Deltex medical

High Definition Impedance CardioGraphy (HD-ICG™)

Deltex Medical presents the HD-ICG non-invasive haemodynamic fluid status monitoring system.

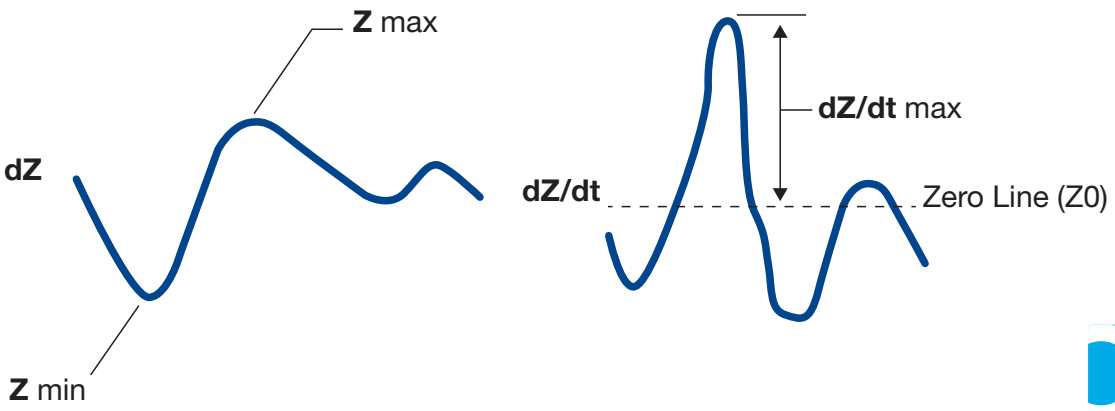
The HD-ICG connects directly to the Deltex Medical ODM+ haemodynamic monitor. The ODM+ is the first truly integrated monitoring system providing a range of haemodynamic solutions to suit your patient care needs.

The ODM+ system delivers true flow-based measurement of Stroke Volume (SV) and Cardiac Output (CO) through oesophageal Doppler monitoring and now non-invasive High Definition Impedance CardioGraphy (HD-ICG). Both systems measure blood flow centrally and avoid the problems associated with peripheral arterial pressure based technologies.

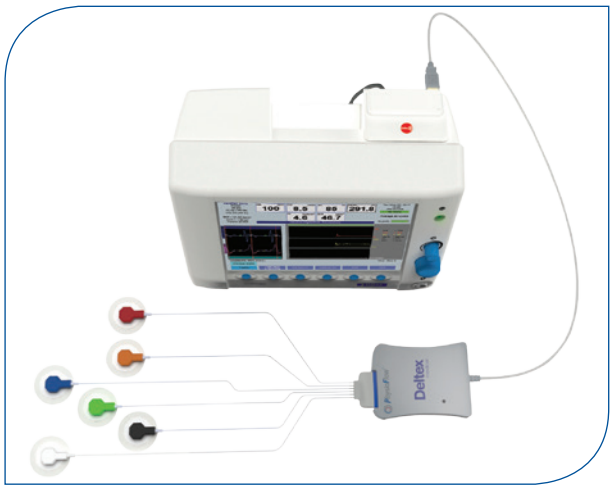
History of Impedance CardioGraphy

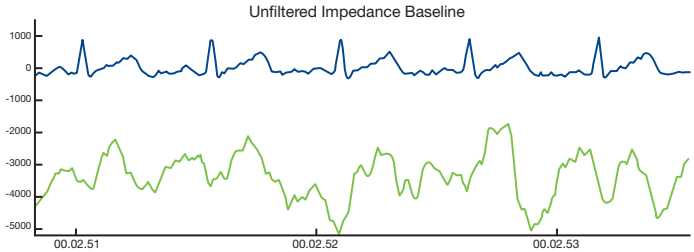
An accurate, non-invasive haemodynamic monitor has been sought after for decades. Initially, conventional impedance cardiography appeared to be an answer, but was limited by the unreliable baseline thoracic impedance measurement (Z0). Impedance cardiography (ICG) uses disposable electrodes on the neck and chest to transmit and detect electrical and impedance changes generated by the heart. A component of these impedance changes relates directly to blood flow generated by the heart, which can then be used to measure and calculate haemodynamic parameters.

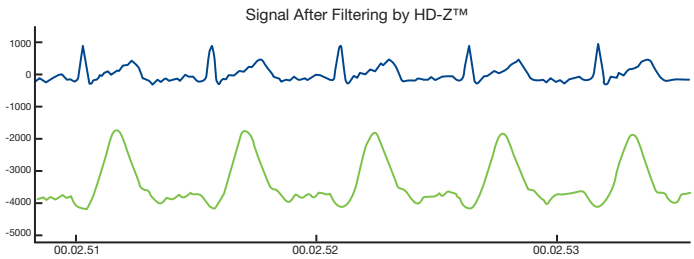
A low magnitude high frequency alternating current is transmitted through the chest. HD-ICG analyses the received response to the transmitted current. The received signal has three components; the baseline impedance Z0; a signal induced by respiration; and signals which are the result of cardiac flow. It is the filtered cardiac flow signals which are the basis of SV measurements. The sensed impedance signal (dHD-Z) is then processed and analysed together with its derivative over time (dHD-Z/dt). Both signals provide a direct real-time picture of the cardiac blood flow.



ODM+







Standard ICG filters out the respiratory component of the impedance signal but still uses the impedance baseline (Z0) in its estimate of the Thoracic Fluid Content (TFC). The TFC is used as a reference to analyse the pulsatile components of the signals (dZ and dZ/dt).

HD-ICG has reinvented the technology to be independent of the baseline thoracic impedance (Z0). Another key to the advancement was the development of the HD-Z™ high definition signal filtering system.

HD-ICG provides continuous and accurate measurements even in challenging measurement conditions and difficult patients, pushing the limits of non-invasive haemodynamic monitoring.

The HD-Z high definition filtering system improves the stability and the signal/noise ratio. With the HD-Z filter, the signal eliminates all artefacts from the chest impedance signals that are not correlated with the heart cycle and the generation of cardiac flow.

Above is an example of how the HD-Z filter works on a “difficult” signal of a ventilated ICU patient.

Conclusion

The HD-ICG independent algorithm, together with HD-Z filter, provides the clarity and stability of signals, with accuracy of data required by clinicians for effective monitoring of cardiac function and fluid status across a broad range of patients and clinical applications.

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