SARTORIUS

Product Datasheet

# BioSMB Process 80 System and BioSMB Process 350 System

## Single-Use Continuous Chromatography Systems for Perfusion and Batch Bioreactor Processes

### Benefits

- Highly efficient resin utilization
- High productivity
- Unparalleled flexibility
- Less than 30 minute manifold installation

### Product Information

The BioSMB platform provides a highly flexible multicolumn chromatography system that delivers high throughput and very efficient resin utilization when compared to traditional batch, and other continuous chromatography methodologies. This is achieved through a unique single-use eight column system architecture which enables a highly flexible flow configuration through the single-use valve cassette.

### System Concept

The platform is fully scalable from process development (PD) to commercial manufacture. There are two flow range variants available targeted to perfusion (BioSMB Process 80 system) and batch (BioSMB Process 350 system) upstream processes.

Chromatographic processes developed using batch chromatography can be readily scaled without changing the resin, buffer system or product quality assays.

By using up to eight smaller pre-packed columns on the BioSMB Process systems, the need for column packing skids, large columns, and other support infrastructure is eliminated.

### BioSMB Continuous Chromatography Systems

#### 1. Resin Utilization

Batch chromatographic processing typically utilizes only 50% to 70% of available binding capacity in the column. To maximize the use of the available binding capacity the BioSMB platform provides the ability to overload a given column, with the breakthrough passed directly onto a subsequent column.

Key benefits:

- Column capacity is maximized
- Buffer consumption is optimized through improved resin utilization

The resin utilization benefits can be leveraged to optimize the purification strategy, i.e. run at a shorter residence time than batch but achieve a similar operational binding capacity – increasing productivity (a typical BioSMB strategy for clinical material production). Alternatively the process can be run at a flow rate similar to that used in a batch process with greatly increased operational binding capacity.

#### 2. Achieving Higher Throughput

Essential to the process economics of the BioSMB platform is the availability of multiple columns for continuous loading. Typically the bottleneck in high titer chromatography is the non-load operations. In batch and two column designs, loading cannot be repeated until the non-load steps are completed. With the BioSMB systems the process can be configured such that the loading steps are continuous; there is always a column ready to be loaded – this often requires a minimum of four columns.

The BioSMB Process platform has the ability to process on up to eight columns.

#### 3. Flexibility

The flexibility of the valve cassette allows multiple columns to be available in the breakthrough zone to collect overload from one column and wash from another, meaning flow rates can be kept high and constant without exceeding the maximum linear velocity for the columns; further increasing productivity.

#### 4. Valve Cassette

While competitive systems use a complex set of valves, the BioSMB technology uses a compact disposable valve cassette specially designed and patented as a single-use component. This valve system eliminates the need for a difficult cleaning validation process.

Each column used with the BioSMB Process systems is assigned a series of valves arranged in a dedicated array, resulting in each pump delivering a single fluid throughout the entire process and eliminating gradients or wash steps between buffer switches.

Additionally, throughout the BioSMB product range, the system hold-up volume is minimized, eliminating many of the uncertainties associated with scaling, validation and process control.

#### 5. Scale Up and Scale Down

To complement the BioSMB Process 80 and BioSMB Process 350 systems, a bench scale version is available, the BioSMB PD system.

The BioSMB PD system uses the same valve technology, flow path configuration and recipe handling to ensure simple scale-down or scale-up. This system is available for flow rates up to 100 mL/min.

### Applications

The BioSMB Process 80 and 350 systems are the ideal solution for manufacturing-scale continuous chromatography.

### BioSMB Process 80 System for Perfusion Bioreactor Processes

The BioSMB Process 80 system, when coupled with the BioSMB Process 80 perfusion manifold, is targeted for perfusion bioreactor-based processes that will run for longer periods of time. The flow rate capability along with the specifically designed low bio-burden manifold meet the requirements for lower flow continuous processing.

### BioSMB Process 350 System for Batch Bioreactor Processes

The BioSMB 350 system is targeted for batch bioreactor-based processes up to 2000 L. The flow rate capability, larger bore single-use tubing and cassette manifold meet the requirements for high throughput continuous processing.

### Software

The software is designed to provide the operator a clear and easy-to-use interface. It has been developed in accordance with usability standards for the most efficient, error-free user experience.

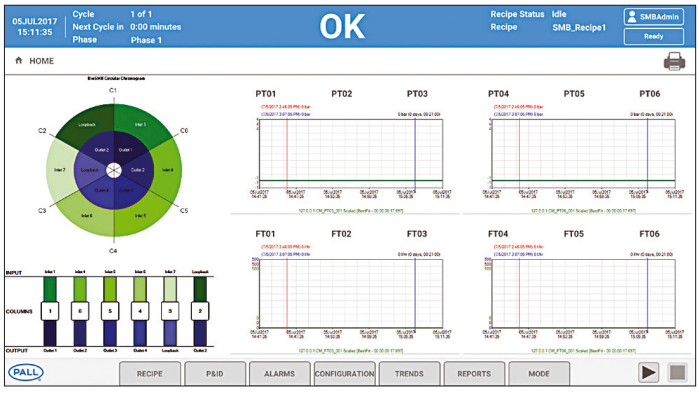


Figure 1: Example - BioSMB software

The BioSMB software allows users to create methods either on the system directly or remotely on another PC (using another install) which can then be downloaded to the BioSMB Process 80 and Process 350 systems.

