# Seraph® 100 Microbind® Affinity Blood Filter

Sorbent Hemoperfusion Filter

STERILE / SINGLE USE / NOT REUSABLE
DO NOT USE IF THE PACKAGING IS OPEN OR DAMAGED
READ CAREFULLY THIS INSTRUCTIONS FOR USE
**CAUTION - For use in the U.S. under FDA EUA200165: Authorization for Emergency Use in patients with COVID-19 admitted to the ICU with confirmed or imminent respiratory failure**

## 1. INTRODUCTION

### 1.1 INTENDED USE

Seraph® 100 Microbind® Affinity Blood Filter (Seraph 100) is a single use extracorporeal broad- spectrum sorbent hemoperfusion device for use as an adjunctive treatment for COVID-19 infection.

- the Seraph 100 device has neither been cleared or approved by the FDA for the indication to treat patients with COVID-19 infection;
- the Seraph 100 device has been authorized by FDA under EUA;
- the Seraph 100 device is authorized only for the duration of the declaration that circumstances exist justifying the authorization of the emergency use of the Seraph device under section 564(b)(1) of the Act, 21 U.S.C. § 360bbb-3(b)(1), unless the authorization is terminated or revoked sooner.

### 1.2 INDICATIONS FOR USE

Seraph 100 is indicated for patients with laboratory confirmed and symptomatic COVID-19 with any of the following:

- Early acute lung injury (ALI)/early acute respiratory distress syndrome (ARDS);
- Severe disease, defined as:
  - dyspnea,
  - respiratory frequency ≥ 30 breaths/min,
  - blood oxygen saturation ≤ 93%,
  - partial pressure of arterial oxygen to fraction of inspired oxygen ration < 300, and/or
  - lung infiltrate >50% within 24 to 48 hours;
- Life -threatening disease, defined as:
  - respiratory failure,
  - septic shock, and/or
  - multiple organ dysfunction or failure

### 1.3 CONTRAINDICATIONS

The treatment with Seraph 100 is contraindicated in the following cases:

- Patients with proven heparin-induced thrombocytopenia (HIT), or patients with hypersensitivity to heparin
- Patients with low platelet count (<30,000/microliter)
- Known allergy to any device component
- Patients <18 years of age
- Inability to tolerate anticoagulation
- Untreated hypercoagulability
- Treatment deemed clinically futile
- Patient is pregnant
- Known allergy to ethylene oxide (Seraph 100 is sterilized with ethylene oxide)

⚠ ***Anticoagulation treatment is associated with a higher risk of hemorrhage, mostly after a surgical intervention. The decision to use Seraph 100 for a patient on anticoagulation therapy must be made by a physician.***

### 1.4 WARNING AND PRECAUTIONS

**Warnings**

1.4.1 Seraph 100 is a disposable medical device valid for single use only. Do not reuse!
1.4.2 Clamp Seraph in a vertical orientation during use with the arrow on the device pointing up. Check the direction of the blood flow through the Seraph to assure that it is in the direction of the arrow: from bottom to top.
1.4.3 Seraph 100 should not be used if dropped.
1.4.4 Seraph 100 should not be used beyond use by date.
1.4.5 Seraph 100 should not be used if the sterilization barrier is compromised. Do not resterilize the Seraph 100.
1.4.6 Do not use device in patients who are actively bleeding. If a patient develops bleeding during a treatment, immediately discontinue the treatment.

**Precautions**

1.4.7 Carefully read these Instructions for Use before using the device.
1.4.8 Single use only.
1.4.9 Use proper aseptic technique during assembly and use.
1.4.10 The circuit must be primed in patients at risk of or with active signs of hemodynamic instability.
1.4.11 Use only under the direction of a physician familiar with the condition of the patient. Seraph 100 should only be administered by personnel that have been properly trained in administration of extracorporeal therapies.
1.4.12 As in all extracorporeal treatments, the trained personnel must monitor the patient at all times during the treatment.
1.4.13 The safety of the treatment in pregnant women and patients under 18 years of age has not been determined.
1.4.14 Carefully check all extracorporeal circuit connections before and during the procedure.
1.4.15 Since the device is sterilized with ethylene oxide (ETO), allergic reactions are possible.

