

April 27, 2020

Dear Valued Customer,

Use of Terumo® Advanced Perfusion System 1 in Extracorporeal Membrane Oxygenation Therapy

Background

In accordance with the FDA's Enforcement Policy for Extracorporeal Membrane Oxygenation and Cardiopulmonary Bypass Devices During the Coronavirus Disease 2019 (COVID-19) Public Health Emergency, Guidance for Industry and Food and Drug Administration Staff, which was issued on April 6, 2020, Terumo Cardiovascular is providing you an update regarding our Terumo Advanced Perfusion System 1 (see Appendix A for list of applicable devices and included components).

Using Terumo Advanced Perfusion System 1 for Extracorporeal Membrane Oxygenation (ECMO) Therapy

The Terumo® Advanced Perfusion System 1 (Terumo System 1) is indicated for use for up to six hours in the extracorporeal circulation of blood for arterial perfusion, regional perfusion, and cardiopulmonary bypass procedures, when used by a qualified medical professional who is experienced in the operation of this or similar equipment. The Terumo System 1 is a configurable system which may include the use of a centrifugal pump, including a disposable pump head. While Terumo Cardiovascular does not have FDA approval or clearance for continuous usage of the device for longer than six hours, the above-referenced FDA Guidance designates many heart-lung machines, including the Terumo Advanced Perfusion System 1, as technologically capable of being used for ECMO therapy.

In order to support the emergency use of Terumo System 1 for ECMO therapy, Terumo Cardiovascular is providing some relevant performance and durability information, an overview of key risks, and a summary of signs indicating that a device change out may be necessary.

Performance and Durability

Prior to use, refer to the corresponding Operator's Manual for all relevant use information and instructions. Provided below are the relevant product performance and durability data excerpts from the currently approved and cleared Operator's Manuals which may be helpful when considering usage of Terumo System 1 in ECMO therapy.

Terumo System 1 Hardware Operating Ranges:

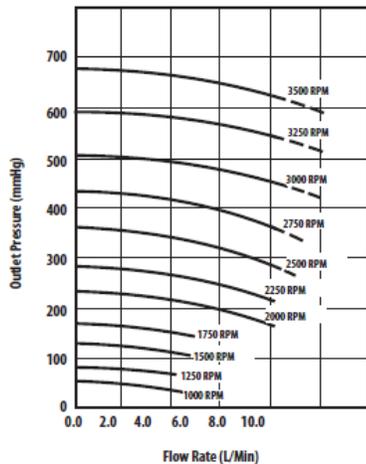
Component	Operating Range
Electronic O ₂ Blender/Analyzer	Flow: 0 – 10 L/min FiO ₂ : 0.21 – 1.00 Measured O ₂ : 21 – 100 %
Roller Pumps	Small (4"): 0 – 4 L/min Large (6"): 0 – 10 L/min
Centrifugal Control Unit	0 – 3,600 RPM
Pressure Module	-250 – 900 mmHg
Temperature Module	0 – 50 °C
Flow Module	-9.9 – 9.9 L/min
Ultrasonic Air Bubble Detector Module	3/8": 0.5 cc or larger up to 6 L/min 1/4": 0.3 cc or larger up to 3 L/min

Centrifugal Pump with Disposable Pump Performance Specifications:

Pressure Versus Flow Graph

The pump output is pressure responsive. In the graph below, the pump flow rate (L/min) versus the outlet pressure (mmHg) is plotted at a variety of pump speeds.

This graph is for informational purposes only and does not necessarily reflect the rates to be achieved under clinical conditions.



Note: Actual obtainable flow is dependent on afterload of the pump which results from extracorporeal circuit components and patient arterial resistance.

Specifications

- Pump Priming Volume: 48 ml*
- Pump Rotation Range: 0-3600 RPM
- Outflow Capacity: 0-9.9 L/min (see note)
- Outflow Pressure: 0-700 mmHg (see note)
- Max Tested Blood Flow Rate: 7.0 L/min

Connects to 3/8 inch (9.5 mm) I.D. tubing.

Durability Information:

When used in accordance with Operator's Manual instructions, the Terumo System 1 and disposable centrifugal pump will operate within the defined performance specifications for up to six hours of use.

The Electronic O₂ Blender/Analyzer contains an O₂ sensor which is designed to support six months of use on typical cardiopulmonary bypass (CPB) cases. The life of a new sensor is equivalent to 42 days of continuous usage at 100% O₂ level. Refer to Device Change Out Instructions below for further detail regarding this component.

