

Signal Morphology-based Impedance Cardiography (SM-ICG<sup>™</sup>)  
A new era in noninvasive **Cardiac Output** monitoring

**STOP guessing.....START MEASURING!**



**The First** Exercise at all levels and demanding critical care applications

**The Only** Proven non inferior to Thermodilution and superior to standard ICG (US-FDA)

**The Best** Measures the heart directly and does not use an arterial line or a finger pulse

### PhysioFlow<sup>®</sup> Parameters

Stroke Volume/Index/Stroke Volume Variation  
Heart Rate/Resp. Rate (New!)  
Cardiac Output/Cardiac Index  
Contractility Index  
Early Diastolic Filling Ratio (Preload Index)  
Systemic Vascular Resistance/Index (Afterload)  
Left Cardiac Work Index (surrogate for MVO<sub>2</sub>)  
Ventricular Ejection Time  
Ejection Fraction (est.)  
End Diastolic Volume (est.)  
**NEW! Aortic (Vascular) Stiffness and Distensibility**

### For Multiple Applications

Critical Care/Anaesthesia/Fluid Management  
Emergency Medicine  
Cardiology/Heart Failure/6MWT/Pacing  
Cardiopulmonary Rehabilitation  
COPD/6MWT/Pulmonary Hypertension  
Internal Medicine/Hypertension  
Hemodialysis  
Obstetrics  
Research and Clinical Studies  
Physiology/Sports Medicine  
Training Optimization/Reconditioning

## Technology

- Analysis of beat by beat heart impedance waveforms obtained noninvasively (6 chest surface electrodes)
- Elimination of the problematic impedance baseline (Z0) in the calculation of stroke volume
- HD-Z™ high performance signal stabilization filter for optimal noise cancellation

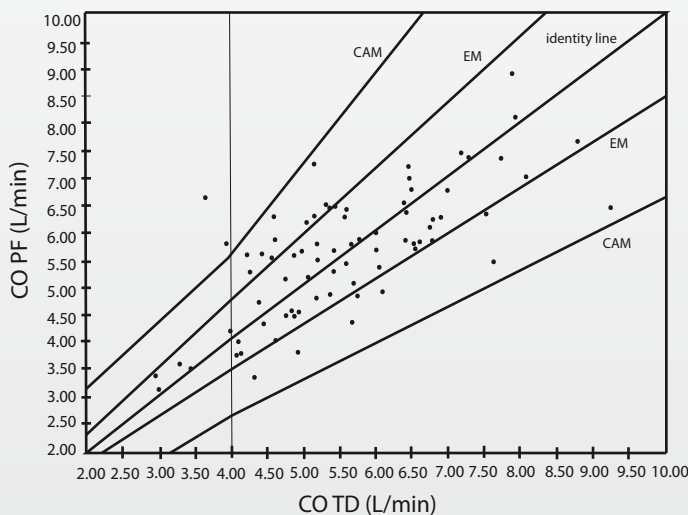
## Validations

- 45+ peer-reviewed validations and application studies, showing Sensitivity, Reproducibility and Accuracy
- US-FDA approved technology, predicate device is thermodilution
- Proven superiority compared to other ICG devices
- 350+ users in 45+ countries for the most demanding applications at rest and during exercise

## Applications

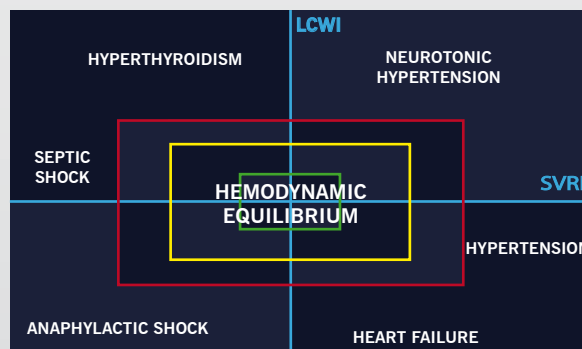
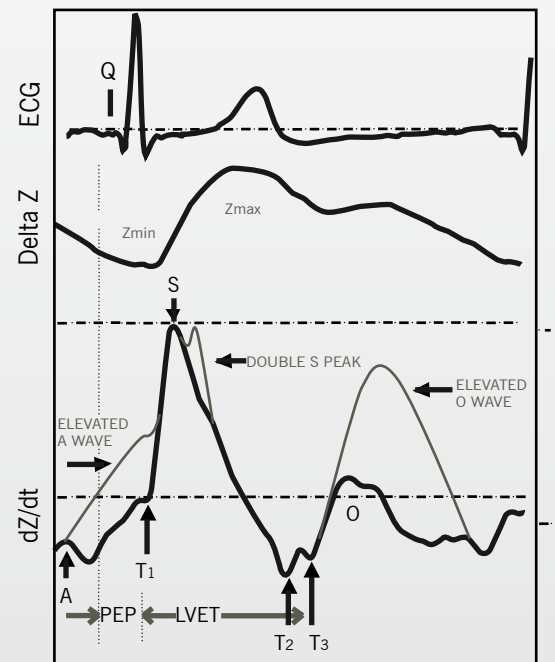
- 13+ useful hemodynamic parameters including preload, contractility and afterload
- Provides efficient fluid status assessment and management
- Early diagnosis thanks to the evaluation of signal abnormalities
- Powerful software for data display, trending, analysis and reports
- Critical care, cardiology, internal medicine, pulmonology, physiology and sports medicine

