MaxiCaps® and Cartridges for the biopharmaceutical industry
A profile of Sartorius Stedim Biotech

Sartorius Stedim Biotech is a leading provider of cutting-edge equipment and services for the development, quality assurance and production processes of the biopharmaceutical industry. Its integrated solutions covering fermentation, filtration, purification, fluid management and lab technologies are supporting the biopharmaceutical industry around the world to develop and produce drugs safely, timely and economically. For next generation processes, Sartorius Stedim Biotech focuses on single-use technologies and added-value services to meet the rapidly changing technology requirements of the industry it serves. Strongly rooted in the scientific community and closely allied with customers and technology partners, the company is dedicated to its philosophy of “Turning science into solutions”.

Headquartered in Aubagne, France, Sartorius Stedim Biotech is listed on the Eurolist of Euronext Paris. With its own manufacturing and sales companies in Europe, North America and Asia, Sartorius Stedim Biotech enjoys a worldwide presence. Its key manufacturing and R&D location is in Germany.
Filtration Technology

Sartorius Stedim Biotech MaxiCaps® and Cartridges are especially used for pilot scale applications and production. Sartorius Stedim Biotech provides a broad range of different membrane materials as well as depth filter materials to match the multiple application requirements of the biopharmaceutical industry. Featuring multiple connector styles, adaptor types and filter formats, Sartorius Stedim Biotech MaxiCaps® and Cartridges can be easily incorporated into any filtration process.

Final Sterilizing Grade Filters
The Sartorius Stedim Biotech product range of Sterilizing Grade Filter elements for liquids consists of 3 different types of hydrophilic membrane filters.

- Featuring ultra low binding Cellulose Acetate membranes, Sartobran® P filters are typically used for filtration of high value pharmaceuticals like coagulation factors, vaccines and preservative containing solutions.

- Sartopore® 2, Sartopore® 2 XLG et XLI filters provide highest total throughput performance based on the highly asymmetric PES membrane, assuring lowest filtration costs, e.g. in media filtration.

- Sartolon® filter elements are ideal for filtration for a wide range of solvents and liquids containing solvents.

Prefiltration
Biological solutions often contain heavy loads of particles and other contaminants which prematurely plug 0.2 μm rated and smaller size membrane filters. The use of Sartorius Stedim Biotech prefilters protects downstream Sterilizing Grade Filters effectively and enhances significantly their total throughput performance.

Sartoclean® CA membrane prefilters are used for bioburden reduction in front of final membrane filters assuring highest product yields by lowest unspecific adsorption due the cellulose acetate membrane material. In combination with glass fibre fleeces Sartoclean® GF prefilters add adsorptive power to enhance the clarification effect.

Sartopure® PP 2 polypropylene depth filters are the ideal choice for removal of hard, non deformable particles upstream of final membrane filters to enhance their total throughput performance. Featuring highly adsorptive glass fibre fleeces Sartopure® GF Plus filters are the ideal choice for removal of contaminants like colloids, lipids and protein aggregates (Host Cell Protein). They are used for protection of membrane filters, chromatography columns, crossflow systems and other downstream processing equipment to assure efficient purification steps with highest product yields.
MaxiCaps®

MaxiCaps® feature an innovative capsule housing design which improves security, filter handling and ease of use. The unique labelling, the advanced valve design, the broad range of connector styles and filter sizes are key features of MaxiCaps®.

Applications
MaxiCaps® are available for all filter materials. Therefore, MaxiCaps® can be used for a broad range of applications in biopharmaceutical manufacturing and form & filling operations like:
– Sterilising Grade Filtration
– Mycoplasma Retentive Filtration
– Bioburden Reduction
– Prefiltration
– Clarification

Unique Labelling
MaxiCaps® feature a comprehensive and easy to read out labelling on the MaxiCap® housing including:
– Filter Type
– Order Code | Lot-no. | Piece-no.
– Pore-Size or Retention Rating
– Operating Parameters
– Flow Direction Indication

This labelling allows secure identification of each filter and assures traceability of the filter throughout the whole process. Operator errors and filter mishandling as well as filter mix-ups are eliminated. Thereby MaxiCaps® contribute significantly to improve the overall safety of manufacturing processes.

