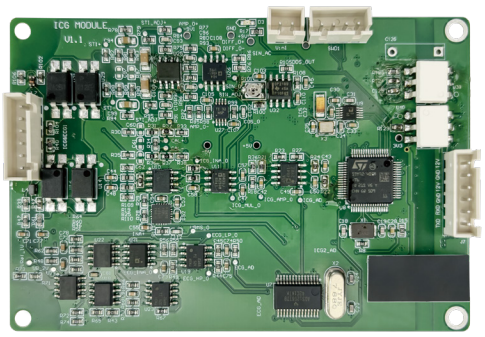
Multi-parameter
MICG ICG Module

Non-invasive cardiac output (Impedance Cardiogram, ICG) is a non-invasive examination method to judge cardiac function and reflect cardiac hemodynamic changes. Compared with invasive cardiac output CO, it is non-invasive, convenient, economical and widely used.

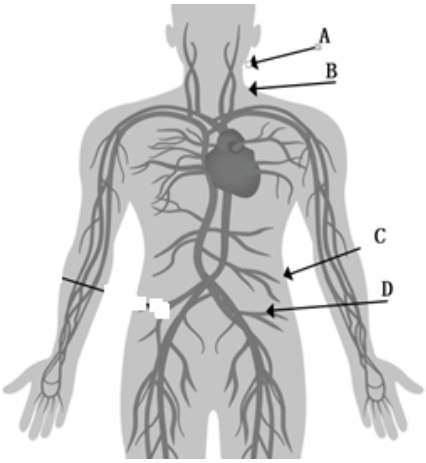


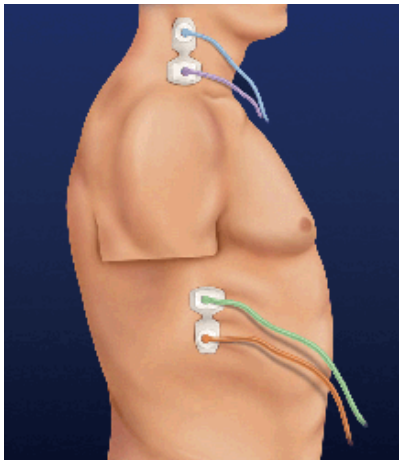
Dimension： 100mm*67mm*25mm

Measuring principle

The non-invasive cardiac output is through the cardiac impedance technique, and the human tissue can be equivalent to a conductor, which will produce impedance when the human body passes through high-frequency alternating current, so the chest of the human body is equivalent to a cylindrical conductor, in which the electrical conductivity of the blood is better. when the heart is in systole or diastole, the blood flow, velocity and volume in the aorta will change accordingly. At this time, the electrical impedance of the blood also changes with the change of blood volume, and the impedance cardiogram can be drawn according to the change of impedance.

The MICG module of the system chooses the four-electrode method as the method to detect the cardiac impedance signal based on the consideration of stability and portability. as shown in the figure, An and D electrodes are used as the excitation signal source for cardiac impedance signal acquisition, that is, the input high frequency current is loaded into the chest of the human body through this electrode, B and C are used as measuring electrodes, and the cardiac impedance signal is detected through these two electrodes, where the D electrode is placed at the xiphoid process. And the distance between B and C is regarded as chest distance L, which can be used in the later calculation of other hemodynamic parameters. The distance between A, B and C, D is generally about 3cm.