### 1.5 POTENTIAL ADVERSE EVENTS/SIDE EFFECTS

The following side effects or adverse reactions could theoretically occur while using Seraph 100:
In rare cases, hypersensitivity reactions may occur during extracorporeal treatment. A history of allergies (heparin, polyethylene, copolyester, ETO residuals) is an indication requiring careful monitoring for hypersensitivity reactions.
Note: In the event of a hypersensitivity reaction, treatment must be discontinued and aggressive, first line therapy for anaphylactoid reaction must be initiated. The decision to return the blood to the patient encountering a hypersensitivity reaction must be made by a physician.

The patient should be monitored for other clinical events associated with extracorporeal Treatment, including but not limited to hypotension, anemia/decreased hematocrit, hypovolemia, thrombocytopenia, cardiac dysrhythmia, hemolysis and hematoma formation at the venipuncture site.
Other less frequently observed events than can be observed are chest pain, dyspnea, and hypertension after treatment.
**Other risks associated with CRRT**: a) Fluid imbalance: hypovolemia, hypervolemia, b) Arrhythmia, c) Blood loss, d) Headache, e) Nausea, f) Cramping, g) Blood pressure abnormalities: hypertension, hypotension, h) Thrombosis, i) Air embolism, j) Infection, k) Temperature dysregulation: hypothermia, hyperthermia, l) Allergic reaction/anaphylaxis, m) Hemolysis, n) Acid-base imbalance: Acidosis, alkalosis, o) Thrombocytopenia / leukopenia, p) Unintended removal of other blood substances (e.g., vitamins, proteins, medications), q) Risks related to vascular access placement (e.g., infection, blood loss, thrombosis, tissue/organ injury), r) Risks related to anticoagulation (e.g., blood loss, allergic reaction), s) Itching, t) Anxiety, u) Convulsions/seizure, v) Altered mental status, w) Hemorrhage, x) Clotting, y) Pyrogenic reactions.

### 1.6 LIMITATIONS

The safety of the treatment using Seraph 100 device in pregnant women and patients under 18 years of age has not been determined.
Seraph 100 is a single-use device and can be used up to 24 hours only. Biocompatibility testing beyond 24 hours has not been performed and therefore the risks when used > 24 hours are unknown.

### 1.7 STORAGE AND HANDLING CONDITIONS

Avoid any impact during transport and handling, as the casing or other components may be damaged. Do not hit the device.
Storage conditions: temperature range of 15-30 degrees Celsius.
Use the device before the use by date indicated on the product label.

## 2.BEFORE STARTING THE TREATMENT

**Aseptic procedures should be used for all steps below.**

**2.1** Seraph 100 is intended for use with standard, commercially available bloodlines compatible with the pump system used. Female Luer connectors are required to connect with Seraph 100 blood ports. The blood pump should be capable of delivering up to 400 mL/min blood flow rate.

⚠ ***Pressure monitoring of the bloodline between the blood pump and the Seraph 100 device is recommended.***

**2.2** Inspect the protective pouch for any sign of damage to the Seraph 100 device. Carefully remove Seraph 100 from the pouch and examine for defects. Do Not use if damaged or defective.
Note: The fluid pathway in an intact device inside the protective pouch is sterile.

⚠ ***DO NOT USE Seraph 100 if it appears to be damaged.***

**2.3** Locate the inlet (arterial) end of the device. With the inlet end of the device facing downward, firmly secure Seraph 100 in a vertical position to the pump system's device holding pole (or alternate device holding system) using a standard dialyzer clamp.
Note: When the Seraph 100 is placed in a vertical position with the inlet end of the device facing downward, the flow arrow on the label is pointing upward.

**2.4** Install the arterial and venous bloodlines on the blood pump.
Note: Refer to the manufacturer's instructions for the blood tubing set and blood pump.

**2.5** Aseptically spike 0.9% sterile normal saline with a clamped Intravenous (IV) administration set. Attach the IV administration set to the patient end of the arterial bloodlines. Ensure all connections are secure in every step. Alternatively, online produced filtration fluid of a regular hemodialysis machine can be used.

**2.6** Open the clamp on the IV set. Prime the arterial bloodline with saline solution using a blood pump speed of approximately 150 mL/min.
Note: Refer to the manufacturer's instructions for the blood pump.

**2.7** Stop the blood pump and clamp the line. Ensure that Seraph 100 is placed in a vertical position with the inlet end of the device facing downward and the flow arrow on the label is pointing upward. Remove the inlet port plug of Seraph 100 and connect the primed arterial bloodline to the inlet port. Remove the tubing clamp.

⚠ ***Avoid the entry of air into Seraph 100 during the priming procedure.***

**2.8** Turn on the blood pump and prime the Seraph 100 with 1 L of saline solution using a blood pump speed of approximately 150 mL/min.

