



**PHILIPS**

Ultrasound

EPIQ

# The **evolution** of premium ultrasound

EPIQ diagnostic ultrasound system specifications

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# 1. Introduction

Unprecedented advances in premium ultrasound performance can help address the strains on overburdened hospitals and healthcare systems, which are continually being challenged to provide a higher quality of care cost-effectively. The goal is quick and accurate diagnosis the first time and in less time.

Premium ultrasound users today demand improved clinical information from each scan and faster and more consistent exams that are easier to perform and allow for a high level of confidence, even for technically difficult patients.

EPIQ is the new direction for premium ultrasound, featuring an exceptional level of clinical performance to meet the challenges of today's most demanding practices.

## 1.1 Applications

- Abdominal
- Obstetrical
- Fetal echo
- Cerebrovascular
- Vascular (peripheral, cerebrovascular, temporal TCD and abdominal)
- Abdominal vascular
- Gynecological and fertility\*
- Small parts and superficial\*
- Breast\*
- Musculoskeletal\*
- Pediatric general imaging\*
- Prostate\*
- Echocardiography (adult, pediatric, fetal)
- Stress echocardiography
- Transesophageal echocardiography (adult and pediatric)
- Surgical imaging
- Interventional imaging
- Contrast imaging
- Bowel imaging\*
- Strain elastography\*
- Shear wave elastography\*
  - ElastPQ
  - ElastQ Imaging\*\*
- Perioperative
- Epicardial echocardiography
- Image fusion and needle navigation\*



\* Not available on all models.

\*\* Currently not approved in all countries.

## 2. System overview



### 2.1 System architecture

- Powerful Philips **nSIGHT** Imaging combines a proprietary massive parallel processing architecture and precision beamforming for real-time coherent beam reconstruction. Capable of processing multiple data streams for structural, functional and Live 3D/4D imaging.
  - Built for 2D, Live xPlane, Live 3D, Live 3D Zoom, Live full volume, up to 102° x 101°, high volume rate (HVR) imaging, Live 3D color, MPR (multiplanar reconstruction), electronic rotational echocardiography (iRotate) and panoramic imaging capability; true real-time volume image-forming capability with multiple rendering engines
  - Supports both strain and shear wave elastography
  - Next-generation Live 3D, PureWave xMATRIX transducers, with microbeamforming and single ASIC beamforming architecture
  - **nSIGHT** Imaging with GPU processes the equivalent of 15 DVDs/sec (69 GB/sec)
    - Live 3D/4D, high volume rate (HVR) imaging over 56,000 imaging elements, allowing outstanding 2D and 3D imaging from the single ergonomic transducer, eliminating the need to change between 2D and specialty 3D transducers
    - Offers up to 7,071,744 total digital channels (xMATRIX configuration)
    - Offers up to 4,718,592 total digital channels (non-xMATRIX configuration)
- Next-generation ultra-low noise, wide dynamic range digital broadband acoustic beamforming with proprietary architecture
  - 3D volume scan conversion that processes 460 megavoxels per second and renders 2300 mega-ray cast samples per second
  - Live full volumes with one-beat, two-beat, four-beat and six-beat options

- 320 dB maximum dynamic range
  - Powerful distributed multi-core processing architecture capable of achieving 450 x 109 40-bit multiply-accumulates/second; includes three hard drives, 1 TB plus 240 GB SSD
    - Advanced pulse shaping, pulse coding and multivariant harmonics technologies incorporated
    - Support for transducer frequencies up to 20 MHz
  - Optimized for high definition 21.5 inch LCD display
  - Operating system supports Windows 10 IoT Enterprise LTSB 2016
  - Premium display option available on some models
  - Designed to support virtually any array configuration: sector, linear, curved, tightly curved, TEE and xMATRIX electronic volume arrays
  - Contrast echo with low MI, mid MI and LVO modes
    - Pulse inversion and Power modulation technology for low MI Imaging
    - Pulse inversion technology
  - Live 3D color imaging
  - iRotate imaging
    - Electronic rotation available with the X5-1, X7-2, X7-2t and X8-2t\* transducers
    - Standard 2D views from the same apical or parasternal window without moving scanning hand
    - Part of a stress echo protocol for fast acquisitions and more consistent views between resting phase and stress phase
    - iRotate achieves frame rates up to 290 Hz
  - Philips next-generation 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
    - Elevation compound imaging on X5-1, X6-1, X7-2, X7-2t and X8-2t\* transducers, which compounds two or more lines of sight in the elevation dimension
    - 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.
- Provides user-selectable levels of XRES adaptive processing for C5-1, C8-5, C9-2, C10-3v, mC12-3, L12-3, L12-5 50, L15-7io, eL18-4, L18-5, S5-1, S8-3, S8-3t, S9-2, S12-4, X5-1, X7-2, X7-2t, X8-2t\* and V6-2
  - Philips XRES Pro features our next-generation high-resolution image processing that elevates tissue definition and image quality to new levels
    - Performs 350 million calculations per frame of image data over 2800 frames per second
    - Operates in 2D and 2D/CFI/Doppler/TDI mixed modes over 2800 frames per second
    - Offers XRES capability in contrast imaging modes
    - Currently available on C5-1, mC7-2, mC12-3, eL18-4, L12-3, L12-3 ERGO, L12-5, L15-7io, L18-5, V9-2, X6-1 and XL14-3
  - Tissue 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 with TSPs adult echo and echo PEN
    - Functions with 2D, 2D behind color, xPlane and 2D behind xPlane color
    - Functions only with harmonics and elevation compounding both ON
    - Functions on reference images for Doppler (except color + CW)
    - Does not function in 3D, MPRs, TDI, contrast or M-mode
  - Philips adaptive broadband flow imaging
    - Doppler bandwidth that automatically adjusts for superb flow sensitivity and resolution
    - Advanced dynamic motion suppression algorithms that reduce flash artifacts
  - Fully independent triplex multiple mode operation for extraordinary ease of use during Doppler procedures
  - Auto Doppler flow optimization for carotid and 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 10 stages
    - Forty views per stage by five modes
  - Multi-application SmartExam workflow protocols
    - Stress echo, echo, abdominal, small parts, Ob/Gyn 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 150 seconds
  - Two levels of transport mode: from sleep mode to on, approximately 20 seconds
    - Standard battery – 30 minutes before recharge required
    - Extended battery – 60 minutes before recharge required

## 2.2 Imaging formats

- 2D linear: WideSCAN with SonoCT
- 2D linear: Trapezoid with SonoCT
- 2D curved: WideSCAN with SonoCT
- 2D sector
- 2D virtual apex sector imaging with wide field of view
- 120° FOV imaging\*\*
- Dual 2D
- Panoramic
- 3D Panoramic
- 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 imaging format for full-screen high-definition image display with the push of a button
  - 38% more viewing area
  - Additional 1,179,648 more pixel image data than standard displays

## 2.3 Imaging modes

- 2D grayscale imaging with advanced pulse coding, pulse shaping and frequency compounding technologies
- xMATRIX-based 2D elevation compounding
- Hyper2D Imaging for xMATRIX
- M-mode
- M-mode color Doppler
- M-mode tissue Doppler
- Anatomical M-mode
- Live 3D Echo (instantaneous volume rendering of cardiac anatomy)
- 3D imaging
- 3D imaging with color Doppler
- 4D imaging
- Live xPlane imaging (simultaneous display of two live imaging planes)
- Live xPlane Doppler imaging's simultaneous display of two live imaging planes and two Doppler sample volume markers allows rapid, accurate Doppler sampling
- Tissue Harmonic Imaging (THI) with pulse inversion technology
- Coded beamforming
- Tissue Boost
- Multivariate Tissue Harmonic Imaging including pulse inversion, power modulation techniques, tissue cancellation and MFI contrast flow display
- Left ventricular opacification (LVO) with pulse inversion and power modulation technologies
- Contrast detection technology using pulse inversion, power modulation techniques, tissue cancellation, and MFI contrast flow display
- 3D contrast imaging on the X5-1
- SonoCT beam-steered real-time compound imaging
- Harmonic SonoCT imaging
- Up to five levels of XRES adaptive image processing technology

- 2D post-processing includes gain, dynamic range, up/down invert, right/left invert, zoom, gray map and Chroma map
- iSCAN intelligent scanning for one-button TGC and gain optimization
- iSCAN with adaptive gain compensation (AGC) for real-time user-initiated frame-by-frame TGC optimization
- 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
- MicroFlow Imaging (MFI)
- MicroFlow Imaging HD (MFI-HD) – twice the resolution and sensitivity of standard MFI
- Strain-based elastography
- Shear wave elastography point quantification imaging (ElastPQ)
- Shear wave elastography imaging for curved array (ElastQ Imaging)\*
- High PRF pulsed wave (PW) Doppler
- Duplex and simultaneous 2D/PW Doppler
- Duplex continuous wave (CW) Doppler
- Duplex color flow and CW Doppler
- Duplex 2D, color flow, PW Doppler
- Duplex 2D, CPA, PW Doppler
- Auto Doppler optimization: Auto PW Doppler, color Doppler, flow optimization for one-button angle correction and steering
- Tissue Doppler Imaging (TDI)
- Adaptive Doppler
- Adaptive Broadband Color Flow
- MicroCPA imaging
- Color Compare mode
- Independent triplex mode for simultaneous 2D, color flow, PW Doppler
- Independent triplex mode for simultaneous 2D, CPA, 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 with pan (write zoom)
- Reconstructed zoom with pan (read zoom)
- Panoramic imaging
- SonoCT panoramic imaging with XRES and harmonic modes
- 3D Panoramic imaging for full organ visualization
- Chroma imaging in 2D, 3D, QLAB MPR and iSlice, Panoramic, M-mode and Doppler modes
- Dynamic colorization in Live 3D mode on X5-1, X7-2, and X7-2t, freehand 3D on C10-3v and 3D/4D on V6-2, X6-1, X7-2 and X8-2t\*
- Live MVI
- Spatio-Temporal Image Correlation (STIC)
- iSTIC on X6-1 transducer

\* Currently not approved in all countries.

\*\* Available on S9-2 only.

