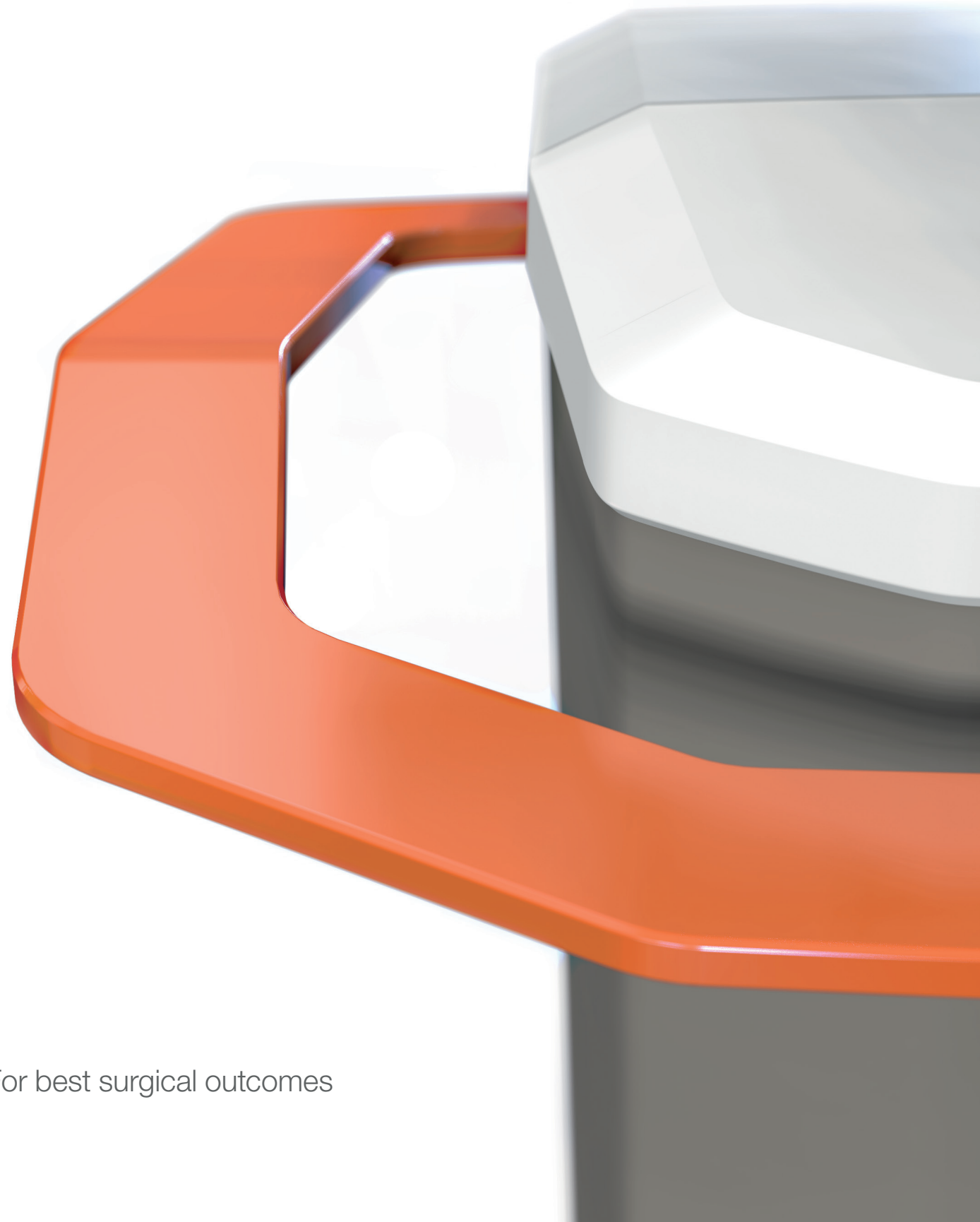
MEDISTIM

MiraQ Cardiac

Intraoperative Surgical Guidance and Quality Assessment



For best surgical outcomes

MEDISTIM

Improve surgical outcomes, demonstrate quality, and increase cost efficiency.