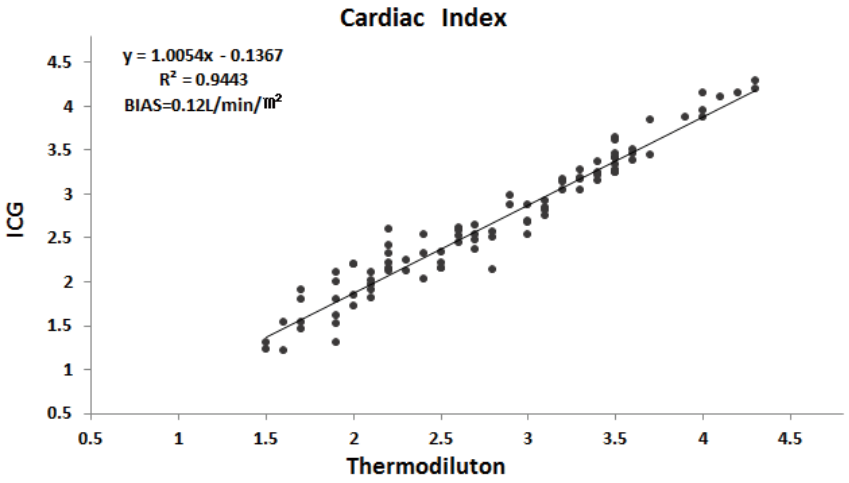
ICG Module measurement

Parameter identification	Parameter definition	Formula	Normal value range
CO	Cardiac output: the total amount of blood pumped by the left ventricle per minute.	$CO = SV \times HR$	4.0-8.0 L/Min
SV	Stroke output: the total amount of blood pumped by the left ventricle per heartbeat.	$SV = r \times (\frac{L}{Z0})^2 \times (\frac{dZ}{dt})_{\max} \times LVET$	60-130ML
CI	Cardiac output index: cardiac output after standardized treatment of body surface area.	$CI = CO / BSA$	2.5-4.5 liters / min / m 2 body surface area
SI	Stroke output index: stroke volume after body surface area standardization	$SI = SV / BSA$	35-65ML/m2body surface area
HR	Heart rate: number of heartbeats per minute	$HR = 60 / RR$	60–100 hops per minute
PEP	Pre-ejection period: the time taken from left ventricular depolarization to aortic opening	$PEP = T_B - T_Q$	Depends on the heart rate preload and the contractility of the heart
LVET	Left ventricular ejection time: the interval between aortic valve opening and aortic valve closure (exercise systole)	$LVET = T_X - T_B$	Depends on the preload of the heart rate and the contractility of the heart
TFC	Chest fluid content: intrapleural electrical conductivity obtained mainly by detecting intravascular, intraalveolar and intrapleural interstitial fluid.	$TFC = 1000 / Z0$	Male: 30—50 / 1000 EU Female: 21—37 / 1000 EU
STR	Systolic time ratio: the ratio of myocardial electrical excitation to mechanical contraction	$STR = PEP / LVET$	
EF	Ejection fraction	$EF = 0.84 - 0.64 * STR$	
SQI	Signal quality index		0-100 SQI range 101-201 SQI range in Artefact mode 254 No signal

ICG waveform

ICG waveform mainly includes ECG waveform, cardiac impedance differential waveform and cardiac impedance waveform. There are 22 parameters, such as cardiac output (CO), stroke volume (SV), pre-ejection period (PEP), left ventricular ejection time (LVET), systolic time ratio (STR), cardiac index (CI), body surface area (BSA), ejection fraction (EF), myocardial contractility index (IC), heart rate (HR) and so on.

Accuracy of ICG



A new generation of non-invasive cardiac output monitors provides an alternative to using conventional invasive methods such as thermodilution. our ICG and thermodilution cardiac output measurements were taken from many patients undergoing right heart catheterisation. Linear regression analysis showed good correlation between thermodilution and our ICG about the line y = 1.0054x-0.1367 (r = 0.94).

Clinical application

> It can be used as a routine diagnosis to evaluate cardiac function.

> Monitor the effect of drugs on cardiac function, guide treatment, and choose the best treatment.

> Real-time monitoring during operation and recovery, timely detection of life-threatening hemodynamic conditions and rescue.

> Available departments: ICU, CCU, Anesthesiology / operating Room, Emergency Room, Cardiology Department.

Purchase Guider

Code	Name	Quantity	Description	Image
041-036001-00	Cable	x 1	/	
041-012003-00	Electrode sheet	x 1	/	

* The data is subject to change without notice. Please refer to the manual for the contraindications and precautions

Headquarter
ZUG MEDICAL SYSTEMS SAS
136 Chemin des Breguieres
83170 Brignoles, France

Tel:+33(0)9 84 116 339
sales@zugmed.com
www.zugmed.com