Risks Associated with Using a Terumo System 1 in ECMO Therapy

The use of Terumo System 1 in ECMO Therapy for longer than the six-hour indication for use period may result in an increased likelihood of functional failure for pumps or gas mixer, as well as potential degradation of tubing or disposable centrifugal pump head. Such failures may result in a need to change out either the disposable centrifugal pump, hardware system module, or the full system to ensure continued performance for the duration of ECMO therapy.

Potential risks associated with functional failures or disposable degradation include hypoperfusion, hemolysis, lower than intended gas flow or delivered percent O₂ (FiO₂), or leaks/debris in the perfusion circuit.

Potential risks, which are well known to clinicians utilizing these devices, are associated with the replacement process of an underperforming device and initial circuit or system setup.

Additional risks are associated with the potential difference in environmental conditions during ECMO therapy as compared to CPB surgery. These conditions and potential risks include:

- Transportation of Terumo System 1 while in use, leading to:
 - Disruption of perfusion circuit.
 - Loss of backup battery power due to extended time removed from AC power.
 - Terumo System 1 hardware may be subject to electromagnetic interference from non-CPB standard device interactions leading to potential functional failure.
- Non-continuous interaction with device leading to missed system messages or alarms.
- Response of an inexperienced user to system messages leading to inappropriate user response to message or alarm.

In order to ensure proper system performance, users should review the existing Terumo System 1 Operator's Manual content related to operating conditions including potential electromagnetic interference, battery backup, and alarm information. As indicated, the system should be used and continuously monitored by a qualified medical professional who is experienced in the operation of this or similar equipment.

Signs Indicating a Device Change Out May Be Needed

General guidance for monitoring and maintaining Terumo System 1 performance can be found in the Operator's Manual. In certain circumstances potentially related to extended use or different environmental conditions in ECMO therapy, the user should monitor the system closely for changes in performance, including:

- Changes in flow or pressure not requested by the clinician.
- Changes in centrifugal pump RPM / flow rate relationship associated with chattering noise or squeal emanating from centrifugal pump disposable.
- If hemolysis is suspected through laboratory testing (i.e., plasma-free hemoglobin levels or increasing lactate levels), assess centrifugal pump for proper operation.
- System messages or alarms provided on the Central Control Monitor and/or affected local user interface indicating hardware performance issues. Refer to Operator's Manual for full listing of system messages.

Device Change Out Instructions

When signs indicate a device change out is needed, replace disposables or the potentially affected device. Device change out procedures should largely mimic provided setup instructions within Operator's Manual for components of the Terumo System 1 or disposable centrifugal pump. The change out procedure should be customized depending upon tubing circuit design and personal preference of the care team.

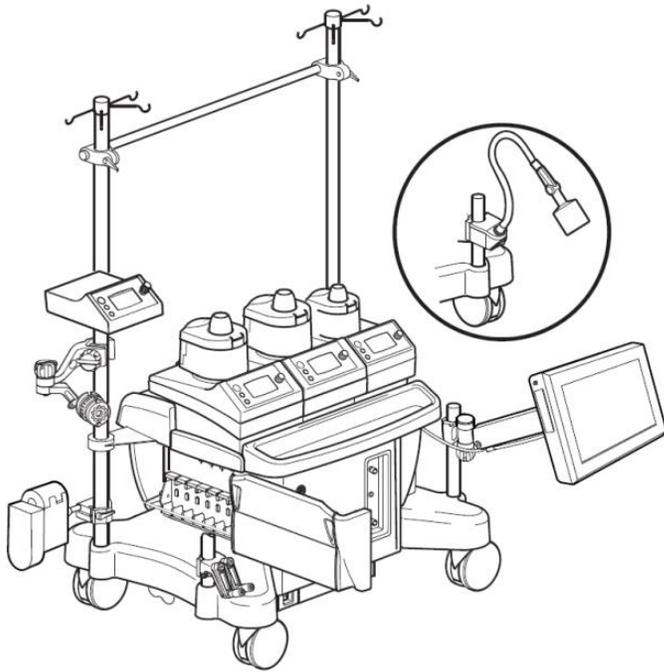
Extended duration of use in ECMO applications may result in premature consumption of the O₂ Sensor within the Electronic O₂ Blender/Analyzer. This condition may result in a "Service O₂ Sensor" message. In the event this message is received, it is not recommended to change out the system. Oxygen levels can be controlled using local, knob adjustment. In these circumstances, consistent with standard of care practices oxygen levels should continue to be monitored using a continuous blood-gas monitor or analysis with point-of-use blood-gas analyzer or laboratory measurement.