Fluid Containment
The vent design including a double o-ring sealing and an integral hose barb for fluid containment avoid contamination and protect operators in an optimal way. The vent design features a defined open | close position to enhance ease of use.

Flexible Integration
MaxiCaps® are available with a broad range of different connector styles and with various filter sizes to allow for an easy integration into any process.
Cartridges

Cartridges feature the same construction and materials as all our standard filter elements. They are designed for filtration in pilot scale and production. Cartridges are used in stainless steel housings and due to their rigid construction they withstand multiple in-line steam sterilization cycles if required.

Scale-up
Our Sartopore® 2 & Sartobran® P filter elements, for example, are made with the same membranes and materials of construction from the smallest available filter element with 150 cm² | 0.015 ft² to 0.45 m² | 5 ft² up to filter cartridges and MaxiCaps® with 1.8 m² | 18 ft² filtration area.

This product selection gives you the opportunity to easily scale-up from R&D laboratory stages to pilot plant and production scale.

Certified Quality
All Sartorius Stedim Biotech filter elements including MaxiCaps® and Cartridges are manufactured according to an ISO 9001:2000 certified Quality Management System. Our manufacturing facilities operate in conformance with cGMP requirements in addition to the ISO standard. Sartorius Stedim Biotech’s quality philosophy ensures that our customers receive products and services that meet the strictest quality requirements for reliable operation.

Validation Guides
Our entire range of filter elements are supplied with a quality assurance certificate to assist you in the validation of your manufacturing process. Comprehensive product specific validation packages are available for all Sartorius Stedim Biotech filter elements.

Process Validation
Sartorius Stedim Biotech offers a wide range of validation support services to qualify the use of our filter products for your processes. The Sartorius Stedim Biotech validation service has a proven track record in assisting customers in validating their products and achieving regulatory approval.
MembraneFilter

Sartopore® 2

Sterilizing grade pharmaceutical filter with broad chemical compatibility

Applications
- Sterile filtration of parenteral solutions with high or low pH
- Sterile filtration of highly viscous products, e.g. ophthalmics
- Sterile filtration of disinfectants
- Sterile filtration of buffers and media
- Mycoplasma removal from serum and cell culture media (0.1 μm)
- Substerile filtration for enhanced sterility assurance (0.1 μm)

Cartridge Construction
- Protective polypropylene layer
- Asymmetric polyethersulfone membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional EPDM, Viton

Available Pore Size Combinations
0.8 + 0.45 μm
0.45 + 0.2 μm
0.2 + 0.1 μm

Adapter Types
21, 25, 27, 28

Filtration Area
0.3 m² (3.2 ft²) per 5” element
0.6 m² (6.4 ft²) per 10” element

Basic Order Number
544...

Sartopore® 2 XLG

Sterilizing grade pharmaceutical filter with broad chemical compatibility and highest throughputs for media & biological filtration processes

Applications
Sterilizing grade filtration of:
- Plant peptone or yeast supplemented cell culture media
- Serum containing cell culture media
- Other cell culture media used in biotech manufacturing
- Clarified cell culture harvest
- Downstream Intermediates (before & after UF/DF and chromatography steps)

Cartridge Construction
- Protective polypropylene layer
- Asymmetric polyethersulfone membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional EPDM, Viton

Available Pore Size Combinations
0.8 + 0.2 μm

Adapter Type
25

Filtration Area
0.8 m² (8.6 ft²) per 10” element

Basic Order Number
544...07G

Sartopore® 2 XLI

Sterilizing grade pharmaceutical filter with broad chemical compatibility and highest throughputs for chemical defined media & Ophthalmics

Applications
Sterilizing grade filtration of:
- Ophthalmic solutions
- Chemically defined cell culture media
- High viscous LVP’s
- Any fully chemically defined media
- Biologicals with small Particle spectrum

Cartridge Construction
- Protective polypropylene layer
- Asymmetric polyethersulfone membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional EPDM, Viton

Available Pore Size Combinations
0.35 + 0.2 μm

Adapter Type
25

Filtration Area
0.8 m² (8.6 ft²) per 10” element

Basic Order Number
544...07I
Membranefilter

Sartopore® 2 HF
Sterilizing grade pharmaceutical filter for highest flow rates and broad chemical compatibility

Applications
- Sterile filtration of Buffers
- Sterile filtration of low viscous, water-based Media
- Water for Injection
- Cleaning and desinfection solutions
- Bulk Pharmaceuticals

Cartridge Construction
- Protective polypropylene layer
- Asymmetric Polyethersulfone membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and endcaps
- Silicone O-rings standard – optional EPDM, Viton

Pore Size:
0.2 μm

Adapter Types
21, 25

Filtration Area:
0.8 m² (8.6 ft²) per 10” element

Basic Order Number
544...

