PHILIPS

Ultrasound

Affiniti CVx

Designed for **cardiology**. Built for your everyday.

Affiniti CVx diagnostic ultrasound system specifications

Contents

1. Introduction

You always go above and beyond to provide the best care to your patients. But you are expected to do so with less time, fewer resources and higher patient volume. The care you want to provide deserves tools that can set you ahead and help you stay ahead.

We designed Philips Affiniti CVx to give you the confident results you need, in the time you have. Engineered for efficiency and reliability and powered by Philips superb performance, it gets you diagnostic images you need, quickly – even on the most technically difficult patients. Its intuitive design and walk-up usability help you provide elegant, efficient care – every day.

1.1 Applications

- Abdominal
- Fetal echo
- Cerebrovascular
- Vascular (peripheral and temporal TCD)
- Abdominal vascular
- Echocardiography (adult, pediatric, fetal)
- Stress echocardiography
- Transesophageal echocardiography (adult and pediatric)
- Surgical imaging
- Interventional imaging
- Contrast imaging
- Perioperative
- Epicardial echocardiography

54.6 cm (21.5 in) monitor articulates for easy viewing and folds down for transport

Tablet-like touchscreen supports easy navigation for commonly manipulated controls via flyout menu selections; reduces button presses

Goes to sleep in two seconds; back to full functionality in 20 seconds

Elegant control panel, simplified for ease of use

Service Request button for immediate access to Philips support

Four transducer ports and one-handed transducer access

2. System overview

2.1 System architecture

- Offers up to 4,718,592 total digital channels
- Ultra-low noise, wide dynamic range, 280 dB, digital broadband acoustic beamforming with proprietary architecture
- Powerful distributed multi-core processing architecture capable of achieving 225 x 10⁹ 40-bit Multiply-Accumulates/second
- Includes 512 GB hard drive support for transducer frequencies up to 22 MHz
- Optimized for high definition 54.6 cm (21.5 in) LED display
- Operating system supports Windows 10 IoT Enterprise LTSB 2016
- Designed to support virtually any array configuration: xMATRIX, sector, linear, curved, tightly curved and TEE
- Contrast imaging uses both Pulse Inversion and power modulation technologies
- Supports depths from skin line (using zoom function) to 40 cm
- Philips SonoCT real-time compound imaging
  - High-precision beam-steered image compounding that acquires more tissue information and reduces angle-generated artifacts
  - Up to nine lines of sight, obtained by steering the ultrasound beam, available on linear, curved and tightly curved arrays and mechanical volume arrays
  - WideSCAN capability to expand field of view during SonoCT imaging
  - Trapezoid capability
  - SonoCT capability available during contrast imaging modes
  - Needle Visualization
    - Enhances the visibility of needles in the region of needle enhancement
    - Provides options for needle approach and various degrees of needle paths and angles

- Variable XRES is an extension of Philips exclusive XRES speckle noise reduction feature that allows the user to select progressive amounts of noise reduction, edge enhancement and textural smoothing. Available with specific transducers under certain tissue-specific presets, users have the option to select the imaging characteristics of their choice from crisp to smooth tissue textures, providing enhanced visualization of target anatomic structures.
- Philips XRES Pro features our high-resolution image processing that elevates tissue definition and image quality to new levels
  - Performs 350 million calculations per frame of image data over 1900 frames per second
  - Operates in 2D and 2D/CFI/Doppler/TDI mixed modes over 1900 frames per second
  - Offers XRES capability in contrast imaging modes
- Image Boost is an advanced image processing technique that suppresses unwanted clutter signals and boosts desired signals from myocardium and other cardiac structures
  - Available on the X5-1, S5-1 with Adult Cardiology clinical option
- Philips adaptive broadband flow imaging
- Doppler bandwidth that automatically adjusts for outstanding flow sensitivity and resolution
- Advanced dynamic motion suppression algorithms that reduce flash artifacts
- Fully independent triplex multiple mode operation for ease of use during Doppler procedures
- Auto Doppler flow optimization for carotid/arterial applications using linear array transducers
  - Automatically adjusts color box position and angle
  - Automatically adjusts PW sample volume placement and angle
  - Includes Auto Flow Tracking for automatic angle correction with sample volume movements
- Advanced stress echo applications
  - Stress protocols with up to ten stages
  - Forty views per stage by five modes
- Multi-application SmartExam workflow protocols
  - Stress echo, echo, abdominal and vascular applications
  - Step-by-step on-screen guidance during exam
  - Full user customization
  - Record function for creation of custom protocols
  - Automatic mode switching including 3D
- Fast system boot up: from off, approximately 110 seconds
- Transport mode: from sleep mode to on, approximately 20 seconds
  - Transport mode lasts 40 minutes before recharge is needed

2.2 Imaging formats

- 2D linear: WideSCAN with SonoCT
- 2D curved: WideSCAN with SonoCT
- 2D sector
- 2D virtual apex sector imaging with wide field of view
- 2D trapezoid
- Dual 2D
- Panoramic imaging
- Live 3D/4D volume
- Live 3D/4D zoom
- 3D full volume
- 2D, MPR and volume
- Dual volume for full volume, 3D zoom and iCrop
- MaxVue image format
  - Allows use of entire monitor viewing area for displaying image with a push of a button
  - Uses a high-definition resolution and an aspect ratio of 16:9

2.3 Imaging modes

- 2D grayscale imaging with advanced pulse coding, pulse shaping and frequency compounding technologies
- M-mode
- M-mode color Doppler
- M-mode tissue Doppler
- M-mode trapezoid
- Anatomical M-mode
- TDI M-mode
- Tissue Doppler Imaging (TDI)
- Adaptive Doppler
- Adaptive Broadband Color Flow
- Color compare mode
- 3D imaging
- 3D imaging with Color Doppler
- Live xPlane imaging (simultaneous display of two live imaging planes)
- Tissue Harmonic Imaging (THI) with pulse inversion technology
- Multivariate Tissue Harmonic Imaging including pulse inversion technology
- Image Boost is an advanced image processing technique that suppresses unwanted clutter signals and boosts desired signals from myocardium and other cardiac structures
  - Available on the X5-1, S5-1 with Adult Cardiology clinical option
- Left ventricular opacification (LVO) with pulse inversion and power modulation technologies
- SonoCT beam-steered real-time compound imaging
- Harmonic SonoCT imaging
- Up to five levels of XRES adaptive image processing technology
  - Variable settings available to the user
- iSCAN intelligent scanning for one-button TGC and gain optimization (i.e., adaptive gain compensation – AGC)
- AutoSCAN with adaptive gain compensation (AGC) for real-time frame-by-frame TGC optimization
- Simultaneous 2D M-mode
- Color Doppler
- Color Power Angio imaging (CPA) and directional CPA

- High resolution option available in relevant clinical applications
- High-PRF pulsed wave (PW) Doppler
- Duplex and simultaneous 2D/PW Doppler
- Duplex continuous wave (CW) Doppler
- Duplex, color flow, CW Doppler
- Duplex 2D, CPA, color flow, PW Doppler
- Auto Doppler optimization: Auto PW Doppler, color Doppler, flow optimization for one-button angle correction and steering
- Independent triplex mode for simultaneous 2D, CPA, color flow, PW Doppler
- Dual imaging with:
  - Two work flow choices; single buffer or dual buffer
  - Mixed mode display with one image live while other is frozen, for example, 2D/2D, 2D/color, color/color, color/CPA
- High definition zoom (write zoom)
- Reconstructed zoom with pan (read zoom)
- Panoramic imaging
- SonoCT panoramic imaging with XRES and harmonic modes
- Chroma imaging in 2D, 3D, QLAB MPR and iSlice, Panoramic, M-mode and Doppler modes

M-mode
- Available on all imaging transducers
- Anatomic M-mode available on all imaging transducers
- TDI M-mode available in cardiac applications
- Selectable sweeping rates
- Time markers: 0.1 and 0.2 seconds
- Acquisition zoom capability
- Selectable display format prospective or retrospective (1/3-2/3, 1/2-1/2, 2/3-1/3, side-by-side, full screen)
- Chroma colorization with multiple color maps
- Cineloop review for retrospective analysis of M-mode data 256 (8 bits) discrete gray levels

2D imaging
- Available with all imaging transducers
- Adjustable sector width and position during live imaging
- Ability to invert image left and right, top and bottom
- Receive gain
- LGC (lateral gain compensation) on cardiac sector transducers
- Selection between one and eight focal zones
- Dynamic range or echo compression, transducer and Tissue Specific Presets (TSP)-dependent
- Gray map
- Chroma imaging providing colorized luminance maps
- Acquisition zoom (HD zoom): ability to position the zoom ROI anywhere within the image and change the height and width of the zoom ROI
- Display zoom and magnify on live or frozen images up to 16 times
- Three levels of frame rate
- Support of frame rates of up to 1900 frames per second
- Tissue optimization
- Contrast resolution enhancement
- Tissue Harmonic Imaging
- SonoCT imaging

- Post-processing includes gain, dynamic range, up/down invert, right/left invert, zoom, gray map and Chroma map
- Live Compare imaging; side-by-side comparison of 2D images where the current live image is compared to a stored image from the same study or retrieved multimodality image
- WideSCAN or trapezoid imaging
- XRES technology
- Persistence (frame averaging)
- Grayscale standard display
- AutoSCAN with adaptive gain compensation (AGC) for real-time line-by-line TGC optimization

Tissue Harmonic Imaging (THI)
- Provides second harmonic processing to reduce artifacts and provides high quality images
- Multivariate pulsing including patented pulse inversion phase cancellation technology for increased detail resolution during harmonic imaging
- Available in all clinical applications
- Extends high performance imaging capabilities to all patient body types
- Support of SonoCT (Harmonic SonoCT) and XRES modes

Color Doppler
- Available on all imaging transducers
- Color gain
- Region of Interest (ROI)
- Freq Opt: fixed transmit/receive frequencies including adaptive flow
- Seventeen selectable baseline positions for CV, nine selectable baseline positions for GI, WHC
- Baseline invert
- B/W suppress
- Color blending
- Color compare dual display (B/W on left, color on right)
- Color map
- Color persistence
- Color trapezoid
- Flow optimization: GI, WHC
- Output power
- Magnify (range from 0.8X to 8X)
- Scale sector width and position on curved and phased array transducers
- Simultaneous mode during PW mode
- Smoothing
- Ability to steer between ±20° steer angle on linear array transducers
- Variance
- Wall filter
- Write priority
- Zoom
- Cineloop review with full playback control
- Advanced motion suppression algorithms adapt to various application types to selectively reduce color motion artifacts
- 256 color bins
- Post-processing includes baseline, color invert, color map, hide color, write priority, blend, variance and zoom

- Parallelogram steering on linear array transducers; three angles on L12-5 50 and L18-5, thirty-one angles on L12-3, L12-4 and L15-7io
- Trackball-controlled color Region of Interest: size and position
- Maps, filters, color sensitivity, line density, smoothing, echo write priority, color persistence, gain and baseline optimized automatically by exam type or is user-selectable
- Velocity and variance displays
- Color invert in live and frozen imaging
- Frequency optimization control for spatial resolution and penetration optimization
- Color and 2D line density control
- Automatically adapts transmit and receive bandwidth processing based on the color box position, providing exceptional sensitivity and color resolution
- Color Doppler PRF maximum 34 KHz, dependent on transducer and clinical application

