GE HealthCare

Vivid *iq*

Standard Data Sheet

Product Description[1]

Vivid™ *iq* combines the proven high performance of the Vivid product line with an ultra-modern and lightweight laptop. Vivid *iq* is a comprehensive digital color flow Doppler ultrasound system. It is designed for cardiac and shared service imaging with support for the following applications: Fetal/Obstetrics, Abdominal (includes GYN), Pediatric, Small Organ (includes breast, testes, thyroid), Neonatal Cephalic, Adult Cephalic, Cardiac (includes Adult and Pediatric), Peripheral Vascular, Musculoskeletal Conventional, Musculoskeletal Superficial, Urology (Including prostate), Transcranial, Transrectal, Transvaginal, Transesophageal, Interventional Guidance (including Biopsy), Thoracic/Pleural, Intraoperative(Vascular), Intracardiac and Intraluminal.

System Architecture

GE HealthCare (GEHC)'s exclusive, patented, beamforming technology provides the power for this multi-purpose ultrasound system. Using both coherent and harmonic image processing, the system provides computational power, ease of imaging, workflow flexibility and product upgradeability.

The Vivid *iq* is designed to excel in the following areas:

Exceptional image quality on the Vivid *iq* is created through ultra- definition clarity filtering and virtual apex (larger field-of-view) for the FPA probes. Coded Harmonics – Produces excellent quality images from even difficult-to-image patients.

Ergonomic Design – Vivid *iq*'s ergonomic design is based on real users' feedback and ex- tensive testing. Its ergonomic user interface design makes the Vivid *iq* an easy-to-learn and highly productive system for experienced and novice users, and similarly for right- and left-hand scanning users alike. The combination of touch screen control, trackpad swipe and click gestures, and a user control panel helps operators maintain their wrist on an ergonomic wrist rest and focus on the patient and ultrasound images during the exam. Other ergonomic features include a touch LCD monitor with easily adjustable viewing and typing angles and a height-adjustable cart for comfortable standing and sitting positions.

Ease of use and extreme productivity are provided by GE HealthCare's exclusive technology delivering auto optimized excellent image quality with minimal manipulation, along with automated quantification tools:

- AI-based automated measurements in 2D and Doppler modes help reduce user interaction by up to 80% and save exam time
- Easy AFI LV and Easy AutoEF include AI-based View Recognition and Auto-ROI, reducing the Strain and EF workflows to just one click[2], and allowing to perform analysis on image data acquired with other vendors' ultrasound scanners
- Easy AutoEF now provides calculated bi-plane Ejection Fraction, as a quick and effortless validation of visual assessment. Calculated Ejection Fraction can also be calculated without ECG signal from live or stored images.

Portability and Flexible Workflow – Vivid *iq*'s innovative compact design and touch user interface is ultra-portable and lightweight. The battery option provides additional scanning time without a power supply and instant boot up from standby mode.

Additionally, Vivid *iq* uses the proven **raw data format technology** that allows for advanced processing on archived images by applying many of the same scan controls and advanced quantitative tools as are available during the original exam.

[1] *Vivid iq Standard version 206 is a configuration of the Vivid iq ultrasound system with software version v206.*

[2] *View Recognition is only applicable to images acquired with TTE probe on GE HealthCare systems.*

General Specifications

Dimensions and Weight

- Height: 64±1 mm (2.5±0.04 inch)
  with feet: 73±1 mm (2.9±0.04 inch)
- Width: 390±1 mm (15.4±0.04 inch)
- Depth: 362±1 mm (14.3±0.04 inch)
- Weight with battery: 5.2±0.1 kg (11.5 ±0.2 lbs)

Console Electrical Power

- **Input**
  - 22V d.c., 6.8A
- Scanning time from battery without power supply is approximately one hour[3]

Console Power Adapter Electrical Power

- **Input**
  - Voltage: 100-240 V a.c.
  - Frequency: 50/60 Hz
  - Power: 2.0A max, 175 VA
- **Output**
  - 22V d.c., 6.82A

Operating System

- Windows® 10

Console Design

- Laptop style
- ECG port
- Integrated solid-state drive
- Multiple USB ports (front/back)
- Integrated speakers for premium sound
- CPU – Intel dual core
- DC power input
- USB interface (5)
- HDMI interface
- ECG
- LAN 10/100/1000 base

Cart Dimension

- Height: 835±20 - 1115±20 mm (32.9±0.8 - 43.9±0.8 inch)
- Width: 524.9±10 mm (20.7±0.4 inch)
- Depth: 552.3±10 mm (21.7±0.4 inch)
- Max Weight: 65 kg (143 lbs.) with full configuration (Console, Cart, Multi-probe box, probes, charge box with batteries)

Cart Electrical Power

- **Input**
  - Voltage: 100-240 V a.c.
  - Frequency: 50/60 Hz
  - Power: 300 VA
- **Output**
  - 22V d.c., 10.4A
- An extended battery is integrated within the Vivid *iq* cart and provides approximately three additional scanning hours[3]

Cart Design

- Three USB ports including one isolated USB interface
- Six probe holders
- Four probe cable hooks
- Charge box (optional) – to charge up to three batteries and to scan more than 180 min with four fully charged batteries
- Multi-probe box (optional) – three RS port and one DLP port

Eco Friendly Design

- Vivid *iq* offers an inverted B&W background printing, helping to prevent waste of ink and paper
- eDelivery remote software update solution helps decrease use of hardware drivers and decrease our service field engineers carbon emission footprint.

User Interface

Operator Keyboard

- Innovative track pad design – a new track pad provides new ergonomic gestures, including two-finger swipe to control Depth and Gain and Click to Set, allowing the user's arm to stay rested for a significant time during the exam
- Ergonomic simplified hard key layout with ergonomic design around the track pad
- Interactive back-lighting of application-specific push buttons – adjustable back-light intensity
- Easy-to-learn user interface with intelligent touch keyboard
- Image manager on the touch screen for quick review of image clipboard contents and easy export of images and loops to remote archives or media

Touch Screen

- Full touch ability including tap, double-tap, swipe, and pinch gestures, for fast and highly responsive user experience
- 15.6" ultra-high-resolution, wide screen format, color, multi-touch LCD screen
- On-screen touch keyboard with support for characters in 14 languages
- Interactive user-configurable shortcut software menu
- Application-specific operator and sidebar touch menu controls operated by finger tapping and swiping
- Overall gain, depth and zoom control bar on the touch for easy adjustment
- Touch-screen control of TGC sliders

Monitor

- 15.6" wide screen full High-Definition (HD) flicker-free LCD display with full touch ability
- 16.7 million simultaneous colors available
- Ergonomic FlexFit design with adjustable typing angle and flexible view angle
- Resolution: 1920 x 1080 pixels, full HD
- Fold down and lock mechanism for transportation
- Screen can be adjusted in different angles for scanning mode, typing mode and closing, allowing to optimize the viewing angle in each position
- Backlight adjustable
- Selectable big image size to use more screen area for the ultrasound image for better visibility from a distance
- Adaptive video formats and resolution

[3] *Depending on operation modes used*

System Overview

Applications (probe dependent)

- Cardiac
- Transesophageal
- Intracardiac and Intraluminal
- Intraoperative
- Interventional guidance
- Peripheral Vascular
- Fetal/Obstetrics
- Abdominal
- Pediatric
- Small Organ
- Neonatal Cephalic
- Adult Cephalic
- Musculoskeletal Conventional
- Musculoskeletal Superficial
- Transcranial
- Transrectal
- Transvaginal
- Thoracic/Pleural
- Urology

Operating Modes

- 2D Tissue
- Tissue M-mode
- Anatomical M-mode
- Curved Anatomical M-mode (optional)
- Extended field-of-view (LOGIQ™ View) (optional)
- Virtual Convex
- Virtual Apex
- Coded Phase Inversion
- Compound Imaging
- 2D Color Flow
- 2D Color Angio Flow
- Color M-mode
- Anatomical Color M-mode
- B-flow
- Blood Flow Imaging
- Blood Flow Angio Imaging
- Strain Elastography
- Pulsed Wave Doppler
- Continuous Wave Doppler
- LVO Contrast (optional)
- Tissue Velocity Imaging
- Tissue Tracking
- Tissue Velocity M-mode
- Tissue Velocity Doppler
- Automatic Optimization
- Scan Assist Pro
- Scan Coach
- Pre-Post Compare (optional)
- 2D Stress (optional)
- Automated Function Imaging (AFI) 3.0 (optional)
- Easy AFI LV (optional)
- Automated Ejection-Fraction (AutoEF) 3.0 (optional)
- Easy AutoEF (optional)
- AI Auto Measure – 2D (optional)
- AI Auto Measure – Spectrum Recognition (optional)

Scanning Methods

- Electronic sector
- Electronic volume
- Electronic convex
- Electronic linear
- CW pencil

Transducer Types

- Sector phased array
- Convex array
- Linear array
- Single crystal matrix array
- 2D matrix array
- Endovaginal

Peripheral Options

- DVDRW
- Color printer
- B/W video printer with optional inverted background printing, allowing for environmentally sensitive ink saving
- USB memory stick
- One TB USB hard drive
- HDMI cable
- Video converter providing electrically isolated video signals for external monitors
  - digital Full HD 1920 x 1080
  - analogue VGA 800 x 600
- Three-pedal configurable footswitch
- Rolling bag
- Ergonomic wrist rest