Sartobran® P
Sterilizing grade pharmaceutical filter for low unspecific adsorption

Applications
- Sterile filtration of parenteral solutions
- Sterile filtration of vaccines, biologicals and antibiotics
- Sterile filtration of serum and plasma fractions
- Sterile filtration of tissue culture media, diagnostic reagents, therapeutic agents, preparations containing proteins, vitamins and preservatives
- Substerile filtration (0.1 μm)

Cartridge Construction
- Protective polypropylene layer
- Reinforced cellulose acetate membrane
- Reinforced cellulose acetate membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional EPDM, Viton

Available Pore Size Combinations
0.65 + 0.45 μm
0.45 + 0.2 μm
0.45 + 0.1 μm

Adapter Types
21, 25, 27, 28

Filtration Area
0.3 m² (3.2 ft²) per 5” element
0.6 m² (6.4 ft²) per 10” element

Basic Order Number
523...P

Sartofluor® GA|LG
Pharmaceutical grade hydrophobic PTFE membrane filter

Applications
- Sterile venting of tanks
- Sterile air filtration for filling equipment
- Fermentation air filtration
- Sterile filtration of gases
- Bioreactor inlet and outlet streams
- Sterile filtration of aggressive media and solvents (LG)

Cartridge Construction
- Protective polypropylene layer
- PTFE membrane filter
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional EPDM, Viton

Available Pore Sizes
0.2 μm (GA) | 0.45 μm (LG)
0.1 μm (GA) | 0.2 μm (LG)
0.1 μm (LG)

Adapter Type
25 (GA)
25, 28 (LG)
21, 27

Filtration Area
0.375 m² (4.0 ft²) per 5” element (GA)
0.75 m² (8.1 ft²) per 10” element (GA)
0.5 m² (5.4 ft²) per 10” element (LG)

Basic Order Number
518...GA
518...LG
Membranefilter

**Sartolon®**

Sterilizing grade pharmaceutical filter with reinforced Nylon membrane for broad solvent compatibility

Applications
- Sterile filtration of solvents
- Sterile filtration of antibiotics
- Sterile filtration of parenteral solutions
- Sterile filtration of bulk pharmaceuticals

Cartridge Construction
- Protective polypropylene layer
- Reinforced Nylon membrane
- Nylon membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional: EPDM, Viton

Available Pore Size Combinations
0.45 + 0.2 μm

Adapter Types
21, 25, 27, 28

Filtration Area
0.6 m² (6.5 ft²) per 10” element

Basic Order Number
510...

**Sartoclean® GF**

Prefilter for pharmaceutical liquids containing colloids and high bioburden

Applications
- Prefiltration of serum and plasma fractions
- Prefiltration of biological products and vaccines
- Prefiltration of cell culture media
- Cell removal from fermentation processes
- Clarification prior to column chromatography

Cartridge Construction
- Protective polypropylene layer
- Non-woven glass fiber material
- Reinforced cellulose acetate membrane(s)
- Reinforced cellulose acetate membrane
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings, standard – optional: EPDM, Viton

Available Pore Size Combinations
- 3 + 0.8 μm (double layer)
- 0.8 + 0.65 μm (double layer)
- 0.45 μm (single layer)
- 0.2 μm (single layer)

Adapter Types
21, 25, 27, 28

Filtration Area
0.6 m² (6.5 ft²) per 10” element

Basic Order Number
560...