### M-mode

- Available on all imaging transducers
- 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

### 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 and WHC
- Baseline invert
- B/W suppress
- Color blending
- Color Doppler flow algorithms provide clear vessel delineation and temporal display
- MicroCPA feature for superb small vessel imaging
- MicroFlow Imaging (MFI)
- MicroFlow Imaging HD (MFI-HD) – twice the resolution and sensitivity of standard MFI
- Color compare dual display (B/W on left, color on right)
- Color map
- Color persistence
- 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  $\pm 3$  steering angles on linear array transducers
- Variance
- Wall filter
- Write priority
- Zoom
- Cineloop review with full playback control
  - Advanced motion suppression with intelligent algorithms; adapts to various application types to selectively eliminate virtually all color motion artifact
- 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, twenty-one angles on L12-3 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 excellent sensitivity and color resolution

### Color Power Angio imaging (CPA)

- Automatically adapts transmit and receive bandwidth processing based on the color box position providing excellent sensitivity and color resolution
- MicroCPA, a highly sensitive flow optimization method 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 with intelligent algorithms; adapts to various application types to selectively reduce 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, twenty-one angles on L12-3 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 excellent sensitivity and color resolution

### MicroFlow Imaging (MFI) and MicroFlow Imaging HD (MFI-HD) on mC12-3, eL18-4 and C5-1 transducers

- Highly sensitive imaging mode designed to detect slow and weak blood flow anatomy in tissue
- Maintains high frame rate and 2D image quality while applying advanced artifact reduction techniques

### 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
- Selectable sweep speeds
- Selectable low-frequency signal filtering with adjustable wall filter settings
- Selectable grayscale curve for excellent 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
- Doppler review for retrospective analysis of Doppler data
- 256 (8 bits) discrete gray levels
- Post-processing includes invert, baseline, angle correct, Quick angle, display format, Doppler gain, sweep speed, reject, compress and Chroma map
- Post-processing in PW frozen mode includes map, baseline, invert and Chroma
- 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
- 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, L12-5 50, L18-5, VL13-5 and L15-7io in carotid and arterial vascular applications
- Auto Doppler is available on the curvilinear transducers C5-1, C8-5, C9-2, C10-3v, C10-4ec and V6-2

#### **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)

#### **Tissue Doppler Imaging (TDI/TDI PW)**

- Available on all cardiac imaging transducers (except S7-3t and S8-3t)
- 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

#### **iRotate echo (X5-1, X7-2, 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
- iRotate with stress echo acquire
- iRotate for contrast echo
- iRotate with color flow and CMQ speckle technology

#### **Live xPlane imaging**

- Available on X5-1, X6-1, X7-2, X7-2t and X8-2t\* xMATRIX transducers
- Simultaneous display of two live imaging planes
- xPlane Doppler imaging available on XL14-3 supports simultaneous display of two independent sample volume gates, one on each of the two Live xPlane displays
- Color and grayscale modes
- Lateral, rotational and elevation steering
- Contrast and interventional modes

#### **Live 3D echo**

- Available on X5-1, X7-2, X7-2t and X8-2t\* xMATRIX transducers
- 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 live volume loop acquire
- Beat-by-beat retrospective 3D loop selection
- Live 3D color flow imaging
- High volume rate (HVR) echo and color
- xMATRIX with LVO, hi MI and low MI, xMATRIX pulse inversion and power modulation
- Contrast and interventional modes
- Live 3D Zoom and Live 3D Zoom preview
- One-beat focused volume
- Half clam shell
- Left and right clam shell switching
- Two volume viewing display
- Crop adjust with cropping
- QuickVue 3D volume cropping tools
- 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 100 vps
- GlassVue 3D rendering goes beyond the surface revealing internal structures
- TouchVue – touchscreen manipulation of 3D volumes and light source placement

### Live 3D/4D and MPR/iSlice imaging

- Supported on X5-1, X6-1, X7-2, X7-2t and X8-2t\* xMATRIX transducers
- Volume display with surface rendering (transparency, brightness and lighting controls)
- Multiplanar reconstruction (MPR) and iSlice view display with QLAB software, including nine simultaneous views from 3D
- Specialized algorithms and maps that increase 3D display
- QuickVue cropping method for rapid access to anatomy of interest within the volume
- Cropping tools on volume views with image reference red, green and blue crop planes, arbitrary plane cropping and ROI-directed cropping with iCrop
- Two and three 2D reference planes optionally available Live 3D, full volume and 3D Zoom imaging, live and review
- AutoView for one-button access to pre-defined volume cropping anatomic views, up to 3 independent views
- Supported XRES modes to reduce noise artifacts

### 3D/4D and MPR imaging (all electronic array transducer)

- Available on X6-1 and XL14-3 xMATRIX
- Volume display with surface rendering (transparency, brightness and lighting controls)
- Multiplanar reconstruction (MPR) view display
- Cropping tools on both volume and multiplanar reconstruction (MPR) views
- Slice control on MPR and volume displays
- Supported by elevation compound imaging and XRES modes to reduce noise artifacts
- Full volume sweep
- Adjustable X, Y, Z rotation
- MultiVue allows real-time alignment of images and volumes for rapid visualization of anatomic structures and devices
- Dynamic colorization
- TrueVue Volume 3D rendering display delivers lifelike image display allowing the user to place the light source anywhere within the 3D volume
- GlassVue 3D rendering goes beyond the surface revealing internal structures
- Adjustable vision preset control
- TrueVue rendered 3D/4D flow volume with subtracted 2D available with XL14-3
- Contrast mode
- AutoView, one-button volume crop to pre-defined anatomic views
- aReveal<sup>AI</sup>, one-button press to sculpt and remove volume data anterior to the fetal face
- Support of volume rates of at least 156 vps
- Zoom
- 3D color flow

### 3D/4D and MPR imaging (hybrid transducers)

- Volume display with surface rendering (transparency, brightness and lighting controls)
- Multiplanar reconstruction (MPR) view display
- Specialized algorithms and maps maximize three-dimensional display to include TrueVue and GlassVue maps
- Cropping tools on both volume and multiplanar reconstruction (MPR) views
- Slice control on MPR and volume displays
- One-button press to sculpt and remove volume data anterior to the fetal face
- FlexVue trimming enables rapid visualization of slices or planes within the acquired 3D data set
  - FlexVue supported on X6-1, 3D9-3v, V6-2 and V9-2
  - FlexVue supports three trace types, straight, curved or continuous
  - Trace types can trim from above the trace line, below the trace line or bilateral above and below the trace line
- Orthogonal View allows anatomic viewing from perspectives
- Supported by SonoCT and XRES modes to reduce noise artifacts
- TrueVue Volume 3D rendering display delivers lifelike image display allowing the user to place the light source anywhere within the 3D volume
- GlassVue 3D rendering goes beyond the surface revealing internal structures
- TrueVue Pro allows TouchVue manipulation of rendered 3D volume via user interaction with touchpanel display for easy sculpting and pinch zoom functionality

### 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 reduce noise artifacts
- Resize control that adjusts for different sweep speeds
- On-screen orientation markers
- TrueVue Volume 3D rendering display delivers lifelike image display allowing the user to place the light source anywhere within the 3D volume
- GlassVue 3D rendering goes beyond the surface revealing internal structures

### **Spatio-Temporal Image Correlation (STIC) imaging**

- Available on V6-2 and V9-2 transducers
- Automated volume acquisition of fetal cardiac cycle allowed
- Grayscale and 3D Color
- CPA and Directional CPA (DCPA)
- Default 25° elevation angle
- User-configurable acquisition time
- Ability to stop acquisition and return to standby
- Ability to accept or reject detected heart rate
- Compatible with QLAB quantification software

### **iSTIC imaging**

- Available on X6-1 transducer
- Automated volume acquisition of fetal cardiac cycle allowed
- Grayscale and color modes
- Automated detection of fetal heart rate
- Acquisition of multiple subvolumes of the fetal heart
- Multiple full volumes in one fetal heart cardiac cycle

### **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 and low MI imaging
- One-touch solution (one-button access in LVO preset) with settings for bolus and infusion
- 2D, Live xPlane, Live 3D Echo and full volume 3D
- X5-1 and S5-1 broad bandwidth pulse inversion and power modulation technologies for high sensitivity and high-resolution visualization of contrast agent at low MI
- LVO and low MI contrast 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
- Low MI with flash
- Low MI with triggered replenishment imaging (TRI) that provides excellent 2D image quality on the S5-1 transducer
- X5-1 with iRotational contrast imaging and iRotational stress contrast imaging

- X5-1 with Live xPlane for contrast imaging
- X5-1 with xMATRIX elevation compounding for contrast imaging
- X5-1 with triggered replenishment imaging
- X5-1 with 3D contrast echo
- Supported on the S5-1 and X5-1 transducers

### **Contrast imaging – general imaging**

- System optimized for detecting contrast agent signatures as they are approved for use
- Contrast modes available on C5-1, C9-2, mC7-2, X6-1, L12-3, L12-5, C10-3v, C10-4ec, S5-1, mC12-3 and eL18-4 transducers
- Tissue cancellation for imaging modes which support CEUS: C5-1, eL18-4 and L12-3
- Live MicroVascular Imaging (MVI)
- Up to 10 Chroma maps for enhanced contrast imaging
- Mid-MI contrast modes available on C5-1 and C9-2 transducers
- Pulse inversion contrast imaging available with SonoCT and XRES technologies
- Touchscreen display timer
- Advanced non-linear pulsing schemes with SonoCT and XRES for increased contrast sensitivity
- Low MI color flow contrast
- Low MI MFI capability
- High frequency contrast capability
- Flash imaging
- Dual imaging mode for simultaneous B-mode and contrast displays
- Dual imaging contrast mode supports simultaneous mirrored calipers, duplicating measurements on both the 2D text and contrast displays
- ECG/timed triggering
- Long loop capture mode during contrast procedures (3-10 minutes)\*
- QLAB ROI and MVI display

### **Interventional imaging**

- TSI available on selected transducers for excellent performance during interventional and biopsy procedures
- Enhanced needle visualization displays
- Biopsy guide selection menus
- Contrast and interventional modes
- Support of multiple biopsy angles on mC7-2, S5-1, X6-1, C5-1, C9-2 and L12-3

### **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
- Ability to electronically steer the 2D beam direction with 3D9-3v, tilt
- 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 preset (TSP)-dependent

\* Depending on frame rate, image size, etc.

- Gray map
- Chroma imaging providing colorized luminance maps
- Acquisition zoom (HD zoom): ability to position the zoom ROI anywhere within the image, change the height and width of the zoom ROI and pan the position once zoomed
- Display zoom and magnify on live or frozen images up to 16 times
- Three levels of frame rate
- Support of frame rates of over 2800 frames per second
- Tissue optimization
- Contrast resolution enhancement
- Tissue Harmonic Imaging
- SonoCT imaging
- Hyper2D Imaging
- 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 imaging
- Trapezoid capability
- Next-generation XRES technology, including up to five selection levels on some transducers
- Tissue 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 with TSPs adult echo and echo PEN
  - Functions with 2D, 2D behind color, xPlane and 2D behind xPlane color
  - Functions only with harmonics and elevation compounding both ON
- 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 improve image quality
- Multivariate pulsing including patented pulse inversion phase cancellation technology for increased detail resolution during harmonic imaging
- Available on all imaging transducers
- Extends high performance imaging capabilities to all patient body types
- Support of SonoCT (Harmonic SonoCT) and XRES modes
- Coded harmonics available with C5-1 in selected modes

#### **Strain-based elastography**

- Strain-based elastography for breast and gynecological imaging
- Available for breast imaging on the eL18-4, L18-5 and L12-5 50 transducers and on the C10-3v for gynecological and urology imaging
- One-touch entry into elastography mode

- Elastogram applied as a Region of Interest box with user control of size and location through entire field of view
- Indicator for compression level
- Display options
- Single-screen 2D with elastogram
- Side-by-side display of 2D image and 2D with elastogram
- Shadow duplication (size compare) and measurement capability in side-by-side display
- Distance and area tools
- Duplication from either side of the display
- Eight selectable elastogram display maps
- Ability to hide or show the elastogram display
- Blend capability to increase 2D visibility through elastogram display
- Four smoothing selections
- Five persistence selections
- Two dynamic resolution system (DRS) selections to alternate between elastogram resolution and penetration
- Four dynamic range selections for elastogram display
- Two elastogram optimization settings for different tissue compositions
- Anechoic imaging (AI) for enhancing areas without ultrasound signals such as cystic and complex cystic structures

#### **Shear wave elastography (ElastPQ)**

- Tissue deformation from special ultrasound push pulses
- Detection pulses used to calculate shear wave velocity
- Available on C5-1 for liver imaging
- Configurable analysis:
  - Pressure (kPa) and velocity (m/s) options available
  - 8 options for individual stiffness sampling
  - IQR (interquartile range) calculation available

#### **Shear wave elastography (ElastQ Imaging)\***

- Real-time tissue deformation from special ultrasound push pulses
- Support for curved array (C5-1) and linear array (eL18-4) options or combination of both\*\*
- Large Region of Interest (ROI) capable of supporting multiple PQ sample points
- Selectable confidence map provides assurance of samples obtained in areas with adequate shear wave propagation

#### **3D Panoramic imaging**

- Real-time extended field-of-view volume imaging, acquired in echo xPlane imaging mode on the X6-1 and XL14-3
- Calibrated grayscale volumes for measurements
- 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

\* Currently not approved in all countries.