Accessories (optional)

- Interface cable for external ECG
- ECG adapter for DIN-type pediatrics electrode leads

Display Modes

- Live and stored display format: Full size and split screen, both with thumbnails, for still and cine
- Instant-review screen displays 12 simultaneous loops/images for a quick study review
- Selectable display configuration of duplex and triplex modes: side-by- side or top-bottom during live, digital replay and clipboard image recall
- Single, dual and quad-screen view
- Simultaneous capability
  - 2D+PW
  - 2D + CFM/TVI + PW
  - 2D + CFM/Angio/TVI/TT
  - 2D + M/AMM/CAMM (optional)
  - 2D + CFM/Angio/TVI/TT + M/AMM/CAMM (optional)
  - Compound + M/CFM/PW
  - 2D + color split screen (simultaneous mode)
- Selectable alternating modes
  - 2D or Compound + PW
  - 2D + CW
  - 2D or Compound + CFM/PW
  - 2D + CFM + CW
- Multi-image (split/quad screen)
  - Live and/or frozen
  - Independent cine playback
- Timeline display
  - Independent 2D (or Compound) + PW/CW/M display
  - A choice of display formats with various sizes of 2D + PW/CW/M
- Top/bottom selectable format
- Side/side selectable format

Display Annotation

- Patient name: First, last and middle
- Patient ID
- Additional patient ID
- Age, sex and birth date
- Hospital name

- Date format: Three types selectable – MM/DD/YYYY, DD/MM/YYYY, YYYY/MM/DD
- Time format: Two types selectable – 24 hours, 12 hours
- Gestational age from LMP/EDD/GA
- Probe name
- Probe orientation
- Depth scale marker
- Focal zone markers
- Image depth
- Zoom depth
- B-mode
  - Gain
  - Imaging frequency
  - Frame averaging
  - Dynamic range
  - Gray map
- M-mode
  - Gain
  - Frequency
  - Time scale
  - Dynamic range
- Doppler mode
  - Gain
  - Angle
  - Sample volume size and position
  - Wall filter (Low Velocity Reject)
  - Velocity and/or frequency scale
  - Spectrum inversion
- Time scale
  - PRF
  - Doppler frequency
- Color Flow Doppler mode
  - Frame rate
  - Sample volume size
  - Color scale
  - Power
  - Color baseline
  - Color threshold marker
  - Color gain
  - Frame averaging
- Spectrum inversion
- Acoustic frame rate
- CINE gauge, image number/frame number
- Bodymarks: Multiple human anatomical structures
- Application/preset name
- Measurement results
- Operator message
- Displayed acoustic output
  - TIS: Thermal Index Soft Tissue
  - TIC: Thermal Index Cranial (Bone)
  - TIB: Thermal Index Bone
- MI: Mechanical Index
- Power output in dB
- Biopsy guideline and zone
- Heart rate
- TrackPad-driven annotation arrows
- Active mode display
- Stress protocol parameters
- Parameter annotation follows ASE standard
- Free text with word library
- Scan plane position indicator and probe temperature are displayed with all TEE probes
- Image orientation marker

General System Parameters

System Setup

- Pre-programmable M&A and annotation categories
- Different user presets per probe/application may be stored for quick access
- User programmable preset capability with administrator preset protection
- Factory default preset data, protected against modification
- QuickApps: Factory and user programmable sub-preset feature that keeps 2D and geometry settings while adapting color flow or contrast parameters
- User Interface languages: English, LA Spanish, French, German, Italian, Portuguese (European and Brazilian), Russian, Swedish, Norwegian, Danish, Dutch, Finnish, Chinese
- User-defined annotations
- Body patterns
- Customized comment home position

CINE Memory/Image Memory

- 500 MB of cine memory
- Selectable cine sequence for cine review
- Measurements/calculations and annotations on cine playback
- Scrolling timeline memory
- Dual-image cine display
- Quad-image cine display
- CINE gauge and cine image number display
- CINE review loop
- CINE review speed

Image Storage

- On-board database of patient information from past exams
- User-selectable ECG and time gated acquisition available on touch panel during live scanning
- User-selectable prospective or retrospective capture in config
- Storage formats:
  - DICOM®-compressed/uncompressed, single/multi-frame, with/without raw data, storage via clipboard and/or seamlessly directly to destination device
  - Transfer/ “Save As” JPEG, MPEG, AVI, DICOM, Raw DICOM formats
- Storage devices (optional):
  - USB memory stick: 32 GB
  - CD-RW storage: 700 MB
  - DVD storage: -R (4.7 GB)
  - Mobile hard drive storage: 1 TB
- Compare old images with current exam
- Reload of archived data sets
- Activation control of USB devices (for security)

Annotations

Body Marks

- Body mark icons for location and position of probe
- Option to automatically activate body mark on freeze
- Easy selection of body marks from touch screen
- Easy selection of body marks for dual-screen layout

Text Annotations

- Easy selection of text annotations from touch screen
- Option to automatically activate annotation on freeze

Connectivity and DICOM

- Ethernet network connection
- USB Wireless network connection kit (optional)
- DICOM 3.0
  - Verify
  - Print
  - Store
  - Modality worklist
  - Storage commitment
  - Modality Performed Procedure Step (MPPS)
  - DICOM Media exchange
  - DICOM spooler
  - DICOM Query/Retrieve
- Structured reporting – compatible with adult cardiac, pediatric, vascular and abdominal
- Media store of structured reporting
- InSite™ ExC capability for remote service/access
- Support of two patients' IDs in DICOM
- Separate DICOM SR and image storage destinations
- Simultaneous transfer of DICOM to multiple destinations
- Streaming (optional) sends the image information as digital video stream over Ethernet in real-time to clients
- DICOM PDF Read
- DICOM / TLS (encryption)
- DICOM Implicit Encoding support

Patient Archive

EchoPAC™ Connectivity

- Integrated EchoPAC functionality adds connectivity and image analysis capability to scanner
- Data format fully compatible with offline EchoPAC Plug-in review/reporting stations of same or newer vintage
- EchoPAC Plug-in allows instant access to ultrasound raw data provided by the system
- Comprehensive review, analysis and post-processing capabilities on EchoPAC Plug-in
- Advanced quantitative analysis and post-processing capabilities
- Q-analysis on raw data from Vivid *iq* on EchoPAC Plug-in
- Three user levels help organize data security requirements
- E-signoff compatibility, with clear indications in patient management screens and report screen that a report was signed off, and by whom and at what time. The signed off report and exam cannot be changed. The "Diagnosing Physician" field is automatically assigned to the user that did the sign-off

Image and Data Management

- Exceptional workflow with instant access data management
- DICOM 3.0 support – see DICOM conformance statement for details
- Support for transfer of the proprietary raw data files within the DICOM standard. With the use of the AI-based View Recognition this can be automated
- 2D, CFM or TVI data at maximum frame rate may be reviewed by scrolling or by running cine loops (can contain more than 1,000 images for imaging modes)
- Image clipboard for stamp-size storage and review of stored images and loops
- Built-in patient archive with images/loops, patient information, measurements and reports
- DICOM-SR Standard structured reporting mechanism
- Structured findings report tools help support efficient text entries with direct editing of findings text, usability enhancements, various configuration options and conclusion section
- User can enter normal values which are then compared to actual measurements
- Configurable HTML-based report function
- Report templates can be customized on board
- ASE-based default text modules (English), user-customizable
- Internal archive data can be exported to removable image storage through DICOM media
- Internal hard disk – for storing programs, application defaults, ultrasound images and patient archive
- All data storage is based on ultrasound raw data, allowing to change gain, baseline, color maps, sweep speeds, etc., for recalled images and loops
- DICOM media – read/write images on DICOM format
- DICOM viewer embedded on media (optional and selectable in Config)
- Alphanumeric data can be exported in Microsoft® Excel® compatible format
- JPEG export ("Save As") for still frames
- AVI and MPEG export ("Save As") for cineloops
- Ability to transfer Systole Only for Stress echo loops to PACS
- Selectable raw data transfer to PACS including AI-based View Recognition for automatic view labelling

CartoSound® Interface (optional)

- The system can interface with the Carto® 3 EP navigation system and the SOUNDSTAR® ultrasound catheters manufactured by Biosense Webster
- The interface allows Vivid *iq* system to send images to the Carto 3 EP system
- Vivid *iq* is able to send ultrasound scaling parameters to the Carto 3 EP system via a peer-to-peer LAN connection

Self-contained DICOM Viewer (optional)

- Exams can be transferred to CD/DVD or USB media with an integrated GE HealthCare Ultrasound DICOM Viewer
- The GE HealthCare Ultrasound DICOM Viewer allows to open and display still images and cline loops from media on

a standard PC without installing any application on the host PC

App Launchpad[4]

- The App Launchpad is a tab available on the Archive screen – when selected, various applications ("Apps") can be launched
- Only validated and released Apps are supported
- 3rd-party Apps can be purchased through an AppStore on a GE HealthCare website
- Consult with a GE HealthCare representative for more details

Raw Data Streaming (optional)

- Provides streaming of raw data out to 3rd-party devices designed to process this data

User Manual Available on Board

User manual and service manual are included on USB flash drive with each system. A printed user manual is available upon request.