**Sartoclean® CA**

Pharmaceutical grade membrane prefilter

Applications
- Prefiltration of parenteral solutions
- Prefiltration of serum and plasma fractions
- Biological products and vaccines
- Prefiltration of cell culture media
- Fermentation feed solutions
- Cell removal from fermentation processes
- Clarification prior to column chromatography
- Particle removal in water systems

Cartridge Construction
- Protective polypropylene layer
- Reinforced cellulose acetate membrane(s)
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional: EPDM, Viton

Available Pore Sizes
- 3 + 0.8 μm (double layer)
- 0.8 + 0.65 μm (double layer)
- 0.45 μm (single layer)
- 0.2 μm (single layer)

Adapter Types
21, 25, 27, 28

Filtration Area
0.74 m² (7.4 ft²) per 10” element

Basic Order Number
562...
Prefilter

**Sartopure® PP2**

- Particle removing polypropylene depth filter

**Applications**
- Prefiltration of parenteral solutions
- Particle removal from DI water systems
- Particle removal from chemicals and solvents
- Particle removal from air and compressed gases
- Prefiltration of biological solutions

**Cartridge Construction**
- Protective polypropylene layer
- Multiple polypropylene layers with progressively finer retention ratings
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings, standard – optional: EPDM, Viton

**Available Nominal Retention Ratings**
- 50 μm
- 20 μm
- 8 μm
- 5 μm
- 3 μm
- 1.2 μm
- 0.65 μm

**Adapter Types**
- 21, 25, 27, 28

**Filtration Area**
- 0.6 m² (6.5 ft²) per 10” element

**Basic Order Number**
- 559...

**Sartopure® GF Plus**

- Highly adsorptive glassfiber prefilter with outstanding total throughput performance

**Applications**
- Clarification of fermentation broths and cell culture solutions after cell harvest
- Prefiltration of serumfree or serum containing cell culture media
- Prefiltration of highly viscous solutions
- Prefiltration of serum
- Prefiltration of media with high content of colloids and lipids

**Cartridge Construction**
- Protective polypropylene layer
- Multiple non-woven glass fibre layers with progressively finer retention ratings
- Polypropylene drainage layer
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional: EPDM, Viton

**Available Nominal Retention Ratings**
- 1.2 μm
- 0.65 μm

**Adapter Types**
- 00 (knife edge), 03, 05, 07, 08

**Filtration Area**
- 0.6 m² per 10” Element

**Basic Order Number**
- 555...

**Sartofine® PP**

- High dirt loading prefilter validated for pharmaceutical applications

**Applications**
- Prefiltration of fermentation feed solutions
- Prefiltration of serum products, tissue culture media, diagnostic sera
- Clarification of solvents
- Particle removal from solvents, acids, bases and chemicals
- Utility filtration for cleaning machine and steam lines
- Capture of DI resin particles from water systems

**Cartridge Construction**
- 14 mm thick multilayer construction of wound non-woven polypropylene with up to seven progressively finer filter zones
- Polypropylene outer cage, core and end caps
- Silicone O-rings standard – optional EPDM, Viton

**Available Retention Ratings**
- 40 μm
- 20 μm
- 10 μm
- 5 μm
- 3 μm
- 1 μm
- 0.7 μm
- 0.5 μm

**Adapter Types**
- 00 (knife edge), 03, 05, 07, 08

**Filtration Area**
- 0.05 m² (0.54 ft²) surface by 14 mm depth filter material

**Basic Order Number**
- 558...
Integrity Testing

Filter Integrity Testing
Sartorius Stedim Biotech offers a broad range of filter integrity test solutions – beginning with our stand-alone units of the Sartocheck family for standard applications up to customized solutions like the WIThin concept and special filter management systems. There are no limits in terms of technical feasibility.

Sartocheck 3 Plus
The stand-alone integrity tester for standard applications. This unit can be used to perform all established integrity test methods. Due to its paper-based concept the requirements regarding 21 CFR part 11 are not applicable.

Sartocheck 4
The state-of-the art integrity tester Sartocheck 4 offers a variety of additional features: Password-protected login function, the definition of individual user rights, an audit trail and a large electronic database for test programs and test results are only some issues that describe the functionalities – in full compliance with 21 CFR part 11.

Sartocheck 4 MultiUnit
Up to four different MultiUnits can be connected to one Sartocheck 4 allowing independent and parallel integrity testing of five filters. This significantly reduces the time required for integrity testing and therefore improves the cost effectiveness.
Filter Management Systems

**WIThin Concept**
The WIThin concept allows to integrity test the filters inside specific equipment like autoclaves and freeze-dryers without connecting an external integrity tester. The system utilizes the existing hardware and software platforms. The control functions as well as the algorithms are directly integrated into the existing system.

