



Revised Warming Flow Rate Specifications for the 3M™ Ranger™ Blood / Fluid Warming High Flow Sets

Catalog No. 24355 and 24370

The 3M™ Ranger™ Blood / Fluid Warming System is designed to warm blood, blood products, and IV fluids before they are administered to patients. Consisting of a Model 245 warming unit and a sterile disposable fluid warming set, it uses dry heat technology to warm fluids as they pass through the warming set. Please refer to the Ranger Model 245 Operator's Manual for detailed operating instructions and unit specifications.

The Ranger System is capable of accommodating fluid warming at a wide range of flow rates from very low flow rates (KVO (Keep Vein Open)) to higher flows suitable for more rapid infusions. While the Ranger System accommodates the flow and provides heating, it does not govern or regulate flow of blood/fluid into the patient nor is it a rapid infusion device. The Ranger System does not contain any mechanism to drive flow, e.g. a pump, and therefore, another infusion mechanism (usually another piece of equipment) is needed to drive the flow whether using a pressure-driven device or gravity as chosen by the physician to address the specific clinical scenario.

Table 1 compares the recommendations of the medical associations against the warming flow rates that the Ranger System is capable of delivering warm fluids when used with a large bore catheter. In all cases, **the Ranger System is capable of warming fluids at the recommended heated infusion volume.**

The updated Ranger System specifications for the high flow sets (catalog no. 24355 and 24370), indicating warming can be achieved at 333 mL/min for 20°C fluids and 167 mL/min for 4°C fluids, meet or exceed modern Massive Transfusion Protocol requirements and accommodate all realistic medical practice scenarios (see Table 1).

As such, the Ranger blood/fluid warming system is designed to warm blood, blood products, and liquids. **Fluids can be warmed from 4°C-20°C inlet temperature to 33°- 41°C.** It takes less than 2 minutes to warm up to the 41°C set point temperature and to begin infusion. An overtemperature alert point is set at 43°C and the under-temperature alert point is set at 33°C.

Set	Inlet Fluid Temperature	Flow Rate Accommodated
Pediatric	4°C-20°C	KVO – 100 mL/min
Standard flow	4°C-20°C	KVO – 150 mL/min
High flow	4°C	KVO – 167 mL/min
High flow	20°C (ambient temperature)	KVO – 333 mL/min



To learn more about the 3M Ranger Blood / Fluid Warming High Flow Sets, scan the QR Code to schedule an in-service

Table 1. Massive transfusion protocol clinical guidelines

Guidelines/publications	Recommendation	3M Ranger Infusion Volume of 333ml/min (19.9L/hr) at 20°C inlet temperature suitable as per the guidelines	3M Ranger Infusion Volume of 167ml/min (10L/hr) at 4°C inlet temperature suitable as per the guidelines
1 AST Guidelines for Best Practices for Massive Transfusion of the Surgical Patient ¹	Four common types of massive transfusion: ≥10 PRBC/24hr + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 3L + Platelets 3L + FFP 3L = 9L/24hr	Yes	Yes
	20 PRBC/24hr 1:1:1 (PRBC + platelets + FFP) Calculation: PRBC 6L + Platelets 6L + FFP 6L = 18L/24hr	Yes	Yes
	4 PRBC units in one hour 1:1:1 (PRBC + platelets + FFP) Calculation: PRBC 1.8L + Platelets 1.8L + FFP 1.8L = 5.4L/hr	Yes	Yes
	Replacement of >50% of total blood volume by blood products within 3hr Calculation = 2.5L/3hr	Yes	Yes
2 British Committee for Standards in Haematology: Guidelines on the management of massive blood loss ²	Blood: >50 ml/kg/hr in adult Platelet: after every 600ml of blood FFP: after every 450ml of blood Calculation – Blood: 4L/hr + Platelets: 2.1L/hr + FFP 2.7L/hr = 8.8L/hr	Yes	Yes
3 The American College of Surgeons: ACP TQIP Massive Transfusion in Trauma Guidelines ³	>10 units of RBC/24hr Platelets: after every 1.8L of Blood FFP: RBC and FFP ratio, 1:1 - 1.2 Calculation: RBC >3L + Platelets 0.6L + FFP 3L to 6L = 9.6L/24hr	Yes	Yes
4 International Society of Blood Transfusion ⁴	≥10 PRBC/24hr + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 3L + Platelets 3L + FFP 3L = 9L/24hr	Yes	Yes
	≥6 PRBC/6hr + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 1.8L + Platelets 1.8L + FFP 1.8L = 5.4L/6hr	Yes	Yes
	≥5 PRBC/4hr + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 1.5L + Platelets 1.5L + FFP 1.5L = 4.5L/4hr	Yes	Yes
5 Massive transfusion in trauma: Current Opinion Anesthesiology ⁵	≥10 PRBC/24hr + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 3L + Platelets 3L + FFP 3L = 9L/24hr	Yes	Yes
	≥20 PRBC/24hr (ultra massive) + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 6L + Platelets 6L + FFP 6L = 18L/24hr	Yes	Yes
	≥4 PRBC/hr + 1:1:1 (PRBC + platelets + FFP) Calculation: ≥PRBC 1.2L + Platelets 1.2L + FFP 1.2L = 3.6L/hr	Yes	Yes
6 Massive blood transfusion and trauma resuscitation: Study on Level 1 trauma center ⁶	8 PRBC transfused in the first 4 hr Calculation: 2.4L/4hr	Yes	Yes
	11 PRBC transfused in the first 24 hr Calculation: 3.3L/24hr	Yes	Yes

PRBC – Packed Red Blood Cell
RBC – Red Blood cells
FFP – Fresh Frozen Plasma

Calculations are based on an average 80kg patient. Each unit of PRBC, Platelets, and Fresh Frozen Plasma has an average of 300ml of volume.



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