Scanning Parameters

- Digital beamformer with up to 974,026 effective digital channels
- Minimum field-of-view (depth): 1 cm (probe dependent)
- Maximum field-of-view (depth): 33 cm (probe dependent)
- Width range: 10° – 168° (probe dependent)
- Continuous dynamic receive focus/continuous dynamic receive aperture
- Composite dynamic range up to 415 dB
- Adjustable dynamic range
- Image reverse: Right/Left
- Image rotation of 0°, 180°
- Touch user-interface inversion for right-hand scanning users

Tissue Imaging

General

- Variable transmit frequencies for resolution/penetration optimization
- Display zoom with zoom area control
- High-Resolution (HR) Zoom – concentrates all image acquisition power into selected Region of Interest (ROI)
- Variable contour filtering – for edge enhancement
- Selectable grayscale parameters (availability preset-dependent): Gain, reject, DDP, clarity, dynamic range and compress – can be adjusted in live, digital replay and image clipboard recall
- Automatically calculated TGC curves help reduce operator interaction
- Automatically calculated lateral gain

2D Mode

- Sector tilt and width control
- Frame rate in excess of 1,000 fps, depending on probe, settings and applications
- Coded octave imaging with coded phase inversion – GE HealthCare 3rd generation harmonic tissue imaging providing enhanced lateral and contrast resolution as compared to previous generation GE HealthCare products. Features help reduce noise, help improve wall definition and axial resolution, making it well suited for a wide variety of patient groups
- Confocal imaging – allows for multiple transmit focal zones over range of view and a high vector density, probes dependent
- Automatic tissue optimization – single keystroke optimizes immediately, automatically and dynamically different grayscale settings with the goal of signal independent uniform gain and contrast distribution
- UD Clarity and UD Speckle Reduction Imaging – an advanced image processing technique to help reduce speckle in real time examining the relative difference between neighboring pixel values and determining whether the grayscale variations have a sharp difference, follow a trend, or are random in nature
- Variable image width – a reduction either increases frame rate or increases the number of focal zones while maintaining the frame rate – application dependent
- Multiple-angle Compound Imaging – multiple co-planar images from different angles combined into a single image in real-time to help enhance border definition, contrast resolution and reducing angular dependence of border or edge as compared to no-compound imaging
- LOGIQ View (optional): Provides the ability to construct and view a static 2D image with wider field-of-view of a given transducer. This allows viewing and measurements of anatomy larger than what would fit in a single image
- Virtual convex allows a wider field-of-view (FOV) in the depth to enhance image quality on linear probes
- Virtual apex provides a wider field-of-view with phased array probes, effective at certain imaging views where a wide near field is preferred
- L/R and up/down invert, in live, digital replay or image clipboard recall
- Digital replay for retrospective review or automatic looping of images, allowing for adjustment of parameters such as gain, reject, Anatomical M-mode, persistence and replay speed
- Data Dependent Processing (DDP) performs temporal processing which helps reduce random noise but leaves motion of significant tissue structures largely unaffected – can be adjusted even in digital replay
- 256 shades of gray
- Colorized 2D-mode, user-selectable in real-time, digital replay

M-mode

- TrackPad steers M-mode line available with all imaging probes – max steering angle is probe dependent
- Simultaneous real-time 2D- and M-mode

[4] *App Launchpad may not be available in all countries and regions. Consult with a GE HealthCare representative for more details.*

- M-mode PRF 1 kHz – image data acquired is combined to give high-quality recording regardless of display scroll speed
- Digital replay for retrospective review of spectral data
- Several top-bottom formats, side-by-side format and time-motion-only format – can be adjusted in live or digital replay
- Selectable horizontal scroll speed: 1, 2, 3, 4, 6, 8, 12, 16 seconds across display
- Horizontal scroll can be adjusted in live or digital replay

Anatomical M-mode

- M-mode cursor can be adjusted at any plane
- Curved Anatomical M-mode (optional) – free (curved) drawing of M-mode generated from the cursor independent from the axial plane
- Can be activated from live, digital replay or image clipboard recall
- Anatomical color and Tissue Velocity M-mode
- M&A capability

Color Doppler Imaging

General

- Steerable color Doppler available with all imaging probes – max steering angle is probe dependent
- TrackPad-controlled ROI
- Touchscreen-controlled ROI
- Removal of color map from the tissue during digital replay
- Digital replay for retrospective review of color or color M-mode data allowing for adjustment of parameters such as encoding principle, color priority and color gain even on stored data
- PRF settings – user-selectable
- Advanced regression wall filter gives efficient suppression of wall clutter
- For each encoding principle, multiple color maps can be selected in live and digital replay – variance maps available
- More than 65,000 simultaneous colors processed, providing a smooth display two-dimensional color maps containing a multitude of color hues
- Simultaneous display of grayscale 2D and 2D with color flow
- Color invert – user-selectable in live and digital replay
- Variable color baseline – user-selectable in live and digital replay
- Multi-variate color priority function gives delineation of disturbed flows even across bright areas of the 2D-mode image
- Color Doppler frequency can be changed independently from 2D

Color Flow Imaging

- TruSpeed imaging allows either ultra-high frame rate or increased lateral resolution as compared to previous generation GE HealthCare products
- Frame Rate in excess of 700 (it is 400 on 12S-RS) fps, depending on probe and settings
- Variable ROI size in width and depth
- User-selectable radial and lateral averaging to help reduce statistical uncertainty in color velocity and variance estimates
- Data Dependent Processing (DDP) performs temporal processing and display smoothing to help reduce loss of transient events of hemodynamic significance
- Digital replay for retrospective review or automatic looping of color images, allowing for adjustment of parameters such as DDP, encoding principle, baseline shift, color maps, color priority and color gain even on frozen/recalled data
- Application-dependent, multi-variate motion discriminator helps reduce flash artifacts
- Dedicated coronary flow application
- Multiple-angle compound imaging in 2D mode is maintained while in color Doppler mode

Color Angio

- Angle-independent power Doppler mode for visualization of slow flow vessels with enhanced sensitivity compared to standard color flow of previous GE HealthCare products

Color M-mode

- Variable ROI length and position – user-selectable
- User-selectable radial averaging to help reduce statistical uncertainty in color velocity and variance estimates
- Selectable horizontal scroll speed: 1, 2, 3, 4, 6, 8, 12, 16 seconds across display – can be adjusted during live, digital replay or image clipboard recall
- Real-time 2D image while in color M-mode
- Same controls and functions available as in standard 2D color Doppler

Anatomical Color M-mode

- GE HealthCare-patented, any plane color M-mode display derived from color Doppler cine loop
- Applicable to Tissue Velocity Imaging
- M&A capability

B-flow

- B-flow is a digital imaging technique that provides real-time visualization of vascular hemodynamics by directly visualizing blood reflectors and presenting this information in a grayscale display
- Use of GE HealthCare-patented techniques to boost blood echoes, and to help preferentially suppress non-moving tissue signals
- B-flow is available for most vascular and shared service applications

Blood Flow Imaging

- Combines color Doppler with grayscale speckle imaging
- Helps improve delineation of blood flow without bleeding into tissue or vessel wall

Blood Flow Angio Imaging

- Combines angio with grayscale speckle imaging

Strain Elastography

- Visualization of relative tissue stiffness

Spectral Doppler

General

- Operates in PW, HPRF and CW modes
- TrackPad steerable Doppler available with all imaging probes – max steering angle is probe dependent
- Selectable Doppler frequency for enhanced optimization
- High-quality, real-time duplex or triplex operation in all Doppler modes, CW and PW, and for all velocity settings
- Frame rate control for optimized use of acquisition power between spectrum, 2D and color Doppler modes in duplex or triplex modes
- Very fast and flexible spectrum analysis with an equivalent DFT rate of 0.2 ms
- Automatic Spectrum Optimization (ASO) provides a single push, automatic, real-time optimization of PW or CW spectrum scale, and baseline display
- Dynamic gain compensation for display of flows with varying signal strengths over the cardiac cycle to help improve ease of use
- Dynamic reject gives consistent suppression of background – user-selectable in real-time, digital replay or image clipboard recall
- Digital replay for retrospective review of spectral Doppler data
- Several top-bottom formats, side-by-side format and time- motion-only format – can be adjusted in live or digital replay
- Selectable horizontal scroll speed: 1, 2, 3, 4, 6, 8, 12, 16 seconds across display – can be adjusted in live or digital replay
- Adjustable spectral Doppler display parameters: gain, reject, compress, color maps – can be adjusted in live or digital replay
- User-adjustable baseline shift – in live, digital replay and image clipboard recall
- Adjustable velocity scale (depending on probe and setting)
- Wall filters with range 10-2000 Hz (velocity scale dependent)
- Angle correction with automatic adjustment of velocity scale – in live, digital replay and image clipboard recall
- Auto Doppler angle
- Stereo speakers mounted in the front panel
- Display annotations of frequency, mode, scales, Nyquist limit, wall filter setting, angle correction, acoustic power indices
- Compound in duplex