The software uses a proprietary visualization tool called the circular chronogram (Figure 2). The circular chronogram allows users to know the exact position of the columns within a process cycle at any given time.

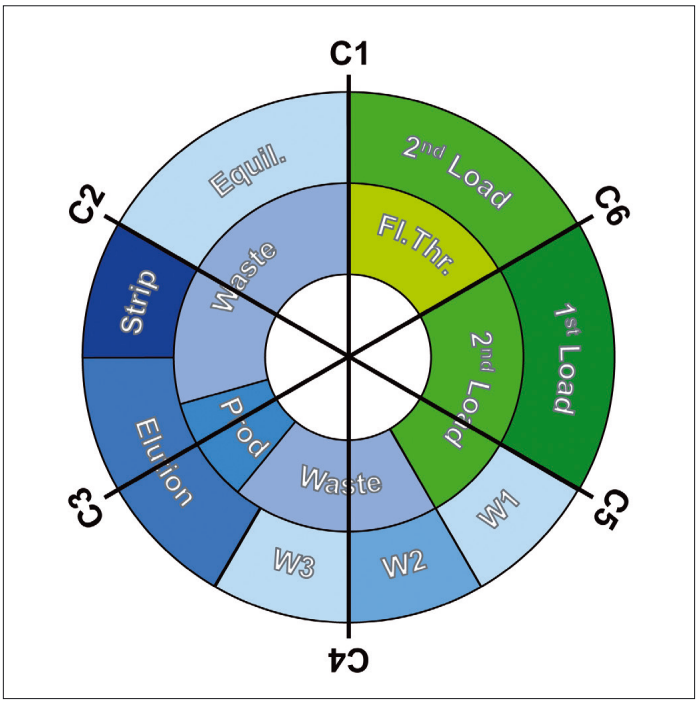


Figure 2: BioSMB Process circular chronogram

Methods developed on the BioSMB PD system, using up to eight columns, are directly transferable to the BioSMB Process 350 system.

# Technical Data

## BioSMB Process 80 and 350 Complete Hardware Systems

Table 1: Each BioSMB Process 80 and 350 system has the following architecture

| | |
|---|---|
| Dimensions (w × d × h) | 2.7 × 1.3 × 2.1 m (106 × 51 × 83 in.) Height without alarm tower: 1.9 m (75 in.) |
| Flow rate range Process 350 | 30 – 350 L/h |
| Flow rate range Process 80 | 5 – 80 L/h |
| Weight | 1000 kg |
| Inlets | 8 (7 usable + 1 for system use as second pass) |
| Outlets | 6 (5 usable + 1 for system use as second pass) |
| Number of column positions | 8 |
| Number of pumps | 7 |
| Maximum operating pressure | 4 bar (58 psi) |
| Air supply | 6 bar (87 psi) with integrated pressure regulator |
| Electricity supply | 3 phase 400 V – 32 A – 50 Hz (other voltages available) |

## BioSMB Pump Modules

If a complete BioSMB Process 80 or Process 350 system is purchased, then it is possible to buy a BioSMB Process 80 or Process 350 pump module respectively to increase the flexibility of the main system.

The pump module can be exchanged easily, requiring a mechanical changeout of the module and a switch in the software. The mechanical swap of the two pump modules typically takes less than an hour. This modularity allows the system to run either from 5 L/h – 80 L/h (BioSMB Process 80 pump module) or 30 L/h – 350 L/h (BioSMB Process 350 pump module).

If a BioSMB Process 80 pump module is used then the BioSMB Process 80 manifold set must be used, and if a BioSMB Process 350 module is used then a BioSMB Process 350 manifold set must be used.


Figure 3: BioSMB Process 80 pump module

## BioSMB Process 80 and 350 Platform – Single-Use (SU) System

Table 2: Manifold specifications

| Item | Description |
|---|---|
| Hose and connectors process 350 | Silicone braided tubing ID: ⅜ in. withHFC39 connectors for internal connections and sanitary connection clamp ¾ in. for upstream and downstream connections |
| Hose and connectors process 80 | Silicone braided tubing ID: ¼ in. Kleenpak® Presto sterile connector for external connections. HFC39 connectors for internal connections (**Note**: The process 80 manifold is available with sanitary connection connections in place of the Kleenpak connectors. Contact us for more details) |
| Pressure | 7 pressure transmitters (1 after each pump with integrated pressure switch) 0 to 5 barg \| 72 psig (**Note**: Maximum operating pressure for system is 4 barg \| 58 psig) |
| Flow | 7 ultrasonic non-invasive flowmeters (1 after each pump) |
| Air | 7 integrated with flowmeters |
| Conductivity | 4 sensors (on outlets 1–4) Range: 0 µS/cm–150 mS/cm, accuracy of 2% measuring range Built in temperature compensation and monitoring |
| pH | 4 sensors (on outlets 1–4) Range of 2–10, accuracy of 0.15 pH unit |
| UV | 4 UV-VIS sensors each with wavelengths in 280 nm as standard 0–2 AU |
| Process pump | 4 piston diaphragm single-use The single-use pump heads are Quattroflow™ sanitary diaphragm pumps, 4 pistons with polypropylene (PP), ethylene propylene diene monomer (EPDM)/PP compound diaphragm and EPDM valves |
| Gamma irradiation dose | 25 kGy |

