CardioFlow 5000 MR Computer-controlled Flow Pump System

Product Description

The CardioFlow 5000 MR flow pump system is designed to generate realistic, accurate and repeatable physiological volume flow waveforms, including pre-programmed; carotid, femoral, sine, square and constant flow waveforms. The system includes an embedded industrial grade motherboard and proprietary SimuFlow III Waveform Editing Software for creating user-defined physiological flow waveforms. Users have the option of inputting their own waveform data points, reshaping the supplied pre-programmed waveforms (click and drag) or downloading waveforms onto the system.

The CardioFlow 5000 MR is accurate to within ±3.0% over a flow range of 50 to 300 ml/s. Each system is calibrated and accompanied by a certificate of calibration specifying the calibration results at relevant flow rates, as well as being provided with a calibration constant to verify the pump systems accuracy.

The CardioFlow 5000 MR is three-unit design, a Control Unit, a Pump Unit and an external Reservoir. For MRI environments the Control Unit is positioned outside the MRI suite, the Pump Unit can be positioned in the scanning room. Shielded cables are supplied to connect the computerized motor control unit to the pump unit via the penetration panel or waveguide.

Combine the CardioFlow 5000 MR with an appropriate vascular, heart or heart valve phantom and blood mimicking fluid, and the closed flow loop ensures easy, accurate and reliable evaluation and validation of diagnostic imaging systems and endovascular techniques. The system is ideal for MRA, iMRI, DSA, CTA, Doppler ultrasound, and endovascular simulation applications.

Applications

Research and new technology developments requiring accurate and repeatable pulsatile and constant flow waveforms (i.e. flow quantification, MRA, iMRI, DSA, CTA Doppler ultrasound, and endovascular techniques).

Ability to control waveform shape.

Gated flow studies.

Calibration of clinical imaging systems.

Product Features

- **REALISTIC PHYSIOLOGICAL FLOW WAVEFORMS**
- **PULSATILE AND CONSTANT FLOW WAVEFORMS**
- **ACCURATE VOLUME FLOW WAVEFORMS**
- **REPRODUCIBLE WAVEFORMS**
- **PROGRAMMABLE USER DEFINED WAVEFORMS**
- **CALIBRATION CERTIFICATE**
- **MULTIMODALITY IDEAL FOR COMPARING IMAGING MODALITIES**

Pump unit can be in close proximity to a magnetic bore, resulting in clinical acquisition of realistic and accurate (± 3.0%) physiological waveforms.

Pre-programmed waveforms include; carotid, femoral, sine, rectangular and constant flow waveforms.

Embedded industrial grade motherboard and SimuFlow III waveform editing software allows for the design of user-defined pulsatile and constant flow waveforms. Users can control the shape of the waveform.

Robust gear pump ensures uninterrupted volume flow waveforms.

Accurate and reproducible physiological flow waveforms including those with reverse flow components such as the femoral waveform.

Control with user supplied keyboard, mouse and monitor to communicate with the embedded computer.

Calibration certificate is provided with each system verifying the systems accuracy. The system can be calibrated and certified traceably to a national standard for regulatory requirements. A re-calibration service is available.
**CardioFlow 5000 MR Computer-controlled Flow Pump System**

**Fluid Flow Specifications**
- Volume range 1.0 – 300 ml/s
- Accuracy of ± 3% for 50 to 300 ml/s
- Sine waves up to 12 Hz
- Physiological flow waveforms including reverse flow components
- Capable of pumping non-viscous fluids

**Mechanical Specifications**
- High-torque servo-motor
- Gear pump
- Adjustable over-pressure shut-off (7 to 50 psi)
- Self-sealing 5/8 inch inner diameter plastic connectors

**Computer Control**
- On-board dedicated motor controller
- Easily upgraded high level control software
- Windows XP Embedded Operating System

**Interface**
- User supplied monitor, keyboard and mouse

**Physical**
- Control Unit dimensions: 14” (L) x 11” (W) x 9” (H)
- Control Unit Weight: 11.2 lbs. (5.1 kg)
- Pump Unit dimensions: 17” (L) x 17 ¾” (W) x 10 ½” (H)
- Pump Unit Weight: 44 lbs. (20 kg)
- Reservoir capacity: 20 litres
- Circulating Fluid Volume: 9 litres minimum

**File Format**
- Waveform data is stored on embedded harddrive
- Files can contain up to 1,000 flow-rate values describing a waveform
- User specified time-base ranging from 2 to 50 ms per point
- Waveforms can be looped continuously
- Variable frequency waveforms can be generated

**Electrical**
- 110/220 VAC 50/60 Hz, 4.0 amps @ 120V
- EMI shielding
- 1 RS-232 serial communication port
- 1 ECG TTL trigger output (BNC)
- Monitor port
- Keyboard port
- Mouse port
- Two shielded cables between the Control Unit and a penetration panel (10 foot lengths).
- Two shielded cables between the Pump Unit and a penetration panel (20 foot lengths).

**Calibration Options**
- Standard calibration
- Traceable calibration to a National Standard

**Accessory Products**
- MR Finger for ECG gated flow studies
- Multi+ Variable Waveform Software Option to mimic arrhythmia
- Anatomically correct hearts, heart valves and vascular models
- Blood mimicking fluids