\*\* Not available on all options.

## 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
- Depth: adjustment from 1.0 to 40 cm depending on transducer, exam and system configuration
- 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
- 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 over 2800 frames/sec (dependent on field of view, depth and angle)
- Live MVI



### Next-generation SonoCT real-time compound imaging

- Available on all transducers except sector and xMATRIX arrays
- Virtually all clutter and artifacts eliminated
- 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

### Elevation compound imaging

- Available on X5-1, X6-1, X7-2, X7-2t and X8-2t\* transducers
- Reduces speckle and improves contrast resolution
- Operates with at least two lines of sight
- Operates in 2D in conjunction with fundamental imaging, Tissue Harmonic Imaging and duplex Doppler
- Operates in conjunction with XRES imaging
- Has no adverse impact on frame rates

### Tissue Boost

- Tissue 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 with TSPs adult echo and echo PEN
  - Functions with 2D, 2D behind color, xPlane and 2D behind xPlane color
  - Functions only with harmonics and elevation compounding both ON

### XRES adaptive image processing

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.

- Available on all imaging transducers
- Eliminates virtually all 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 user up to five levels of variable XRES on C5-1, C8-5, C9-2, C10-3v, mC12-3, V6-2, eL18-4, eL18-4 EMT, L12-3, L12-5 50 mm, L18-5, S5-1, S7-3t, S8-3, S8-3t, S9-2, S12-4, X5-1, X6-1, X7-2, X7-2t and X8-2t\*

- XRES Pro next generation image processing is available on eL18-4, L12-3, L12-3 ERGO, L12-5, L15-7io, L18-5, C5-1, mC7-2, mC12-3, V9-2, X6-1 and XL14-3
- Provides high-resolution algorithms for advanced speckle noise reduction, refined tissue pattern displays and fine border definition
- Provides high speed processing that allows over 2800 frames-per-second displays

### Live volume imaging/Live 3D Echo (CV)

- Grayscale imaging controls
- 3D Vision control
- Dynamic volume colorization
- Chroma colorization
- Reset orientation
- Up/down invert
- XRES technology, including variable selection on X5-1 and X7-2
- Auto View for pre-defined anatomic crop views
- Zoom
- Show/hide color
- Reset controls
- Rotate X, Y, Z
- QuickVue cropping
- Auto crop
- Plane/Manual crop
- Face crop
- MultiVue image alignment
- Auto View for pre-defined anatomic crop views
- Brightness
- Smoothing
- Reference images
- Post processing
- Left/right Invert
- Res/speed control
- Capture
- Compress
- Gain
- ECG
- ECG trigger
- Cineloop/Live volume imaging/Live 3D Echo
- Review/full volume
- Save volume in native or native loop
- Distance and area measurements on rendered volumes
- 2D optimization settings
- Tissue Harmonic Imaging
- Density
- 3D optimization settings
- Sector width
- Angle
- Elevation width control
- Lateral width control
- Lateral position control
- Elevation position control
- MPR Rotate

- MPR Tilt
  - Laser line display orthogonal, colored lines overlay the rendered volume corresponding to the MPR slice views
  - 3D volume: front, center, back
  - 3D view control: up, down, left, right, front, back
  - 3D home
  - 3D swivel
  - Magnify
  - 3D LVO setting (available on X5-1 transducer)
  - Rotation in either absolute or relative trackball motion
  - Live 3D Zoom mode with zoom preview
  - 3D color optimization
  - 3D size and position
  - Independent trackball control of lateral and elevation sizing and positioning in live full volume and Live 3D color modes
  - iSlice – automated cropping of 3D volume into four MPR views using standard or user-defined slicing protocols
  - iCrop: two orthogonal MPR views with volume mode
    - Enables cropping during the exam or from review
    - Separates elevation and lateral rotation of cropping tools
    - Provides variable view directions and view direction color indicator
    - Allows prospective or retrospective long volume loop acquire
  - Beat-by-beat 3D loop selection
  - Review/full volume
  - Calibrated 3D grid
  - Generic distance and area measurements available on volume
  - Distance and area measurements on MPRs
  - Multiple 3D display layouts (volume, volume + 2 MPR, volume + 3 MPR)
  - Dual volume display
  - 3D color zoom
  - 3D rotate and rotate-Z
  - X-hair manipulation controls for MPR alignment
  - Volume acquisition method (1, 2, 4 and 6 beat, HVR)
- Live volume imaging/Live 3D ultrasound (GI/WHC)**
- Single sweep, 4D, STIC, iSTIC and panoramic 3D
  - 3D preview ROI size and position
  - 3D preview ROI curve adjust
  - Sector width
  - Angle
  - Res/speed control
  - Grayscale imaging controls
  - 2D optimization settings
  - 2D color optimization settings
  - 2D power optimization settings
  - Tissue Harmonic Imaging
  - Rotate X, Y, Z
  - Slice
  - ROI size and position
  - ROI curve adjust
  - Pointer trim adjust
  - Pointer xHair move
  - Pointer cine
  - Edit/accept
  - Hide volume
  - Up/down invert
  - QuickFlip
  - 3D rotate: 0, 180, 90, 270
  - 3D swivel support
  - 3D view control: up, down, left, right, front, back
  - aReveal<sup>AI</sup> for one button sculpting to enhance fetal face viewing
  - Reset orientation
  - Magnify
  - AutoVue - icon driven workflow
  - 3D vision control
  - TrueVue 3D Image rendering maps
  - GlassVue 3D Image rendering maps
  - TrueVue Touch allows direct manipulation of the light source and 3D volume on the touchscreen
  - TrueVue Pro enables touchscreen sculpting and pinch zoom functionality
  - User controllable light source placement within the 3D volume for optimal viewing
  - Dynamic volume colorization
  - Chroma colorization
  - Layout
  - Reference
  - XRES technology
  - Zoom
  - Show/hide echo or color
  - Reset controls
  - Pan
  - Sculpt
  - FlexVue visualization tool
  - Threshold
    - Orthogonal view
  - Brightness
  - Smoothing
  - Lighting
  - Transparency
  - xHair display
  - Save volume in native or native loop
  - Acquisition sweep save
  - MPR sweep save
  - Generic distance and area measurements available on rendered volumes
  - Distance and area measurements on MPRs
  - QLAB plug-ins, including GI 3DQ and FHN

### Tissue aberration correction (TAC)

- Automatically enabled when ABD maximum penetration TSI is selected on C5-1 transducer
  - Corrects for speed of sound disturbances due to excessive adipose layer on obese patients
- User selections with the L18-5, L12-5 50, eL18-4 and eL18-4 EMT for advanced breast, superficial, thyroid, vascular TSI and testicle TSI
  - Corrects for speed-of-sound disturbances in fatty tissue

### Coded beamforming

- Automatically enabled when ABD, Ob or Gyn maximum penetration TSI is selected on C5-1 transducer
- Coded excitation using chirp transmit technology that improves penetration and recovers more tissue information for detailed resolution at extended depths
- Coded harmonics mode that reduces image-degrading artifacts while maintaining penetration qualities

### iSCAN intelligent 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/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 improve image uniformity with 2D and 3D imaging

### AutoSCAN intelligent 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, xPlane, 3D, 4D and M-mode grayscale data
  - Every image frame has individually adjusted image brightness
  - Available from 2D touchscreen controls

### iOPTIMIZE intelligent optimization

Multiple technologies for one-button approach to automatically and instantly adjust system performance for different patient sizes, flow states and clinical requirements.

- **Tissue Specific Preset** – adjusts over 7,500 parameters during transducer/application selection
- **Patient optimization** – adjusts 2D performance to instantly adapt to different patient sizes

- **Flow optimization** – adjusts broadband flow performance to instantly 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
- Touch panel configurable and customizable to user-preferred control placement for maximum exam efficiency\*
- 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
- Two programmable acquire controls
- Pull-out alphanumeric backlit keyboard for text entry

## 3.3 Touchscreen

- Widescreen touchscreen for dynamic presentation of controls
- 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 Imaging parameters
- Tabbed layout and swipe capability for quick access to hidden controls
- Touchscreen control adjustment of LGC curve
- Touchscreen alphanumeric keyboard for text entry
- TouchVue manipulation and icon-driven 3D workflow on touchscreen simplifies 3D data navigation

## 4. Workflow



EPIQ combines a complete range of premium imaging technologies with superb sophisticated ergonomics, dynamic adaptive software and ease of use to help keep busy departments on schedule.

### 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
- Touchscreen supports easy navigation for commonly manipulated controls via flyout menu selections, reduces button presses
- Touch panel configurable and customizable to user preferred control placement for maximum exam efficiency\*
- 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 improved user posture and increasing comfort during exams (meets industry standards recommendation for the prevention of WRMSD)
- Highly mobile cart with single pedal brake operation facilitating 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 (TI<sub>b</sub>, TI<sub>c</sub>, TI<sub>s</sub>)
- 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
- Doppler baseline invert in live and frozen imaging
- Compression changes available live or scrolling loop
- Post-processing of 2D gain, compression or dynamic range, and zoom after acquisition on single-frame images

\*Available on some models.

- 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 instant 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 the 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, cardiac and Ob/Gyn 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
- 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
    - 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
- CMQ stress
  - Pre and post data curves
  - Pre and post bull's-eye maps
  - Pre and post strain comparisons

## 4.5 Volume imaging solutions for connected radiology departments

- Customizable to your workflow
- Fast, one-button press volume acquisition and on-cart review
- Advanced volume and MPR visualization with QLAB GI 3DQ
  - iSlice and thick slice on cart
- Capability to export freehand electronic, and hybrid acquired 3D grayscale data for visualization on most PACS in a stacked “fly-through” manner (like CT/MR)
- Off-cart evaluation of volume data on a multimodality clinical workstation
- Powerful 3D manipulation tools including volume rendering, MPR, MIP, slab viewing (thick slice), 3D orientation graphics
- Advanced 3D visualization with QLAB GI 3DQ including ability to handle 3D color flow and xMATRIX data
- Orientation labels feature for spatial orientation of 3D data sets
  - Adult orientation labels for non-fetal applications
  - Fetal orientation labels for fetal applications
- MPR Export capability
  - Ability to export A, B and C planes as a multiframe loop for review on a DICOM device
  - Available on all transducers, but not supported for any STIC or iSTIC files

## 4.6 Anatomical Intelligence for Breast (AI Breast)

AI Breast is a fully integrated screening, diagnostic and workflow tool for whole breast ultrasound, that utilizes Philips unique Anatomical Intelligence and the eL18-4 EMT ultra-broadband linear transducer. The system provides the ability to automatically track and document the transducer position relative to the patient’s breast during image acquisition.