Color Power Angio imaging (CPA)
- Automatically adapts transmit and receive bandwidth processing based on the color box position providing excellent sensitivity and color resolution
- Highly sensitive mode for small vessel visualization
- Available on all imaging transducers for general imaging and women's healthcare
- Cineloop review
- Multiple color maps
- Individual controls for gain, filters, sensitivity, echo write priority and color invert
- Adjustable CPA Region of Interest: size and position
- User-selectable persistence
- User-selectable blending on/off
- Cineloop review with full playback control
- Advanced motion suppression algorithms adapt to various application types to selectively eliminate virtually all color motion artifact
- 256 color bins
- Post-processing includes hide CPA, write priority, invert, DCPA map, blend and zoom
- Parallelogram steering on linear array transducers; three angles on L12-5 50 and L18-5, thirty-one angles on L12-3, L12-4 and L15-7io
- Trackball-controlled color Region of Interest: size and position
- Maps, filters, color sensitivity, line density, smoothing, echo write priority, color persistence, gain and baseline optimized automatically by exam type or is user-selectable
- Velocity and variance displays
- Color invert in live and frozen imaging
- Frequency optimization control for spatial resolution and penetration optimization
- Color and 2D line density control
- Automatically adapts transmit and receive bandwidth processing based on the color box position, providing optimal sensitivity and color resolution
- CPA PRF maximum 34 KHz, dependent on transducer and clinical application

MicroFlow Imaging (MFI)
· Highly sensitive imaging mode designed to detect slow and weak blood flow anatomy in tissue

Spectral Doppler
· Display annotations including Doppler mode, scale (cm/sec) Nyquist limit, wall filter setting, gain, acoustic output status, sample volume size, normal/inverted, angle correction, grayscale curve
· Ultra-high resolution millisecond spectral FFT rate
· Angle correction with automatic velocity scale adjustment
· Adjustable velocity display ranges
· Nine position shifts (including 0)
· Normal/invert display around horizontal zero line
· Five selectable sweep speeds: Min, Slow, Medium, Fast and Max
· Selectable low-frequency signal filtering with adjustable wall filter settings
· Selectable grayscale curve for optimal display
· Selectable Chroma colorization maps
· Selectable display format prospective or retrospective – 1/3-2/3, 1/2-1/2, 2/3-1/3, side-by-side, full screen
· Steering available to up to 90° (+/- 45°), dependent on transducer and clinical application
· Doppler review for retrospective analysis of Doppler data
· 256 (8 bits) discrete gray levels
· Post-processing includes gain, compress, invert, baseline, angle correct, Quick angle, display format, sweep speed, reject, Chroma map
· Available on all imaging transducers
· Adjustable sample volume size: 1.0-20 mm (transducer-dependent)
· Simultaneous or duplex mode of operation
· Simultaneous 2D, color Doppler, pulsed Doppler
· High-PRF capability in all modes including duplex, simultaneous duplex and triplex
· PRF range between 200 Hz-34 KHz, depending on transducer and clinical application
· 50 dB or more gain available to the user, depending on clinical application
· iSCAN optimization that automatically adjusts scale and baseline

Auto color and Auto Doppler
· In live imaging provides the following capabilities:
  – Automatically adjusts color box position and angle
  – Automatically adjusts PW sample volume placement and angle
  – Includes Auto Flow Tracking for automatic angle correction with sample volume movements
  – Automatically adjusts PW scale and baseline
· When image is frozen and Doppler is active, automatically adjusts PW scale and baseline
· Auto color and Auto Doppler is available on the linear transducers L12-3, L12-4, L12-5 50, L18-5 and L15-7io in carotid/arterial vascular applications
· Auto Doppler is available on the curvilinear transducers C5-1, C6-2, C8-5 and C9-2

Steerable continuous wave (CW) Doppler
· Available on all cardiac applications using sector transducers
· Steerable through 90° sector
· Maximum velocity range: 19 m/sec (transducer-dependent)
· iSCAN optimization that automatically adjusts scale and baseline

Tissue Doppler Imaging (TDI/TDI PW)
· Available on all cardiac imaging transducers (except S7-3t)
· Frame rate control: high frame rate acquisition of tissue motion (up to 240 fps)
· TDI gain, TGC and LGC compatible
· TDI Opt: optimized transmit and receive frequencies
· Eight maps
· TDI M-mode and TDI-PW available, dependent on transducer and clinical application

iRotate echo (X5-1, X7-2t and X8-2t*)
· Ability to image in 2D and rotate the image without moving the transducer
· Home rotational key
· High frame rate rotational imaging

Live xPlane imaging
· Available on X5-1, X7-2t and X8-2t* xMATRIX transducers
· Simultaneous display of two live imaging planes
· Color and grayscale modes
· Lateral, rotational and elevation steering
· Live xPlane pulse Doppler (available on X8-2t*) allows precise placement of the Doppler sample volume using both longitudinal and transverse reference image

Live 3D echo
· Available on X7-2t and X8-2t* xMATRIX transducer
· Live full volume imaging
· High volume rate imaging (HVR)
· ECG display
· Live one-beat, two-beat, four-beat and six-beat
· 3D volume imaging
· Long volume loop acquire in Live 3D
· Beat-by-beat retrospective 3D loop selection
· Live 3D color flow imaging
· High volume rate (HVR) echo and color
· Live 3D zoom and Live 3D zoom preview
· Live 3D zoom supports region of interest resize and reposition within the Live 3D mode
· One-beat focused volume
· Half clam shell
· Left and right clam shell switching
· Two volume viewing display
· Crop adjust with cropping
· 3D color flow
· 3D Zoom: 2D and Color
· 3D Zoom: 2D and Color Preview
· Enhanced Live 3D dynamic colorization for enhanced 3D effect
· Full volume sweep

- Adjustable live volume angle control
- Volume rotation using 3D Rotate and Rotate-Z
- Dynamic colorization
- Adjustable vision preset control
- Adjustable center, back, front, volume imaging control
- Maximum 105° by 105° live volume imaging (mode-dependent)
- Support of volume rates up to 90 vps

Live 3D and MultiVue/multislice imaging
- Supported on X7-2t and X8-2t xMATRIX transducers
  - MultiVue supports volume display with 3D rendering
  - Multiple MPR layouts and up to 12 live MPR planes visualized (MultiSlice)
  - Intuitive MPR aiignment (single click on MPR and Live 3D) and adjustment
  - Possibility to lock and unlock relative MPRs
  - Viewline enables the possibility to overlay the MPRs on the 3D rendering
  - Possibility to memorize MPR location for quick alignment

Freehand 3D volume and MPR imaging
- Qualitative grayscale volume acquisition supported on all imaging transducers
- Volume display with surface rendering (transparency, brightness and lighting controls)
- Multiplanar view display
- Specialized algorithms and maps increase 3D display
- Trim tools on both volume and multiplanar reconstructed (MPR) views
- Supported by SonoCT and XRES modes to help reduce noise artifacts
- Resize control that adjusts for different sweep speeds
- On-screen orientation markers

Panoramic imaging
- Real-time extended field-of-view composite imaging, acquired in fundamental or SonoCT mode
- Ability to acquire composite image in XRES mode
- Ability to back up and realign the image during acquisition
- Full zoom, pan, cineloop review and image rotation capabilities
- Auto fit of composite image
- Distance, curved-linear distance and area in review mode can be measured with distance marker displayed via skin-line ruler
- Ability to display or remove skin-line ruler
- Cineloop review that allows measurement on individual frames
- Scaling information included for connectivity prints allowing for measurements on a workstation
- Available on linear and curved array transducers (not available on endovaginal transducers)

Contrast imaging – cardiovascular
- System optimized for left ventricular opacification
- One-touch solution (one-button access in Adult Echo preset) with settings for bolus and infusion
- S5-1 broad bandwidth pulse inversion and power modulation technologies for high sensitivity

- LVO on and off and contrast optimization choices and transmit power settings that can be saved with Gain Save feature for stress echo studies, reducing setup time for image acquisition at peak stress
- Supported on the X5-1, S5-1 and S4-2 transducers

Contrast imaging – general imaging
- System optimized for detecting contrast agent signatures as they are approved for use
- Contrast modes available on C5-1, C6-2, C9-2, L12-3, L12-4 and L12-5 transducers
- Up to 10 Chroma maps for enhanced contrast imaging
- Mid-MI contrast modes available on C5-1, C9-2 transducers
- Pulse modulation contrast imaging available with SonoCT and XRES technologies
- Touchscreen display timer
- Advanced non-linear pulsing schemes with XRES for increased contrast sensitivity
- High frequency contrast capability
- Flash imaging
- Dual imaging mode for simultaneous fundamental and contrast displays
- Dual imaging contrast mode supports simultaneous mirrored calipers duplicating measurements on both the fundamental and contrast displays
- ECG/timed triggering
- Long loop capture mode during contrast procedures (3-10 minutes)
- QLAB ROI and MVI display

Interventional imaging
- TSP available on selected transducers for optimal imaging during interventional and biopsy procedures
- Biopsy guide selection menus
- Contrast and interventional modes
- Support of multiple biopsy angles on S5-1, C5-1, C6-2, C9-2, L12-3 and L12-4

3. System controls

Philips common user experience provides readily accessible and logically grouped primary controls along with an easy-to-learn graphical user interface.