Table 3: Process wetted components materials of construction

| Description | Materials |
|---|---|
| Tube | Platinum cured silicone |
| Fittings | Polycarbonate, polypropylene, polyphenylsulfone |
| Valve diaphragm | Fluoroelastomer (FKM) |
| pH sensor | Glass |
| Pump head | Polypropylene, EPDM/PP compound |
| Pressure sensor | Polysulfone |
| UV-VIS sensor windows | Quartz |
| Conductivity sensor | Polysulfone |

## BioSMB Process 350 SU Systems

Table 4: The BioSMB Process 350 SU system is comprised of four separate manifolds; inlet manifold, valve cassette manifold, column manifold and outlet manifold. These can be purchased individually, the manifolds are supplied individually double bagged and gamma irradiated.

| Part Number | Description |
|---|---|
| BIOSMB-IT-8 | BioSMB Process 350 inlet tubing set |
| BIOSMB-OT-8 | BioSMB Process 350 outlet tubing set |
| BIOSMB-CT-8 | BioSMB Process 350 column tubing set |
| BIOSMB-VB-8 | BioSMB 8 mm Process 350 valve cassette |

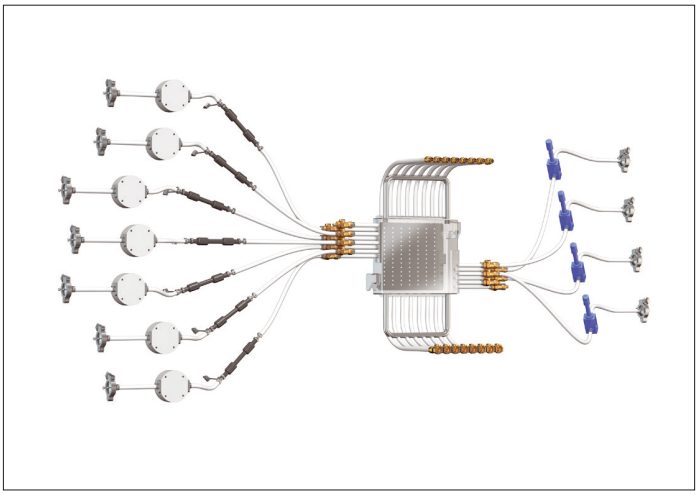

Figure 4: BioSMB Process 350 SU system manifold*

* Second pass and column tubing not shown.

## BioSMB Process 80 SU Systems

Table 5: The BioSMB Process 80 SU system is comprised of one single manifold. The system is supplied double bagged and gamma irradiated.

| Part Number | Description |
|---|---|
| BIOSMB-PF-5 | BioSMB Process 80 SU system comprising inlets, valve cassette, outlets and column connectors only. Other connectors are available on request. |

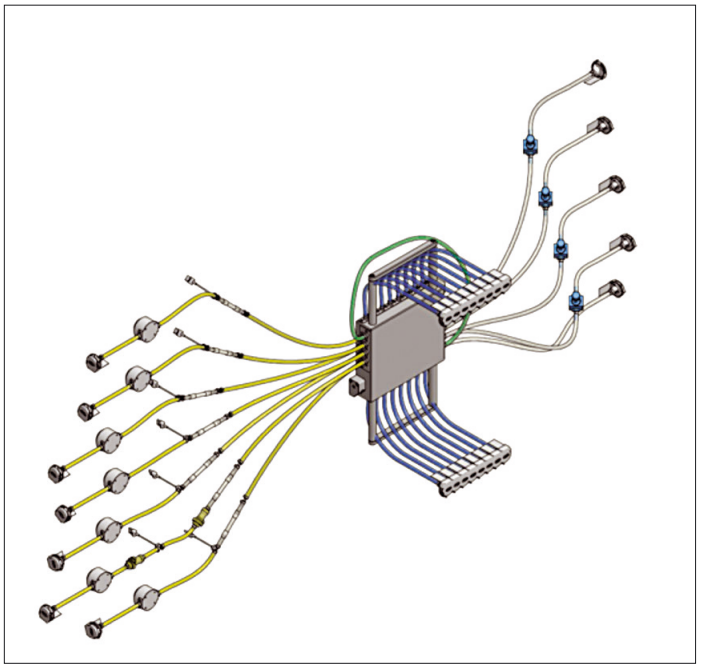

Figure 5: BioSMB Process 80 SU system manifold

# Sales and Service Contacts

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