- Auto Annotate – automatically adds annotation indicating transducer position in relation to the body mark during breast scanning
- Coverage Assistant: unique tracking technology maps 2D projection of breast tissue covered in real time to enable new levels of confidence during breast screening and diagnostic exams
- Bookmark key images during acquisition for quick review
- Find Orthogonal – the system automatically finds images that are orthogonal from the reference point, for fast comparison and diagnosis
- Reverse lookup – the system finds frames near defined targets by clicking on the position in the corresponding breast body mark graphic
- Available with integrated electromagnetic tracking on the eL18-4 and external electromagnetic tracking on the L12-5

## 4.7 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

## 4.8 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)
- Depth from 1 cm to 40 cm (transducer-dependent)
- MaxVue image display, high-definition full-screen imaging viewing

## 4.9 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 or up to 64 seconds of pulsed wave 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
- 3D iCrop from cineloop review
- 3D iSlice from cineloop review
- Trim capability of 2D data
- Capture of over 20 seconds of Live 3D imaging per loop
- Available in all imaging modes plus:
  - Panoramic imaging
  - 3D 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

## 4.10 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

### 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

## 4.11 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 1 TB storage capacity
  - Storage capacity of approximately 350 patient exams (assuming 40 images, 6 seconds of clips and 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
  - Cartesian volume acquisition: 3D, 4D, STIC, 3D panoramic
  - Cardiac temporal volume acquisition: Live 3D, full volume 3D
  - 3D clips: volume render views and MPR views
  - Q-Apps frames and clips
  - Image fusion frames and clips
- Printing
  - Local print to on-board or off-board video 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
  - Supported media
    - Read and write (single session) to CD (CD-R)
    - DVD read-only (DVD+R)
    - DVD read + write (single session) (DVD+RW, CD-R and DVD-R)
    - USB storage (flash memory or hard drives)

- 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
- 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 (2.4GHz and 5GHz)
    - 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 2 spatial streams
      - Transmit beamforming
      - Fast channel switch (1ms within band and 2ms 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-TLS
    - AES/CCM encryption
- Network addressing
  - IPV4 addressing: static or DHCP for system address, static or hostnames (DNS lookup) for server addresses
  - IPV6 addressing: link local, router advertisement, and stateful DHCP for system address, hostnames for server addresses
- Collaboration Live
  - Video two-way video streaming
  - Audio two-way audio
  - Text two-way instant message
  - Remote visual asset display JPEG, PNG, MP4, OBJ
  - Screen-sharing web RTC
  - Webcam universal USB driver
  - Headset universal USB driver

### NetLink connectivity option (standard on premium and high end)

- Supported DICOM services
  - Image storage
  - Structured Report (SR) storage includes Ob/Gyn, vascular, adult echo, pediatric echo, fetal echo, and 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)
    - 50 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, M-mode and elastography
    - 3D volume data including crop, resize, gain, compression, automated border tracking, color baseline, 3D vision control, 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 into the image

- Images exported to media may optionally have patient information removed from DICOM attributes or PC format
- 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, and OB authors with standard DICOM structure reporting for:
  - Adult echo           – Vascular
  - Pediatric echo       – TCD
  - Fetal echo           – Abdominal
  - Ob/Gyn               – Small parts

### Report

- Report templates per clinical exam
- User-configurable report
- Off-cart report configuration tool available
- On-cart report configuration

### Core security features

- Internet firewall protection
- OS hardening
- Media export security

### Government security option

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
- Configurable Federal Information Processing Standard (FIPS) selection supported

### 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 Imaging (TSI) software
- If two transducers are connected that both support the same TSI 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 TSI, iFOCUS 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 better penetration with less artifacts
- Breakthrough broadband frequency response
- Support for very high frequencies
- Advanced micro-electronics in linear, curved, tightly curved, sector, hybrid volume array and xMATRIX configurations
- High-precision automated volume transducers

### PureWave crystal technology

- Available on the mC12-3, S5-1, S9-2, eL18-4, eL18-4 EMT, X5-1, X6-1, X7-2, X7-2t, X8-2t\*, XL14-3, C5-1, C9-2, V9-2 and C10-3v transducers
- Breakthrough crystal technology that allows enhanced acoustic efficiency and bandwidth

### xMATRIX technology

- Available on the X5-1, X6-1, XL14-3, X7-2, X7-2t and X8-2t\* transducers
- Unique array configuration of fully-sampled elements that allows 2D, Live xPlane, Live xPlane Doppler and volume imaging

## Curved array

### C5-1 broadband curved array with PureWave crystal technology

- 5 to 1 MHz extended operating frequency range
- 111° field of view (wide scan-enabled)
- High density curved array with 160 elements
- 2D, steerable pulsed wave, High PRF and color Doppler, and Color Power Angio (CPA), directional CPA, SonoCT, variable XRES, XRES Pro, contrast imaging, multivariate harmonic imaging, M-mode and MicroFlow Imaging
- General purpose abdominal, obstetrical, gynecological and interventional applications
- Discreet TSI for deep abdominal, obstetrical and gynecology penetration enables:
  - Tissue aberration correction
  - Coded beamforming with chirp transmit and coded harmonics
- Interventional applications
- Elastography – shear wave
- Supports biopsy guide capabilities

#### **mC7-2 broadband curved array**

- 7 to 2 MHz extended operating frequency range
- 73° field of view (wide scan-enabled)
- 2D, steerable pulsed wave, High PRF pulsed wave, Tissue Harmonic Imaging, SonoCT, XRES Pro, Color Power Angio (CPA), directional CPA, 2D panoramic, contrast imaging and MicroFlow Imaging (MFI)
- Embedded tracking sensor for fusion imaging support (EMT)
- Abdominal imaging support
- Supports biopsy guide capabilities

#### **mC12-3 broadband curved array**

- 12 to 3 MHz extended operating frequency range
- 96° field of view
- Steerable pulsed Doppler, color Doppler, CPA, MFI, MFI HD, SonoCT, XRES, harmonic imaging
- Peripheral vascular, pediatric abdominal, neonatal cephalic imaging

#### **C8-5 broadband curved array**

- 8 to 5 MHz extended operating frequency range
- 122° field of view (wide scan-enabled)
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), directional CPA, SonoCT, variable XRES imaging, harmonic imaging, M-mode and MicroFlow Imaging
- 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
- 102° field of view (wide scan-enabled)
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), directional CPA, SonoCT, variable XRES, contrast imaging, harmonic imaging, M-mode and MicroFlow Imaging
- General purpose obstetrical and gynecological, small adult and pediatric abdominal applications
- Supports biopsy guide capabilities (4 angle)

#### **C10-3v broadband curved array with PureWave crystal technology**

- 10 to 3 MHz extended operating frequency range
- End-fire sector, 11.5 mm radius of curvature, 163° field of view (wide scan-enabled)
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), directional CPA, SonoCT, variable XRES, contrast imaging, harmonic imaging and M-mode
- Endovaginal applications
- Elastography – strain-based
- Supports biopsy guide capabilities

#### **C10-4ec broadband curved array**

- 10 to 4 MHz extended operating frequency range
- End-fire sector, 8 mm radius of curvature, 147° field of view (wide scan-enabled)
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), directional CPA, SonoCT, XRES, contrast imaging and harmonic imaging
- Endocavitary applications, including vaginal and rectal
- Supports biopsy guide capabilities

#### **V6-2 broadband curved array**

- 6 to 2 MHz extended operating frequency range
- 100° field of view (wide scan-enabled)
- High-resolution 2D imaging, steerable pulsed wave, High PRF, and color Doppler; Color Power Angio (CPA), directional CPA, SonoCT, variable XRES, harmonic imaging, STIC and M-mode
- Support of high-resolution, quantitative, single sweep 3D volume acquisition
- Support of 4D imaging up to 36 volumes per second
- General purpose obstetrical volume applications
- Supports biopsy guide capabilities

#### **V9-2 broadband curved array with PureWave crystal technology**

- 9 to 2 MHz extended operating frequency range
- 100° field of view (wide scan-enabled)
- High-resolution 2D imaging and steerable pulsed wave
- Color Doppler, Color Power Angio (CPA), directional CPA, SonoCT, Tissue Harmonic Doppler, XRES Pro, STIC and M-mode
- Support of high-resolution, quantitative, single sweep 3D volume acquisition
- Support of 4D imaging up to 21 volumes per second
- General purpose obstetrical volume applications, GYN and pelvic floor
- Supports biopsy guide capabilities

#### **3D9-3v broadband curved array**

- 9 to 3 MHz extended operating frequency range
- 164° field of view (wide scan-enabled)
- High-resolution 2D imaging, steerable pulsed wave and color Doppler, Color Power Angio, SonoCT, XRES, harmonic imaging, M-mode and Directional CPA
- Support of high-resolution, quantitative, single sweep 3D volume acquisitions (hybrid and freehand)
- Support of 4D imaging up to 22 volumes per second
- Support of Tilt Imaging feature
- Endovaginal applications
- Supports biopsy guide capabilities

## 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, XRES Pro, harmonic imaging, 2D, M-mode, MicroFlow Imaging and Directional CPA
- High-resolution superficial applications including small parts, breast, vascular, musculoskeletal, bowel, pediatric and OB imaging
- Tissue aberration correction selection for advanced MSK, breast and vascular venous TSP
- Neonatal head TSP
- MicroFlow Imaging support
- Full solution elastography 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

### **eL18-4 EMT 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
- Integrated electro-magnetic tracking
- Steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, variable XRES, XRES Pro, harmonic imaging, 2D, M-mode, MicroFlow Imaging and Directional CPA
- High-resolution superficial applications including small parts, breast, vascular, musculoskeletal, bowel, pediatric and OB imaging
- Tissue aberration correction selection for advanced MSK, breast and vascular venous TSP
- MicroFlow Imaging support
- Full solution elastography support
- Needle visualization support
- Anatomical Intelligence for Breast (AI Breast) support with integrated electro-magnetic tracking
- Auto Doppler flow optimization
- Contrast mode
- Panoramic Imaging
- High frame rates available
- Precision biopsy support compatible with CIVCO Verza Guidance System

### **L12-3 ERGO broadband linear array**

- 12 to 3 MHz extended operating frequency range
- Fine angle steering of color and pulsed wave Doppler
- 2D, 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 (carotid, vertebral), peripheral vascular (venous, arterial), internal mammary vessels, and musculoskeletal imaging
- Surgical applications
- Auto Doppler flow optimization

### **L12-3 broadband linear array**

- 12 to 3 MHz extended operating frequency range
- Fine angle steering of color and pulsed wave Doppler
- 2D, 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), internal mammary vessels, and musculoskeletal imaging
- Surgical applications
- 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
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, variable XRES, XRES Pro, contrast imaging, harmonic imaging, M-mode and Directional CPA
- High frame rates available
- Panoramic imaging
- High-resolution superficial applications including small parts, breast, vascular and musculoskeletal imaging
- Tissue aberration correction selection for advanced MSK and breast imaging TSI
- Pediatric applications
- Elastography – strain-based
- Auto Doppler flow optimization
- Supports biopsy guide capabilities

### **L15-7io broadband compact linear array**

- 15 to 7 MHz extended operating frequency range
- Fine angle steering of color and pulsed wave Doppler
- Unique lens design allowing high-resolution imaging at transducer surface
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), panoramic and XRES imaging, XRES Pro, M-mode and Directional CPA
- High-resolution intraoperative vascular and superficial (MSK and small parts) applications
- Auto Doppler flow optimization

### **L18-5 broadband linear array**

- 18 to 5 MHz extended operating frequency range
- Ultra-fine pitch, 288 element, high-resolution linear array
- 2D, steerable pulsed wave and color Doppler, Color Power Angio (CPA), SonoCT, panoramic, variable XRES, XRES Pro, harmonic imaging, M-mode and Directional CPA
- High-resolution superficial applications including small parts, breast, vascular and musculoskeletal imaging
- Tissue aberration correction selection for MSK and breast imaging TSI
- Elastography – strain-based
- Auto Doppler flow optimization
- Supports biopsy guide capabilities