The Medistim **MiraQ™ Cardiac** combines ultrasound imaging and transit time flow measurement (TTFM) in a single system that is specifically designed for cardiac surgery.

There is growing support of the idea that checking grafts and anastomoses during cardiac surgery should be standard of care. Reliability and ease of use is a major determinant for this to become reality.

The **MiraQ™ Cardiac** System has built-in support for Guided Workflows. These are software protocols that assist the user to a standardized approach to quality assessment. Intraoperative quality assessment has become easier to adopt, is customizable to the surgeon's needs and enhances work efficiency.

Epicardial imaging

Epicardial ultrasound imaging gives a simple, fast and safe imaging of coronary stenoses and graft anastomoses, providing immediate feedback on the quality of the CABG surgery.

Transit Time Flow Measurement

Performing flow measurements with the **MiraQ™ Cardiac** is the quickest and most accurate way to verify graft patency while the patient is still in the operating room.

Epiaortic imaging

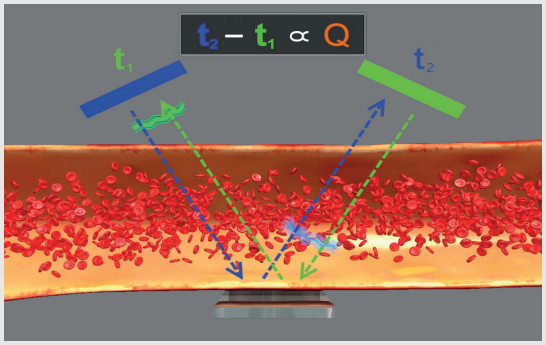
Epiaortic imaging provides a sensitive and direct diagnosis of aortic disease. This may lead to modifications of the surgical strategy and thus contribute towards reduced rates of major adverse cardiac and cerebrovascular events (MACCE).

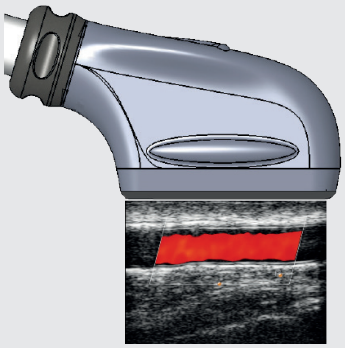
A system adapted for optimal OR integration

The **MiraQ™ Cardiac** System uses Medistim's flow measurement and high-resolution ultrasound imaging probes to provide a complete quality assessment.

Medistim's L15 High-frequency Ultrasound Imaging Probe provides high-resolution images that allows the surgeon to asses morphology. Medistim's flow probes utilize transit time technology to accurately measure blood volume flow intraoperatively.

Combining the spatial information from epicardial ultrasound imaging and quantitative data from TTFM enables the surgeon to perform a prompt and accurate assessment, and revise the graft when necessary.





TTFM

The TTFM principle is based on measuring the difference between upstream and downstream transit time of a wide ultrasound beam. The transit time difference is directly proportional to the blood volume flow. This measurement principle gives an accurate quantification of the real time volume flow that compliments the ultrasound imaging.

Imaging

Ultrasound imaging generates images by transmitting ultrasound pulses and receiving echoes from the pulses as they travel through the body. The received echoes are used to create an image of the target area. The color flow mode uses the Doppler principle to detect and visualize blood flow. Pulsed Wave (PW) Doppler uses the same principle to measure blood flow velocity.

