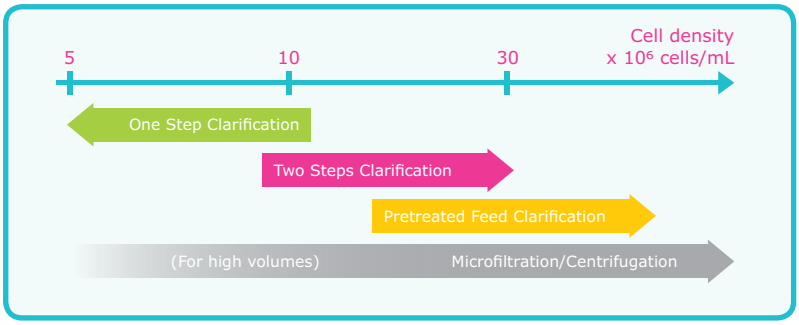
Millipore®
Filtration, Separation
& Preparation

Clarification of mammalian cell cultures by depth filtration



Cell density

Direct Harvest

ONE STEP

≤ 10⁷ cells/mL

→ Millistak+® HC C0HC depth filter

Average Range of Capacity	80 L/m² to 300 L/m²

If capacity is below 80 L/m² a two step process should be considered (see below).

TWO STEPS

10-30 x 10⁷ cells/mL

→ Millistak+® HC D0HC depth filter
Primary Clarification
→ Millistak+® HC X0HC depth filter*
Secondary Clarification

Average Range of Capacity	50 L/m² to 200 L/m²	100 L/m² to 500 L/m²
Area Ratio for In-Line Testing	2**	1**

*Alternative media can be used, see on next page.
**Area ratio can range from 1:1 to 5:1 and above. See details on reverse.

Bioreactor

PRETREATED FEED

≥ 20x10⁷ cells/mL

→ Pre-treatment Agent
→ Clarisolve® depth filter

Acid Precipitation	20MS	150 L/m² to 450 L/m²
Cationic Flocculants, Salts	40MS	
Stimulus Responsive Polymer	60HX	

Pretreatment can be performed in bioreactor. A polishing step can be applied using X0HC post Clarisolve®. Centrifugation can also be used after pretreatment.

High Volume

MICROFILTRATION/CENTRIFUGATION

> 30x10⁷ cells/mL or high volumes to clarify

→ Centrifugation
→ Millistak+® HC X0HC depth filter

Average Range of Capacity	80 L/m² to 300 L/m² and above

→ Millipore Express® SHC or Durapore® device
>1000 L/m²
(for filtrates above 10 NTU, consider further polishing prior to sterile filtration)