PW/HPRF Doppler

- Automatic HPRF Doppler maintains its sensitivity even for shallow depths and with high PRF's
- Digital velocity tracking Doppler employs processing in range and time for high-quality spectral displays
- Adjustable sample volume size of 1-16 mm (probe dependent)
- Maximum sample volume depth 30 cm

CW Doppler

- Highly sensitive steerable CW available with all phased array probes
- Tissue Velocity Doppler

Contrast Imaging (optional)

LV Contrast (optional, accessed through QuickApps)

- Enables contrast applications intended for imaging of the left ventricle
- LV harmonic contrast imaging(3Sc-RS and 6Tc-RS probe) enhances delineation of the LV border in combination with ultrasound contrast agents. The new implementation of GE HealthCare's Coded Phase Inversion (CPI) provides high- resolution detection of contrast in the LV cavity and excellent suppression of myocardial tissue signals

Tissue Velocity Imaging

Tissue Velocity Imaging Mode

- Myocardial Doppler imaging with color overlay on tissue image
- Tissue Doppler data can be acquired in background during regular 2D imaging
- The velocity of myocardial segments after entire heart cycle can be displayed in one single image
- Tissue color overlay can be removed to show just the 2D image, still retaining the tissue velocity information
- Quantitative profiles for TVI, Tissue Tracking can be derived
- Time markers for valve events derived from any TM mode help simplify understanding of signals in velocity traces or Curved Anatomical M-mode (optional)

Tissue Tracking Mode

- Real-time display of the time integral of TVI for quantitative display of myocardial systolic displacement
- Myocardial displacement is calculated and displayed as a color-coded overlay on the grayscale and M-mode image – different colors represent different displacement ranges

Physiological Traces

- Integrated three-lead ECG module
- Automatic QRS complex detection with user ability to modify QRS trigger positions
- External ECG lead input
- Internally generated respiratory trace using ECG leads
- ECG trigger
- ECG lead selection
- Adjustable ECG QRS markers

Automatic Optimization

- Optimize B-mode image to help improve contrast resolution, gain, TGC and grayscale
- Auto Spectral Optimize (ASO) – dynamic adjustments of baseline, PRF (on live image) and angle correction

Protocol Features

Scan Assist Pro

- Customizable automations that assist the user through each step of the scan
- Helps enhance consistency and reduce keystrokes

- Ultrasound image, anatomical picture, step by step training through a predefined protocol
- Supports selection of all modes, all measurements and dual annotations
- Imaging attributes: Octave, Steer, Dual/Quad screen, Compound, LOGIQ View (optional), Zoom, Depth, Scale and Baseline
- On-line or off-line protocol editor
- Image acquisition according to predefined protocol templates
- Various factory protocol templates
- User-configurable protocol templates

Scan Coach

- A reference tool that provides modules depicting basic scanning techniques with animated graphics of probe position, schematic of anatomy and reference clinical image
- Exam protocols can be customized based on local guidelines

Pre-Post Compare (optional)

- Labelling of measurements and images acquired in different stages of an exam or procedure, allowing to compare measurements pre and post procedure.

Smart Stress Echo (optional)

Supported Protocol Examinations

- 2D pharmacological stress echo
- 2D bicycle stress echo
- 2D continuous capture stress echo (treadmill stress echo)

Protocol Examinations Features
(enabled with Smart Stress option)

- Wall motion scoring: Analysis by wall motion in individual myocardial segments
- Show reference: Show a reference image from baseline or previous level during acquisition
- Smart stress: Automatically set up various scanning parameters (for instance geometry, frequency, gain, etc.) according to same projection on previous level
- Scan mode settings: Scan mode may be specified for individual views in the protocol
- Stress protocol editor with over 10 levels and maximum 10 projections
- Preview of store: Show running loops as preview before storing to the examination

Continuous Capture

- Continuously acquire large amounts of 2D image data, and selection of projection views for analysis afterwards
- The entire continuous capture recording may be kept in memory while it is possible to store new images outside the protocol template, or the entire recording can be stored to file
- Selection of projection views on EchoPAC SW Only when the entire recording is stored to file

Wall Motion Scoring

- As part of the measurement and analysis package one can access a wall motion assessment module, providing analysis/scoring of individual myocardial segments
- For use with all stress modalities

Measurement and Analysis (M&A)

- Personalized measurement protocols allow individual set and order of M&A items
- Measurements can be labeled seamlessly by using protocols or post assignments
- Measurements assignable to protocol capability
- Parameter annotation follows ASE standard
- Seamless data storage and report creation
- User-assignable parameters
- Comprehensive set of adult and pediatric cardiac measurements and calculations to help assess dimensions, flow properties and other functional parameters of the heart
- Comprehensive set of shared service measurements and calculations covering vascular, abdominal, obstetrics and other application areas
- Configuration package to set up a customized set and sequence of measurements to use, defining user-defined measurements and changing settings for the factory- defined measurements
- Stress echo support allowing wall motion scoring and automatic stress level labeling of measurements
- Stress echo is directly accessible from the system control panel with a dedicated button
- Support for measuring on DICOM images
- AI-based Cardiac Auto 2D Measurement (optional) enables automated quantification of the most common distance measurements performed on parasternal LAX 2D images, with minimum user guidance
- AI-based Spectrum Recognition (optional) enables automated recognition of the most common Doppler spectra and automatically starts the Auto Doppler measurement (where available), or opens the according manual measurement
- Cardiac Auto Doppler automatically provides Doppler measurement results for the most common parameters with minimal user guidance
- Automatic Doppler trace functionality for use in non-cardiac applications in both live and replay
- Worksheet allows user to review, edit and delete performed measurements
- Reporting support allowing a configurable set of measurements to be shown in the exam report
- DICOM SR export of measurement data

Automated Function Imaging (AFI 3.0) (optional)

- Third generation parametric imaging tool which gives quantitative data for global and segmental strain
- Allows comprehensive assessment at a glance by combining three apical longitudinal views into one comprehensive bull's eye view
- Integrated into M&A package with specialized report templates

- 2D strain based data moves into clinical practice
- Simplified and flexible workflow with fully automated ROI tracing (if configured), adaptive ROI width and combined display of traces from all segments
- User-selectable endo or full wall global strain values displayed
- Random sequence of analysis of the three views supported
- Ability to exit tool after one or two views completed
- Applicable to transthoracic and 2D TEE data
- Integrated AutoEF calculation
- On-scanner automatic labelling of views during acquisition enabled by an intelligent algorithm called View Recognition, is used to simplify the AFI workflow eliminating the need to pick views
- Can process GE HealthCare raw data and DICOM data acquired with other vendors' Ultrasound scanners

Easy AFI LV (optional)

- Automated one-click AFI LV analysis. Our AI-based Auto ROI detection algorithm allows users to complete the AFI workflow with no manual interaction apart from initiating the measurement tool and approving the results

Automated Ejection-Fraction Calculation (AutoEF 3.0) (optional)

- Third generation automated 2D EF measurement tool based on 2D speckle tracking algorithm and on Simpson
- Calculated Ejection Fraction with or without ECG signals with automated[5] workflow from a frozen image in 2-chamber or 4-chamber view.
- Calculated bi-plane Ejection Fraction with or without ECG signal from recalled images.
- Integrated into M&A package with worksheet summary
- Can process GE HealthCare raw data and DICOM data acquired with other vendors' Ultrasound scanners

Easy AutoEF (optional)

- Automated one-click Ejection Fraction (EF) measurement. Our AI-based Auto ROI detection algorithm allows users to complete the Ejection Fraction (EF) measurement on loops acquired with or without ECG signal, and with no manual interaction apart from initiating the measurement tool and approving the results

Quantitative Analysis Package (Q-Analysis)

- Traces for tissue velocity or derived parameters inside defined regions of interest as function of time
- Contrast analysis with traces for gray-scale intensity or angio power inside defined regions of interest as function of time
- Curved Anatomical M-mode (optional) display allowing an M-mode along an arbitrary curve in a 2D image
- Sample-area points may be dynamically anchored to move with the tissue when running the cineloop
- Cine Compound displays cineloops generated from a temporal averaging of multiple consecutive heart cycles

Generic Measurements

- BSA (Body Surface Area)
- MaxPG (Maximum Pressure Gradient)
- MeanPG (Mean Pressure Gradient)
- % Stenosis (Stenosis Ratio)
- PI (Pulsatility Index)
- RI (Resistivity Index)
- HR (Heart Rate) – beats/minute
- A/B Ratio (Velocities Ratio)
- TAMAX (Time Averaged Maximum Velocity) – Trace method is Peak or Manual
- TAMIN (Time Averaged Minimum Velocity) – Trace method is Floor
- TAMEAN (Time Averaged Mean Velocity) – Trace method is Mean
- Volume
- Area
- Spline Tool

