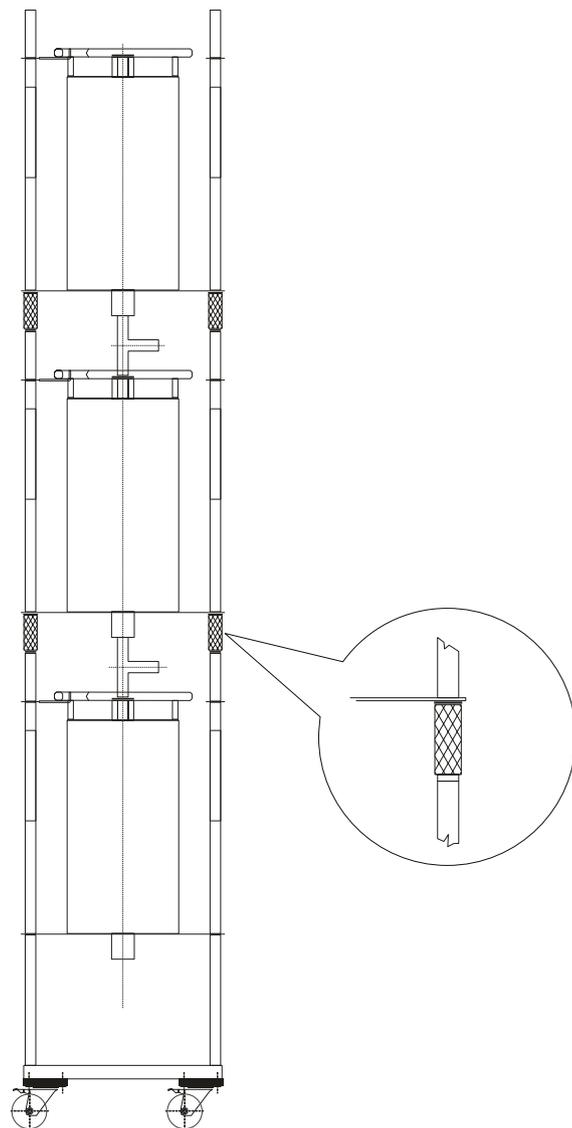


Fig 3. Mustang Q XT 5000 stand.

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