

Quantum Perfusion Systems



Quantum Perfusion Systems

Spectrum Medical proudly presents a modular range of Quantum Perfusion Modules and Patient Safety Systems in combination with flexible space frame solutions for all ECLs procedures used in Cardiopulmonary Bypass.

- The robust and compact Stainless Steel Space Frame construction improves usability by significantly reducing both footprint and weight. The independent placement of system modules allows fine-tuning of overall ergonomics, which leads to improved patient focus and safety.
- The compact modular design and customization opportunities offers an unprecedented degree of flexibility in the optimization of perfusion circuits focused on lowering hemodilution for improved patient outcomes.
- Integrated into the Stainless Steel Space Frame is the Quantum Power Management Module which contains a four-hour battery pack and can integrate up to thirteen Quantum modules to support changing clinical practice.
- This system can also drive two centrifugal pumps with no change in overall footprint. The Quantum Perfusion System can be upgraded at any time, with the addition of an external drive motor, to support the integration of centrifugal pumps into your clinical practice.
- All power management cabling is contained within the stainless steel frame to improve both ergonomics and system durability.



The Vienna Frame



The Cheltenham Frame



The New York Frame

Quantum Workstations

The window to intuitive control of the most advanced and safest perfusion technology available.



12" Quantum Workstation

The 12" Quantum Workstation

The 12" Quantum Workstation is a direct replacement for the System M Monitoring system and an optional alternative to the 15" Quantum Workstation. The 12" Workstation with its high-resolution LCD screen has been designed to provide customers with a reduced spatial envelope and a simplified graphical user interface.

The 12" Quantum Workstation retains a range of capabilities that supports connectivity to the

Quantum Ventilation System, Quantum Diagnostics Module and third party physiologic monitors for the central display of critical clinical information. Additionally, it includes a range of Best Practice Apps and associated alert systems and network connectivity to Spectrum Medical's LIVE VUE remote monitoring technology.

The 12" Quantum Workstation does not support the Quantum HLM Pump Manager App.

The 15" Quantum Workstation

The 15" Quantum Workstation is the gateway into the management of the World's most advanced Perfusion Management System.

Integrated software applications (Apps) supported by a unique range of advanced Quantum System Modules extend both Perfusion management and Perfusion functionality well beyond today's conventional technologies.

With a commitment to both patient and physician safety the Quantum Workstation with its high resolution 15" LCD screen has been designed to allow the centralization of critical patient data and perfusion management functions into a single user interface.

The Quantum software system is totally configurable to the needs of individual customers. Apps can be selected from the Quantum App Store and integrated into the practice work flow to provide the following functionalities:

- Blood Flow Management, the Delivery of Cardioplegia and Patient Weaning
- Patient Ventilation, Gas Blending and Vacuum Management
- Vitals Management and Diagnostic Alarm Settings
- Quantum EMR and Quantum System Settings



15" Quantum Workstation with optional Pump Control Module

The Quantum Ventilation and Diagnostic Modules

Spectrum Medical's advanced technologies - a breakthrough in the safe delivery of patient ventilation and non-invasive diagnostics.

Quantum Ventilation System

The Quantum Ventilation System is a world first solution designed to manage extracorporeal patient ventilation, including the blending of gases, the management of vacuum, integrated patient safety systems and perfusion diagnostics.

The ultra-compact Quantum Ventilation System employs the very latest gas blending technologies to ensure the precision delivery of FiO_2 , CO_2 and sweep flow rates. The System provides a sweep flow range from 0.025 to 10 L/m when flowing a single gas e.g. O_2 and up to a maximum flow rate of 20 L/m when modulating the delivery of at least two gases e.g. 60% FiO_2 .

To ensure system performance and safety the

ventilation system has a fully integrated secondary monitoring system that continuously compares actual measured values with user defined requirements and activates an alarm when the discrepancy between the two systems is greater than 10%.

In 'Patient Ventilation Mode' the Quantum Ventilation System, combined with its patented PaO_2 and PaCO_2 measurement technologies, provides a decision support capability that will assist the clinician in the setting of gas flows and gas concentrations when setting PaO_2 and PaCO_2 target values.

The Quantum Ventilation System provides precision modulation and monitoring of two independent vacuum channels.





To further improve patient safety the Quantum Ventilation System provides real-time monitoring of the following gas-ventilation parameters.

Incoming Gas Concentrations and System Pressures:

- Air, O₂, CO₂, Vacuum Incoming Supply Pressures
- O₂ and CO₂ Gas Concentrations to the Oxygenator
- Overall Gas Flow to the oxygenator (SWEEP)
- CO₂ concentrations measured at the primary exhaust port

Integrated within the Quantum Ventilation System is Spectrum Medical's full range of Non-Invasive Diagnostic and Calculated Physiologic Measurements. To further improve usability the system includes the measurement of Flow (including bubble detection), Pressure, Temperature and Reservoir Level Management.