Cardiac Measurements/Calculations

- %FS (LV Fractional Shortening)
- %IVS Thck (IVS Fractional Shortening)
- %LVPW Thck (LV Posterior Wall Fractional Shortening)
- Ao Arch Diam (Aortic Arch Diameter)
- Ao Asc (Ascending Aortic Diameter)
- Ao Desc Diam (Descending Aortic Diameter)
- Ao Isthmus (Aortic Isthmus)
- Ao Root Diam (Aortic Root Diameter)
- AR ERO (PISA: Regurgitant Orifice Area)
- AR Flow (PISA: Regurgitant Flow)
- AR PHT (AV Insuf. Pressure Half Time)
- AR Rad (PISA: Radius of Aliased Point)
- AR RF (Regurgitant Fraction over the Aortic Valve)
- AR RV (PISA: Regurgitant Volume Flow)
- AR Vel (PISA: Aliased Velocity)
- AR Vmax (Aortic Insuf. Peak Velocity)
- AR VTI (Aortic Insuf. Velocity Time Integral)
- ARed max PG (Aortic Insuf. End-Diastole Pressure Gradient)
- ARed Vmax (Aortic Insuf. End-Diastolic Velocity)
- AV Acc Slope (Aortic Valve Flow Acceleration)
- AV Acc Time (Aortic Valve Acceleration Time)
- AV AccT/ET (AV Acceleration to Ejection Time Ratio)
- AV EOAI (VTI) (Aortic Valve Effective Orifice Area Index by Continuity Equation VTI)
- AV EOAI Vmax (Aortic Valve Effective Orifice Area Index by Continuity Equation Peak V)
- AV CO (Cardiac Output by Aortic Flow)
- AV Cusp (Aortic Valve Cusp Separation, 2D)

[5] *Automated refers to workflow potentially involving no user interaction before approval; users can adjust contours and frame selection during the process.*

- AV Dec Time (Aortic Valve Deceleration Time)
- AV Diam (Aortic Diameter, 2D)
- AV max PG (Aortic Valve Peak Pressure Gradient)
- AV mean PG (Aortic Valve Mean Pressure Gradient)
- AV SV (Stroke Volume by Aortic Flow)
- AV Vmax (Aortic Valve Peak Velocity)
- AV Vmean (AV Mean Velocity)
- AV VTI (Aortic Valve Velocity Time Integral)
- AVA (Vmax) (AV Area by Continuity Equation by Peak V)
- AVA (VTI) (AV Area by Continuity Equation VTI)
- AVA Planimetry (Aortic Valve Area)
- AVET (Aortic Valve Ejection Time)
- CO (Teich) (Cardiac Output, M-mode, Teicholtz)
- D-E Excursion (MV Anterior Leaflet Excursion)
- E' Avg (Averaged Early Diastolic Mitral Valve Annular Velocity)
- E' Lat (Early Diastolic Mitral Valve Lateral Annular Velocity)
- E' Sept (Early Diastolic Mitral Valve Septal Annular Velocity)
- E/E' Avg (Mitral Inflow E Velocity to E' Avg Ratio)
- E/E' Lat (Mitral Inflow E Velocity to E' Lat Ratio)
- E/E' Sept (Mitral Inflow E Velocity to E' Sept Ratio)
- EDV (Cube) (Left Ventricle Volume, Diastolic, 2D, Cubic)
- EF (A-L A2C) (Ejection Fraction 2CH, Single Plane, Area-Length)
- E-F Slope (Mitral Valve E-F Slope)
- EPSS (E-Point-to-Septum Separation, M-mode)
- ERO (Effective Regurgitant Orifice)
- ESV (Cube) (Left Ventricle Volume, Systolic, 2D, Cubic)
- HR (Heart Rate, 2D, Teicholtz)
- IVC (Inferior Vena Cava)
- IVCT (Isovolumic Contraction Time)
- IVRT (Isovolumic Relaxation Time)
- IVSd (Interventricular Septum Thickness, Diastolic, 2D)
- VSs (Interventricular Septum Thickness, Systolic, 2D)
- LA Diam (Left Atrium Diameter, 2D)
- LA Major (Left Atrium Major)
- LA Minor (Left Atrium Minor)
- LA/Ao (LA Diameter to AoRoot Diameter Ratio, 2D)
- LAAd (A2C) (Left Atrium Area, Apical 2C)
- LAEDV (A-L) (LA End Diastolic Volume, Area- Length)
- LAEDV Index (A-L) (LA End Diastolic Volume Index, Area-Length)
- LAESV (A-L) (LA End Systolic Volume, Area-Length)
- LAESV Index (A-L) (LA End Systolic Volume Index, Area-Length)
- LAEDV MOD (LA End Diastolic Volume MOD)
- LAESV MOD (LA End Systolic Volume MOD)
- LIMP (Left Index of Myocardial Performance)
- LVA (s) (Left Ventricular Area, Systolic, 2CH)
- LVAd (A2C) (Left Ventricular Area, Diastolic, 2CH)
- LVAd (SAX) (LV Area, SAX, Diastolic)
- LVAend (d) (LV Endocardial Area, SAX)
- LVAepi (d) (LV Epicardial Area, SAX)
- LVAs (A4C) (Left Ventricular Area, Systolic, 4CH)
- LVAs (SAX) (LV area, SAX, Systolic)
- LVd Mass (LV Mass, Diastolic, 2D)
- LVd Mass (LV Mass, Diastolic, M-mode)
- LVd Mass Index (LV Mass Index, Diastolic, 2D)
- LVEDV (A-L A2C) (LV Volume, Diastolic, 2CH, Area-Length)
- LVESV (A-L A2C) (LV Volume, Systolic, 2CH, Area-Length)
- LVET (Left Ventricle Ejection Time)
- LVIDd (LV Internal Dimension, Diastolic, 2D)
- LVIDs (LV Internal Dimension, Systolic, 2D)
- LVLd (Apical) (Left Ventricular Length, Diastolic, 2D)
- LVLs (Apical) (Left Ventricular Length, Systolic, 2D)
- LVOT Area (Left Ventricle Outflow Tract Area)
- LVOT CO (Cardiac Output by Aortic Flow)
- LVOT Diam (Left Ventricular Outflow Tract Diameter)
- LVOT Max PG (LVOT Peak Pressure Gradient)
- LVOT Mean PG (LVOT Mean Pressure Gradient)
- LVOT SI (Stroke Volume Index by Aortic Flow)
- LVOT SV (Stroke Volume by Aortic Flow)
- LVOT Vmax (LVOT Peak Velocity)
- LVOT Vmean (LVOT Mean Velocity)
- LVOT VTI (LVOT Velocity Time Integral)
- LVPWd (Left Ventricular Posterior Wall Thickness, Diastolic, 2D)
- LVPWs (Left Ventricular Posterior Wall Thickness, Systolic, 2D)
- LVs Mass (LV Mass, Systolic, 2D)
- LVs Mass Index (LV Mass Index, Systolic, 2D)
- LAAd (A2C) (Left Atrium Area, Apical 2C)
- MCO (Mitral Valve Closure to Opening)
- MP Area (Mitral Valve Prosthesis)
- MR Acc Time (MV Regurg. Flow Acceleration)
- MR ERO (PISA: Regurgitant Orifice Area)
- MR Flow (PISA: Regurgitant Flow)
- MR Max PG (Mitral Regurg. Peak Pressure Gradient)
- MR Rad (PISA: Radius of Aliased Point)
- MR RF (Regurgitant Fraction Over the Mitral Valve)
- MR RV (PISA: Regurgitant Volume Flow)
- MR Vel (PISA: Aliased Velocity)
- MR Vmax (Mitral Regurg. Peak Velocity)
- MR Vmean (Mitral Regurg. Mean Velocity)