MiraQ Cardiac

Specialized design for cardiac applications

Easy access to imaging and flow data through optimised screen view and interactive user interface

Use a Guided Workflow for a simplified approach

Adjustable arm facilitates visibility

Practical storage for user manual and interface cables

Connect to external screens and the hospital information systems

The **MiraQ™ Cardiac** may be delivered as a 'Flow only' system, but can easily be upgraded on-site to include an imaging module at a later stage

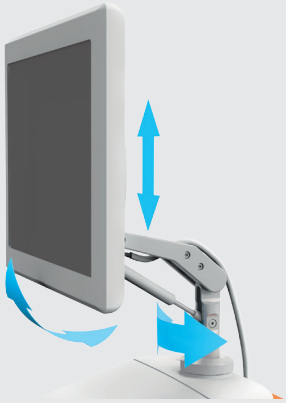
Spatial efficient design allows for flexible system placement and movement in the operating room

Guided Workflow
Standardized quality assessment

Utilize the Guided Workflow software feature for a standardized approach to quality assessment. Create your own workflow that describes your standard operating procedure, or use a community created template.

Minimize user interaction and increase work efficiency with preset measurement definitions and system configurations.

Full visibility
Efficient design



Optimize visibility with the flexible monitor display arm.

Rotate the screen to suit both the surgeon and the operator's needs.

Operating room integration
Expanded options

Connect to an external overhead screen using the easily accessible DVI port located on the media panel. The **MiraQ™ Cardiac** software has native support for configuring screen size and resolution.

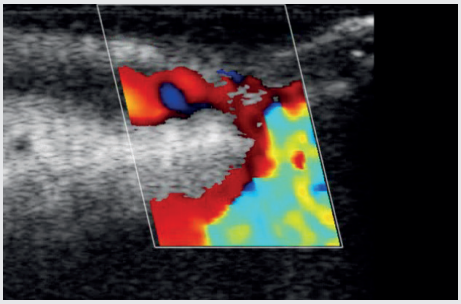
Export and import data to the hospital's information system using the DICOM option. All **MiraQ™ Cardiac** Systems come equipped with an isolated network connection, allowing for safe and secure access to the hospital network.

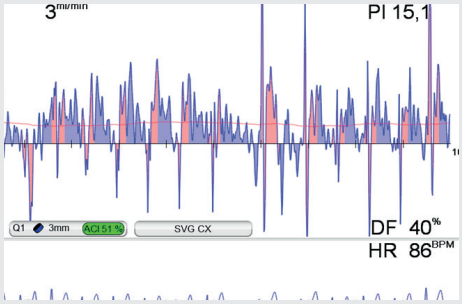
Upgrade to Imaging
Modular design

The **MiraQ™ Cardiac** may be delivered as a 'Flow only' system, but can easily be upgraded on-site to include an imaging module at a later stage.

MiraQ™ Cardiac gives surgeons ultimate control, enabling planning, navigation, and verification during cardiac surgery.

Instant feedback
See and measure

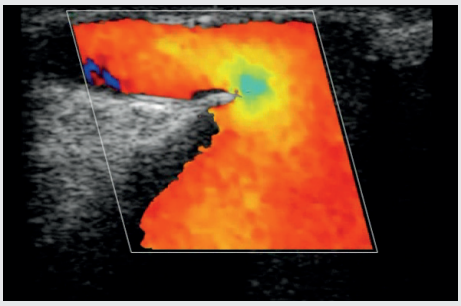


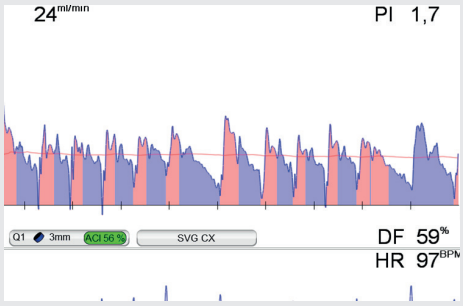


The **MiraQ™ Cardiac** provides instant feedback on the performance of a graft. Eliminate guesswork with ultrasound imaging visualization and quantifiable TTFM data.

In the SVG-CX measurements presented here, ultrasound imaging was used to scan both the distal and proximal anastomosis for defects. An occluded proximal anastomosis was discovered and verified by a TTFM measurement (PI 15.1, DF 40% and Flow 3 ml/min).

Revise on the spot
Before closing





When occluded or underperforming grafts are detected they can be revised on the spot. Take every measure to avoid reinterventions.