3.1 Optimization controls

2D grayscale imaging
- Smart TGC: pre-defined TGC curves optimized for consistently excellent imaging with minimal TGC adjustment
- Lateral gain compensation (LGC) and Smart LGC for cardiac sector transducers
- Adjustable temporal resolution and spatial resolution with DRS control
- Selection between one and eight transmit focal zones
- 16-level digital reconstructed zoom with pan capability
- High definition zoom that concentrates all image processing power into a user-defined area of interest; including HD Zoom Pan and possible to combine high definition zoom with pan zoom
- Cineloop image review
- Selectable 2D compression settings
- Tissue aberration correction
- Sector size and steering control for sector and curved array image formats
- Selectable 2D line density with DRS control
- Dual imaging with either independent cineloop buffers or split screen imaging
- Dual imaging with color compare
- Dual imaging with fundamental and contrast optimization
- Chroma imaging with multiple color maps
- 256 (8 bits) discrete gray levels
- 2D acquisition frame rate up to 1900 frames/sec (dependent on field of view, depth and angle)

SonoCT real-time compound imaging
- Available on all transducers except sector
- Reduced clutter and artifacts
- Automatic selection of the number of steering angles based on the user-selected resolution/frame rate (Res/Speed) condition
- Up to nine lines of sight automatically adjusted via DRS control
- Operates in conjunction with Tissue Harmonic Imaging, volume modes, panoramic imaging and duplex Doppler
- Operates in conjunction with XRES
- Available in contrast modes
- Available with WideSCAN format during 2D imaging for extended field-of-view operation

XRES adaptive image processing
- Available on all imaging transducers
- Reduces speckle noise and enhances border definition
- Available in all imaging modes including color flow and Doppler
- Available in contrast modes
- Operates in conjunction with SonoCT imaging

- Provides high resolution algorithms for advanced speckle noise reduction, refined tissue pattern displays, and fine border definition
- Provides high speed processing that allows up to 1900 frames-per-second displays
- Five different levels available, dependent on transducer and clinical application
- XRES Pro image processing available, dependent on transducer and clinical application

Tissue aberration correction (TAC)
- Automatically enabled when ABD maximum penetration TSP is selected on C5-1 transducer
  – Corrects for speed of sound disturbances due to excessive adipose layer on obese patients
  – Corrects for speed of sound disturbances in fatty tissue

iSCAN intelligent image optimization
- One-touch image optimization
  – In 2D mode, one-button automatic adjustment of system gain and TGC to achieve balanced brightness of tissues
- Available in contrast imaging for selected transducers and applications
  – Independent settings based upon whether the contrast timer is active
- In Doppler mode, one-button automatic adjustment of:
  – Doppler PRF based on detected velocity
  – Doppler baseline based on detected flow direction
- Available on all imaging transducers
- Operates in conjunction with SonoCT and XRES imaging
- AutoSCAN continuous automatic optimization
- Adaptive gain compensation (AGC) dynamically adjusts (every pixel on every scan line) low level 2D echoes to reduce gain artifacts (shadows/through transmission) and enhance image uniformity with 2D and 3D imaging

AutoSCAN intelligent image optimization
- Continuous, real-time adjustment of system gain and TGC to achieve balanced brightness of tissues
  – When activated, applies gain balancing to all grayscale image data including 2D, 3D and M-mode grayscale data
  – Every image frame has individually adjusted image brightness
  – Available from 2D touchscreen controls

iOPTIMIZE intelligent image optimization
Multiple technologies for one-button approach
to automatically and immediately adjust system
performance for different patient sizes, flow states,
and clinical requirements.
- **Tissue Specific Presets** – adjusts over 7,500
  parameters during transducer/application selection
- **Patient optimization** – adjusts 2D performance
  to immediately adapt to different patient sizes
- **Flow optimization** – adjusts broadband flow performance
  to immediately adapt to different flow states
- **Dynamic resolution system (DRS)** – one control adjusts
  nearly 40 parameters simultaneously for user preference
  of spatial resolution or temporal resolution during clinical
  procedures
- One control optimizes functions such as:
  – Line density
  – Persistence
  – Pulse inversion harmonics
  – Synthetic aperture
  – Number of lines of sight (SonoCT)
  – RF interpolation
  – Parallel beamforming

3.2 Control panel

- Easy-to-learn graphical user interface with reduced
  number of hard controls
- Primary controls concentrated in cluster around trackball
- Tri-state control panel lighting (active, available,
  and unavailable)
- Ambient lighting control for exceptional image viewing
  in both light and dark environments
- Full-color 12-inch capacitive touchscreen, complete with
  swipe technology, enables easy navigation of controls and
  system interaction
- Dual function mode switch and independent gain controls
  for 2D, CPA, M-mode, Color, PW, CW Doppler, TDI and 3D
- Eight-slide pot control adjustment of TGC curve
- iSCAN control for 2D/Doppler automatic optimization
- High definition/pan zoom control
- Dual mode control
- Freeze control
- Three programmable acquire controls

3.3 Touchscreen

- Widescreen touchscreen for dynamic presentation of
  controls via flyout menu selections; reduces button presses
- Workflow-related controls (Patient, Review, Report,
  End Exam, Help) always present on touchscreen
- Direct selection of any attached transducer
- Automatic or manual selection of Tissue Specific
  Presets parameters
- Tabbed layout and swipe capability for quick access
  to hidden controls
- Touchscreen control adjustment of LGC and TGC curve
  with simultaneous display of image on touchscreen
  to enhance ergonomics and reduce user steps
- Touchscreen alphanumeric keyboard for text entry
- TouchVue manipulation and icon-driven 3D workflow
  on touchscreen simplify 3D data navigation

4. Workflow

The Affiniti CVx ultrasound system features innovative Philips technologies that combine for outstanding performance and efficient workflow.

4.1 Ergonomics

- Advanced control panel design with fewer, clustered controls and easily accessed mode keys to reduce reach
- Tri-state lighting that provides immediate feedback of active, available and unavailable controls
- Widescreen touchscreen allows more controls to be available at a time
- Touchscreen controls are grouped for quick recognition
- Many touchscreen controls can also be accessed from the main display, allowing user to maintain consistent visual focus
- Independent adjustment of height, rotation and lateral movement of monitor and control panel allowing enhanced user posture, increasing comfort during exams (meets industry standards recommendation for the prevention of WRMSD)
- Highly mobile cart that facilitates portable exams and positioning in confined space environments

4.2 Display annotation

- On-screen annotation of all pertinent imaging parameters for complete documentation, including transducer type and frequency, active clinical options and optimized presets, display depth, TGC curve, grayscale, color map, frame rate, compression map value, color gain, color image mode, hospital name and patient demographic data
- User-selectable display of patient birth date, patient gender, institution name, system name and user
- Fixed position title area for consistent annotation
- Patient name, ID, birth date, gender and system date that can be turned off (hidden) for generating still images for publication
- Additional patient information can be displayed on demand
- Sector steering icon for endocavitary transducers
- Scan plane orientation marker
- User-selectable depth scale display
- Real-time display of mechanical index (MI)

- Real-time display of thermal index (TIb, TIc, TIs)
- Multiple trackball-driven annotation arrows
- Pre-defined annotations and body markers (application-specific and user-selectable), with two body markers supported in dual imaging format
- Annotations editable and movable in Review
- Configurable label control for quick access to labels and body markers
- Doppler baseline invert in live and frozen imaging
- Compression changes available live or scrolling loop
- TGC curve (On/Auto/Off display)
- TGC values (On/Off display)
- Tool Tips provides a brief description of the abbreviated on-screen image parameters
- Trackball icon displaying functions assigned to trackball buttons
- Informative trackball arbitration prompts
- Thumbnail display of images printed/stored
- On-screen selection and display of calculations
- On-screen selection and editing of protocols
- Calculations results and analysis labels
- Graphical tabs that allow navigation to other analysis features
- Network and connectivity icons to allow immediate feedback about network and printer conditions
- Icons to display status of and/or allow access to the following functions: Print Job status, media read/write status, battery level, wireless connectivity, remote service, microphone, HIPAA status indicator icon, iSCAN status, acquisition status, physio status
- Cineloop frame number display
- Cineloop bar with trim markers
- Prompt region for display of informational text and icons
- Trackball icon displaying functions assigned to trackball buttons
- Contrast specification
- Protocol procedure list with status

4.3 SmartExam protocols

- On-screen selection and editing of protocols
- Exam guide with on-screen display
- Required views based on exam type
- SmartExam customization
  – Creates a protocol as the user performs an exam
  – Saves all annotation, body markers and labeled measurements defined in each view
  – Records modes used to capture each view
  – Captures the acquisition method (print, capture, 3D data set) in each individual view
  – Provides user ability to pause and resume recording process if needed
  – Allows user to edit views before finalizing new protocol
- Fully customizable protocol capability for any clinical application supported on the system with flexibility to conduct the examination protocol in any sequence
- Preset protocols including but not limited to abdominal, vascular and cardiac exams based on industry and accreditation guidelines

- Automatic launching of annotation and body marker icon on required views
- Ability to automatically launch modes (2D, 3D, color modes, Doppler, dual, color compare) defined in a SmartExam
- Ability to pause and resume SmartExam function at any time
- Flexibility for automatic or manual advance of views
- Quick access tool bar for protocol navigation
- System analysis capabilities supported in all defined protocols

4.4 Stress echo

- Acquisition of echocardiography single frame or loops of the left ventricle in any imaging mode including 2D, color and spectral Doppler
- Gain Save that adjusts automatically to different views and automatically saves your preferred control settings, such as gain, depth, ROI, position and many other parameters:
  – For each view while acquiring resting images
  – At immediate post-exercise, automatic retrieval of saved settings for each view
  – Different gain profiles for parasternal LAX and SAX views, AP4 and AP2 views allowed
- Length of acquired images that is user-adjustable between 1 and 180 seconds
- Ability to acquire routine cardiac images in timed and R-R interval clip (varies with selected compression ratio and available system memory)
- For timed acquisition, the ability to start acquisition on the R-wave if the ECG is active and an R-wave is present
- Your preferred control settings automatically saved – such as MI (mechanical index), gain and depth for each view while acquiring resting images
- Live Compare
- Ability to defer selection by stage
- Default stress protocols
  – Factory-provided non-editable default protocols include:
    – Two-stage exercise stress
    – Four-stage pharmacological stress
    – Three-stage exercise stress (bicycle)
    – Four-stage quantitative: wall motion and contrast
- Default protocols that may be used as the basis for user-defined versions
  – Support between 1 and 10 stages
  – Support user-defined stage names
  – Support between 1 and 40 views per stage
  – Support user-defined view names
  – Prompt for a particular stage and view
  – Assign stage and view names
  – Set clip length for each image or group of images
  – Set the number of cycles/beats for each image
  – Define prospective, retrospective, or multi-cycle/full disclosure acquisition
  – Define the capture format of each image or group of images
  – Define the default replay mode for each protocol
  – Set mode acquisition for each view

- Support for up to five modes
- Save user-defined protocols within a preset
- Save user-defined protocols to removable media for import onto separate systems at the same software level
- Modify protocols during use
- Add stages at any point after the current stage
- Pre and post data curves
- Pre and post bull's-eye maps
- Pre and post strain comparisons
- aBiometry Assist utilizes anatomical intelligence technology for automatic measurements of the most commonly used fetal biometry parameters BPD, OFD, HC, AC and FL

4.5 QuickSAVE feature

- The system provides the ability to quickly save preferred system settings as individual exam types
- Over 40 QuickSAVE exams can be created per transducer
- Saved parameters include virtually all imaging parameters as well as color box size
- QuickSAVE exams can be copied to USB/DVD and transferred to other systems of like configuration
- Factory default exam types can be hidden, allowing only display of the QuickSAVE exam types

4.6 Image presentation

- Up/down
- Left/right
- Multiple duplex image formats (1/3-2/3, 1/2-1/2, 2/3-1/3, 50/50 and full screen)
- MaxVue image format
  - Allows use of entire monitor viewing area for displaying image with a push of a button
  - Uses a high-definition resolution and an aspect ratio of 16:9
- Depth from 1 cm to 40 cm (transducer-dependent)

4.7 Cineloop review

- Acquisition, storage in local memory, and display in real-time and duplex modes of up to 2,200 frames of 2D and color images, up to 64 seconds of Doppler data and M-mode for retrospective review and image selection, or up to 48 seconds CW for retrospective review and image selection
- Prospective or retrospective loop acquire "accept" prior to store or clip store
- Trackball control of image selection
- Variable playback speed
- Trim capability of 2D data
- Available in all imaging modes plus:
  - Panoramic imaging
  - 3D imaging