- MR VTI (Mitral Regurg. Velocity Time Integral)
- MV A Dur (Mitral Valve A-Wave Duration)
- MV A Velocity (MV Velocity Peak A)
- MV Acc Slope (Mitral Valve Flow Acceleration)
- MV Acc Time (Mitral Valve Acceleration Time)
- MV Acc/Dec Time (MV: Acc.Time/Decel.Time Ratio)
- MV Ann Diam (Mitral Valve Annulus Diameter, 2D)
- MV CO (Cardiac Output by Mitral Flow)
- MV Dec Slope (Mitral Valve Flow Deceleration)
- MV Dec Time (Mitral Valve Deceleration Time)
- MV E Velocity (MV Velocity Peak E)
- MV E/A Ratio (Mitral Valve E-Peak to A-Peak Ratio)
- MV Max PG (Mitral Valve Peak Pressure Gradient)
- MV Mean PG (Mitral Valve Mean Pressure Gradient)
- MV PHT (Mitral Valve Pressure Half Time)
- MV Reg Frac (Mitral Valve Regurgitant Fraction)
- MV SI (Stroke Volume Index by Mitral Flow)
- MV SV (Stroke Volume by Mitral Flow)
- MV Time to Peak (Mitral Valve Time to Peak)
- MV Vmax (Mitral Valve Peak Velocity)
- MV Vmean (MV Mean Velocity)
- MV VTI (Mitral Valve Velocity Time Integral)
- MVA (Mitral Valve Area)
- MVA By PHT (Mitral Valve Area according to PHT)
- MVA by Plan (Mitral Valve Area, 2D)
- MVET (Mitral Valve Ejection Time)
- P Vein A (Pulmonary Vein Velocity Peak A) – Reverse
- P Vein A Dur (Pulmonary Vein A-Wave Duration)
- P Vein D (Pulmonary Vein End-Diastolic Peak Velocity)
- P Vein S (Pulmonary Vein Systolic Peak Velocity)
- PAEDP (Pulmonary Artery Diastolic Pressure)
- PE(d) (Pericard Effusion, M-mode)
- PEs (Pericard Effusion, 2D)
- PR Max PG (Pulmonic Insuf. Peak Pressure Gradient)
- PR Mean PG (Pulmonic Insuf. Mean Pressure Gradient)
- PR PHT (Pulmonic Insuf. Pressure Half Time)
- PR Vmax (Pulmonic Insuf. Peak Velocity)
- PR VTI (Pulmonic Insuf. Velocity Time Integral)
- PRend Max PG (Pulmonic Insuf. End-Diastole Pressure Gradient)
- PRend Vmax (Pulmonic Insuf. End-Diastolic Velocity)
- Pulmonic Diam (Pulmonary Artery Diameter, 2D)
- PV Acc Slope (Pulmonic Valve Flow Acceleration)
- PV Acc Time (Pulmonic Valve Acceleration Time)
- PV Acc Time/ET Ratio (PV Acceleration to Ejection Time Ratio)
- PV Ann Diam (Pulmonic Valve Annulus Diameter, 2D)
- PV Ann Area (Pulmonic Valve Area)
- PV CO (Cardiac Output by Pulmonic Flow)
- PV Max PG (Pulmonic Valve Peak Pressure Gradient)
- PV Mean PG (Pulmonic Valve Mean Pressure Gradient)
- PV SV (Stroke Volume by Pulmonic Flow)
- PV Vmax (Pulmonary Artery Peak Velocity)
- PV Vmean (PV Mean Velocity)
- PV VTI (Pulmonic Valve Velocity Time Integral)
- PVA (VTI) (Pulmonary Artery Velocity Time Integral)
- PVein S/D Ratio (Pulmonary Vein SD Ratio)
- PVET (Pulmonic Valve Ejection Time)
- PVPEP (Pulmonic Valve Pre-Ejection Period)
- PVPEP/ET Ratio (PV Pre-Ejection to Ejection Time Ratio)
- Qp/Qs (Pulmonic-to-Systemic Flow Ratio)
- RA Major (Right Atrium Major, 2D)
- RA Minor (Right Atrium Minor, 2D)
- RAA (d) (Right Atrium Area, 2D, Diastole)
- RAA (s) (Right Atrium Area, 2D, Systole)
- RAEDV A2C (Right Atrium End Diastolic Volume, Apical 2 Chamber)
- RAESV A-L (RA End Systole Volume [A-L])
- RALd (Right Atrium Length, Diastole)
- RALs (RA Length, Systole)
- RIMP (Right Index of Myocardial Performance)
- RJA (A4C) (Regurgitant Jet Area)
- RJA/LAA (Regurgitant Jet Area Ratio RJA/LAA)
- RV Major (Right Ventricle Major)
- RV Minor (Right Ventricle Minor)
- RV S' (Tricuspid Annulus Systolic Excursion Velocity)
- RVAWd (Right Ventricle Wall Thickness, Diastolic, 2D)
- RVAWs (Right Ventricle Wall Thickness, Systolic, 2D)
- RVET (Right Ventricle Ejection Time)
- RVIDd (Right Ventricle Diameter, Diastolic, 2D)
- RVIDs (Right Ventricle Diameter, Systolic, 2D)
- RVOT Area (Right Ventricle Outflow Tract Area)
- RVOT Diam (RV Output Tract Diameter, 2D)
- RVOT Diam (RV Output Tract Diameter, M-mode)
- RVOT Max PG (RVOT Peak Pressure Gradient)
- RVOT Mean PG (RVOT Mean Pressure Gradient)
- RVOT SI (LV Stroke Volume Index by Pulmonic Flow)

- RVOT SV (Stroke Volume by Pulmonic Flow)
- RVOT Vmax (RVOT Peak Velocity)
- RVOT Vmean (RVOT Mean Velocity)
- RVOT VTI (RVOT Velocity Time Integral)
- RVSP (Right Ventricle Systolic Pressure)
- RVWd (Right Ventricle Wall Thickness, Diastolic, M-mode)
- RVWs (Right Ventricle Wall Thickness, Systolic, M-mode)
- RAA (d) (Right Atrium Area, 2D, Diastole)
- RAA (s) (Right Atrium Area, 2D, Systole)
- SI (A-L A2C) (LV Stroke Index, Single Plane, 2CH, Area-Length)
- SI (A-L A4C) (LV Stroke Index, Single Plane, 4CH, Area-Length)
- SI (Bi-plane) (LV Stroke Index, Bi-plane, MOD)
- SI (bullet) (LV Stroke Index, Bi-plane, Bullet)
- SI (MOD A2C) (LV Stroke Index, Single Plane, 2CH, MOD)
- SI (MOD A4C) (LV Stroke Index, Single Plane, 4CH, MOD)
- SI (Teich) (LV Stroke Index, Teicholtz, 2D)
- SI (Teich) (LV Stroke Index, Teicholtz, M-mode)
- SV (A-L A2C) (LV Stroke Volume, Single Plane, 2CH, Area-Length)
- SV (A-L A4C) (LV Stroke Volume, Single Plane, 4CH, Area-Length)
- SV (Bi-plane) (LV Stroke Volume, Bi-plane, MOD)
- SV (Bullet) (LV Stroke Volume, Bi-plane, Bullet)
- SV (MOD A2C) (LV Stroke Volume, Single-plane, 2CH, MOD) – Simpson
- SV (MOD A4C) (LV Stroke Volume, Single-plane, 4CH, MOD) – Simpson
- SV (Cube) (LV Stroke Volume, 2D, Cubic)
- SV (Cube) (LV Stroke Volume, M-mode, Cubic)
- SV (Teich) (LV Stroke Volume, 2D, Teicholtz)
- SV (Teich) (LV Stroke Volume, M-mode, Teicholtz)
- Systemic Diam (Systemic Vein Diameter, 2D)
- Systemic Vmax (Systemic Vein Peak Velocity)
- Systemic VTI (Systemic Vein Velocity Time Integral)
- TAPSE (Tricuspid Annular Plane Systolic Excursion)
- TCO (Tricuspid Valve Closure to Opening)
- TR Max PG (Tricuspid Regurg. Peak Pressure Gradient)
- TR Mean PG (Tricuspid Regurg. Mean Pressure Gradient)
- TR Vmax (Tricuspid Regurg. Peak Velocity)
- TR Vmean (Tricuspid Regurg. Mean Velocity)
- TR VTI (Tricuspid Regurgitation Velocity Time Integral)
- TV A Dur (Tricuspid Valve A-Wave Duration)
- TV A Velocity (Tricuspid Valve A Velocity)
- TV Acc Time (Tricuspid Valve Time to Peak)
- TV Ann Area (Tricuspid Valve Area)
- TV Ann Diam (Tricuspid Valve Annulus Diameter, 2D)
- TV Area (Tricuspid Valve Area, 2D)
- TV CO (Cardiac Output by Tricuspid Flow)
- TV Dec Slope (Tricuspid Valve Flow Deceleration)
- TV E Velocity (Tricuspid Valve E Velocity)
- TV E/A Ratio (Tricuspid Valve E-Peak to A-Peak Ratio)
- TV Max PG (Tricuspid Valve Peak Pressure Gradient)
- TV Mean PG (Tricuspid Valve Mean Pressure Gradient)
- TV Mean PG (Tricuspid Valve Mean Pressure Gradient)
- TV PHT (Tricuspid Valve Pressure Half Time)
- TV SV (Stroke Volume by Tricuspid Flow)
- TV Vmean (TV Mean Velocity)
- TV VTI (Tricuspid Valve Velocity Time Integral)
- VSD Max PG (VSD Peak Pressure Gradient)
- VSD Vmax (VSD Peak Velocity)

Please refer to the Reference Manualfor the full list of measurements andcalculations for all applications.

Z-Scores

- Support for six sets of user-selectable Z score publications[6] covering the most common pediatric dimension measurements

[6] *Michael D. Pettersen, MD; Wei Du, PhD; Mary Ellen Skeens, MS; and Richard A. Humes, MD; Detroit, Michigan; and Andover, Massachusetts. Regression Equations for Calculation of Z Scores of Cardiac Structures in a Large Cohort of Healthy Infants, Children, and Adolescents: An Echocardiographic Study. Journal of the American Society of Echocardiography Pettersen et al. 923 Volume 21 Number 8.*

C Kampmann, C M Wiethoff, A Wenzel, et. al. Normal *Values of M Mode Echocardiographic Measurements of More Than 2000 Healthy Infants and Children in Central Europe. Heart 2000; 83; 667-672.*

M Cantinotti, MD; M Scalese, MS; B Murzi, MD; et. al. Echocardiographic Nomograms for Chamber Diameters and Areas in Caucasian Children. Journal of American Society of Echocardiography December 2014; Volume 27, Issue 12; 1279-1292.e2.

M Cantinotti, MD; M Scalese, MS; B Murzi, MD; et. al. Echocardiographic Nomograms for Ventricular, Valvular and Arterial Dimensions in Caucasian Children with a Special Focus on Neonates, Infants and Toddlers. Journal of American Society of Echocardiography February 2014; Volume 27, Issue 2; 179-191.e2.