### **VL13-5 broadband linear array**

- 13 to 5 MHz extended operating frequency range
- Fine pitch, 192 element, high-resolution linear array
- High-resolution 2D imaging, steerable pulsed wave and color Doppler, Color Power Angio, SonoCT, XRES, harmonic imaging, M-mode and Directional CPA
- Support of high-resolution 2D imaging
- Support of high-resolution, quantitative, single sweep 3D volume acquisition
- Support of 4D imaging
- High-resolution superficial applications including small parts, breast and vascular imaging
- Tissue aberration correction selection for advanced breast imaging TSI
- Supports biopsy guide capabilities

## Sector array

### **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, M-mode and M-mode tissue Doppler
- Adult echo, pediatric echo and TCD applications
- Contrast applications

### **S7-3t sector array TEE**

- 7 to 3 MHz extended operating frequency range
- Transesophageal sector array with 48 elements
- Manually rotatable array from 0 to 180°
- 2D, steerable PW Doppler, CW Doppler, color Doppler, XRES, harmonic imaging and M-mode
- Pediatric and adult TEE applications: patients > 3.5 kg (7.7 lb)
- 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

### **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, harmonic imaging, M-mode and M-mode tissue Doppler
- Adult and pediatric cardiac applications

### **S8-3t sector array TEE**

- 8 to 3 MHz extended operating frequency range
- Transesophageal sector array with 32 elements
- Manually rotatable array from 0 to 180°
- 2D, steerable PW Doppler, CW Doppler, color Doppler, XRES, harmonic imaging and M-mode
- Pediatric and adult TEE applications: patients > 2.5 kb (5.5 lb)
- 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

### **S9-2 broadband sector array with PureWave crystal technology**

- 9 to 2 MHz extended operating frequency range
- Phased array, 128 elements
- 2D, steerable PW Doppler, CW Doppler, High PRF Doppler, color Doppler, tissue Doppler, advanced variable XRES and harmonic imaging
- Adult and pediatric cardiac applications and fetal echo application
- 120° FOV

### **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, harmonic imaging, M-mode and M-mode tissue Doppler
- Pediatric and adult cardiac applications, neonatal head applications

## xMATRIX array

### **X5-1 xMATRIX array with PureWave crystal technology**

- 5 to 1 MHz extended operating frequency range
- 3,040 elements with microbeamforming
- iRotate – rotatable scan angle from 0 to 360°
- 2D, Live 3D volume, high volume rate (HVR), one-beat, two-beat, four-beat, six-beat, Live volume, color flow, Live 3D color, PW, CW, M-mode, color M-mode, contrast hi MI, contrast low MI, Tissue Boost, pulse inversion, flash imaging, high 2D frame rate mode, TDI, TDI PW, TDI M-mode, CMQ quantification, Live xPlane imaging
- 3D color zoom, 3D color zoom preview, high volume rate (HVR) color and two-volume view display
- Ergonomic xMATRIX handle with lightweight cable

- Shorter length for easy apical fit
- 2D and Live 3D Echo solution with all modes
- Extended cable length
- Single ASIC architecture
- Adult, contrast LVO, pediatric CHD, contrast low MI, cardiology coronary, adult general and echo PEN
- 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)

#### **X6-1 xMATRIX array with PureWave crystal technology**

- 6 to 1 MHz extended operating frequency range
- Fully sampled matrix phased array with 9,212 elements
- 2D modes including 2D, M-mode, color Doppler, Color Power Angio including directional CPA, pulsed Doppler, elevation compounding, biplane (Live xPlane) with color, 3D with color and CPA, 4D, triggered full volume with color, advanced variable XRES, XRES Pro, contrast imaging and harmonic imaging
- Auto-heart rate detection for triggered full volume fetal echo in grayscale and color
- Dynamic focusing over range in both lateral and elevation dimensions
- Three line densities in 3D and 4D modes
- General purpose abdominal, obstetrical, fetal echo, gynecological and interventional applications
- Supports biopsy guide capabilities

#### **XL14-3 xMATRIX array with PureWave crystal technology**

- 14 to 3 MHz extended operating frequency range
- Fully sampled matrix linear array with 56,320 elements
- 2D modes including 2D, color Doppler, Color Power Angio (CPA), 3D with color and CPA, 4D high volume color, Live xPlane, xPlane pulsed Doppler, 3D panoramic, advanced variable XRES, XRES Pro, harmonic imaging and 3D/4D vessel cast presentation
- Multi-dimensional focusing for ultra-thin slice imaging
- Vascular, musculoskeletal, thyroid and pediatric abdomen applications
- Supports biopsy guide capabilities

#### **X7-2 xMATRIX array with PureWave crystal technology**

- 7 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
- 2D, biplane (Live xPlane), triggered full volume, Live 3D Echo, elevation compounding imaging, 2D, biplane and 3D imaging color Doppler, pulsed Doppler, XRES, harmonic imaging and M-mode
- Adult and pediatric echo

#### **X7-2t xMATRIX array TEE with PureWave crystal technology**

- 7 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
- 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 3D Echo, Live 3D Zoom, 3D zoom color, 3D zoom color preview, two-volume view, triggered full volume and triggered 3D color volume

#### **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
- 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 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**

#### **D2cwc CW transducer (Pedoff)**

- Dedicated 2 MHz continuous wave Doppler
- Adult cardiology applications

#### **D5cwc CW transducer (Pedoff)**

- Dedicated 5 MHz continuous wave Doppler
- Deep venous and arterial applications

#### **D2tcd PW transducer (Pedoff)**

- Dedicated 2 MHz pulsed wave Doppler
- Transcranial Doppler applications

## 5.2 EPIQ Elite transducers, features and presets



Transducer		C5-1	mC7-2	mC12-3	C8-5	C9-2	C10-3v	C10-4ec
Type of array		Curved	Tightly curved	Tightly curved	Tightly curved	Curved	Tightly curved	Tightly curved
Number of elements		160	128	160	128	192	128	128
Scanplane aperture		55.5 mm	26.5 mm	16 mm	15 mm	53.76 mm	26.1 mm	24.3 mm
Field of view		111°	73°	90°	90°	102°	163°	147°
Volume field of view								
Broadband frequency range		5-1 MHz	7-2 MHz	12-3 MHz	8-5 MHz	9-2 MHz	10-3 MHz	10-4 MHz
<b>Features</b>								
PureWave		•		•		•	•	
xMATRIX								
Number of BX angles		4/5	5		1	4/5	1	1
HPRF		•	•			•		
XRES Pro		•	•	•				
MicroFlow Imaging		•	•	•	•	•		
MicroFlow Imaging HD (MFI-HD)		•		•				
Variable XRES		•	•	•	•	•	•	
Tissue Boost								
MicroCPA		•			•	•	•	
2D Opt Inheritance		•	•			•	•	
Pan zoom		•	•	•	•	•	•	•
Contrast		•	•	•		•	•	•
Elastography		SW					ST	
Image fusion		•	•			•		•
Compatible Affiniti 50			•		•			•
Compatible Affiniti 70		•	•		•	•	•	•
Compatible CX50		•			•		•	
<b>Preset</b>								
<b>Abdominal</b>	Bowel	•				•		
	General	•	•			•		
	Resolution	•	•			•		
	Penetration	•						
	Renal	•				•		
	User (China only)	•						
	Vascular	•						
	Intervention	•						
	General (1.2)	•						
<b>Obstetrics</b>	General	•				•	•	•
	Penetration	•						
	Early OB	•				•	•	•
	NT	•				•		
	Early fetal echo					•		
	OB fetal echo	•				•	•	•
	OB fetal heart	•				•		
	GYN pelvis	•				•	•	•
	GYN fertility	•					•	
	GYN penetration						•	
<b>Pediatrics</b>	Abdomen	•		•	•	•		
	Hip							
	Neonatal head			•	•			
<b>Small parts</b>	General							
	Superficial							
	Breast							
	Testicular							
	Thyroid							
<b>Urology</b>	Bladder						•	•
	Prostate							•
<b>Musculoskeletal</b>	General					•		
	Superficial							
<b>Vascular</b>	Arterial				•			
	Carotid			•	•			
	Superficial							
	Surgical							
	Venous				•	•		
	Intraoperative							
	TCD							
<b>Cardiac</b>	Adult echo							
	Echo penetration							
	Adult general (China only)							
	Pediatric (echo)							
	Cardiac epiaortic							
	Epicardiac							

INF = Infinite Angles ST = Strain Elastography SW = Shear Wave Elastography



Transducer		V6-2	V9-2	3D9-3v	eL18-4	eL18-4 EMT	L12-3 ERGO	L12-3
Type of array		Curved	Curved	Tightly curved	Linear	Linear	Linear	Linear
Number of elements		192	192	128	1920	1920	160	160
Scanplane aperture		63.36 mm	53.8 mm	26.1 mm	50 mm	50 mm	38 mm	38 mm
Field of view		100°	100°	164°			NA	NA
Volume field of view		100° x 85°	100° x 80°	156° x 85°				
Broadband frequency range		6-2 MHz	9-2 MHz	9-3 MHz	22-2 MHz	22-2 MHz	12-3 MHz	12-3 MHz
<b>Features</b>								
PureWave					•	•		
xMATRIX								
Number of BX angles		2	5	1	INF/3/5	INF/3/5	3/5	3/5
HPRF		•			•	•		
XRES Pro			•		•	•	•	•
MicroFlow Imaging			•		•	•	•	•
MicroFlow Imaging HD (MFI-HD)					•	•		
Variable XRES		•	•		•	•	•	•
Tissue Boost								
MicroCPA		•			•	•	•	•
2D Opt Inheritance		•	•		•	•	•	•
Pan zoom		•	•	•	•	•	•	•
Contrast					•	•		
Elastography					ST, SW	ST, SW		
Image fusion					•	•		
Compatible Affiniti 50		•	•	•			•	•
Compatible Affiniti 70		•	•	•	•	•	•	•
Compatible CX50							•	•
<b>Preset</b>								
<b>Abdominal</b>	Bowel				•	•	•	•
	General				•	•		
	Resolution							
	Penetration							
	Renal							
	User (China only)	•						
<b>Obstetrics</b>	Vascular							
	Intervention							
	General (1.2)							
	General	•	•	•	•	•		
	Penetration							
	Early OB	•	•	•				
	NT		•					
	Early fetal echo							
<b>Pediatrics</b>	OB fetal echo	•		•				
	OB fetal heart		•					
	GYN pelvis			•				
	GYN fertility			•				
	GYN penetration			•				
	Abdomen				•	•		
<b>Small parts</b>	Hip				•	•		
	Neonatal head							
	General							
	Superficial						•	•
	Breast				•	•	•	•
<b>Urology</b>	Testicular				•	•		
	Thyroid				•	•		
	Bladder			•				
	Prostate							
<b>Musculoskeletal</b>	General				•	•	•	•
	Superficial				•	•		
	Arterial				•	•	•	•
<b>Vascular</b>	Carotid				•	•	•	•
	Superficial				•	•		
	Surgical						•	•
	Venous				•	•	•	•
	Intraoperative							
	TCD							
<b>Cardiac</b>	Adult echo							
	Echo penetration							
	Adult general (China only)							
	Pediatric (echo)							
	Cardiac epiaortic							
	Epicardiac							