- Independent control of 2D image or spectral data in duplex mode
- Simultaneous control of 2D and spectral data in simultaneous mode
- On-screen display of current 2D frame number
- Many controls available in cineloop review for post-processing, such as 2D gain, dynamic range/compress, XRES, magnify zoom

4.8 Exam management features

- Internal storage
- Data export
- Temporary ID feature
  - One-click start of exam from patient data entry screen with system-provided information
  - Storage of images that were created without a patient name with a temporary identification
  - Patient identification via bar code reader

Rapid Procedure Setup
- With a single selection, choose transducer, preset, study type, study description and optionally gender
- Procedure definitions are built-in for built-in study types
- Additional procedure definitions may be added by the user
- Procedure may be automatically selected based on modality Worklist scheduled procedure information

4.9 Connectivity
Standard connectivity features
- Digital image acquisition and on-board patient exam storage
  - Direct digital storage of B/W and color loops to internal hard disk drives
  - Combined 512 GB storage capacity
  - Storage capacity of approximately 350 patient exams (assuming 40 images, 6 seconds of clips/reports per exam)
  - Fully integrated user interface
  - User-configurable "auto delete" capability
  - On-screen recall, measurement and text editing
  - Exam directory
  - Append exam
    - To existing study
    - To new study using existing patient information
- Data types
  - 2D, M-mode, Doppler spectral frame acquisition
  - 2D clip acquisition up to 2,200 frames per clip
  - Scrolling M-mode, Doppler acquisition
  - Cardiac temporal volume acquisition: Live 3D, full volume 3D
  - 3D clips: volume render views and MPR views
  - Q-Apps frames and clips
- Printing
  - Local print to on-board or off-board video printers
  - Printing of images in configurable N-up format to local plain paper printers
  - Page report print
  - DICOM grayscale or color print

- Media storage and retrieval
  - Export DICOM Image and structured report export to removable media
  - Export PC format image export to removable media
  - Export PDF report to removable media
  - Supported media
    - Read and write (single session) to CD (CD+R)
    - DVD read-only (DVD+R)
    - DVD read + write (single session) (DVD+RW)
    - USB storage (flash memory or hard drives)
    - Export PC format images and loops to network share
    - Export PDF report to network share
  - DICOM image import
    - Ultrasound images
    - Multimodality images (CT/MRI/X-Ray/Mammography/PET)
  - OB trending data
    - Export OB trending information via USB storage device
    - Import OB trending information via USB storage device
    - Export and import of trending data is compatible with iU22
- RS-232 serial storage
  - Export of report data to off-line analysis computer programs
- Basic networking connectivity
  - Wired gigabit Ethernet
  - Wireless networking
  - 2x2 second-generation IEEE802.11ac Wave 2 wireless adapter
  - Dual bands (2.4 GHz and 5 GHz)
  - Supported data rates
    - 802.11ac 6.5-867 Mbps
    - 802.11n 6.5-300 Mbps
    - 802.11g 6-54 Mbps
    - 802.11b 1-11 Mbps
    - 802.11a 6-54 Mbps
  - Features include
    - MU-MIMO with two spatial streams transmit beamforming
    - Fast channel switch (1 ms within band and 2 ms across bands
    - High-density modulation (up to 256-QAM)
    - Low-density parity check (LDPC)
    - Maximum ratio combining (MRC)
    - Rx space time block code (STBC)
    - Offloading for minimal host utilization at 802.11ac speeds
    - Compliant with iEEE802.11 d, e, j and i amendments
    - Wireless security
    - WPA2 Personal
    - WPA2 Enterprise EAP-TLS, PEAP/MS-CHAPv2, PEAP/EAP-TLSIPV4 addressing: static or DHCP for system address, static or hostnames (DNS lookup) for server addresses
    - IPV6 addressing: link local, router discovery, or DHCP for system address, host names for server addresses
  - Network addressing
    - IPV4 addressing: static or DHCP for system address, static or hostnames (DNS lookup) for server addresses
    - IPV6 addressing: link local, router discovery, or DHCP for system address, host names for server addresses

NetLink connectivity option
- Supported DICOM services
  - Image storage
  - Structured Report (SR) storage includes vascular, adult echo, pediatric echo, fetal echo, congenital cardiology
  - Modality Worklist with automatic patient demographic entry
  - Modality Performed Procedure Step (MPPS)
  - Storage commitment push model
  - Query/retrieve of ultrasound images (study-root)
- Image and structured report export to network storage servers
  - Send images after each Print/Acquire
  - Send images at End of Exam (batch send)
  - Send images and report on-demand during exam
  - Send images or exams manually
  - Send to up to 5 storage SCPs concurrently (at End Exam or after each Print/Acquire)
  - Independently configurable destinations for each acquisition control (e.g., Acquire1, Acquire2, Save 3D, etc.)
- DICOM compression options
  - Uncompressed (Explicit VR Little Endian, Implicit VR Little Endian)
  - JPEG lossy compression (loops) with configurable quality factor 60-100
  - RLE lossless compression
  - JPEG lossless compression (frames)
- Other DICOM export options
  - Monochrome or true color
  - Configurable image size/loop export 640 x 480 or 800 x 600 or 1,024 x 768
  - Secure DICOM configurable
  - Grayscale mapping choices
    - DICOM Grayscale Standard Display Function (GSDF)
    - 25 additional grayscale curves, user-selectable
  - Export optimization tool to aid user in evaluating PACS display monitor calibration and in selecting which grayscale curve to use for exported images

- Native data attached to DICOM ultrasound images (lossless compressed)
  - 2D native data types: tissue, flow, tissue Doppler, spectral Doppler and M-mode
  - 3D volume data including crop, resize, gain, compression, colorize, color suppress, B/W suppress, XRES and 3D quantification
- Ultrasound region calibration (standard for ultrasound images)
- Pixel spacing attribute for measurement calibration (optional)
- DICOM query/retrieve of other modality images (CT/MRI/X-ray/mammography/PET)
- De-identification feature
- Send images to PACS and media without identifying information burned in to the image
- Images exported to media may optionally have patient information removed from DICOM attributes or PC format names
- All pages sent to DICOM printer have patient identification overlay – not configurable
· All pages sent to local printers are configurable to include or exclude patient identification overlay
· DICOM mapping for user-defined measurements, calculations and OB authors
· Support of the export of user-defined measurements, calculations with standard DICOM structure reporting for:
  - Adult echo   - Vascular   - Pediatric echo
  - Fetal echo   - Abdominal   - TCD

Configurable Federal Information Processing Standard (FIPS) selection

Configurable option to provide up-to-date security features while fully hardening the system for patient data protection. Option also fully removes the capability for creating or configuring any VPN functionality.
· Antivirus protection
· Malware protection
· In-memory protection
· USB/DVD protection
· Internet firewall protection
· OS security
· Custom-configurable password

Report
· Report templates per clinical exam
· User-configurable report
· Off-cart report configuration tool available
· On-cart report configuration
· Video two-way video streaming
  - Audio two-way audio
  - Text two-way instant message
  - Remote visual asset display JPEG, PNG, MP4, OB 17
  - Screen sharing Web RTC
  - Webcam Universal USB driver
  - Headset Universal USB driver

Collaboration Live option
· Provides ultrasound system users with the ability to communicate and collaborate with colleagues or with Philips technical and clinical support personnel for diagnostic use, directly from the ultrasound system
  - Video two-way video streaming
  - Audio two-way audio
  - Text two-way instant message
  - Bandwidth indicator
  - Remote visual asset display JPEG, PNG, MP4, OBJ 17
  - Screen-sharing Web RTC
  - Webcam universal USB driver
  - Headset universal USB driver
  - Support for iOS, Android and Chrome web clients
  - Cursor mapping for remote measurements
  - Monitor test screen for remote display qualification

Core security features
· Internet firewall protection
· OS hardening
· Media export security

Government security option
Option fully removes the capability for creating or configuring remote service functionality.

SafeGuard security option
Configurable option for enabling state-of-the-art computer whitelisting protection against virus or malware for maximum system protection.
· Malware protection
· In-memory protection

Security Plus option
Configurable option to provide up-to-date security features for system and patient data protection.
· Configurable access levels
· Hard drive encryption
· Local and remote (LDAP) user management
· Custom-configurable password policies
· Custom-configurable login/legal banner
· Audit log export

5. Transducers

5.1 Transducer selection

- Electronic switching of transducers using four universal connectors
- Dedicated (Pedoff) continuous wave Doppler connector is available
- Automatic parameter optimization of each transducer for exam type through Tissue Specific Presets (TSP) software
- If two transducers are connected that both support the same TSP, the system supports instantaneous switching between transducers while maintaining current depth parameter if possible
- User-customizable imaging presets for each transducer
- Automatic dynamic receive focal optimization
- Transmission of focal characteristics automatically controlled through TSP, focal control and DRS functions

Compact transducers
- Ergonomic designs with lightweight super-flexible cables
- Fully contained pinless style direct electrical contact points
- Advanced low-loss lens technology for penetration with less artifacts
- Breakthrough broadband frequency response
- Support for very high frequencies from skin line (with zoom function) to 30 cm
- Advanced micro-electronics in linear, curved, tightly curved, sector and hybrid volume array configurations
- High-precision automated volume transducers

PureWave crystal technology
- Available on the eL18-4, X7-2t, X8-2t*, S5-1, C5-1 and C9-2 transducers
- Breakthrough crystal technology that allows greater acoustic efficiency and bandwidth

xMATRIX technology
- Available on the X5-1, X7-2t and X8-2t* transducers
- Unique array configuration of fully sampled elements that allows 2D, Live xPlane and volume imaging

Curved array

C5-1 broadband curved array
with PureWave crystal technology
- 5 to 1 MHz extended operating frequency range
- End-fire sector, 45 mm radius of curvature, 111° field of view (wide scan enabled)
- High density curved array with 160 elements
- Steerable pulsed, High-PRF and color Doppler; and Color Power Angio (CPA), directional CPA, SonoCT, variable XRES, XRES Pro and mulitvariate harmonic imaging
- General purpose abdominal (adult and pediatric, including vascular), bowel and interventional applications
- Intervention application
- Contrast mode
- Supports biopsy guide capabilities
- Precision biopsy support compatible with CIVCO Verza Guidance System[1]

C6-2 broadband curved array
- 6 to 2 MHz extended operating frequency range
- End-fire sector, 50 mm radius of curvature, 72° field of view (wide scan enabled)
- High density curved array with 128 elements
- Steerable pulsed, High-PRF and color Doppler; and Color Power Angio (CPA), directional CPA, SonoCT, variable XRES and mulitvariate harmonic imaging
- General purpose abdominal (adult and pediatric, including vascular), bowel and interventional applications
- Intervention application
- Contrast mode
- Supports biopsy guide capabilities

C8-5 broadband curved array
- 8 to 5 MHz extended operating frequency range
- End-fire sector, 14 mm radius of curvature, 122° field of view (wide scan enabled)
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), directional CPA, SonoCT and XRES imaging
- Vascular, pediatric abdominal and neonatal cephalic imaging
- Supports biopsy guide capabilities