Lopez L et. al. Relationship of Echocardiographic Z Scores Adjusted for Body Surface Area to Age, Sex, Race, and Ethnicity. The Pediatric Heart Network Normal Echocardiogram Database. Circ Cardiovasc Imaging. 2017 ov; 10(11). pii: e006979. doi: 10.1161/CIRCIMAGING.117.006979.

BEI Xia, Pediatric Ultrasound Imaging. Beijing: People's Medical Publishing House, 2013 (Second Edition): 173-227 and 261-289.

Vascular Measurements/Calculations

- RT ECA (Right External Carotid Artery Velocity)
- RT CCA (Right Common Carotid Artery Velocity)
- RT BIFURC (Right Carotid Bifurcation Velocity)
- RT ICA (Right Internal Carotid Artery Velocity)
- RT ICA/CCA (Right Internal Carotid Artery Velocity/Common Carotid Artery Velocity Ratio)
- LT ECA, LT CCA, LT BIFURC, LT ICA, LT ICA/CCA (same as above, for Left Carotid Artery)
- RT BULB (Right Bulbus Artery), RT VERT (Right Vertebral Artery), RT SUBC (Right Subclavian Artery), RT INN (Right Inn Artery)
- LT BULB, LT VERT, LT SUBC, LT INN
- Stent, pre-stent, post-stent
- A/B Ratio (Velocities Ratio)
- % Stenosis (Stenosis Ratio)
- S/D Ratio (Systolic Velocity/Diastolic Velocities Ratio)
- PI (Pulsatility Index)
- RI (Resistivity Index)
- HR (Heart Rate) – beats/minute
- UEV (Upper Extremity Vein velocities): IJV, SUBC, Axill V, BaSV, RV, UV, Ves, Pseudo, AVF, CephV
- UEA (Upper Extremity Artery velocities): Inn, SUBC, Axill, BA, RA, UA, Pseudo, AVF, Ves
- LEV (Lower Extremity Vein velocities): CFV, Saph FemJunc V, PopV, PTV, ATV, FV, GSV Calf, GSV Thigh, GSV Access, LSV, Saph PopJunc
- LEA (Lower Extremity Artery velocities): EIA, SFA, Pop, PTA, Peron, DPA, ATA,CFA, DFALEA
- MCA (Middle Cerebral Artery), ACA (Anterior Cerebral Artery), PCA (Posterior Cerebral Artery), AcomA (Anterior Communicating Artery), PComA (Posterior Communicating Artery), Basilar (Basilar Artery), Ves

Intima Media Thickness (IMT) Measurements

- Automatic measurements of carotid artery Intima-Media Thickness (IMT) on any acquired frame
- On-board IMT package facilitates non-interrupted workflow – fully integrated with M&A, worksheet, archiving and reporting functions
- Algorithm provides robust, quick, reliable measurements which can be stored to the on-board archive for review and reporting
- IMT measurement can be made from frozen images or images retrieved from archive
- IMT package supports measurements of different regions of the intima in the carotid vessel (e.g., Lt./Rt./CCA/ICA etc.)
- Frame for IMT measurement can be selected in relation to the ECG waveform

OB/GYN Application Module

- OB package for fetal growth analysis containing more than 100 biometry tables
- Dedicated OB/GYN reports
- Fetal graphical growth charts
- Growth percentiles
- Multi-gestational calculations (up to four)
- Programmable OB tables
- Expanded worksheets
- User-selectable fetal growth parameters based on European, American or Asian methods charts
- GYN package for ovary and uterus measurements and reporting

OB Measurements/Calculations

- Gestational age by:
  - GS (Gestational Sac)
  - CRL (Crown Rump Length)
  - FL (Femur Length)
  - BPD (Bi-Parietal Diameter)
  - AC (Abdominal Circumference)
  - HC (Head Circumference)
  - APTD x TTD (Anterior/Posterior Trunk Diameter by Transverse Trunk Diameter)
  - LV (Length of Vertebra)
  - FTA (Fetal Trunk Cross-sectional Area)
  - HL (Humerus Length)
  - BD (Binocular Distance)
  - FT (Foot Length)
  - OFD (Occipital Frontal Diameter)
  - TAD (Transverse Abdominal Diameter)
  - TCD (Transverse Cerebellum Diameter)
  - THD (Thorax Transverse Diameter)
  - TIB (Tibia Length)
  - ULNA (Ulna Length)
- Estimated Fetal Weight (EFW) by:
  - AC, BPD
  - AC, BPD, FL
  - AC, BPD, FL, HC
  - AC, FL
  - AC, FL, HC
  - AC, HC
  - EFBW
- Calculations and Ratios
  - FL/BPD
  - FL/AC
  - FL/HC
  - HC/AC
  - CI (Cephalic Index)
  - AFI (Amniotic Fluid Index)
  - CTAR (Cardio-Thoracic Area Ratio)
- Measurements/calculations by: ASUM, ASUM 2001, Berkowitz, Bertagnoli, Brenner, Campbell, CFEF, Chitty, Eik-Nes, Ericksen, Goldstein, Hadlock, Hansmann, Hellman, Hill, Hohler, Jeanty, JSUM, Kurtz, Mayden, Mercer, Merz, Moore, Nelson, Osaka University, Paris, Rempen, Robinson, Shepard, Shepard/Warsoff, Tokyo University, Tokyo/Shinozuka, Yarkoni
- Fetal graphical trending
- Growth percentiles
- Multi-gestational calculations (four)
- Fetal qualitative description (anatomical survey)
- Fetal environmental description (biophysical profile)
- Programmable OB tables
- Over 20 selectable OB calculations

- Expanded worksheets

GYN Measurements/Calculations

- Right ovary length, width, height
- Left ovary length, width, height
- Uterus length, width, height
- Cervix length, trace
- Ovarian volume
- ENDO (endometrial thickness)
- Ovarian RI
- Uterine RI
- Follicular measurements
- Summary reports

Abdominal Measurements/Calculations

- Splenic index
- Liver volume, mass, cyst
- Pancreas
- CBD
- GB wall, length
- Aorta prox, mid, dist
- Aorta iliac
- Spleen volume
- Bladder, post void bladder volume
- Renal
- Cortex thickness
- Mesenteric (CA, SMA, IMA)

Safety Conformance

Vivid *iq* is:

- The European Medical Device Regulation (MDR) 2017/745 (CE Marking) on Concerning Medical Device, Conforms to the following standards for safety:
- IEC 60601-1 Medical electrical equipment – Part 1: General Requirements for Basic Safety and Essential Performance
- IEC 60601-1-2 Medial electrical equipment – Part 1-2: General requirements for basic safety and essential performance –Collateral standard: Electromagnetic disturbances – Requirements and tests
- EMC Emissions Group 1 Class A device requirements as per CISPR 11
- IEC 60601-1-6 Medial electrical equipment – Part 1-6: General requirements for safety - Collateral Standard: Usability
- IEC 60601-2-37 Medical electrical equipment – Part 2-37: Particular requirements for the safety of ultrasonic medical diagnostic and monitoring equipment
- ISO 10993-1 Biological evaluation of medical devices – Part 1: Evaluation and testing within a risk management process
- IEC 62366-1 Medical devices – application of usability engineering to medical devices
- IEC 62304 Medical device software – Software life cycle processes
- IEC 62359 Ultrasonic - Field characterization Test methods for the determination of thermal and mechanical indices related to medical diagnostic ultrasonic fields - Edition 2.1, 2017
- Directive 2011/65/EU on the restriction of use of certain hazardous substances
- Directive 2014/53/EU Radio Equipment (RED)
- According to Protection against electric shock in IEC/EN 60601-1 , Vivid iq is classified as Class I, with BF (probes) and CF (ECG leads) and Defibrillation- Proof Type (ICE catheters) applied parts according to IEC60601-1
- Commission Regulation (EU) No 207/2012 on electronic instructions for use of medical devices

Privacy & Security

Virus Protection

To reduce virus vulnerability, Vivid *iq* is configured with a minimal set of open ports and with all network services not actively used by the system closed down. This helps to reduce the risk of a virus attack on Vivid *iq*.

GE HealthCare is continuously judging the need for additional actions to reduce vulnerability of equipment; this includes vulnerability scanning of our products and evaluation of new security patches for the 3rd- party technology used. Microsoft® (and other) security patches that address serious issues with Vivid *iq* will be made available to customers after GE HealthCare verification of those patches.

Whitelisting

- Prevents non-listed applications from running
- To improve protection against potentially harmful software

User Policies

- Secure and advanced user password and login scheme according to user's password requirements

LDAP

- Users can log in to the system by using the same user credentials as used for domain connected computers

Disc Encryption

- Optional encryption of the scanner's E drive containing patient identifiable data

User Management

- Last login information
- Customer configurable login banner

Microsoft OS Patches

- OS vulnerability patches are distributed as part of regular SW maintenance releases during the life cycle of the product.