Parke's Error Grid  
PhysioFlow® vs. TD



**PhysioFlow vs. TD** N=80 bias=0.08 L/min SD=0.96 L/min  
 TD=Thermal Dilution Method  
 EM=TD Error Margin (20%)  
 CAM=Clinical Acceptance Margin (30%)

Impedance Signals + Abnormalities



## A Breakthrough Concept: the Hemodynamic Cross

A graphic representation of the Vascular Resistance/Cardiac Work equilibrium, for more accurate and faster diagnosis and assessment of the hemodynamic impact of a treatment

## The first and only system fully validated for demanding critical care applications and during exercise

The well established PhysioFlow<sup>®</sup> Signal Morphology-based Impedance Cardiography (SM-ICG<sup>™</sup>) technology has been fully validated in the last ten years, resulting in more than 40 international peer-reviewed publications and a market presence in over 45 countries.

Its accuracy is comparable to invasive techniques and its clinical reproducibility and sensitivity are unsurpassed. PhysioFlow<sup>®</sup> pushes the limits of noninvasive cardiac output monitoring in general and thoracic electrical bioimpedance in particular by opening more arenas where continuous noninvasive Cardiac Output measurements are made possible: exercise at all levels, obesity, thoracic fluid overload, COPD, low cardiac outputs etc.

### PhysioFlow<sup>®</sup> Lab1<sup>™</sup> : A new era in Cardiac Output monitoring From the lab to the clinic

The ideal solution for stationary applications. Its analogue output enables easy interface with other systems (mainly for research). PhysioFlow<sup>®</sup> Lab1<sup>™</sup> is connected to a computer via a USB to serial converter and is powered from an outlet. It is particularly robust and reliable by design.



### PhysioFlow<sup>®</sup> Enduro<sup>™</sup> : A new era in Cardiac Output testing From the lab to the field

PhysioFlow<sup>®</sup> has been further developed to include the latest advances in electronic and signal processing technologies. The result is PhysioFlow<sup>®</sup> Enduro<sup>™</sup>, the first holster-size wireless cardiac output monitor for real time recordings or use as data logger. A new filter technology for high performance noise cancellation (HD-Z<sup>™</sup>) is available as well. The combination of advanced hardware and embedded DSP software enables new applications in the field for trainers and exercise physiologists and more sensitive measurements for cardiac patients tested on treadmills.



### PhysioFlow<sup>®</sup> Q-Link<sup>™</sup> : The missing link in your diagnosis

PhysioFlow<sup>®</sup> Q-Link<sup>™</sup> is connected to a computer via a USB port that provides communication and power. Its small size, easy set-up and user-friendly features make this a new, cutting edge technology in the world of hemodynamically guided diagnosis and therapy. Based on the high-tech wireless Enduro<sup>™</sup>, PhysioFlow<sup>®</sup> has been further developed to reduce costs and enhance user friendliness. The result is PhysioFlow<sup>®</sup> Q-Link<sup>™</sup>: all the performance of PhysioFlow<sup>®</sup> Enduro<sup>™</sup> without the batteries and with a computer connection via a simple USB port.



## EASY TO USE

### *MS-Windows™, XP / Seven based software:*

- User friendly, short learning curve
- Versatile for every application
- Detailed printed report and data export to text and MS-Excel files

### *Easy to handle hardware:*

- Few connections or wireless
- Transportable or handheld
- No maintenance

## COST EFFECTIVE

### *Economical day-to-day use:*

- Disposables: 6 electrodes per patient only
- Low cost compared to invasive or other noninvasive technologies
- Saves valuable time for operators

### *An attractive business model:*

- No indirect costs (catheter complications)
- May improve patient outcome
- Potential direct or indirect revenue generator

## NONINVASIVE

### *Fewer constraints:*

- Complete safety for the patient
- No risk of infection or injury
- Saves time for patient care

### *More flexibility:*

- Extensive applications (measurements at rest and during exercise)
- Snapshots or continuous monitoring
- Can be used routinely by nurses and/or technicians



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[www.physioflow.com](http://www.physioflow.com)

## RELIABLE

### *Validations:*

- Unmatched reproducibility and sensitivity
- Good agreement with reference methods at rest (incl. in severely ill patients) and during exercise
- Proven clinical value even in difficult patients and challenging measurement conditions

### *High quality standards:*

- Excellence in manufacturing and customer service
- ISO 9001/13485 standards
- Market approvals in the USA (FDA), Europe, Japan, among others

## UNIQUE FEATURES

- Potentially more efficient than other invasive or noninvasive hemodynamic systems thanks to similar accuracy, but better reproducibility and sensitivity
- Offers a combination of parameters that enables accurate evaluation of any hemodynamic condition. For instance: fluid status and optimization can be efficiently assessed and guided
- Features a display that enables a quick and efficient evaluation of the patient's hemodynamic equilibrium: the Hemodynamic Cross
- The analysis of signal abnormalities is potentially extremely useful for the early diagnosis of severe pathologies while they are still reversible

The combination of the low cost and ease of use, reduced limitations, zero risk and high performance make PhysioFlow® the technology of choice to finally establish noninvasive hemodynamic diagnosis and monitoring as a standard of care.

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