C9-2 broadband curved array
with PureWave crystal technology
- 9 to 2 MHz extended operating frequency range
- End-fire sector, 45 mm radius of curvature, 102° field of view (wide scan enabled)
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), directional CPA, SonoCT, variable XRES, and harmonic imaging
- General purpose small adult and pediatric abdominal applications
- Contrast mode
- Supports biopsy guide capabilities (4 angle)
- Precision biopsy support compatible with CIVCO Verza Guidance System[1]

Linear array

eL18-4 ultra-broadband linear array
with PureWave crystal technology
- Ultra-broadband PureWave array generates frequencies from 2 to 22 MHz
- Multi-row array with fine elevation focusing
- Optimized diagnostic operating bandwidth: 18-4 MHz
- Fine pitch, 1920 active elements
- Steerable pulsed wave and color Doppler, Color Power
- Angio (CPA), SonoCT, variable XRES and harmonic imaging
- High resolution superficial applications including vascular, bowel and pediatric imaging
- MicroFlow Imaging support
- Needle visualization support
- Auto Doppler flow optimization
- Contrast mode
- Panoramic Imaging
- High frame rates available
- Precision biopsy support compatible with CIVCO Verza Guidance System[1]

L12-3 broadband linear array
- 12 to 3 MHz extended operating frequency range
- Fine pitch, 160 element, high resolution linear array
- Steerable pulsed wave and color Doppler
- Color Power Angio (CPA), SonoCT, panoramic, variable XRES, XRES Pro, harmonic imaging, M-mode, MicroFlow Imaging and Directional CPA
- Fine angle steering of color and pulsed wave Doppler
- Vascular (carotid, arterial and venous), intervention and bowel applications
- Cerebrovascular (carotids, vertebrals), peripheral vascular (venous, arterial) and internal mammary vessels imaging
- Surgical application
- Auto Doppler flow optimization
- Supports biopsy guide capabilities
- Precision biopsy support compatible with CIVCO Verza Guidance System[1]

L12-3ERGO broadband linear array
- 12 to 3 MHz extended operating frequency range
- Fine angle steering of color and pulsed wave Doppler
- Steerable pulsed wave and color Doppler
- Color Power Angio (CPA), SonoCT, variable XRES, XRES Pro, harmonic imaging, M-mode, MicroFlow Imaging and Directional CPA
- Vascular (carotid, surgical, arterial and venous) and superficial imaging applications
- Cerebrovascular (carotids, vertebrals), peripheral vascular (venous, arterial) and internal mammary vessels imaging
- Surgical applications
- Auto Doppler flow optimization

L12-4 broadband linear array
- 12 to 4 MHz extended operating frequency range
- Fine pitch, 128 element, high resolution linear array
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, panoramic, variable XRES, and harmonic imaging
- Fine angle steering of color and pulsed wave Doppler
- Vascular (carotid, arterial and venous), intervention and bowel imaging applications
- Cerebrovascular (carotids, vertebrals), peripheral vascular (venous, arterial) and internal mammary vessels imaging
- Surgical application
- Auto Doppler flow optimization
- Supports biopsy guide capabilities

L12-5 50 broadband linear array
- 12 to 5 MHz extended operating frequency range
- Fine pitch, 256 element, high resolution linear array
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, variable XRES and harmonic imaging
- High resolution superficial applications including vascular and bowel imaging
- Auto Doppler flow optimization
- Contrast mode
- Panoramic imaging
- Pediatric application
- High frame rates available
- Supports biopsy guide capabilities

- Precision biopsy support compatible with CIVCO Verza Guidance System[1]

L15-7io broadband compact linear array
- 15 to 7 MHz extended operating frequency range
- Fine pitch, 128 element, high resolution linear array
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, panoramic and XRES imaging
- Unique lens design allowing high resolution imaging at transducer surface
- High resolution intraoperative vascular and epiaortic applications
- Auto Doppler flow optimization
- Fine angle steering of color and pulsed wave Doppler

L18-5 broadband linear array
- 18 to 5 MHz extended operating frequency range
- Ultra-fine pitch, 288 element, high resolution linear array
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, panoramic, variable XRES, and harmonic imaging
- High resolution superficial applications including vascular imaging
- Auto Doppler flow optimization
- Supports biopsy guide capabilities
- Precision biopsy support compatible with CIVCO Verza Guidance System[1]

Sector array

S4-2 broadband sector array
- 4 to 2 MHz extended operating frequency range
- Phased array, 80 elements
- 2D; CW, steerable pulsed wave, High-PRF and color Doppler; tissue Doppler, variable XRES, AutoSCAN/iSCAN and harmonic imaging
- Adult echo, abdominal, pediatric echo and TCD applications
- Contrast mode
- Supports biopsy guide capabilities

S5-1 broadband sector array with PureWave crystal technology
- 5 to 1 MHz extended operating frequency range
- Phased array, 80 elements
- 2D; CW, steerable pulsed wave, High-PRF and color Doppler; tissue Doppler, variable XRES, AutoSCAN/iSCAN, harmonic imaging and Image Boost
- Adult echo, abdominal, pediatric echo and TCD applications
- Contrast mode; coronary color and PW Doppler
- Supports biopsy guide capabilities

S7-3t sector array TEE
- 7 to 3 MHz extended operating frequency range
- Transesophageal sector array with 48 elements
- 2D, steerable PW Doppler, CW Doppler, color Doppler, variable XRES and harmonic imaging
- Physical dimensions:
  - Tip: 10.7 x 8 x 27 mm (0.42 x 0.31 x 1.1 in)
  - Shaft: 7.4 mm (0.29 in) diameter, 70 cm (27.6 in) L

- Manually rotatable array from 0° to 180°
- Pediatric and adult TEE applications: patients > 3.5 kg (7.7 lb)

S8–3 sector array
- 8 to 3 MHz extended operating frequency range
- Phased array, 96 elements
- 2D, steerable PW Doppler, CW Doppler, High–PRF Doppler, color Doppler, tissue Doppler, advanced variable XRES and harmonic imaging
- Adult, fetal and pediatric echo cardiac applications; pediatric abdomen; neonatal head application
- Coronary color and PW Doppler

S8–3t sector array TEE
- 8 to 3 MHz extended operating frequency range
- Transesophageal sector array with 32 elements
- Physical dimensions:
  – Tip: 7.5 x 5.5 x 18.5 mm (0.3 x 0.2 x 0.7 in), WHL
  – Shaft: 5.2 mm (0.2 in) diameter, 88 cm (34.6 in) L
- Manually rotatable array from 0° to 180°
- 2D, steerable PW Doppler, CW Doppler, color Doppler, advanced XRES, M-mode and harmonic imaging
- Pediatric, including infants and adult TEE applications: patients > 2.5 kg (5.5 lb)

S12–4 sector array
- 12–4 MHz extended operating frequency range
- Phased array, 96 elements
- 2D, steerable PW Doppler, CW Doppler, High–PRF Doppler, color Doppler, tissue Doppler, advanced variable XRES and harmonic imaging
- Pediatric cardiac applications, neonatal head application
- Coronary color Doppler

xMATRIX array

X5–1 xMATRIX array with PureWave crystal technology
- 5 to 1 MHz extended operating frequency range
- 3,040 elements with microbeamforming
- Ergonomic xMATRIX handle with lightweight cable
- Shorter length for easy apical fit
- Extended cable length
- Single ASIC architecture
- iRotate – rotatable scan angle from 0 to 360°
- 2D and Live xPlane imaging
- CW, steerable pulsed wave, High–PRF and color Doppler; tissue Doppler, variable XRES, AutoSCAN/iSCAN, harmonic imaging and Image Boost
- Adult echo, abdominal, pediatric echo and TCD applications
- Contrast mode; coronary color and PW Doppler
- Physical dimensions:
  – Dimensions: 9.2 x 3.9 x 2.9 cm (3.6 x 1.5 x 1.1 in) LWD with a shallow waist and push ridges for superb scanning comfort; the shortened 3D length helps to fit into the bed for apical views
  – Lens: 1.7 x 2.3 cm (0.67 x 0.9 in)
- Green label approved transducer (environmental improvement measure)

X7–2t xMATRIX array TEE with PureWave crystal technology*
- 7 to 2 MHz extended operating frequency range
- Transesophageal xMATRIX array transducer with 2,500 elements
- 2D, advanced variable XRES, harmonic imaging, M-mode, color M-mode, color flow, PW Doppler, CW Doppler, Live xPlane imaging, Live 3D Echo, Live 3D zoom, 3D zoom color, 3D zoom color preview, two-volume view, triggered full volume and triggered 3D color volume
- Physical dimensions:
  – Tip: 1.7 x 3.8 cm (0.7 x 1.5 in) WxL
  – Shaft: 1 cm (0.4 in) diameter, 1 m (39.4 in) L
- Electronically rotatable array from 0° to 180°
- Electrocautery suppression
- Adult TEE applications: patients > 30 kg (66 lb)

X8–2t* xMATRIX array TEE with PureWave crystal technology
- 8 to 2 MHz extended operating frequency range
- Fully sampled matrix phased array with 2,500 elements
- Triple-high line density in live volume and full volume modes
- User programmable button can be configured for freeze/iSCAN or acquire controls
- Adult TEE applications: patients > 30 kg (66 lb)
- Physical dimensions
  – Tip: 1.7 x 3.8 cm (0.7 x 1.5 in) WxL
  – Shaft: 1 cm (0.4 in) diameter, 1 m (39.4 in) L
  – Electronically rotatable array from 0 to 180°
  – Electrocautery suppression
  – 2D, advanced XRES, harmonic imaging, M-mode, color M-mode, color flow, PW Doppler, CW Doppler, TDI, TDI PW, Live xPlane imaging, Live xPlane PW/CW Doppler, Live 3D Echo, Live 3D zoom, 3D zoom color, 3D zoom color preview, two-volume view, triggered full volume and triggered 3D color volume

Non–imaging

D5cwc CW transducer (Pedoff)
- Dedicated 5 MHz continuous wave Doppler
- Deep venous and arterial applications

D2cwc CW transducer (Pedoff)
- Dedicated 2 MHz continuous wave Doppler
- Adult cardiology applications

D2tcd PW transducer (Pedoff)
- Dedicated 2 MHz pulsed wave Doppler
- Transcranial Doppler applications

5.2 Transducer application guide

Transducer	S4–2	S5–1	S8–3	S12–4	S7–3t	S8–3t
Type of array	Sector	Sector	Sector	Sector	Sector	Sector
Number of elements	80	80	96	96	48	32
Scanplane aperture	20.3 mm	20.3 mm	15.4 mm	9.78 mm	5 mm	4.76 mm
Field of view	90˚	90˚	90˚	90˚	90˚	90˚
WideSCAN available						
Volume field of view						
Broadband frequency range	4–2 MHz	5–1 MHz	8–3 MHz	12–4 MHz	7–3 MHz	8–3 MHz
PureWave technology		•				