**2.9** Examine if air bubbles are observed within the inlet of the device. If air bubbles are detected, gently thump the outlet side of the device with the palm of your hand during the priming to remove them.
Note: If stubborn bubbles are present, turn off the pump and aseptically connect a 40 – 60 mL syringe filled with saline to outlet tubing of the device (venous bloodline). Rotate the Seraph 100 clamp 180° so the flow arrow on the label is pointing downward and the bubble on the inlet side is visible. Using the syringe to push saline into the device until the air bubble is pushed into the saline bag and there are no visible air bubbles in the Seraph 100 or tubing. Aseptically connect the Seraph 100 inlet to the dialysis circuit. Rotate the Seraph 100 clamp 180° into a vertical position with the arrow on the label pointing upward. Remove the syringe. Do not use if an air bubble is present.

**2.10** Attach the venous line to connect the Seraph 100 outlet to the dialysis circuit.
**2.11** Turn on the blood pump and prime the venous line at approximately 150 mL/min.
**2.12** Turn the blood pump off.

⚠ ***Verify that the circuit connections to Seraph 100 are as shown in the illustration (on reverse page). DONOT kink any of the blood lines.***

# Seraph® 100 Microbind® Affinity Blood Filter

Sorbent Hemoperfusion Filter

STERILE / SINGLE USE / NOT REUSABLE
DO NOT USE IF THE PACKAGING IS OPEN OR DAMAGED
READ CAREFULLY THIS INSTRUCTIONS FOR USE
**CAUTION - For use in the U.S. under FDA EUA200165: Authorization for Emergency Use in patients with COVID-19 admitted to the ICU with confirmed or imminent respiratory failure**

**2.13** The priming of the extracorporeal circuit should be completed with blood pump speed of approximately 150 mL/min and with a minimum of 1 L of normal saline / online produced filtration fluid.

Note: Use the Seraph 100 immediately after rinsing and priming.

**2.14** In case concomitant renal replacement therapy (dialysis, hemofiltration, CRRT) is required, Seraph 100 shall be placed prior (proximal or upstream) to the dialyzer or hemofilter. An accessory bloodline between Seraph 100 and the dialysis device is required. Priming will require a minimum of 1L of normal saline, which includes the priming volume of 160 mL, and anticoagulation should be tailored to the treatment.

## 3. INITIATION OF TREATMENT

### 3.1 Anticoagulation

Heparin: Patient shall be anticoagulated with a bolus of heparin to an ACT of 160 – 210 seconds or an aPTT of 60 – 80 seconds prior to the start of treatment. Systemic heparinization during hemodialysis is recommended with a 3 to 5-minute waiting period after the initial heparin bolus.

⚠ ***Anticoagulation with an excess of heparin is associated with a higher risk of hemorrhage, mostly after a surgical intervention. Physician shall monitor and pay attention to the recommended doses throughout the treatment. The use of citrate as anticoagulation for patients undergoing Seraph 100 therapy is not known. The decision to use citrate must be made by a physician.***

Increase the blood pump speed slowly to a blood flow rate of 100-350 mL/min.

⚠ ***Be sure to monitor the arterial and venous blood pressure carefully during this process to note any possible flow restrictions or inappropriate pressure readings.***

**3.2** To optimize sufficient exposure of patient's blood to the Seraph 100 adsorption media, please refer to table below for recommended blood flow rates according to treatment duration:

| Blood Flow Rate | Number of Hours |
|---|---|
| 400 ml/min | 4 hours |
| 350 ml/min | 5 hours |
| 300 ml/min | 6 hours |
| 250 ml/min | 7 hours |
| 200 ml/min | 8 hours to <24 hours |

**3.3** Treatment time may be extended up to 24 hours at the discretion of the local provider if the patient has not met goal reduction in vasopressor requirement and nurse staffing allows.

**3.4** Treatment will be repeated if:

- The patient still as a vasopressor requirement 24 hours after completion of Seraph-100 treatment
- The patient initially weaned off vasopressors but the vasopressor requirement returned.

⚠ ***Caution: The patient's hemodynamics and blood access can affect tolerated blood flows, the decision for treatment duration must be made by physician.***

Note: If being used with a dialysis device, initiate treatment as directed by the manufacturer's instructions for use included with the hemodialyzer. Once the prescribed blood flow rate has been achieved, set the prescribed ultrafiltration rate and rotate the dialyzer to the arterial end up position.