**Filter Management System**
The concept of the Filter Management System decouples the filter handling procedure from the point-of-use of the filter. The in-place and off-line method saves expensive time and eliminates the risk of integrity test failures before production runs.

Sartocheck 4 allows easy and reliable data entry via barcode scanner (optional)
Biotech Services

Our capabilities are your key to success.
Source all your needs from one reliable partner for process optimization, customized validation and regulatory support, substantiated by practical training courses and instrument services.

We are aware of our responsibilities toward the success of your business, and take them seriously. That’s why we are rapidly deployable and globally available. You can expect the very best in science-driven consulting service, maximum regulatory expertise by our specialists, fast turnaround, on-site support and globally valid standards from Sartorius Stedim Biotech. But don’t take our word for it. We invite you to see for yourself. Count on the people who know your industry inside and out: Sartorius Stedim Biotech.
DISCOVER®
Our audit and survey services:
- Compliance audits
- Regulatory inspection readiness
- Plant|Process surveys
- Validation surveys
- Quality system surveys
- Technical studies

EXPAND®
Our training and seminar services:
- FDA risk-based approach
- Regulatory inspection
- CFR 21 Part 11|GAMP
- Aseptic processing
- Upstream|Downstream processing
- Process validation
- Cell culture|Fermentation
- Sterilization and integrity testing
- Quality control and quality assurance

INCREASE®
Our optimization services:
- Corrective actions guidance
- Process optimization and development support
- Design review and technology transfer
- Documentation and submittal optimization
- Regulatory guidance

CONFIDENCE®
Our validation services:
- Validation designs
- Pre-approval inspection preparation
- Post-approval change support
- CFR 21 Part 11|GAMP compliance
- Regulatory liaison
- Equipment qualification
- Filter|Cleaning|Process validation
- Risk assessment support
- Grouping support
- Extractables|Leachables testing for filters, fluid management systems and other polymer-based process components like tubing, gaskets, stoppers.

Explore your possibilities – we continue to lead and innovate in the field of services to increase the added value to the biopharmaceutical and pharmaceutical industry.

Visit our website
www.sartorius-stedim.com
## Ordering information

### Standard cartridges

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<thead>
<tr>
<th>Cartridge Type</th>
<th>Adapter Type or MaxiCap (μm)</th>
<th>Pore Size (µm)</th>
<th>1-high (10&quot;)</th>
<th>2-high (20&quot;)</th>
<th>3-high (30&quot;)</th>
<th>4-high (40&quot;)</th>
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<td>558 10W4</td>
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<td>558 12W2</td>
<td>558 12W3</td>
<td>558 12W4</td>
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<td>558 02W2</td>
<td>558 02W3</td>
<td>558 02W4</td>
</tr>
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<td>558 03W2</td>
<td>558 03W3</td>
<td>558 03W4</td>
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<td></td>
<td>0.7</td>
<td>558 05W1</td>
<td>558 05W2</td>
<td>558 05W3</td>
<td>558 05W4</td>
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<td></td>
<td>0.5</td>
<td>558 06W1</td>
<td>558 06W2</td>
<td>558 06W3</td>
<td>558 06W4</td>
</tr>
</tbody>
</table>

---

Please replace the blanks with the appropriate two-letter combination for the adapter type or MaxiCap.

### 5" cartridges

<table>
<thead>
<tr>
<th>Cartridge Type</th>
<th>Pore Size (µm)</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sartobran P</td>
<td>0.2 µm</td>
<td>5232507H0----P</td>
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<tr>
<td></td>
<td>0.1 µm</td>
<td>5232558H0----P</td>
</tr>
<tr>
<td>Sartopore 2</td>
<td>0.2 µm</td>
<td>5442507H0</td>
</tr>
<tr>
<td></td>
<td>0.1 µm</td>
<td>5442558K0</td>
</tr>
<tr>
<td>Sartofluor GA</td>
<td>0.2 µm</td>
<td>5182507T0----GA</td>
</tr>
</tbody>
</table>
### Ordering information