The occluded SVG-CX was immediately revised, and the improved result was documented with ultrasound imaging and TTFM. As shown above, the graft flow was significantly improved (PI 1.7, DF 59% and Flow 24 ml/min).

TTFM
Reliable flow volume measurement

The established numeric indices Pulsatility Index (PI), Diastolic Filling (DF%) and Mean Flow, the basis of our 3-parameter assessment method, provide an accurate insight into the dynamics of graft function.

TTFM is included in the guidelines endorsed by EACTS/ESC, NICE, and STS.[1,2,3]

Medistim MiraQ™ Cardiac System

MQC1 -Standard configuration

Profile	Channel configuration	System features
Cardiac adapted interface with imaging and flow	**Imaging** **2 Flow** **1 AUX**	**Ultrasound imaging** • **B-Mode imaging** • **Color Doppler imaging** • **Pulsed Wave (PW) Doppler** **Transit Time Flow Measurement** **AUX/ECG display** **Guided Workflow**

MQC0 - Standard configuration

Profile	Channel configuration	System features
Cardiac adapted interface with flow only	**2 Flow** **1 AUX**	**Transit Time Flow Measurement** **AUX/ECG display** **Guided Workflow**

Customizable Options	MQC1 Factory configuration	MQC0 Factory configuration
2 extra flow channels	✔	✔
1 Doppler channel		✔
1 Pressure channel*	✔	✔
1 extra AUX channel**	✔	✔
Printer support	✔	✔
Printer support and color printer	✔	✔
DICOM interface	✔	✔

* *Pressure channels are intended to be connected to a transducer to measure pressure directly.*
** *AUX channels are designed to receive signals from other monitoring systems, such as ECG and pressure.*

Field Upgrade Module

Name	System features
Ultrasound Imaging Upgrade Kit*	**Add ultrasound imaging module to a flow-only system**

** When a flow system with Doppler is upgraded, an ultrasound imaging module will be substituted in its place.*

References

1. Transit Time Flow Measurement (TTFM) should be used to verify graft patency, as recommended by guidelines issued jointly in 2014 by the European Society of Cardiology (ESC) and European Association for Cardio-Thoracic Surgery (EACTS).
Guidelines on myocardial revascularization.
European Heart Journal (2014) doi:10.1093/eurheartj/ehu278b.

2. Epiaortic imaging guidelines published in 2007 by the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists have been endorsed by the Society of Thoracic Surgeons.
Glas et al. Guidelines for the performance of a comprehensive intra-operative epiaortic ultrasonographic examination: recommendations of the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists; endorsed by the Society of Thoracic Surgeons.
J Am Soc Echocardiogr. 2007 Nov;20(11):1227-35.

3. Medistim's VeriQ™ system recommended by NICE for routine clinical use (Nov 2011):
The National Institute for Health and Clinical Excellence (NICE) has accepted the health economics derived from routine usage of the VeriQ system for assessing graft blood flow during coronary artery bypass graft (CABG) surgery, compared to clinical assessment alone. NICE reports an estimated cost saving of more than £115 per patient. NICE also support the clinical evidence, suggesting reduction of early graft failure, stroke, myocardial infarction or recurrent angina.
Medical technologies guidance MTG8. Issued November 2011.

4. Transit-time flow predicts outcomes in coronary artery bypass graft patients: a series of 1000 consecutive arterial grafts.
Teresa Mary Kieser*, Sarah Rose, Ryszard Kowalewski and Israel Belenkie.
Department of Cardiac Sciences, LIBIN Cardiovascular Institute of Alberta, University of Calgary, Calgary, Alberta, Canada.
European Journal Cardio-Thoracic Surgery Volume 38, Issue 2Pp. 155-162.

BR00INO05, ver 5, 12/15

Please refer to the User Manual for indications, contraindications, warnings, precautions, and further specifications and descriptions. Specifications may be changed without notice. For a list of available probes, contact your Medistim representative.

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