Application	Exam type						
Abdominal	General						
	Renal						
	Bowel						
	Vascular	•	•				
	Penetration						
	Resolution						
	Intervention						
Fetal	Early fetal heart						
	Fetal heart			•			
Cardiology	Adult	•	•	•		•	•
	Pediatric	•	•	•	•	•	•
	Epicardial						
	Epiaortic						
Vascular	Carotid						
	Arterial						
	Venous						
	TCD	•	•				
	Intraoperative						
	Intervention						
	Superficial						
Pediatric	Abdomen			•	•		
	Hip						
	Neonatal cephalic			•	•		
Biopsy guide		•	•				

Transducer	C5-1	C6-2	C8-5	C9-2	eL18-4	L12-3
Type of array	Curved	Curved	Tightly curved	Curved	Linear	Linear
Number of elements	160	128	128	192	1920	160
Scan plane aperture	55.5 mm	63.7 mm	22.4 mm	53.76 mm	50 mm	38 mm
Field of view	111˚	72˚	122˚	102˚		
WideSCAN available					•	•
Volume field of view					•	
Broadband frequency range	5–1 MHz	6–2 MHz	8–5 MHz	9–2 MHz	2–22 MHz	12–3 MHz
PureWave technology	•			•	•	

Application	Exam type	C5-1	C6-2	C8-5	C9-2	eL18-4	L12-3
Abdominal	General	•	•		•		
	Renal	•	•		•		
	Bowel	•	•		•	•	•
	Vascular	•	•		•		
	Penetration	•	•		•		
	Resolution	•			•		
	Intervention	•	•				
Fetal	Early fetal heart				•		
	Fetal heart	•	•		•	•	
Cardiology	Adult						
	Pediatric						
	Epicardial						
	Epiaortic						
Vascular	Carotid			•		•	•
	Arterial			•		•	•
	Venous			•		•	•
	TCD						
	Intraoperative						
	Intervention						•
	Superficial						•
Pediatric	Abdomen	•	•	•	•	•	•
	Hip					•	•
	Neonatal cephalic			•			•
Biopsy guide		•	•	•	•		•

5.2 Transducer application guide

(continued)

Transducer	L12-3ERGO	L12-4	L12-5	L15-7io	L18-5
Type of array	Linear	Linear	Linear	Linear	Linear
Number of elements	160	128	256	128	288
Scanplane aperture	38 mm	34 mm	50 mm	23 mm	38.9 mm
Field of view					
WideSCAN available	•	•	•	•	•
Volume field of view					
Broadband frequency range	12–3 MHz	12–4 MHz	12–5 MHz	15–7 MHz	18–5 MHz
PureWave technology					

Application	Exam type	L12-3ERGO	L12-4	L12-5	L15-7io	L18-5
Abdominal	General					
	Renal					
	Bowel	•	•	•		
	Vascular					
	Penetration					
	Resolution					
	Intervention					
Fetal	Early fetal heart					
	Fetal heart					
Cardiology	Adult					
	Pediatric				•	
	Epicardial				•	
	Epiaortic					
Vascular	Carotid	•	•	•	•	•
	Arterial	•	•	•	•	•
	Venous	•	•	•	•	•
	TCD					
	Intraoperative				•	
	Intervention	•	•			
	Superficial	•	•	•	•	
Pediatric	Abdomen	•	•	•	•	•
	Hip	•	•	•		•
	Neonatal cephalic	•	•			
Biopsy guide			•	•		•

Transducer	X5-1	X7-2t	X8-2t	D2cwc	D5cwc	D2TCD
Type of array	xMATRIX	xMATRIX	xMATRIX			
Number of elements	3040	2500	2500			
Scanplane aperture	Proprietary	Proprietary	Proprietary			
Field of view	90˚	90˚	90˚			
WideSCAN available						
Volume field of view	98˚ x 98˚	86˚ x 86˚	105 x 105			
Broadband frequency range	5–1 MHz	7–2 MHz	8–2 MHz			
PureWave technology	●	●	●			

Application	Exam type	X5-1	X7-2t	X8-2t	D2cwc	D5cwc	D2TCD
Abdominal	General						
	Renal						
	Bowel						
	Vascular	●					
	Penetration						
	Resolution						
	Intervention						
Fetal	Early fetal heart						
	Fetal heart						
Cardiology	Adult	●	●	●	●		
	Pediatric	●					
	Epicardial						
	Epiaortic						
Vascular	Carotid					●	
	Arterial					●	
	Venous					●	
	TCD	●					●
	Intraoperative						
	Intervention						
	Superficial						
Pediatric	Abdomen						
	Hip						
	Neonatal cephalic						

6. Measurements and analysis

6.1 Measurement tools and general description

- 2D distance
- 2D circumference/area by ellipse, continuous trace, trace by points
- Auto conversion of distance to ellipse
- 2D curved-linear distance
- 2D angle: intersection of two lines
- In 2D, three distance or distance and ellipse tools to calculate volume
- In 2D, hip angle tool and d,D ratio tool
- In 2D, percent area reduction and percent diameter reduction tools
- In 2D, Simpson tool calculate LV (left ventricle) area and volume
- In 2D, area-length tool used to calculate LA (left atrium) area and volume
- In 2D, biplane volume calculation
- In 2D, comparison tool available in contrast applications
- PISA calculation available in cardiac applications
- 3D: ellipse and distance on 2 MPR views
- 3D: stacked contours on one MPR
- M-mode distance (depth, time, slope)

- M-mode heart rate calculation
- Manual Doppler distance
- Auto conversion of distance to ellipse
- 2D trace by points
- 2D distance (micro calipers)
- 2D Simpsons
- Generic angle
- 3 distance volume
- Distance and ellipse volume
- Diameter percent reduction
- Area percent reduction
- Hip angle
- d:D ratio
- Size compare
- Doppler peak velocity
- Doppler two calipers tool
- Doppler continue trace
- Doppler trace by points
- Cardiac dP/dt
- Volume flow
- Color aliasing velocity

- Manual data entry
- RA pressure
- 3D stacked ellipses
- 3D auto stacked contours
- Manual Doppler trace
  – Cardiac trace tool generates Vmean, Vmax, MeanPG, MaxPG, VTI
  – General imaging trace tool generates PSV (peak–systolic velocity), EDV (end diastolic velocity), MDV (minimum diastolic velocity), TAPV (time averaged peak velocity), TAMV (time averaged mean velocity), RI (resistive index), PI (pulsatility index), S/D (systole/diastole) ratio, and heart rate
- Time/slope measurements in Doppler and M–mode
- High Q automatic Doppler analysis (general imaging only)
  – Automatically calculates PSV, EDV, MDV, TAPV, TAMV, RI, PI, S/D ratio and heart rate
  – Functions in live or frozen imaging
- RA (right atrium) systolic pressure tool

6.1.1 Auto Measure

Powered by artificial intelligence, the fully automated Doppler and 2D distance measurements improve exam efficiencies by more than 50% of time saving on cardiac measurements for everyday echo. With capability to accept, edit or decline the results.

2D Measurements
- Left Heart
  – Intraventricular Septum diameter (IVSd)
  – Left Ventricular Septal diameter (LVIDd)
  – Left Ventricular Posterior Wall dimension (LVPWd)
  – Left Ventricular Internal dimension systole (LVIDs)
  – Aortic Root Diameter (AoR Diam)
  – Ascending Aortic Diameter (Asc Ao Diam)
  – Left Ventricular Outflow Track Diameter (LVOT Diam)
  – Aortic Sinus diameter (Ao Sinus Diam)
  – Aortic Sinus Tube Junction Diameter (Ao STJ Diam)
- Right Heart
  – Right Ventricular Base (RV Base)
  – Right Ventricular Mid (RV Mid)
  – Right Ventricular Length (RV Length)
  – Right Ventricular Annulus (RV Annulus)

Doppler Measurements
- MV Peak E Vel
- MV Peak A Vel
- MV Inflow (macro measurement)
  – MV Peak E Vel
  – MV Peak A Vel
- Left Ventricular Outflow Tract Velocity time integral (LVOT VTI)
- Left Ventricular Outflow Tract Maximum Velocity (LVOT Vmax)
- Aortic Valve Velocity Time Integral (AV VTI)
- Aortic Valve Velocity Maximum (AV Vmax)
- Pulmonic Valve Velocity Time Intergral (PV VTI)
- Pulmonic Valve Velocity Maximum (PV Vmax)
- Tricuspid Regurgitation Velocity Maximum (TR Vmax)
- Mitral valve lateral annulus E' velocity (Lat E' Vel)

- Mitral valve lateral annulus A' velocity (Lat A' Vel)
- Mitral valve medial annulus E' velocity (Med E' Vel)
- Mitral valve medial annulus A' velocity (Med A' Vel)
- Lat Vel (macro measurement)
  – Lat E' Vel
  – Lat A' Vel
- Med Vel (macro measurement)
  – Med E' Vel
  – Med A' Vel
- RV S Vel

6.2 Measurement tools and quantification

QLAB quantification software
Cardiac 3D Quantification (3DQ)
- On–cart and off–cart access
- Customize capabilities via optional plug–ins
- Capable of performing 2D measurements from 3D volume and, 3D color volume multiplanar reconstruction (MPR) views
- Review and quantification of Live 3D, 3D zoom, 3D full volume and color full volume files
- 3D image controls: 3D vision map, 3D single or dynamic colorization, 3D color render, 3D color suppress control
- Multiplanar reconstruction (MPR) views
  – 3D slice plane
  – Parallel plane
  – Unlimited MPR manipulation
  – Plane rotation, tilt, movement controls to reduce left ventricle foreshortening
- 3D annotation
- 3D spatial reference icon
- Cardiac 3D measurements, 3D quantification from MPR views includes the following measurements
  – Distance
  – Area
  – Biplane LV volume (Simpson's)
  – Biplane LV ejection fraction
  – Biplane LV mass

Cardiac 3D Quantification Advanced (3DQ Advanced)
- Left ventricle global and regional volume and timing analyses with no geometric assumption
- Comprehensive report page with AHA/ASE 17–segment bull's–eye plots and numeric values
- Image quality index using dedicated color scale for 3D volume quality control
- Display and manipulation of dynamic 3D rendering and left ventricular (LV) true volumes of Live 3D data sets
- Displays of 3D or dynamic 3D renderings in grayscale, single colorization, or dynamic colorization
- Multiplanar reconstruction (MPR) views
- Option to flip LV apical two–chamber display and corresponding septal, anterior, lateral, inferior (SALI) sequence
- iSlice display–compatible
- Measurements of LV endocardial true 3D volumes, LV ejection fraction and stroke volume using semi–automated 3D border detection