#### How to order: Sartobran P, Adapter 25, 0.2 μm, 10"

<table>
<thead>
<tr>
<th>Cartridge Type</th>
<th>Pore Size Final Filter</th>
<th>Configuration Standard Cartridges/MaxiCaps&lt;sup&gt;®&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 2 3 Sartobran P</td>
<td>7 0 = 70 μm</td>
<td>0 5&quot; (157 mm)</td>
</tr>
<tr>
<td>5 4 4 Sartopore 2</td>
<td>5 0 = 50 μm</td>
<td>1 10&quot; (250 mm)</td>
</tr>
<tr>
<td>5 1 0 Sartolon</td>
<td>4 0 = 40 μm</td>
<td>2 20&quot; (500 mm)</td>
</tr>
<tr>
<td>5 1 8 Sartofluor GA/LG</td>
<td>2 0 = 20 μm</td>
<td>3 30&quot; (750 mm)</td>
</tr>
<tr>
<td>5 6 2 Sartoclean CA</td>
<td>1 5 = 15 μm</td>
<td>4 40&quot; (1,000 mm)</td>
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<tr>
<td>5 6 0 Sartoclean GF</td>
<td>1 0 = 10 μm</td>
<td>dom Sartopore 2</td>
</tr>
<tr>
<td>5 5 9 Sartopure PP2</td>
<td>0 1 = 8 μm</td>
<td>G</td>
</tr>
<tr>
<td>5 5 5 Sartopure GFPlus</td>
<td>0 2 = 3 μm</td>
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<tr>
<td>5 5 8 Sartofine PP</td>
<td>0 3 = 1.20 μm</td>
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<tr>
<td></td>
<td>0 4 = 0.80 μm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 5 = 0.65 μm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 6 = 0.45 μm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 7 = 0.20 μm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 8 = 0.10 μm</td>
<td></td>
</tr>
</tbody>
</table>

#### Pore Size Prefilter

- A Single membrane
- P Only polypropylene layer
- T Only one PTFE (Teflon<sup>®</sup>) membrane
- W Multilayer (Sartofine)
- E 3.00 μm
- G 0.80 μm
- D 0.65 μm
- H 0.45 μm
- I 0.35 μm
- K 0.20 μm

#### Application

- P Pharmaceutical grade
- G A Optimized for gas filtration
- L G Optimized for liquid filtration
- H F High Flow

#### Adapter Standard Cartridges: (⌀ 71 mm)

- 2 1 Double open end
- 2 5 2-flange bayonet type
- 2 7 Double-O-ring
- 2 8 3-flange bayonet type

#### Standard Cartridges: (⌀ 63 mm)

- 0 0 Knife edge type (03, 05, 07, 08 see 21, 25, 27, 28)

#### MaxiCap

- 1 3 MaxiCap

#### Connectors

- S
- O
- F
- B
Cartridges Adapter

Top:
- 25, 28, 05, 08
- 27, 07
- 21, 03

Bottom:
- 21, 03
- 25, 05
- 27, 07
- 28, 08

MaxiCaps® Connector

S Connector
1½" sanitary flange Tri-Clamp

O Connector
½" single stepped hose barb

F Connector
¼" sanitary flange Tri-Clamp

B Connector
¼"–1" multiple stepped hose barb
Sales and Service Contacts

For further contacts, visit www.sartorius-stedim.com

Europe

Germany
Sartorius Stedim Biotech GmbH
August- Spindler-Strasse 11
37079 Goettingen
Phone +49.551.308.0
Fax +49.551.308.3289
www.sartorius-stedim.com

Sartorius Stedim Systems GmbH
Schwarzenberger Weg 73–79
34212 Melsungen
Phone +49.5661.71.3400
Fax +49.5661.71.3702
www.sartorius-stedim.com

France
Sartorius Stedim Biotech S.A.
ZI de Jouques – BP 1051
13781 Aubagne Cedex
Phone +33.442.845600
Fax +33.442.846545

Sartorius Stedim France SAS
ZI de Jouques – CS 71058
13781 Aubagne Cedex
Phone +33.442.845600
Fax +33.442.846545

Austria
Sartorius Stedim Austria GmbH
Franzosegraben 12
A-1030 Vienna
Phone +43.1.7965763.18
Fax +43.1.796576344

