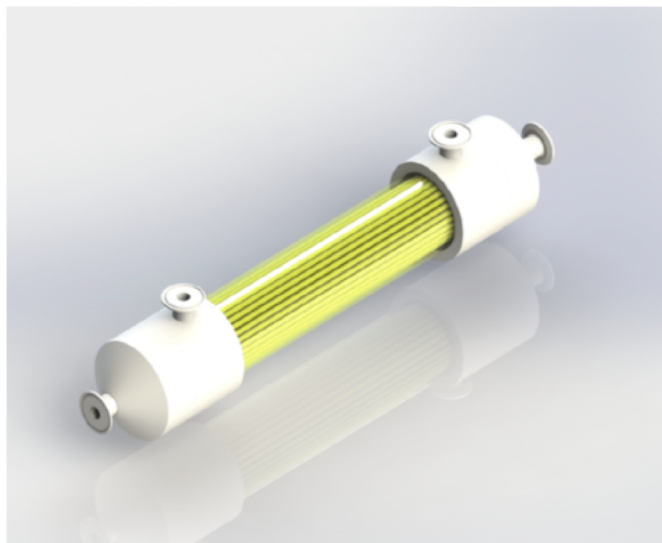


# VHU® Module, PS / PP

## Data Sheet



- ARTEMIS has developed and patented a “universal” tubular membrane cell retention module (VHU®) for the continuous harvesting of viral vectors, VLPs, monoclonal antibodies, recombinant proteins, etc.
- VHU® modules are single use.
- VHU® modules are connected to a bioreactor by sterile connections which comply with all pharmaceutical requirements.
- Retraceability of installed materials
- PS/PP: USPVI quality polysulfone and polypropylene.

- A variety of module sizes accommodates a wide variety of applications for the production of viral vectors.
- The VHU® module is provided as sterile by gamma radiation (25kGa-40kGa).
- The VHU® module is also provided with CPC connectors (e.g. AQG 33012) for “plug&play”.
- All fluid path materials of construction meet USP Class VI requirements and do not contain any substances derived from animal products or are compliant with EMEA 410/01.
- All materials of construction are 100% lot traceable.

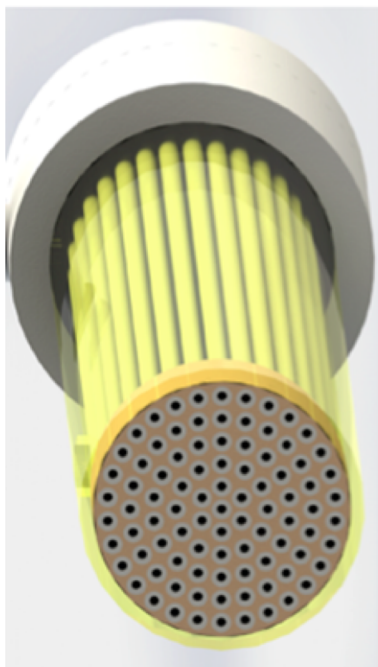
### Operating Conditions

| Type  | VHU®1   | VHU®2  | VHU®3  |
|---|---------|--------|--------|
| Membrane Surface Area (cm <sup>2</sup> )      | 60      | 527    | 7658   |
| Length (cm)                                   | 20      | 60     | 90     |
| Diameter (cm)                                 | 1.85    | 2.85   | 10.2   |
| Pump Rate (Recommended Nominal Max-Min (LPM)) | 0.1-0.3 | 0.3-1  | 1-10   |
| Permeate Flowrate (mL/min)                    | 0.1-1   | 1-20   | 10-100 |
| Pressure Drop (TMP)                           | <2 psi  | <4 psi | <8 psi |

# VHU® Module, PS / PP

## Data Sheet

Rev. 01/2021



| Parameter          | Specification                                  |
|--------------------|--|
| Scalable           | 0.25L-1000L                                    |
| Preferred          | CPC Genderless Sterile Connectors              |
| Pump               | Levitronix i30, i100, i600 Single Use Pumps    |
| Bioreactor         | Bioreactor with a bottom port                  |
| Range of Operation | 1x10 <sup>6</sup> -80x10 <sup>6</sup> cells/mL |
| Robust             | Continuous Operation for 1 week                |
| Cell Retention     | >99%   |
| LV Recovery        | >99%   |

| Parameter         | Results                     |              |            |
|-------------------|-----------------------------|--------------|------------|
| Pool Volume VHU®2 | 2L                          |              |            |
| Yield             | >99%                        |              |            |
| Titer             | 1.3 x 10 <sup>8</sup> TU/mL |              |            |
| Turbidity         | <16 NTU                     |              |            |
| NTU reduction     | 96.8%                       |              |            |
| Process Time      | 1.5 hours                   |              |            |
| Process Mode      | Turbidity (NTU)             |              |            |
|                   | Broth                       | Post-Harvest | Clarified  |
| Batch             | 50-90                       | N/A          | Target: ~5 |
| VHU® Perfusion    | ~500                        | <16          | N/A        |

| Type                                       | VHU®1 | VHU®2 | VHU®3 |
|--|-------|-------|-------|
| Hydraulic Connections                      |       |       |       |
| Retentate (in)                             | ¼"    | 3/8"  | 0.75" |
| Permeate (in)                              | 1/8"  | ¼"    | 0.5"  |
| Recommended Length of tubing return to SUB | <10"  | <28"  | <40"  |