If you have questions, please contact:

Terumo Cardiovascular Customer Service at **800.521.2818**.
Customer Service Hours: Monday – Friday 8 a.m. – 6 p.m. ET

Terumo Cardiovascular Technical Support at **800.441.3220**
24-hour hot line

APPENDIX A



Terumo Advanced Perfusion System 1
REF: 801763, 801764



Sarns Centrifugal Disposable Pump
REF: 164275, 164275X

Applicable System Components:

Description	REF/Catalog No.	Description	REF/Catalog No.
Central Control Monitor	816300	Modules (Continued)	
System Configuration PC Card	803739	Level Detect Module	
Service Data PC Card	803740	Level Sensor Pads	195240
Monitor Mounting Arm	801441	Temperature Module	802114
Roller Pump, 6 inch	801041	Pressure Module	802112
Roller Pump, 6 inch, Gray	816571	Occluder Module	803480
Cover-Hinge Assembly, 6 inch	871928	Occluder Head	806455
Roller Pump, 4 inch	801040	Flowmeter Module	802018
Roller Pump, 4 inch, Gray	816570	Flow Sensor	6382
Cover-Hinge Assembly, 4 inch	871929	Flowmeter Mounting Bracket	801550
Centrifugal Control Unit	801046	Ultrasonic Sensor Gel	164278
Centrifugal Control Unit, Gray	816572	Electronic Gas Blender Module	801188
Centrifugal Drive Motor	164267	Oxygen Sensor	801074
Flexible Mounting Arm	816620	Galvanic Oxygen Sensor	889773
Manual Drive Unit	164268	Gas Supply Hose Kit (US)	814475
Telescoping Pole	16431701	Oxygen Hose – green; Air Hose – yellow	
(1.3 inch (3,3 cm) diameter; 6 –7.5 feet		Hoses do not include adapters for hospital gas outlets	
(1,8 – 2,3 m) in length		Gas Supply Hose Adapter sets (US)	
Mounting Pole (4 feet (1,2 m) in length)	16553401	NCG Hose Adapter Set	144207
Mounting Pole (3 feet (0,9 m) in length)	131115	DISS Hand Tight Hose Adapter Set	144215
Mounting Pole (2 feet (0,6 m) in length)	16553301	Ohio Diamond Hose Adapter Set	144223
Short Pole	801407	Gas Supply Hose Kit (Outside the US)	814474
Crossbar	16426	Oxygen Hose – white; Air Hose – white/black	
Pole Collar	150826	Hoses do not include adapters for hospital gas outlets	
Crossbar Fitting	145980	Gas Supply Hose Adapter Sets (Outside the US)	
Solution Rack	146819	DISS Hose Adapter Set	815457
Shelf (not shown)	816489	NCG Hose Adapter Set	815459
Lamp, 33 inch (83,8 cm)	801238	Ohio Diamond Hose Adapter Set	815461
Lamp, 15 inch (38,1 cm)	801558	95-5 Supply Hose (%O2/%CO2)	164595
Hand Crank Bracket	802089	Interface Module for CDI 500	803479
(includes 2 each hand cranks)	801016	Serial Cable	804981
Roller Pump Pole Mount	801093	Interface Module RS-232	802113
Dual Pumps Pole Mount	816477	Serial Cable	804982
Descending Pump Bracket	816483	Module Cover	
Centrifugal Unit Pole Mount	804372	Right Side	804405
Roller Pump Mounting Extension, large	802523	Left Side	804404
Roller Pump Mounting Extension, small	802524	Wire Cover	816622
Sliding Back Cover Panel Kit	816370		
Modules			
Air Bubble Detect Module	802110		
Air Sensor, 3/8 in. x 3/32 in.	5773		
Air Sensor, 1/4 in. x 1/16 in.	5785		
Air Sensor, 1/4 in. x 3/32 in.	5791		
Cable Assembly	822763		
Sensor Holder	149876		
Air Sensor Bracket	5793		
Level Detect Module	802111		
Alarm Sensor, Red	195274		
Alert Sensor, Yellow	195215		