## 4. DURING TREATMENT

4.1 If possible, withhold non-essential intravenous medications until after device therapy is completed.

4.2 Monitor the pressure in the extracorporeal circuit, including the line between the blood pump and Seraph 100, if available. Investigate any indication of abnormal pressure.

4.3 Visually inspect the Seraph 100 for any signs of clotting or blood leaks from the circuit or within the dialyzer. Report all clotting or blood leaks to the responsible medical professional.

4.4 Periodically monitor the extracorporeal circuit for evidence of obstruction, security of fittings, and air within the circuit.

⚠ ***Air entering the extracorporeal circuit during dialysis can result in serious injury or death. Should air get into the venous line during the treatment, the dialysis treatment must be discontinued without returning any of the blood mixed with air to the patient.***

## 5. TERMINATION OF TREATMENT

5.1 When the treatment is completed, stop the blood pump, disconnect the"arterial"line from the vascular access of the patient and connect it to a bag of saline. Turn on the blood pump to low flow rates (usually 50 mL/min). Ensure that there is enough 0.9% sterile saline solution in the bag (usually 250 mL) for rinsing the blood in the extracorporeal circuit back to the patient.

Note: Terminate the treatment as directed by the manufacturer's instructions for use included with the bloodlines and blood pump.

5.2 Discard the bloodlines and Seraph 100 in an appropriate biohazard waste receptacle.

5.3 Post treatment medication will be determined by the physician.

## 6. PERFORMANCE CHARACTERISTICS

Blood Priming Volume: 160 mL
Blood Flow Rate (min, max): 100, 350 mL/min
Priming Fluid: Physiologic Saline
Sterilization: Ethylene Oxide (ETO)
Treatment duration (per Seraph 100): up to 24 hours
Maximum pressure limit: 1138 mmHg
Flow resistance:

Qb ≤ 100 mL/min: 13.4 mmHg
Qb ≤ 250 mL/min : 21.2 mmHg
Qb ≤ 350 mL/min : 29.5 mmHg

## 7. BLOOD CONTACTING MATERIAL

The patient body tissue (blood) contacting materials of Seraph 100 are listed in the following table. The duration of the contact with blood is limited and less than or equal to 24 hours in all cases.

| Device Component | Materials |
|---|---|
| Column Body and End Caps | Copolyester, DuraStar™ Polymer |
| End Plate | Hydrophilic porous polyethylene |
| Adsorption media, beads | Ultra-high molecular weight polyethylene |
| End Point Attached Heparin | Heparin Sodium, USP |

## 8. ACCESSORIES

Seraph 100 is compatible with standard hemodialysis circuits and connectors. Seraph 100 is compatible with the standard large-bore female threaded dialyzer connectors. When treating with Seraph 100 and a dialyzer/hemofilter simultaneously, a Female-Female Luer Lock Connector is required to connect Seraph 100 to the dialyzer/hemofilter.

## 9. WASTE MANAGEMENT

Make sure that all local requirements and the health center's policy on precautions and prevention of infections and environmental contamination are met when the Seraph 100 components and other accessories (e.g., tubing) are discarded in the appropriate biohazard waste receptacles.

## 10. MANUFACTURER

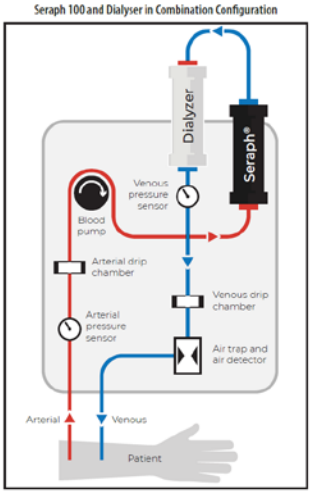
Manufactured under ISO 13485:2016.

ExThera Medical Corporation
757 Arnold Drive, Suite B
Martinez, CA 94553 US
☎ +1 925-839-2060
+1 925-839-2075
Email: info@extheramedical.com

EXPLANATIONS OF SYMBOLS

| | | | |
|---|---|---|---|
| | | 30°C 15°C | Temperature Limit |
| | Manufacturer | | Do not re-use |
| REF | Catalogue number | | Caution! Please read carefully the instructions for use |
| | Use by date | | |
| LOT | Batch code | | Blood flow from bottom to top |
| STERILE EO | Sterilized using ethylene oxide | | Phone |
| | Do not use if package is damaged | | Fax |
| | Do not resterilize | | |

Seraph 100 and Dialyser in Combination Configuration




Seraph 100 in Stand-Alone Configuration