INF = Infinite Angles ST = Strain Elastography SW = Shear Wave Elastography

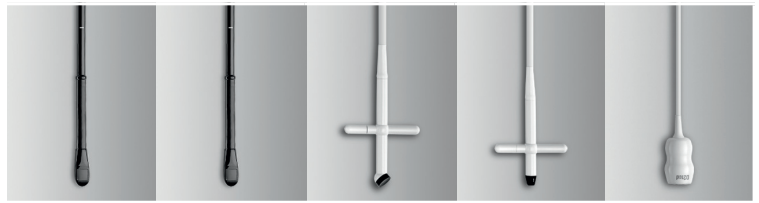


Transducer	L12-5 50	L15-7io	L18-5	VL13-5	S5-1	S7-3t	S8-3
Type of array	Linear	Linear	Linear	Linear	Sector	Sector	Sector
Number of elements	256	128	288	192	80	48	96
Scanplane aperture	50 mm	23 mm	38.9 mm	38 mm	20.3 mm	5 mm	15.4 mm
Field of view	NA	NA	NA		90°	90°	90°
Volume field of view				38 mm x 30°			
Broadband frequency range	12-5 MHz	15-7 MHz	18-5 MHz	13-5 MHz	5-1 MHz	7-3 MHz	8-3 MHz
<b>Features</b>							
PureWave					•		
xMATRIX							
Number of BX angles	INF/5		INF/5	2	3		
HPRF					•		•
XRES Pro	•	•	•				
MicroFlow Imaging							
MicroFlow Imaging HD (MFI-HD)							
Variable XRES	•		•		•	•	•
Tissue Boost							
MicroCPA	•		•		•		•
2D Opt Inheritance					•	•	•
Pan zoom	•	•	•	•	•	•	•
Contrast	•				•		
Elastography	ST		ST				
Image fusion	•				•		
Compatible Affiniti 50	•	•	•	•		•	•
Compatible Affiniti 70	•	•	•	•	•	•	•
Compatible CX50	•	•			•		•
<b>Preset</b>							
<b>Abdominal</b>							
Bowel	•						
General					•		
Resolution							
Penetration							
Renal							
User (China only)							
Vascular							
Intervention							
General (1.2)							
<b>Obstetrics</b>							
General	•						
Penetration							
Early OB							
NT							
Early fetal echo							
OB fetal echo							
OB fetal heart							
GYN pelvis							
GYN fertility							
GYN penetration							
<b>Pediatrics</b>							
Abdomen	•		•				
Hip	•		•				
Neonatal head							
<b>Small parts</b>							
General				•			
Superficial	•		•				
Breast	•		•	•			
Testicular	•		•				
Thyroid	•		•	•			
<b>Urology</b>							
Bladder							
Prostate							
<b>Musculoskeletal</b>							
General	•		•				
Superficial	•	•	•				
Arterial	•		•				
Carotid	•		•	•			
Superficial		•					
Surgical							
Venous	•		•				
Intraoperative		•					
TCD					•		
<b>Cardiac</b>							
Adult echo					•	•	•
Echo penetration					•		
Adult general (China only)					•		
Pediatric (echo)					•	•	•
Cardiac epiaortic							
Epicardiac							

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Transducer		S8-3T	S9-2	S12-4	X5-1	X6-1	XL14-3	X7-2
Type of array		Sector	Sector	Sector	xMATRIX	xMATRIX	xMATRIX	xMATRIX
Number of elements		32	128	96	3040	9212	>56,000	2500
Scanplane aperture		4.76 mm	25.36 mm	9.78 mm	Proprietary	Proprietary	Proprietary	
Field of view		90°	120°	90°	90°	100°		90°
Volume field of view					98° x 98°	90° x 90°	90° x 90°	86° x 86°
Broadband frequency range		8-3 MHz	9-2 MHz	12-4 MHz	5-1 MHz	6-1 MHz	3-14 MHz	7-2 MHz
<b>Features</b>								
PureWave					•	•	•	•
xMATRIX					•	•	•	•
Number of BX angles					3	3	3	
HPRF			•	•	•	•	•	•
XRES Pro						•	•	
MicroFlow Imaging								
MicroFlow Imaging HD (MFI-HD)								
Variable XRES		•	•	•	•	•		•
Tissue Boost					•			
MicroCPA			•	•			•	
2D Opt Inheritance		•	•	•	•	•	•	•
Pan zoom		•	•	•	•	•	•	•
Contrast					•	•		
Elastography								
Image fusion						•		
Compatible Affiniti 50				•				
Compatible Affiniti 70		•		•	•			
Compatible CX50				•				
<b>Preset</b>								
<b>Abdominal</b>	Bowel					•		
	General					•		
	Resolution							
	Penetration					•		
	Renal					•		
	User (China only)					•		
	Vascular				•	•		
<b>Obstetrics</b>	Intervention					•		
	General (1.2)							
	General					•		
	Penetration					•		
	Early OB					•		
	NT					•		
	Early fetal echo					•		
	OB fetal echo					•		
	OB fetal heart					•		
	GYN pelvis					•		
<b>Pediatrics</b>	GYN fertility							
	GYN penetration							
	Abdomen							
	Hip							
<b>Small parts</b>	Neonatal head			•				
	General							
	Superficial							
	Breast							
	Testicular							
<b>Urology</b>	Thyroid						•	
	Bladder							
	Prostate							
<b>Musculoskeletal</b>	General						•	
	Superficial							
<b>Vascular</b>	Arterial						•	
	Carotid						•	
	Superficial							
	Surgical							
	Venous						•	
	Intraoperative							
<b>Cardiac</b>	TCD				•			
	Adult echo	•	•	•	•			•
	Echo penetration				•			
	Adult general (China only)							
	Pediatric (echo)	•	•	•	•			•
	Cardiac epiaortic							
Epicardiac								



Transducer		X7-2t	X8-2t*	D2cwc	D5cwc	D2tcd
Type of array		xMATRIX	xMATRIX			
Number of elements		2500	2500			
Scanplane aperture		Proprietary	Proprietary			
Field of view		90°	90°			
Volume field of view		98° x 98°	105° x 105°			
Broadband frequency range		7-2 MHz	8-2 MHz			
<b>Features</b>						
PureWave		•	•			
xMATRIX		•	•			
Number of BX angles						
HPRF						
XRES Pro						
MicroFlow Imaging						
MicroFlow Imaging HD (MFI-HD)						
Variable XRES		•	•			
Tissue Boost						
MicroCPA						
2D Opt Inheritance		•	•			
Pan zoom		•	•			
Contrast						
Elastography						
Image fusion						
Compatible Affiniti 50				•	•	•
Compatible Affiniti 70		•	•	•	•	•
Compatible CX50		•	•	•	•	
<b>Preset</b>						
<b>Abdominal</b>	Bowel					
	General					
	Resolution					
	Penetration					
	Renal					
	User (China only)					
	Vascular					
	Intervention					
	General (1.2)					
<b>Obstetrics</b>	General					
	Penetration					
	Early OB					
	NT					
	Early fetal echo					
	OB fetal echo					
	OB fetal heart					
	GYN pelvis					
	GYN fertility					
	GYN penetration					
<b>Pediatrics</b>	Abdomen					
	Hip					
	Neonatal head					
<b>Small parts</b>	General					
	Superficial					
	Breast					
	Testicular					
	Thyroid					
<b>Urology</b>	Bladder					
	Prostate					
<b>Musculoskeletal</b>	General					
	Superficial					
<b>Vascular</b>	Arterial				•	
	Carotid					
	Superficial					
	Surgical					
	Venous				•	
	Intraoperative					
	TCD					•
<b>Cardiac</b>	Adult echo	•	•	•		
	Echo penetration					
	Adult general (China only)					
	Pediatric (echo)			•		
	Cardiac epiaortic					
	Epicardiac					

\*Only available on EPIQ systems. Currently not approved in all countries.

## 6. Image fusion and interventional navigation



### 6.1 Overview

The image fusion and interventional navigation system provides the operator with the following capabilities:

#### Ultrasound only

- Utilize electromagnetic tracking to define and track a specific target area during live ultrasound-guided interventions
- Fuse an ultrasound sweep (US or CEUS) with live ultrasound, to enhance workflow and visualization before, during and after ablation procedures
- Needle Navigation via Adaptive Needle Tracker (ANT): plan entry point and trajectory, and track a needle/device during live approach towards multiple targets

#### Image fusion

- Track a variety of ultrasound transducers to fuse ultrasound (US) with CT, MRI, or PET/CT to find Regions of Interest that are easier to see when combining imaging modalities
- Fuse up to three advanced modality images (CT, MRI, or PET) to one another to find Regions of Interest that are easier to see when combining imaging modalities
- Fuse previously acquired (historic) advanced images (CT, MRI, or PET/CT) with live ultrasound
- Perform fusion and navigation procedures using integrated color Doppler controls
- Perform fast, automated fusion setup (image registration) using reusable patient trackers attached to the patient
  - Image fusion patient trackers provide that fusion accuracy is maintained during unexpected patient motion without the need to perform fusion setup again during a procedure
  - Image fusion patient trackers are used to monitor respiratory motion to ensure consistent interventional access

- Perform fusion and navigation procedures using integrated color Doppler controls
- Perform fusion setup (image registration) using internal landmarks with fast internal plane matching or by selecting corresponding internal landmarks in each imaging modality
- Perform fusion setup (image registration) using external landmarks by manually selecting corresponding external landmarks using an image fusion tracked instrument
- Anatomical Intelligence Ultrasound (AIUS) Auto Registration
  - Perform automatic fusion setup (image registration) to contrast and non-contrast liver CT or liver MRI by performing an ultrasound sweep of the liver
  - Co-registration of three data sets is possible with Auto Registration in the liver
- Acquire a 3D ultrasound sweep and fuse to live 2D ultrasound for pre-/intra-/post-procedural imaging comparison (US-to-US fusion)
- Use the transducer or the control panel trackball for fast fusion adjustment in 3D and 2D, respectively
- Adjust image registration landmarks to achieve exceptional fusion accuracy using the control panel trackball and set keys
- Manually adjust the fusion overlay opacity (blend) using the control panel scroll knob or have image fusion automatically scroll through the opacity to verify fusion accuracy
- Adjust image fusion by adding an additional internal landmark point around an area of interest
- Insert annotations or measurements in the fusion mode using the touch panel and keyboard/virtual keyboard
- Visualize live Bmode fundamental ultrasound, CEUS, and fusion of CT/MR/PET in quad-screen view

#### **Interventional navigation and planning software**

- Use the trackball and set key to scroll through images and annotate and update targets and points of needle entry to pre-plan procedures and guide to a pre-defined trajectory
- Navigate instruments for diagnostic and therapeutic procedures such as biopsy, ablation, drainages, and injections
- Perform out-of-plane navigation using the image fusion Ultrasound Tracker and image fusion navigation-tracked instrumentation
- Display a tracked instrument position graphic on CT, MRI, or PET/CT images without the use of ultrasound
- Display a tracked instrument position graphic on ultrasound with and without fusion to CT, MRI, or PET/CT.
- Display an ultrasound guidance bar representing the distance between the ultrasound scan plane and the operator-selected target
- Perform live multi-planar (coronal/sagittal/axial) reconstructions on CT, MRI, or PET/CT images
- Live reformatting of CT, MRI, or PET/CT images around the tracked needle to visualize structures
- Use color Doppler to identify areas of interest and guide interventions
- Monitor the status of, and configure, connected image fusion instruments directly from the primary monitor