Belgium
Sartorius Stedim Belgium N.V.
Leuvensesteenweg, 248/B
1800 Vilvoorde
Phone +32.2.756.06.80
Fax +32.2.756.06.81

Denmark
Sartorius Stedim Nordic A/S
Hoerskaetten 6D, 1.
DK-2630 Taastrup
Phone +45.7023.4400
Fax +45.4630.4030

Netherlands
Sartorius Stedim Netherlands B.V.
Edisonbaan 24
3439 MN Nieuwegein
Phone +31.30.6025080
Fax +31.30.6025099

Spain
Sartorius Stedim Spain SA
C/Isabel Colbrand 10–12,
Planta 4, Oficina 121
Poligono Industrial de Fuencarral
28050 Madrid
Phone +34.91.3586102
Fax +34.91.3588804

Switzerland
Sartorius Stedim Switzerland GmbH
Lerzenstrasse 21
8953 Dietikon
Phone +41.44.741.05.00
Fax +41.44.741.05.09

U.K.
Sartorius Stedim UK Limited
Longmead Business Park
Blenheim Road, Epsom
Surrey KT19 9 QQ
Phone +44.1372.737159
Fax +44.1372.726171

America

USA
Sartorius Stedim North America Inc.
5 Orville Drive
Bohemia, NY 11716
Toll-Free +1.800.368.7178
Fax +1.631.254.4253

Sartorius Stedim SIS Inc.
1910 Mark Court
Concord, CA 94520
Phone +1.925.689.6650
Toll Free +1.800.914.6644
Fax +1.925.689.6988

Sartorius Stedim Systems Inc.
201 South Ingram Mill Road
Springfield, MO 65802
Phone +1.417.873.9275
Fax +1.417.873.9275

Argentina
Sartorius Argentina S.A.
Int. A. Avalos 4251
B1605ECS Munro
Buenos Aires
Phone +54.11.4721.0505
Fax +54.11.4721.0505

Brazil
Sartorius do Brasil Ltda
Av. Dom Pedro I, 241
Bairro Vila Pires
Santo André
São Paulo
Cep 09110-001
Phone +55.11.4451.6226
Fax +55.11.4451.6226

Mexico
Sartorius de México S.A. de C.V.
Circuito Circunvalación Poniente No. 149
Ciudad Satélite
53100 Naucalpan, Estado de México
Phone +52.5555.62.1102
Fax +52.5555.62.2942

Asia|Pacific

China
Sartorius Stedim Beijing
Representative Office
No. 33, Yu’an Road,
Airport Industrial Zone B, Shunyi District
Beijing 101300
Phone +86.10.80426516
Fax +86.10.80426580

Sartorius Stedim Shanghai
Representative Office
Room 618, Tower 1, German Centre,
Shanghai, PRC, 201203
Phone +86.21.28986393
Fax +86.21.28986392.11

Sartorius Stedim Guangzhou Office
Room 704, Broadway Plaza,
No. 233–234 Dong Feng West Road
Guangzhou 510180
Phone +86.20.8351.7921
Fax +86.20.8351.7931

India
Sartorius Stedim India Pvt. Ltd.
10, 6th Main, 3rd Phase Peenya
KIADB Industrial Area
Bangalore – 560 058
Phone +91.80.2839.1963|0461
Fax +91.80.2839.8262

Japan
Sartorius Stedim Japan K.K.
KY Building, 8–11
Kita Shinagawa 1-chome
Shinagawa-ku
Tokyo 140-0001
Phone +81.3.3740.5407
Fax +81.3.3740.5406

Malaysia
Sartorius Stedim Malaysia Sdn. Bhd.
Lot L3–E–3B, Enterprise 4
Technology Park Malaysia
Bukit Jalil
57000 Kuala Lumpur
Phone +60.3.8996.0622
Fax +60.3.8996.0755

Singapore
Sartorius Stedim Singapore Pte. Ltd.
10, Science Park Road, The Alpha
#02-25, Singapore Science Park 2
Singapore 117684
Phone +65.6872.3966
Fax +65.6778.2494

Australia
Sartorius Stedim Australia Pty. Ltd.
Unit 5, 7-11 Rodeo Drive
Dandenong South Vic 3175
Phone +61.3.8762.1800
Fax +61.3.8762.1828

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