Quantum Diagnostic System

The 'entry level' Quantum Diagnostics sensor-module is designed to provide the complete range of perfusion circuit parameters required for the safe management of extracorporeal circulation. The sensor module includes three measurement channels of pressure and flow (including emboli & bubble detection), two temperature channels and a reservoir level detection system.

The Quantum Diagnostics module integrates the entry level sensor module capabilities with Spectrum Medical's proven System M non-invasive Diagnostic technology as well as its complete range of Calculated Physiologic indices. New to Spectrum Medical is the capability for a single configuration to measure with high accuracy a gas flow range from 0.025 to 10.00 L/m.

Offering complete flexibility, the Quantum Diagnostics module can be connected directly to the Quantum Workstation and to multiple locations on the Quantum Pump Console.

Perfusion Roller Pump

A Quantum leap in patient safety and perfusion systems' functionality.



The compact range of Quantum direct drive peristaltic roller pumps are provided with 4", 6" and 8" raceway diameters which maximizes both flexibility and compactness when optimizing HLM design. In particular, the introduction of the mid-range 6" option eliminates the current compromise that compels users to use 8" pumps in medium flow applications.

The Quantum Universal Clamping System supports the mounting of pumps into multiple locations and pump change times of less than 60 seconds. Importantly, Quantum's pump detection software eliminates user intervention when adding or exchanging pumps.

Smart LEDs enable visual identification of pump function and color coordination with both the Quantum Workstation and the Quantum Pump Control Module

Spectrum Medical's universal tube clamping system is designed to eliminate the frustration of using current tube clamping solutions and colour coded plastic inserts. A single 'bobbin' solution allows for the clamping of all tubing diameters associated within the selected size of race-way.

Intelligent Tube Occlusion



The Quantum Smart Occluder is a revolutionary new approach to the management of perfusion-tube occlusion during bypass surgery. The Quantum Smart Occluder replaces the guess-work associated with conventional technologies with precise user inputs for the setting of flow – a critical requirement during certain phases of care.

The introduction of closed loop flow control ensures flow control within +/- 2% of the requested set point. System wide communication allows the user to combine the Smart Occluder with other Quantum Modules to deliver levels of functionality new to the

world of Perfusion, such as automated initiation and weaning.

Continuing the Quantum philosophy of seeking to improve system ergonomics, wherever possible, the Smart Occluder module includes two channels of flow measurement and bubble detection, two channels of pressure measurement and a two channel reservoir level detection system.

An interlocking Lid, Color-coded LEDs and a mechanical override system maximizes system safety.

Quantum Directed Perfusion

The tools to help improve outcomes.

Quantum Directed Perfusion provides the next generation capabilities beyond traditional Perfusion monitoring and basic Goal Directed Perfusion (GDP) techniques. Quantum Directed Perfusion (QDP) from Spectrum Medical goes well beyond the simplistic approach of measuring DO_2 . This multifaceted approach to QDP provides the clinician team with the methodologies to develop best practice strategies that can lead to the reduction of AKI, and the higher costs associated with extended I.C.U. Time.^{1,2,3,4}

The Principles of Quantum Directed Perfusion (QDP)

- The starting point for QDP is the use of Spectrum Medical's non-invasive diagnostic technology for the measurement of Oxygen Delivery (DO_2), Oxygen Consumption (VO_2), CO_2 Production (VCO_2), and multiple other calculations and indices.
- The monitoring of real-time total Oxygen Deficit is a completely new and critically important concept to the world of Perfusion. The Quantum technology displays the real-time reporting of total time and percentage of case time when actual DO_2 is below target DO_2 . Having this information intra-operatively and in real-time significantly increases the quality of bypass management.

However, more importantly Quantum Directed Perfusion calculates Oxygen Deficit or a total "area under the curve" calculation which is generated by the accumulation of an actual deficit value (i.e. target DO_2 minus actual DO_2) multiplied by a unit of time.

It is accepted that the potential of AKI is significantly increased with large DO_2 deficits.⁴ Calculating the Oxygen Deficit and then equating it to outcomes is a relatively straight forward process using Quantum's Informatics technology. Such an analysis is useful in determining intra-op best practice.

- Spectrum Medical's Critical Care Scoring technology supports a pro-active clinical risk assessment using recognized AKI markers such as age, gender, Pre-op Hct /Hb, EF, DM, and existing renal issues, and the subsequent deployment of an individual patient care strategy.
- Quantum Informatics and its LIVE VUE technology improve patient care with the seamless integration of "multiple information feeds" into central viewing systems that are available to everybody in the Operating Room.