- Manual ablation parameter entry for treatment planning, and intra-procedural ablation monitoring and navigation
- On-screen help instructions for guidance through various fusion or navigation workflows
- Select layouts or save a customized layout with configurable views from the touchscreen

#### **Interventional navigation tracking instrumentation**

- Track instruments within a large dome-shaped tracking volume generated by the image fusion field generator (FG)
- Connect up to six instruments to the tool connection unit (TCU) for attachment of multiple instruments including image fusion patient trackers, ultrasound trackers, coaxial needle trackers and the adaptive needle tracker
- Carry and attach the portable TCU with its handle and flexible clip, respectively
- Easily store TCU on the back of the ultrasound system cart
- Two options for tracking interventional devices: the versatile image fusion adaptive needle tracker or the image fusion coaxial needle tracker
- Turn any interventional device (10G-18G) into a tracked instrument by attaching the reusable image fusion adaptive needle tracker
- Use the image fusion adaptive needle tracker and accompanying stylus to locate and match external landmarks during fusion setup (image registration), and to plan interventional trajectories
- Track the exact tip location and orientation using miniature electromagnetic sensors implanted at the tip of the image fusion coaxial needle tracker
- Use the image fusion coaxial needle tracker to guide a wide range of ablation, biopsy or other instruments with gauge compatibility from 13G-20G and length compatibility from 9 cm to more than 20 cm
- Compatible with CIVCO eTRAX™ needle-tip tracking system
- Reusable non-sterile needle handle available in 12G, 14G, 16G, 18G; compatible with CIVCO needle available separately

#### **Anatomical measurements**

- 2D and 3D distance and angle measurements for measurement of skin-to-target, target size, interventional window, distance between multiple trajectories, and other distances




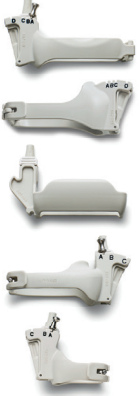


#### **Connectivity**

- Support for network DICOM image transfer from advanced imaging scanners or PACS on a hospital network
- Support for DICOM image import from USB or CD/DVD media
- Support for DICOM image export to external media (USB, CD/DVD) or PACS

#### **Adaptive needle tracker**

- Coaxial needle trackers: 13Gx11 cm, 13Gx16 cm, 16Gx11 cm, 17Gx16 cm, 18Gx8 cm, 18Gx13 cm, 20Gx8 cm, 20Gx13 cm, 20Gx17cm
- eTRAX

## 6.2 Image fusion accessories

Product	Description	Features
<p><b>Image fusion adaptive needle tracker</b></p> 	<p>Attach the image fusion adaptive needle tracker onto a variety of interventional devices for navigation tracking, interventional planning and fusion setup.</p>	<ul style="list-style-type: none"> <li>• Easily attach and detach from devices by tightening and loosening locking mechanism</li> <li>• Compatible with devices of various gauges (10G–18G) and various lengths</li> <li>• All components reusable in sterile field after reprocessing</li> <li>• 7 cm stylus included for external landmark matching and intervention planning</li> </ul>
<p><b>CIVCO eTRAX™</b></p> 	<p>eTRAX needle-tip tracking system tracks the tip of a needle using electromagnetic technology and real-time navigation.</p>	<ul style="list-style-type: none"> <li>• The system allows physicians safe and accurate placement of instruments during interventional procedures by monitoring the real-time trajectory of the needle as it advances through delicate anatomy to the center of a target</li> <li>• Supports: various gauges (12G, 14G, 16G, 18G) and lengths</li> <li>• CIVCO disposable coaxial needle sold separately</li> </ul>
<p><b>Image fusion coaxial needle tracker</b></p> 	<p>The image fusion coaxial needle tracker contains a miniature sensor embedded at the tip of a stylet inserted through an image fusion cannula. Use image fusion software to navigate the image fusion coaxial needle tracker to the Region of Interest. Remove the stylet and insert the interventional device through the image fusion cannula to perform the procedure. Example procedures include biopsy, ablation and drainage.</p>	<ul style="list-style-type: none"> <li>• One sterile stylet and cannula pair are used for interventional procedures</li> <li>• Robust tracking of the tip that provides tip location regardless of needle deflection or obscured tip visualization</li> <li>• Each image fusion coaxial needle tracker pouch contains three sterile cannulas and one sterile stylet for multiple insertions</li> <li>• Supports various gauges (13G–20G) and lengths (9 cm to greater than 20 cm)</li> </ul>
<p><b>Image fusion ultrasound tracker</b></p>  <p><b>C5-1 tracking bracket</b></p> <p><b>C9-2 tracking bracket</b></p> <p><b>L12-5 50 tracking bracket</b></p> <p><b>X6-1 tracking bracket</b></p> <p><b>S5-1 tracking bracket</b></p>	<p>Ultrasound transducer tracking device is compatible with image fusion biopsy guide brackets for:</p> <ul style="list-style-type: none"> <li>• Philips C5-1 transducer</li> <li>• Philips C9-2 transducer</li> <li>• Philips L12-5 50 transducer</li> <li>• Philips X6-1 transducer</li> <li>• Philips S5-1 transducer</li> <li>• Philips eL18-4 EMT transducer: integrated tracking technology is provided in this transducer, therefore no external tracking bracket is required</li> </ul>	<ul style="list-style-type: none"> <li>• Easily attach and detach a single device from any of the compatible image fusion biopsy guide brackets</li> <li>• Reusable in sterile field after decontamination, under a sterile drape</li> <li>• Perform 3D tracked sweep and image registration</li> <li>• Track location of ultrasound image relative to targets and tracked interventional devices</li> </ul>
<p><b>Image fusion endocavity tracker</b></p> 	<p>Endocavity transducer tracking device is compatible with image fusion biopsy guide brackets for Philips C10-4ec transducer.</p>	<ul style="list-style-type: none"> <li>• Reusable tracking after decontamination, under sheath</li> <li>• Perform image registration to advanced imaging (MRI, CT, PET/CT)</li> <li>• Track location of ultrasound image relative to targets and tracked interventional devices</li> </ul>
<p><b>Image fusion patient tracker</b></p> 	<p>The image fusion patient tracker contains multiple miniature embedded sensors and CT-visible markers inside the body of the device. The device is attached to a patient with a sterile-safe adhesive on its own when used for out-of-plane ultrasound navigation, or two or more when used for automated fusion setup.</p>	<ul style="list-style-type: none"> <li>• Rapid fusion setup for CT-guided procedures</li> <li>• Provides fusion accuracy during unexpected patient or field generator motion</li> <li>• Reusable in sterile field after decontamination, under a sterile drape</li> </ul>

# 7. Measurements and analysis

## 7.1 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
- 3D: ellipse and distance on 2 MPR views
- 3D: stacked contours on one MPR
- M-mode distance (depth, time, slope)
- Manual Doppler distance
- Manual Doppler trace
- Time/slope measurements in Doppler and M-mode
- Auto conversion of distance to ellipse
- 2D trace by points
- 2D distance (micro calipers)
- 2D Simpsons
- Generic angle
- Distance volume
- Distance and ellipse volume
- Diameter percent reduction
- Area percent reduction
- Hip angle
- Ratio
- Size compare
- High Q automatic Doppler analysis (general imaging only)
  - Doppler values including PI, RI, S/D indices
- Volume flow
- 2D volume (two volume methods)
- Heart rate
- Trackball-controlled electronic measurement calipers: eight sets
- User-defined protocols, measurements and equations
- On-the-fly measurement labels
- Fully editable results data sheet
- Integrated patient exam report
- Delete last measurement
- Embed image and graphs in report
- 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

## 7.2 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 excellent 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
- Display 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
- 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

### General Imaging 3D Quantification (GI 3DQ)

- Access to 3D viewing controls
- Simple annotation
- Linear distance measurements
  - Polygon, free-form polygon, spline, free-form spline, rectangle measurements
- Curved distance measurements
- Ellipse measurements
- Area measurements
- Auto area measurements semi-automated tool to simplify measurement of hypoechoic structures
- Angle measurements
- 3D measurement tools
  - Stacked contour measurements
  - Auto-stacked contour measurements semi-automated tool to simplify volume measurements of hypoechoic structures
  - Auto-volume tool
  - 3D distance/curved iSlice
  - Stacked ellipsoid measurements
  - Ellipsoidal measurements
- Calculation of the following color indices using the 2D and 3D measurement tools
  - Vascularization index (VI)
  - Flow index (FI)
  - Vascularization flow index (VFI)
  - Pixel intensity index (PII) and echo histogram display
- Support of the display of 3D orientation labels (when enabled)
  - Trending capability (available only on stand-alone PC)
- Display of timer (when enabled)

### Abdominal Aortic Aneurysm (AAA) Model

Software application that detects, segments and quantifies 3D ultrasound data for use in surveillance of native and post-endovascular aneurysm repair (EVAR) AAAs. Provides alternative to current standard of care by addressing drawbacks associated with 2D ultrasound for native AAA surveillance, inter-operator variability, and CTA for post-EVAR surveillance, patient exposure to high levels of radiation and nephrotoxic contrast agents.

- Detects, then segments native and post-EVAR AAAs in a 3D ultrasound scan collected with the Philips X6-1 xMATRIX array transducer
- Provides key measurements, including maximum anterior-to-posterior (AP) diameter and partial volume of aneurysm, while also indicating the centerline of aneurysm
- Ability to adjust segmentation performed by the software application or manually determine outline of aneurysm in the 3D ultrasound scan
- Results exported in these DICOM SR and .xls formats
  - Maximum anterior-to-posterior (AP) diameter
  - Maximum lateral (LAT) diameter
  - Maximum any (MAD) diameter
  - Partial volume

### Mitral Valve Navigator<sup>A.I.</sup> (MVN<sup>A.I.</sup>)

- 3D assessment of mitral valve anatomy and associated structures
- Review and quantification of Live 3D and full volume data sets from X7-2t and X8-2t\* xMATRIX transducers (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

#### **Automated Cardiac 2D Quantification<sup>A.I.</sup> (a2DQ<sup>A.I.</sup>) and a2DQ<sup>A.I.</sup> LA\***

- Left ventricle and left atrial 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<sup>A.I.</sup> (aCMQ<sup>A.I.</sup>)**

- Automated Region of Interest for selected anatomical views
- Objective assessment of left ventricle global function and regional wall motion, deformation and timing using the next generation of 2D speckle tracking technology
- File compatibility
  - Quantification of 2D native and non-native ultrasound DICOM images
  - Quantification of non-ECG images
- Available methods with dedicated preferences settings
  - Global workflow
- Latest generation of 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 transitioned 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

#### **Cardiac Motion/Mechanics 2D Quantification for Stress (CMQ Stress)**

- Designed to help objectify stress echo exam interpretation, CMQ Stress employs a user interface specifically designed for stress echo exams and around stress echo practitioners.
- Automated Region of Interest for selected anatomical views
  - Objective assessment of left ventricle global function and regional wall motion, deformation and timing using the next generation of 2D speckle tracking technology



- File compatibility
  - Display and quantification of 2D native ultrasound DICOM stress echo images
- Global workflow
  - Latest generation of 2D speckle tracking technology
  - Semi-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 tool editable threshold helps to display various quality tracking
  - 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, MVC mechanical events auto-imported from ultrasound cart analysis via DICOM SR or manual entry)
- 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
  - Waveform auto peak or systolic peak detection to report time to peak and peak values
  - Timing calipers
  - 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
  - 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
- Measurement data exported in Excel formats