- Computation of regional volumes based on AHA/ASE 17-segment LV model
- Edit mode that adds flexibility for optimal 3D border tracking in four dimensions
- Display of global LV volume waveforms, all 17 regional volume waveforms, or a subset of user-selected regional volume waveforms
- Displays of dyskinetic segments and corresponding volume waveforms in specific color and format
- Display of regional end-diastolic normalized regional volume waveforms
- User-selectable waveforms: single, by wall, by level (ring) modes
- A bull's-eye visualization of all 17 regional segments or the user-defined and user-selected regional segments
- Global and regional reports that provide 3D LV global values and regional timing indices from all or a subset of 17 regional segments and bull's eye-based parametric imaging display
  - 3D true volume-based EDV, ESV, stroke volume and EF
  - Standard deviation and maximal difference of time to minimum systolic volume (Tmsv) based on all or a subset of 17 regional segments
  - Tmsv values displayed in time (msec) or normalized to the R-R interval (%)
  - Bull's eye showing the user-selected segments for time to minimum systolic volume (Tmsv) calculation
  - LV timing and radial excursion parametric images in bull's-eye format using effective color-coded scales
  - Parametric imaging supporting AHA/ASE 17-segment overlay on the bull's eye for direct and rapid visualization
  - Parametric imaging that provides a radial excursion threshold slider for selective visualization of LV segments in the timing parametric display
  - Measurement data exported in Excel or DICOM SR formats

Mitral Valve Navigator (MVN)
- 3D assessment of mitral valve anatomy and associated structures
- Review and quantification of Live 3D and full volume data sets from X7-2t, X8-2t* and xMATRIX transducer (Live 3D TEE)
- Task-driven workflow provides user direction and guidance illustrations
- Automated ES selection
- Automated 3D annulus segmentation and leaflet surface
- Associated 2D, 3D, and projected measurements and calculations sorted by group
  - Annulus
  - Leaflet
  - Aortic-Mitral
  - Coaptation
  - Papillary
- 3D image controls
  - 3D vision map
  - 3D single or dynamic colorization
  - Auto-view
  - Absolute and relative rotation
  - Three 3D render modes: volume, slices, model

- Multiplanar reconstruction (MPR) views
  - 3D slice plane
  - Unlimited MPR manipulation
  - Slice thickness
  - MPR smooth
- 3D mitral labels
- 3D mitral model
  - Model displays: tenting surface, leaflet surface, minimum surface
  - Enhanced coaptation line tracing
  - Leaflet discontinuity traces
  - Leaflet segmentation
  - Up to 53 measurements overlay
  - Exposed and coapted leaflet length and surfaces
  - Continuous display during loop playback
- Mitral valve 3D measurements and 2D/3D quantification from model view include the following measurements
  - Distances
  - Curve distances
  - Areas
  - Projected areas
  - Volumes
  - Angles
  - Ratio
- Measurement and calculation definition and overlay on 3D model
- Comprehensive reporting
- Data exported in Excel or DICOM SR formats
- Measurement data exported in Excel or DICOM SR formats

TOMTEC 3D Auto MV
3D Auto MV helps to analyze the complex anatomy of the mitral valve in 3D as well as its dynamic mechanics during systole. The mitral valve anatomy and topology are visualized with a comprehensive static and dynamic model.

- Mitral valve analysis based on Live 3D echo data
  - Streamlined workflow with automated mitral valve orientation with annulus and leaflet detection
  - Manual review and the possibility to edit the automated model proposal
  - Comprehensive automatic measurements for annulus, leaflets and coaptation
  - Advanced edit options for definition and quantification of open coaptation regions
  - Automatic calculation of annular and leaflet dimensions
  - Definition and display of ''Surgical View``
  - Dynamic tracking of MV structures through systolic phase
  - Export of automatically generated measurements
- Export of results to DICOM SR and/or .txt formats arranged in measurements groups
  - Annulus
  - Leaflets
  - Coaptation
  - Miscellaneous
  - Manual measurements
  - Dynamic measurements
- Supports export of the MV model in .stl or .obj format

3D Auto LAA
3D Auto LAA helps to quickly get left atrial appendage-related measurement from a 3D TEE data set.
- Requires proper MPR/MultiVue alignment before getting measurement

- Provides automatic measurements of LAA landing zone/ostium: minimum and maximum axis, perimeter and area
- Measurements are editable using global or local editing
- Ability to quantify with and without EKG signal
- Possibility to change MPR/MultiVue layout

Intima Media Thickness (IMT) Quantification plug-in
- Automated assessment of the IMT on user-selected frames
- For carotid and other superficial arteries

Region of Interest (ROI) Quantification plug-in
- Pixel intensity index – pixel intensity analysis, data types: echo, velocity
- Pixel intensity analysis, data types: echo, velocity (color) or power (angio)
- Up to 10 user-defined regions
- Thumbnail display of frames for easy trimming
- TDI velocity timing measurement
- Log/linear data display selection
- Smoothed data display option with various curve fitting techniques
- Vascularization index, flow index and vascularization flow index results on color mode files
- Motion compensation for multiframe objects

Strain Quantification (SQ) plug-in*
- Tissue Doppler Imaging (TDI) velocity quantification
  - Used in the evaluation of regional myocardial function
- Measures the myocardial velocity from color TDI data set and derives the displacement, strain and strain rate along user-defined M-lines
- Cardiac phases display (overlay of AVO, AVC, MVO, and MVC mechanical events auto-imported from ultrasound cart analysis via DICOM SR or manual entry) on SQ curves for left ventricle mechanical events
- User-selectable waveform display that makes SQ curves easy to read
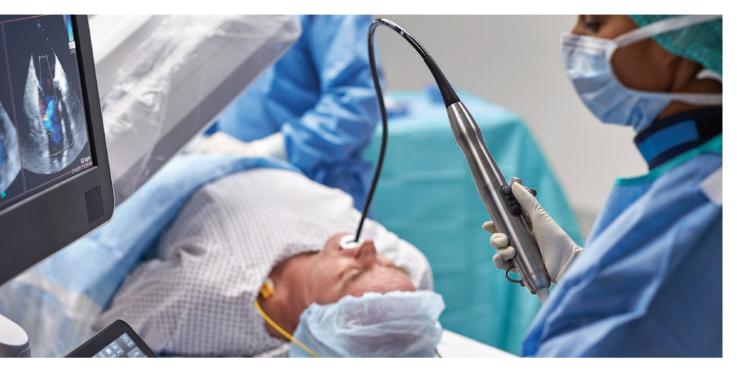 - User-defined M-line motion to follow the myocardial motion
- Point of Interest (POI) tool that obtains values from any point on the M-mode display
- M-mode (hide or display) control
- User-defined and automatic (using speckle tracking algorithms) M-line motion compensation to follow myocardial motion
- Able to present TDI results in two display formats
  - Anatomical M-mode display
  - Graph display
- User-selectable waveforms for optimal sub-region visualization
- Curve processing modes
- TDI velocity, displacement, strain and strain rate timing measurements with dedicated time calipers and labels
  - Automatic subdivision of M-line into a customizable number of sub-regions
  - Averages up to 20 cardiac beat cycles in both M-mode and graph displays

Automated Cardiac 2D Quantification (a2DQ) and a2DQ LA*
- Left ventricle and left atria global volume analysis from 2D and biplane images
- Quantification of native and non-native images
- Quantification of non-ECG images
- Automated border detection for cardiac chambers and vessel cavities
- Computation of area, LV volumes and advanced parameters for LV systolic and diastolic function including fractional area change (FAC), ejection fraction (EF), peak ejection rate (PER), peak rapid filling rate (PRFR) and atrial filling fraction (AFF)
- Computation of LA area, volumes and advanced parameters including fractional area change (FAC) and ejection fraction (EF)
- Single-plane volume measurements based on Simpson's Single Plane Method of Disks (MOD)
- Biplane volume measurements based on Simpson's Biplane Method of Disks (MOD)
- Automated Tissue Motion Annular Displacement (aTMAD)
  - Mitral valve and other valve annular motion tracking over time
  - Computation of valve annular displacement curves over time
  - Color Kinesis overlay to visualize valve annular plane motion parametrically
  - Measurement data exported in Excel or DICOM SR formats
  - Simplified workflow with SmartExam

Automated Cardiac Motion 2D Quantification (aCMQ)
- Automated Region of Interest for selected anatomical views
- Objective assessment of left ventricle global function and regional wall motion, deformation and timing using 2D speckle tracking technology
- File compatibility
  - Quantification of 2D native and non-native ultrasound DICOM images

---

* Not available in all countries.

- Quantification of non-ECG images
- Available methods with dedicated preferences settings
  - Global workflow
- 2D speckle tracking technology
- Auto ROI can be set either on ED or ES frame
- Automated border detection for cardiac chambers and vessel cavities
- Auto aortic valve closure time detection
- Smooth color transited bull's-eye presentation
  - Multiple cardiac view/images capable
  - 18 or 17 left ventricle segmentation templates (three apical views and three short-axis view templates)
  - Easy-to-edit template position and shape
  - Intuitive step-by-step user interface
  - Tracking quality control by right clicking the segment to remove the poorly tracked segment
  - User-editable post LV segments display consistent display with corresponding waveform and reported values beat-to-beat selection
- Display
  - Border (hide or show)
  - Image ROI Overlay (hide or show)
  - Cardiac phases (overlay of AVO, AVC, MVO and MVC mechanical events auto-imported from ultrasound cart analysis via DICOM SR or manual entry)
  - Four up display
- 2D speckle parameters
  - Volume/EF and area/FAC
  - Longitudinal strain and strain rate
  - Circumferential strain and strain rate
  - Radial and transversal displacement
  - Radial fractional shortening
  - Radial velocity
  - Speed (absolute angle independent velocity)
  - Regional rotation and rotation velocity

- Global rotation (SAX)
- Endo-Epi mural torsion and local rotation
- Measurement and calculations
  - Selectable GLS measurement points: peak, peak-systolic and end-systolic
  - Time-to-peak and peak values
  - Timing caliper
  - Global result display one view and global result display
  - Results display in 18 or 17 LV segment bull's-eye plot format and numerical table
  - Layer specific (Endo, Mid and Epi) longitudinal strain per view and global longitudinal strain
  - Circumferential strain per view and global circumferential strain
  - User-defined workflow for specific local strain analysis
- Up to 18 dedicated colors to help differentiate each cord and corresponding waveform
- Up to three waveform auto peak detections to report time-to-peak and peak values
- Simplified workflow with SmartExam
- Measurement data exported in Excel or DICOM SR formats

3D Auto LAA

3D Auto LAA helps to quickly get left atrial appendage-related measurement from a 3D TEE data set.
- Requires proper MPR/MultiVue alignment before getting measurement
- Provides automatic measurements of LAA landing zone/ostium: minimum and maximum axis, perimeter and area
- Measurements are editable using global or local editing
- Ability to quantify with and without EKG signal
- Possibility to change MPR/MultiVue layout

TOMTEC AutoStrain LV
· Provides automated 2D longitudinal strain quantification
· Objective assessment of left ventricle global function and regional wall motion deformation and timing using TOMTEC 2D speckle tracking technology
· One-button-push global longitudinal strain
· Automated view recognition and labeling with manual correction
· Automated contour detection and placement
· Image orientation selection
· Editing contour on ED and ES
· Fast speckle tracking on three apical images at once
· Peak longitudinal strain for each apical view and global average
· Automated R-AVC with manual correction
· 18 segments peak-systolic longitudinal strain bull's-eye display
· 18 segments end-systolic longitudinal strain bull's-eye display
· 18 segments time-to-peak longitudinal strain bull's-eye display
· 18 segments waveform display for three apical views
· 6 segments waveform display for each apical view
· Ability to de-select segments
· Highlighted global strain and strain rate curve display
· Measurement data exported in Report and DICOM SR