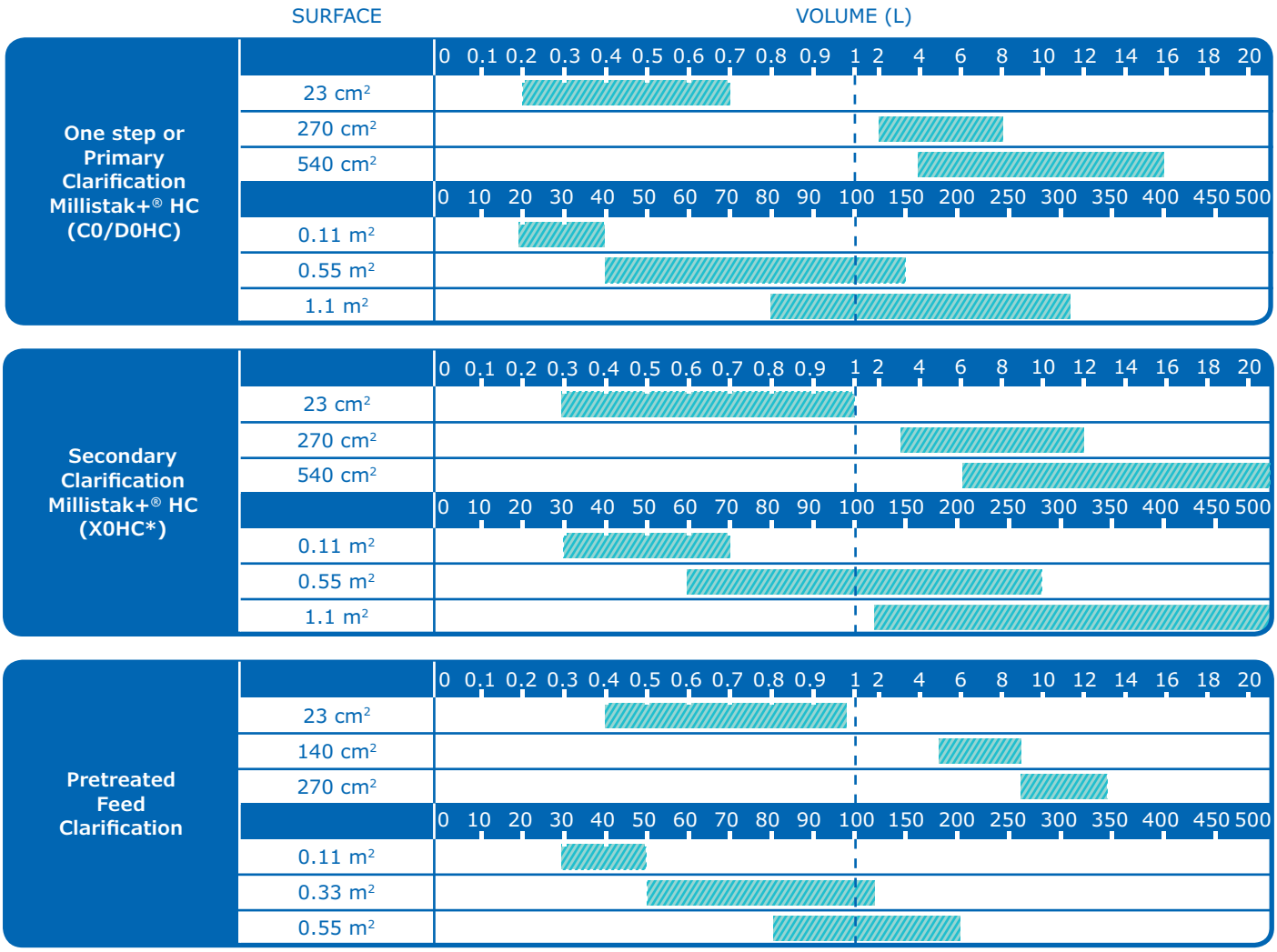
→ Downstream
filtrate
< 10 NTU

For more information, please refer to our Clarification Portfolio Guide PB1241EN00

emdmillipore.com/clarification

MilliporeSigma

Volumetric Loading Recommendations for Scale-up



Recommendations for selection and trials

* Millistak+® HC F0HC alternative media if capacity is low, Millistak+® HC A1HC or Millistak+® HC B1HC alternative media to test if product yield and purification levels after Millistak+® HC D0HC are low. Other parameters may influence the testing protocol and grades selected (yield, flow, cell culture viability, etc).

** Area ratio of 2:1 is suggested to start with if in-line testing is considered. For determining maximum filter capacities of each filter and an optimum filter area ratio, each filter can be tested separately by a constant flow (Pmax™) assay. Running a trial in-line with the selected filtration train and in process conditions is an important confirmation step. For a video tutorial on how to run a Pmax™ Constant Flow Test, please visit www.emdmillipore.com/process-development-tools. Depending on the feed, any area ratios can be implemented. Please reach out to your local technical contact for more information.

Sterilizing grade filter can be selected from a range of single or multi-layer PES or PVDF membrane (Millipore Express® and Durapore® devices).

Recommended test conditions

Flow from 100-150 LMH primary clarification (Millistak+® HC C0HC; Millistak+® HC D0HC)

Flow from 100-300 LMH for secondary clarification (Millistak+® HC X0HC; Millistak+® HC F0HC; Millistak+® HC A1HC or Millistak+® HC B1HC)

Maximum end point pressure 1 bar (15 psi) to 1.8 bar (22 psi).

To place an order or receive technical assistance

In the U.S. and Canada, call toll-free 1-800-645-5476

For other countries across Europe, please visit:
www.emdmillipore.com/offices

For Technical Service, please visit:
www.emdmillipore.com/techservice