### Intima Media Thickness (IMT) measurements

- Automated measurements of intima media thickness (IMT) in carotids and other superficial vessels
- Automated measurement technique on user-selected frames
- Selector chart to record location and side of vessel from where IMT is measured
- Report of the IMT values in mean millimeters and standard deviation
- Quick optimization for thin or thick intima media complexes
- User-adjustable Region of Interest
- User-defined measurement capability
- Persistent storage of up to ten measurements with image files for future reference
- Measurement data exported in Excel or DICOM SR formats

### MicroVascular Imaging (MVI)

- Review loops including side-by-side display files
- Motion compensation algorithm selectable in Preferences menu
- Export of single frames as BMP, JPG or TIF file format
- Export of movie files as AVI file format

### Region of Interest (ROI) Quantification

- Vascular, general radiology and cardiac images
- Trending capability (available only on stand-alone PC)
- Up to ten user-defined regions
- Thumbnail display of frames for easy trimming
- Pixel intensity index (PII) and echo histogram display, supported data types: echo, velocity or power (angio)
- Custom tools to auto trim relative to ECG trigger on cardiac and other triggered files for quantification of specific parts of cardiac cycle
- Region shaping tools
  - Polygon
  - Free-form spline
  - Free-form polygon
  - Rectangle
  - Spline
  - Square 5 mm
- Single frame tools
  - Angle
  - Ellipse
  - Annotation
  - LivexPlane ROI
  - Curved distance
  - combination
  - Distance
- Auto area for semi-automated quantification of hypoechoic structures
- Adjustable ROI dynamic tool
- Motion compensation algorithm selectable in Preferences menu
- Data display selection
  - Log
  - Linear
- Data display smoothing option
- Mean, median and standard deviation calculation
- Time-intensity curves
- Curve fitting tools
  - Gamma-variate (wash-in and wash-out)
  - One minus exponential
  - Linear
  - Log normal WI
  - Log normal WIWO
  - LDRW WIWO

- Graphic results with dB, intensity or velocity/frequency, time to peak, "A" value, area under curve, and peak intensity (when a gamma variate curve has been applied) for each frame
- Calculation of the following color indices using the 2D measurement tools
  - Vascularization index (VI)
  - Flow index (FI)
  - Vascularization flow index (VFI)

### Strain Quantification (SQ)\*

- 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
- Includes ability to overlay opening and closing of aortic and mitral valves on SQ curves to display left ventricle mechanical events
- User-selectable waveform display that makes SQ curves easier to read
- Capable of drawing up to four M-lines at a time
- 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 exceptional sub-region visualization
- Curve processing modes
- Cardiac mechanical timing reference overlay
- 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
- Measurement data exported in Excel format

### HeartModel<sup>A.I.\*</sup>

- Philips HeartModel<sup>A.I.</sup> brings robust 3D quantification to everyday clinical practice. This anatomically intelligent premier cardiac application automatically detects, segments and quantifies the left ventricle (LV) and left atrium (LA) from a Live 3D volume. HeartModel<sup>A.I.</sup> provides automated 2D views and reproducible quantification across users and over time, with the workflow efficiency to facilitate faster exams for the robust measurement of cardiac function necessary for management of patients with chronic disease.
- HeartModel<sup>A.I.</sup> automatically segments the heart chambers within a 3D volume
  - HeartModel<sup>A.I.</sup> displays the routine 2D apical and short axis views at end-diastole and end-systole for adult hearts
  - HeartModel<sup>A.I.</sup> finds the shape of the heart chambers and displays the chamber border in ASE/ESE views for the user to accept, reject or edit

- Users can adjust the automated border where desired for the end-diastolic (ED) and end-systolic (ES) cardiac phases; edit capabilities include a global or regional edit function
- Results are exported in these DICOM SR and .xls formats
  - End diastolic LV length
  - End-systolic LV length
  - End diastolic LV volume
  - End-systolic LV volume
  - End-systolic LA volume
  - LV ejection fraction
  - Heart rate
  - Stroke volume
  - Default ES and ED border settings
  - Current ES and ED border settings

#### Dynamic HeartModel<sup>A.1.\*</sup>

- Provides full cycle cardiac quantification
- Shows moving contours for left ventricle (LV) and left atrium (LA) volumes
- Offers measurement of LV mass, cardiac index, complete LA volumes and index
- A multi-beat analysis allows the user to analyze different beats and average the results with the same acquisition

#### TOMTEC 3D Auto RV

The RV quantification tool for clinical routine work, pulmonary hypertension and right-sided heart failure, 3D Auto RV allows complete evaluation of the RV and combines 3D and 2D values including EDV, EDVi, ESV, ESVi, EF and SV, RVLS, TA PSE and FAC. 3D Auto RV helps to overcome the RV complexity by calculating standard values based on a 3D surface model. A detailed and easy-to-follow workflow allows users to adapt the proposed contour quickly and easily

- Increase your diagnostic confidence by visualizing the complex RV shape in 3D
- Calculate RV data based on a complex 3D surface model
- Validated model of the RV
- Display model in combination with 2D planes for a better control
- Automated 2D measurements with every 3D analysis available for DICOM SR and .txt formats
- 3D measurement results: RV EDV, EDVi, ESV, ESVi, EF and SV
- 2D measurement results: TAPSE, Distances and FAC
- Additional strain values: RVLS free wall and septum

HeartModel<sup>A.1</sup>, Dynamic HeartModel<sup>A.1</sup> and TOMTEC's 3D Auto RV require the use of the HeartModel<sup>A.1</sup> acquisition mode on the X5-1 transducer.

#### 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
  - Manual three-point ROI workflow
  - Ability to analyze images with or without ECG
  - Ability to analyze non-native data images
  - 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
- 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

#### TOMTEC 4D Mitral Valve Assessment (MVA)

4D Mitral Valve Assessment (MVA) 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.

Geometric measurements such as annular dimensions, leaflet morphology and coaptation descriptions can be used from the initial discovery of MV disease or pathology, through support in device planning and up to the monitoring of pre- and postoperative cases. Additionally, advanced navigation options and flexible manual measurements in 2D and 3D allow for individual planning of new devices.

- Mitral valve analysis based on 4D echo data
  - Streamlined workflow with semi-automated annulus detection
  - Manual review and the possibility to edit the automated model proposal
  - Comprehensive automatic measurements for annulus, leaflets and coaptation
- Export of results to DICOM SR and .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

### 7.3 High Q automatic Doppler analysis

- Automatic real-time and retrospective tracing of:
  - Instantaneous peak velocity
  - Instantaneous 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

### 7.4 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 three-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
  - Fetal biometry (up to quintuplets)
  - Biophysical profile
  - Amniotic fluid index
  - Early gestation
  - Fetal long bones
  - Fetal cranium
  - Other OB measurements
    - 2D echo
    - Fetal heart M-mode
    - Fetal Doppler
    - Fetal echo
- Gynecology/fertility
  - Uterine volume
  - Right and left ovary volumes
  - Right and left follicles (10)
  - Endometrial thickness
  - Cervical length
- Abdominal vascular
  - Labels for all major abdominal arteries and veins
  - Left and right segmentation for kidneys
- General imaging
  - General
  - User-defined labels
- Prostate
  - Prostate gland
- Pediatric
  - General
  - d:D ratio
- Small parts
  - General
  - Breast with right and left protocols for up to five lesions per breast
  - Testicle
    - Testicle volume
    - EPI head, body, tail
  - Urology
  - Prostate, PSA, PSA density

## 8. Physical specifications



- Easily accessed transducer connector ports, USB, and DVD media drive, if equipped
- Transducer and gel bottle holders
- Mobility through high-quality, shock-absorbing casters with foot pedal controls for:
  - 4-wheel swivel
  - 2-wheel swivel lock
  - 2-wheel brakes
- Integrated footrests
- Transducer connector and OEM bay illumination for easy visibility in scanning rooms
- Digitally-enhanced two-speaker high-fidelity stereo output with rear-mounted subwoofer
- On-board storage tray behind control panel touchscreen and in rear bay left and right storage drawers
- Universal peripheral bay that provides easy access for up to two on-board hardcopy or documentation devices
- Built-in A/C line conditioner that provides isolation from voltage fluctuations and electrical noise interference
- Three high-capacity fans with automatic speed adjustment to optimize cooling efficiency with minimal audible noise

### 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 for reduced eyestrain
  - 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

### System dimensions

<b>Width</b>	60.6 cm/23.9 in
<b>Height</b>	146-171.5 cm/57.5-67.5 in
<b>Depth</b>	109.2 cm/43 in
<b>Weight</b>	104.3 kg/230 lb without peripheral devices

### System cart

- State-of-the-art 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

### Optional HD MAX display monitor

- Immersive 24 inch/60.96 cm monitor with WLED backlight technology that achieves 350 cd/m2 maximum brightness
- 40% brighter than OLED technology
- Meets the ACR display standard for diagnostic imaging brightness levels
- IPS architecture achieves superb off-angle viewing of >180° allows visualization of clinical images throughout scanning room
- Backlight stabilization circuitry
- Response time <10 ms
- Ultra-wide color gamut with 10 bit color depth (billions of colors) for accurate color reproduction
- High contrast dynamic range >1000:1 and enhanced black levels for subtle delineation of grayscale values
- Glass faced design for panel protection and easy cleaning
- Designed for MaxVue high definition (FHD 1920 x 1080) image display format

## Control panel

- Articulation facilitates nearly infinite positioning adjustments for excellent scanning ergonomics: height, swivel and tilt
  - Up and down 25.4 cm/10 in
  - Rotates 180° from center
  - Complete freedom for side-to-side slide movement, infinite positions
  - Operates on battery for adjustment during mobile exams
  - Retractable, backlit alphanumeric keyboard
  - Palm rest

## Physio

- One three-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 format digital color printer (USB)
  - Small format digital B/W printer (USB)
  - Image fusion
- AI Breast
- Support for large format external color printer
- Support for various Hewlett-Packard and Epson 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)
- Display port video export available for either full screen resolution of 1920x1080 (1080p) or display area 1024x768

## Power requirements and video parameters

- 100V-240 V, 50 Hz/60 Hz – PAL/NTSC
- Integrated A/C line conditioning and battery back-up system
- Power consumption: <600 VA depending on system configuration

## 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)



# 9. Maintenance and services

## Maintenance

- Flexible service agreements to meet varied customer needs and budgets
- Centralized technical and clinical support
- On-site support
- Modular design for rapid repairs
- Easy customer access to trackball and air filter for cleaning
- Remote log file transfer
- On-cart software maintenance tools
  - Optimization
  - Maintenance
  - Repair
  - Configuration management
- Comprehensive diagnostics
  - Hardware
  - Software
  - Network
  - On-cart electronic transducer testing
- First responder access to diagnostics and utilities
- Spare parts availability for seven years from end of production



\* Service agreement required for access to Philips Remote Services. Access to the Internet required. Not all remote features available in all countries; contact your Philips representative for details.

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## Services

### Clinical education\*

- Webinars
- Symposiums
- On-site
- Classroom
- Remote

### Philips Remote Connectivity\*

- iSSL and encryption
- Patient de-identify
- Security
- Remote Desktop
  - Remote technical support
  - Remote clinical support
  - Remote clinical education
- On-cart remote support request
- Proactive monitoring with alerting capability
  - Monitors key system parameters
    - Voltage
    - Temp
    - Fan speeds
    - Error conditions
  - Local alert handling and response

### Warranty

- Philips standard product warranty



[philips.com/epiq](https://philips.com/epiq)

Printed in the Netherlands.  
4522 991 60011 \* MAY 2020