TOMTEC AutoStrain LA
AutoStrain LA allows fast and easy assessment of LA deformation analysis using 2D speckle tracking according to the Strain Task Force standardization consensus report.
· Measurements exported to DICOM SR and .txt export
  – LA reservoir strain (ED reference/preA reference)
  – LA conduit strain (ED reference/preA reference)
  – LA contraction strain (ED reference/preA reference)

TOMTEC AutoStrain RV
AutoStrain RV allows fast and easy assessment of RV deformation analysis using 2D speckle tracking according to the Strain Task Force standardization consensus report.
· Measurements exported to DICOM SR
  – RV free wall strain longitudinal
  – RV global 4-chamber strain longitudinal
· Additional results available on the UI and as .txt export
  – Segmental peak-systolic or end-systolic longitudinal strain of three free-wall segments
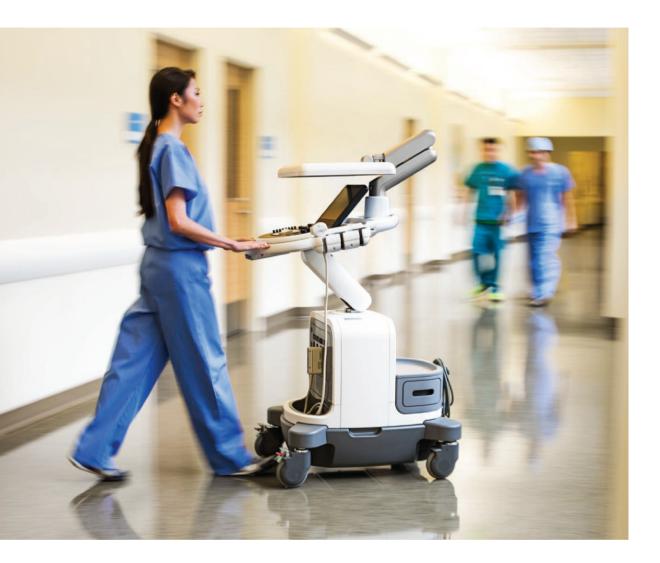
6.3 High Q automatic Doppler analysis

· Automatic real-time and retrospective tracing of:
  – Immediate peak velocity
  – Immediate intensity-weighted mean velocity
· Automatic real-time display of (user-selectable up to six):
  – Volume flow
  – Time-averaged peak velocity
  – Time-averaged mean velocity
  – Resistive index
  – Pulsatility index
  – Systolic/diastolic ratio

– Acceleration/deceleration times
– Illustrated High Q

6.4 Clinical option analysis packages

· Cardiac analysis
  – Left atrium
  – Right atrium
  – Right ventricle
  – Left ventricle
  – TAVI (transcatheter aortic valve implantation)
  – Valve stenosis
  – Prosthetic aortic valve
  – Prosthetic mitral valve
  – TAPSE (tricuspid annular plane systolic excursion)
  – MAPSE (mitral annular plane systolic excursion)
  – PCWP (pulmonary capillary wedge pressure or pulmonary artery occlusion pressure)
  – Stress echo measurements in various stages
  – MPI (or TEI index)
  – Volume by area/length method
  – M-mode ejection fraction (via Teichholz or cubed method)
  – Novel 3-point adjustable Simpson's template
  – Simpson's biplane and single plane volume and ejection fraction
  – Area, length, volume and ejection fraction
  – LV mass
  – 2D all points
  – M-mode all points
  – Peak velocity
  – Maximum and mean pressure gradients
  – Pressure half time
  – E/A ratio
  – D/E slope
  – Continuity equation
  – Diastolic function
  – Cardiac output
  – Acceleration time
  – Heart rate
· Vascular analysis
  – Right and left carotid artery protocols
  – ICA/CCA ratio
  – Bilateral lower extremity arterial and venous labels
  – Bilateral upper extremity arterial and venous labels
  – Percent diameter and area reduction
  – Vascular graft measurement package
  – User comments
  – High Q automatic Doppler analysis
· OB analysis
  – Fetal echo application
  – 2D echo
  – Fetal heart M-mode
  – Fetal Doppler
  – Fetal echo
· Abdominal vascular
  – Labels for all major abdominal arteries and veins
  – Left and right segmentation for kidneys
· Pediatric
  – General
  – d:D radio

7. Physical specifications

System dimensions

Width	57.2 cm/22.5 in
Height	142.2–162.6 cm/56–64 in
Depth	98.3 cm/38.7 in
Weight	83.6 kg/184.4 lb without peripheral devices

System cart

- Ergonomic design for comfort and convenience
- Easy maneuverability and mobility
  - Wheel-lock and monitor adjustments that facilitate bedside exams
- Independent height adjustment of control panel and display monitor
- Easily accessed transducer connector ports, USB and DVD media drive
- Transducer and gel bottle holders
- Unique easy clip cable management solution that keeps cables tangle-free and reduces damage while decreasing cable strain to enhance comfort while scanning
- Mobility through high quality, shock-absorbing casters with foot pedal controls for:
  - 4-wheel swivel
  - 2-wheel swivel lock
  - 2-wheel brakes
- Integrated footrests
- Digitally enhanced two-speaker high fidelity stereo output with rear-mounted subwoofer
- On-board storage tray behind control panel touch screen and in rear bay storage drawer
- On-board printer bay that provides easy and ergonomic access to your printing device
- Universal peripheral bay that provides easy access for on-board hardcopy or documentation devices
- Built-in A/C line conditioner that provides isolation from voltage fluctuations and electrical noise interference
- Two high-capacity fans with decreased audible noise

Sustainability

The Affiniti CVx ultrasound system with improved functionality and ergonomics has compact imaging and processing core hardware, which allows for a reduced cart footprint and reduction in overall body size. The system shows significant reduction (37%) in power consumption* by a re-architected system design which requires fewer circuit boards and a more efficient power supply subsystem.

Energy
- On mode: 268 W
- Off mode: 6 W
- Energy usage/year*: 1008.9 kWh
- Power for battery charging: 24 W

Packaging
- Total weight: 51.5 kg
- Cardboard/paper: 13.4 kg
- Plastic: 2.3 kg
- Ferro metal: 0.6 kg
- Wood: 35.2 kg
- Certified wood: 100% SFI

Substances
- RoHS-2-compliant

Eco passport
- Philips Green Product

Monitor

- Flat panel LED display monitor
  - 54.6 cm (21.5 in) wide format high definition flat panel TFT/IPS display
  - High contrast ratio >1000:1
  - Extended viewing angle >178° (horizontal and vertical)
  - Response time: <14 ms
  - Virtually flicker-free technology
  - Mounted on fully articulating extension arm
  - Four-way articulation with 87.6 cm/34.5 in lateral and 17.8 cm/7 in vertical adjustment range
    - Nearly infinite positioning adjustments: height, swivel and tilt

Control panel

- Articulation facilitates nearly infinite positioning adjustments for optimum scanning ergonomics: height, swivel and tilt
  - Up and down 20.3 cm/8 in
  - Rotates 180° from center
  - Palm rest
- Lowest position from ground: 76.2 cm (30 in)
- Highest position from ground: 96.5 cm (38 in)

Physio

- One 3-lead ECG input
  - Gain, sweep rate and display position controls
  - Automatic heart rate calculation and display
  - Fault condition display
  - Cineloop locator displayed on one ECG input from an ECG source like stress ECG or ECG monitor

Peripherals

- The system supports up to two on-board peripheral devices (excluding report printers)
  - Video-recording peripherals, operated via system user interface
  - DVD recorder (cart-dependent)
  - Small and large format digital B/W printers (USB)
- Support for large format external B/W or color printer
- Support for various Hewlett-Packard, Epson and Xerox brand color and monochrome report printers (USB, externally mounted)

Input/output ports

- Export of measurement and analysis data to off-line reporting software packages (USB) and RS-232
- Display port video export available for either full screen resolution of 1920x1080 (1080p), display area 1024x768 VGA, or S-Video in NTSC or PAL format

Power requirements, video parameters

- 100V-240 V, 50 Hz/60 Hz – PAL/NTSC
- Integrated A/C line conditioning and battery back-up system
- Power consumption: up to 450 watts

Electrical safety standards

- Electromechanical Safety Standards met
  - CAN/CSA 22.2 No. 60601-1, Medical Electrical Equipment: General requirements for basic safety and essential performance
  - IEC 60601-1, Medical Electrical Equipment: General requirements for basic safety and essential performance
  - IEC 60601-1-2, Collateral Standard, Electromagnetic compatibility – requirements and tests
  - IEC 60601-2-37, Particular Requirements for the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment
  - ANSI/AAMI ES60601-1, Medical Electrical Equipment: General requirements for basic safety and essential performance
- Electromechanical Safety Standards met (EU Only)
  - EN60601-2-37, Particular requirements for the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment
- Agency approvals
  - Canadian Standards Association (CSA)
  - CE Mark in accordance with the European Medical Device Directive issued by British Standards Institute (BSI)

8. Maintenance and services

Maintenance

- Easy customer access to air filter for cleaning
- System designed for easy replacement of key components by your facility's biomedical engineers
- First responder access to diagnostics and utilities
- Flexible RightFit service agreements
  – Maximize uptime
  – Access Philips award-winning service organization
  – Minimize risk

Services*

Philips Remote Services Connectivity is designed with security in mind and allows for many advanced service features.

Security
Philips Remote services are based on a comprehensive security infrastructure including iSSL technology, encryption and protocols to protect patient information

Advanced service features
- Virtual on-site visits for both clinical and technical support, providing fast resolution to issues and questions
- Remote clinical education
- Remote log file transfer decreases downtime by allowing rapid diagnosis of problems by call center personnel
- Online Support Request
  – Simplifies support engagement
  – Provides fast response to clinical questions and technical issues
  – Allows request to be entered by user directly on ultrasound system
- Proactive monitoring
  – Helps prevent unscheduled downtime
  – Monitors key system parameters
  – Sends an alert to Philips Call Center so action can be taken before system operation is affected
- Remote Software Distribution boosts performance over the entire system lifecycle
- Clinical applications support available
- On-cart transducer test provides confidence in your transducer quality
- Optional Utilization Report provides data to help manage ultrasound assets
  – Track system and transducer usage
  – Summarize data about exam types and duration
  – Provide data to help with credentialing and privileging
  – Identify referrals by exam type
- Flexible Clinical Education offerings include:
  – Webinars
  – Symposiums
  – On-site
  – Classroom
  – Remote

* Optional. Not all services available in all geographies; contact your Philips representative for more information. May require service contract.

CIVCO Verza Guidance System is a trademark of CIVCO Medical Solutions.

PHILIPS

www.philips.com/affiniti

Printed in the Netherlands.
4522 991 71451 * SEP 2021