*Transonic-Inside* ™ OEM Development Kit



# Transonic Inside<sup>™</sup> Flow Measurement Solutions for ECMO





## **ECMO Measurement Technology**



Transit-time Ultrasound Flow Measurement Methodogy (TTFM)

Using wide-beam illumination, transducers pass ultrasonic signals back and forth, alternately intersecting flowing liquid in upstream and downstream directions. The transit time of the ultrasonic beam is decreased when travelling downstream and increased when traveling upstream.

The integrated differences between the upstream and downstream transit times over the distance of the tubing/vessel provide a measure of volume flow. The sum of the transit times yields information about liquid properties that affect ultrasound velocity and allow for a suite of ultrasound dilution measurements.

### Ultrasound Dilution Technology Measurement Methodology (UDT)

- 1. A bolus of isotonic saline is introduced into the extracorporeal circuit, diluting the blood. A corresponding drop in protein concentration reduces the liquid's ultrasound velocity.
- 2. Paired flow/dilution sensors (arterial and venous) attached to the extracorporeal circuit sense this decreased in velocity. Indicator dilution curves can then be produced and displayed.
- 3. This flow-derived measurement data allows for a variety of parameters to be calculated incluing recirculation, clotting indication, cardiac function measures and much more.

Flow/dilution Sensor: The blood line is inserted into the channel of the flow/dilution sensor body. The direction of flow is indicated by arrows. Ultrasonic beam is shown emanating from the two transducers in the sensor body.





#### The Krivitski Method®

Pioneered by Nikolai Krivitski, PhD, DSc, the Krivitski Method marries transit-time ultrasound and indicator dilution principles. It can be used in any situation involving an extracorporeal blood circuit and leverages Transonic's highly



Nikolai Krivitski

accurate tubing flow sensors. Measurements are immediate, non-invasive, and can provide a wide variety of clinically valuable data points for healthcare providers. It is commonly used today in the hemodialysis and ECMO fields.



## **ECMO** Parameters

Through the use of UDT technology leveraging dual sensors and bi-directional flows, it becomes possible to acquire many parameters beyond just volume flow:



\* Transonic research ongoing

### Recirculation

During venovenous ECMO, some reinfused oxygenated blood can be withdrawn through the drainage cannula, thus not contributing to systemic oxygen delivery. Knowing the amount of recirculation helps clinicians make informed judgements relative to treatment efficacy and adjustments that can be made (e.g. cannula positioning, pump settings, tubing issues, etc.)

#### **Oxygenator Blood Volume/Clotting Indicator**

Oxygenator clotting is a major concern in medical devices circulating blood for any length of time. A quantitative indicator of clotting provides the ability to identify issues early and avoid adverse or catastrophic outcomes. Knowing OXBV brings objective data to the bedside, rather than having to rely only on subjective visual cues for decision making.

### Cardiac Output and Other Cardiac Function Parameters

When managing hemodynamically unstable patients, it can be important for clinicians to recognize changes in cardiac function. Transonic's R&D team has discovered simple, non-invasive methodologies to accurately measure Cardiac Output (CO) and other cardiac function parameters. This information can contribute to recognizing potential warning signs and improving overall therapy effectiveness.

### **Additional Parameters**

Research is ongoing with regard to many additional parameters and Transonic is committed to exploring and developing clinically meaningful measurements that can be utilized by our OEM partners.



### Let's Get Started

Transonic can help you develop meaningful ECMO measurements that will set you apart from the competition. The top flow minds in the business are at your disposal – scientists, engineers, and clinical specialists. Put us to the test with any project – big or small!

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