References

1. Alshaikh, et al. Financial Impact of Acute Kidney Injury After Cardiac Operations in the United States. *Ann Thorac Surg*. 2018 Feb;105(2):469-475.
2. de Somer, et al. O_2 Delivery and CO_2 Production During Cardiopulmonary Bypass as Determinants of Acute Kidney Injury: Time for a Goal-Directed Perfusion Management? *Critical Care* 2011; 15:R192.
3. Dasta JF, Kane-Gill SL, Durtschi AJ, et al. Costs and Outcomes of Acute Kidney Injury (AKI) Following Cardiac Surgery. *Nephrol Dial Transplant*. 2008;23:1970-1974.
4. Ranucci M, Romitti F, Isgro G, et al. Oxygen Delivery During Cardiopulmonary Bypass and Acute Renal Failure After Coronary Operations. *Ann Thorac Surg*. 2005;80:2213-20.

I.T. Solutions for Perfusion, ECMO and the I.C.U.



Quantum Informatics, I.T. Solutions for Perfusion, ECMO and the I.C.U.

Quantum Informatics is a revolutionary new methodology for the provision of specialized health informatics solutions for the critical care space including the I.C.U. and the O.R. The real-time integration of physiologic data facilitates the real-time implementation of Best Practice and Evidence Based Protocols that can support the identification of adverse events before they become adverse outcomes. Quantum Informatics is highly configurable and can easily integrate within existing Hospital Information Systems, clinical workflows and diverse care locations. The overall system consists of the following three modules:

VIPER EMR – VIPER EMR is the clinical interfacing software that uses an App based architecture for easy integration into the individual work-flow needs of a hospital. VIPER EMR can run on either the 12" or 15" Quantum Workstation or a Quantum Tablet.

VISION – Spectrum Medical's VISION server application provides system-wide maintenance of software, system-wide communication, the creation and transfer of patient records (end of case and real-time) and bi-directional HL7 communication to the

H.I.S. using a Mirth Interface Engine. VISION's SQL database is used for the storage of critical patient information and is supported by a comprehensive analytics package to support improved quality outcomes.

LIVE VUE – LIVE VUE is Spectrum Medical's web-based near real-time remote monitoring solution. Highly configurable graphical presentation systems and integrated best practice alert systems provide clinicians with instant access to live patient data from a variety of care locations to enhance patient safety and rapid decision support.

Total Customer Support

With an absolute dedication to customer support and a total solutions approach to maximizing equipment availability within the hospital, Spectrum Medical has designed a two-tier customer support program called Sentinel Total Care and Vigilance Total Care.

Sentinel Total Care:

Extended Warranty: Full warranty on your Quantum Perfusion System including Associated Accessories (sensors, cable assemblies) for its 10-year life at no cost to the customer. Quantum products beyond economic repair will be replaced with latest 'new build' technologies.

Annual Servicing: Includes all required servicing visits performed by dedicated Spectrum Medical's service personnel and the cost of all servicing items.

Accidental Damage: Accidental damage including accessories (sensor, cable assemblies) for the 10-year life of your Quantum Product at no cost to the customer. (Available with Vigilance in US Markets).

Emergency Loan Equipment: Loan equipment provided at no cost if the defective equipment cannot be rectified within 24 hours of being returned to Spectrum Medical.

Annual Software Updates: During the service visit Quantum Software will be maintained to latest standards, including changes to user functionality, updates to enhance maintainability, reliability and protocol changes to third party device driver software at no cost to the customer. Software deployment is subject to prior customer approval and training via webinar or in-house at Spectrum Medical is included free of charge.

Telephone Support: Within standard working hours.

Vigilance Total Care: additional support when using Spectrum Medical's Quantum Informatics and VISION Data Management System.

Vigilance Server: Vigilance Server is a revolution in customer support and uses current technology developed for Spectrum Medical's Perfusion Management System. Integrated within the VISION Server System the Vigilance maintenance application provides for the pro-active, real-time monitoring and reporting of electronic and functional sub-systems, real-time fault diagnosis, deployment of system wide software updates, and on-line system support. With access to a private VPN, this diagnostic information is communicated in real-time to Spectrum Medical.

Quantum Instant Access: To maximize operational uptime of the Quantum Perfusion System, Spectrum Medical will, at its discretion, deploy a 'bonded inventory' of critical Quantum modules within a secure hospital location. Customers will have immediate 24-hour access to this bonded stock and more importantly prior approval from Spectrum Medical will not be required.

Spectrum Medical must be notified as soon as practically possible that the bonded stock has been used.



UK Headquarters:
Call +44 (0) 1242 650120
enquiries@spectrummedical.com

USA and Canada:
Call 800 265 2331
ussales@spectrummedical.com
www.spectrummedical.com



SPECTRUM MEDICAL LIMITED
Registered to:
ISO 13485:2016
File No. A14554