Service / Life cycle Offerings

Insite™ Express Connection (ExC)

- Enables Remote Service and Training
- Easy, flexible and secure connectivity configuration. The “Contact GE” on-screen button directly generates a real-time service request to the GE HealthCare online engineering or application specialist. It takes a snapshot (e.g., error logs, setup files) of the system at the time of the service request to enable analysis of problem before customer contact
- Virtual Console Observation (VCO) enables the customer to allow desktop screens to be viewed and controlled remotely over the encrypted

tunnel to enable real-time training, device configuration

- Operation of Insite Express Connection is dependent on the infrastructure being available – check with your local GE HealthCare service representative
- File transfer enables the customer (biomed or clinician) to directly transfer system information (e.g., system logs, images, parametric data) to GE HealthCare product engineering teams (no patient data transferred)
- Software reload provides remote application reconstruction and recovery capabilities in the event of system corruption

Smart Service Interface (SSI) (optional)

- A suite of GE HealthCare proprietary service tools, designed for expert Healthcare Technology Management Professionals who want to streamline troubleshooting and diagnostics on their GE HealthCare Vivid systems
- Provides an intelligent visual dashboard with drill-down capability to rapidly assess equipment status and health
- Can drive productivity by quickly isolating specific issues and decreasing overall system downtime
- SSI is available for licensed qualified users. Please contact your local sales representative for more information

eDelivery (optional)[7]

- eDelivery facilitates download of software patches for service purpose (e.g., security patches)
- It is also an enabler for the ability to download apps from the AppStore

Digital Expert (optional)[7]

- Enables the user to connect remotely to a GE HealthCare Clinical Specialist to receive application related training and help

Imaging Insights

- Support of Imaging Insights offering by providing system utilization data

Probe Check (optional)[8]

- Automated transducer element check and reporting of potential image quality impacts

[7] *eDelivery and Digital Expert may not be available in all countries and regions. Consult with a GE HealthCare representative for more details.*

[8] *Probe Check is offered as a standard feature in USA in compliance with FDA requirements. It may be available in other regions. Consult with a GE HealthCare representative for more details.*

Transducers





Name	3Sc-RS	6S-RS	12S-RS	6Tc-RS	9T-RS
Catalog#	H45041DL	H45021RP	H44901AB	H45551ZE	H45531YM
Description	Phased Array Transducer	Phased Array Transducer	Phased Array Transducer	TEE Transducer	TEE Transducer
Number of elements	64	96	96	64	44
Foot Print	18 x 24 mm	17 x 24 mm	13 x 18 mm	Tip(LxWxH) 45x14x12 mm	Tip(LxWxH) 35x11x8 mm
Max. Bandwidth	1 - 5 MHz	2 - 7 MHz	4 - 12 MHz	3 - 8 MHz	3 - 10 MHz
Field of View	120°	120°	90°	90°	90°
Depth of Field	30 cm	30 cm	14 cm	30 cm	14 cm
Biopsy Guide Available	Multi-angle disposable with a reusable bracket	N/A	N/A	N/A	N/A
Application					
Fetal/Obstetrics	+	+			
Abdominal [1]	+	+	+		
Thoracic/Pleural	+	+	+		
Pediatric	+	+	+		
Small Organ[2]					
Neonatal Cephalic		+	+		
Adult Cephalic	+				
Cardiac (Adult)	+	+	+	+	
Cardiac (Pediatric)	+	+	+		+
Peripheral Vascular					
Musculo-skeletal Conventional					
Musculo-skeletal Superficial					
Urology[3]					
Transesophageal				+	+
Transvaginal					
Transrectal	+	+	+		
Intra-cardiac and Intra-luminal					
Intraoperative (Vascular)					
Interventional Guidance[4]	+				

Transducers





Name	9L-RS	12L-RS	L8-18i-RS	4C-RS	C1-5-RS
Catalog#	H40442LL	H40402LY	H40462LF	H4000SR	H40462LA
Description	Linear Array Transducer	Linear Array Transducer	Intraoperative Linear Array Transducer	Curved Array Transducer	Curved Array Transducer
Number of elements	192	192	168	128	192
Foot Print	14 x 53 mm	13 x 47 mm	11 x 35 mm	18 x 66 mm	17 x 69 mm
Max. Bandwidth	2 - 10 MHz	4 - 13 MHz	4 - 18 MHz	1 - 5 MHz	1 - 5 MHz
Field of View	44 mm	38 mm	25 mm	58°	70°
Depth of Field	16 cm	12 cm	10 cm	33 cm	33cm
Biopsy Guide Available	Multi-angle disposable with a reusable bracket	Multi-angle disposable with a reusable bracket	N/A	Multi-angle disposable with a reusable bracket	Multi-angle disposable with a reusable bracket
Application					
Fetal/Obstetrics				+	+
Abdominal [1]	+	+		+	+
Thoracic/Pleural	+	+	+	+	+
Pediatric	+	+		+	+
Small Organ[2]	+	+	+		
Neonatal Cephalic	+	+			
Adult Cephalic					
Cardiac (Adult)					
Cardiac (Pediatric)					
Peripheral Vascular	+	+	+		
Musculo-skeletal Conventional	+	+	+	+	+
Musculo-skeletal Superficial	+	+	+	+	+
Urology[3]				+	+
Transesophageal					
Transvaginal					
Transrectal					
Intra-cardiac and Intra-luminal					
Intraoperative (Vascular)			+		
Interventional Guidance[4]	+	+		+	+

Transducers





Name	8C-RS	P2D	E8Cs-RS	ICE Cord-RS	AcuNav8F*
Catalog#	H40402LS	H45551CA	H48062AF	H48952AR	Distributed by Biosense Webster, Inc.
Description	Curved Array Transducer	Pencil Transducer	Endo Micro Convex Transducer	Connector Cable	Intra Cardiac Phased Array Catheter
Number of elements	128	2	128	N/A	64
Foot Print	12 x 22 mm	16 mm	19 x 24 mm	N/A	8 Fr diameter
Max. Bandwidth	3 - 10 MHz	1 - 3 MHz	3 - 10 MHz	N/A	4 - 12 MHz
Field of View	131°	N/A	168°	N/A	90°
Depth of Field	14 cm	N/A	14 cm	N/A	16 cm
Biopsy Guide Available	N/A	N/A	Single angle, disposable	N/A	N/A
Application					
Fetal/Obstetrics			+		
Abdominal [1]	+		+		
Thoracic/Pleural	+				
Pediatric	+				
Small Organ[2]	+				
Neonatal Cephalic	+				
Adult Cephalic					
Cardiac (Adult)	+	+			
Cardiac (Pediatric)	+				
Peripheral Vascular	+				
Musculo-skeletal Conventional	+				
Musculo-skeletal Superficial	+				
Urology[3]			+		
Transesophageal					
Transvaginal			+		
Transrectal	+		+		
Intra-cardiac and Intra-luminal					+
Intraoperative (Vascular)					
Interventional Guidance[4]			+		

Transducers

Name	AcuNav10F*	Sound Star 3D 10F*	Sound Star eco 10F*	Sound Star eco 8F*
Catalog#	Distributed by Biosense Webster, Inc.	Distributed by Biosense Webster, Inc.	Distributed by Biosense Webster, Inc.	Distributed by Biosense Webster, Inc.
Description	Intra Cardiac Phased Array Catheter	Intra Cardiac Phased Array Catheter	Intra Cardiac Phased Array Catheter	Intra Cardiac Phased Array Catheter
Number of elements	64	64	64	64
Foot Print	10 Fr diameter	10 Fr diameter	10 Fr diameter	8 Fr diameter
Max. Bandwidth	4 - 12 MHz	4 - 12 MHz	4 - 12 MHz	4 - 12 MHz
Field of View	90°	90°	90°	90°
Depth of Field	16 cm	16 cm	16 cm	16 cm
Biopsy Guide Available	N/A	N/A	N/A	N/A
Application				
Fetal/Obstetrics				
Abdominal [1]				
Thoracic/Pleural				
Pediatric				
Small Organ[2]				
Neonatal Cephalic				
Adult Cephalic				
Cardiac (Adult)				
Cardiac (Pediatric)				
Peripheral Vascular				
Musculo-skeletal Conventional				
Musculo-skeletal Superficial				
Urology[3]				
Transesophageal				
Transvaginal				
Transrectal				
Intra-cardiac and Intra-luminal	+	+	+	+
Intraoperative (Vascular)				
Interventional Guidance[4]				

[1] Abdominal including GYN

[2] Small Organ including breast, testes, thyroid

[3] Urology including prostate

[4] Interventional Guidance including Biopsy

NOTE:

* *Not available in all countries. Please contact Biosense Webster, Inc. for availability.*

Product may not be available in all countries and regions. Full product technical specification is available upon request. Contact a GE HealthCare Representative for more information. Please visit www.gehealthcare.com/promotional-locations.

Data subject to change.

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About GE HealthCare

GE HealthCare is a leading global medical technology and digital solutions innovator. GE HealthCare enables clinicians to make faster, more informed decisions through intelligent devices, diagnostic pharmaceuticals, data analytics, applications and services, supported by its Edison intelligence platform. With over 100 years of healthcare industry experience and around 50,000 employees globally, the company operates at the center of an ecosystem working toward precision health, digitizing healthcare, helping drive productivity and improve outcomes for patients, providers, health systems and researchers around the world. Follow us on Facebook.com, LinkedIn.com, Twitter.com and Insights.com or visit our website www.gehealthcare.com for more information.

GE HealthCare

9900 Innovation Drive Wauwatosa, WI 53226

U.S.A.

www.gehealthcare.com

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