High performance compact ultrasound

Philips CX30 CompactXtreme ultrasound
system specifications

PHILIPS
sense and simplicity

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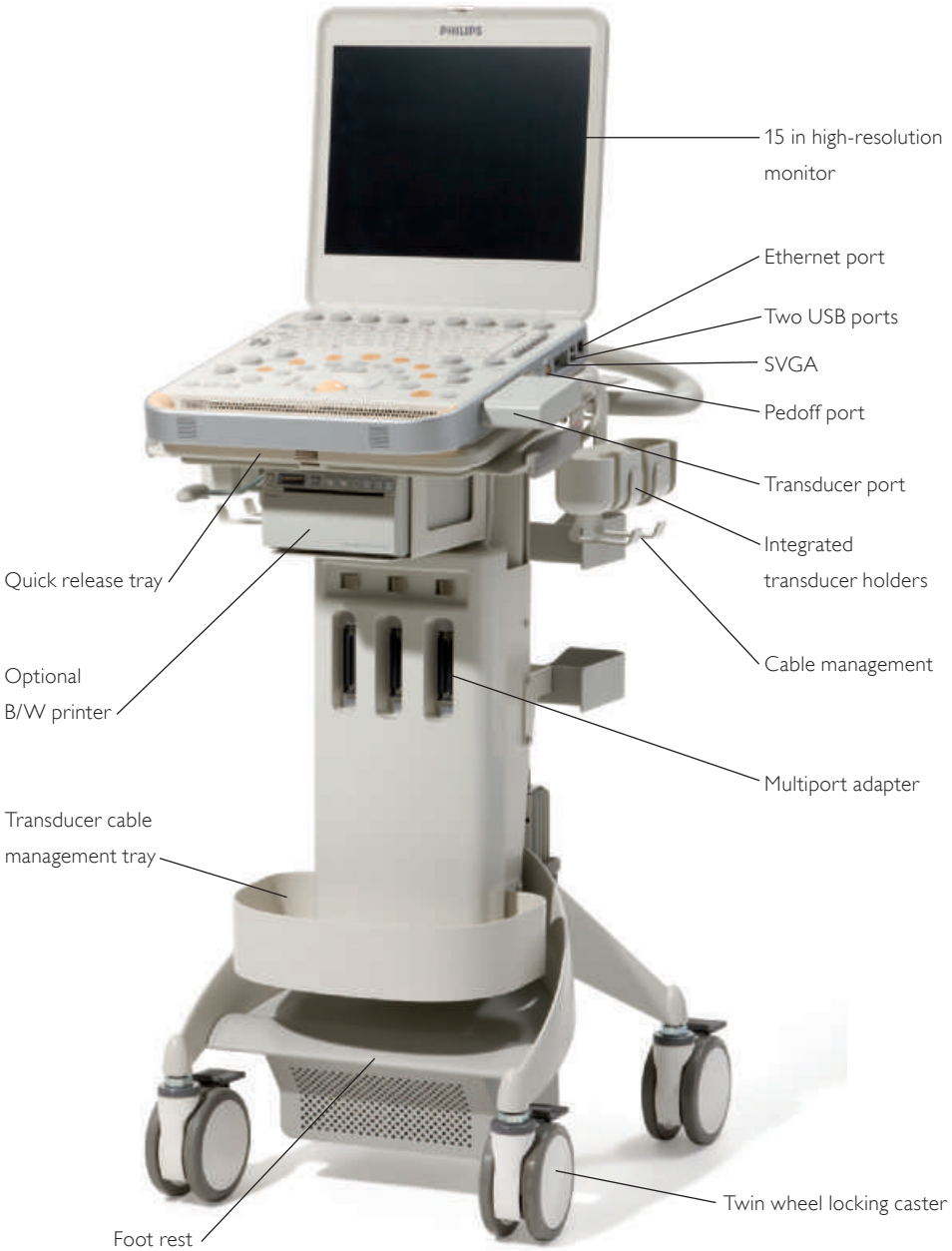
1. Introduction

Philips CX30 CompactXtreme ultrasound system goes wherever you need it, bringing ultrasound excellence to the bedside and beyond. A fully-featured system in a compact package, it combines portability with utility to fit in almost any clinical situation.

The CX30 is fully configurable, allowing you to select imaging capabilities, transducers, and clinical analysis to support your exam needs.

Key advantages

- Clinical versatility, for use in varied settings
- Extreme portability, so that you can always access ultrasound imaging at the point of care
- Advanced technology, for increased diagnostic confidence



1.1 Applications

- Adult cardiac
- Stress echo
- Abdominal
- Pediatric
- Vascular
- Obstetrical
- Gynecological and fertility
- Small parts
- Breast
- Musculoskeletal
- Emergency medicine
- Regional anesthesia
- Intervention

1.2 Optional portability

- Specially designed cart
- Wheeled travel case
- Additional AC adapter

2. System overview

Philips proprietary technologies are an integral part of the CompactXtreme platform, and provide the basis for its extensive range of imaging capabilities.

2.1 System architecture

- Next generation all-digital compact broadband beamformer with pulse shaping capability
- High resolution A/D conversion with 170 dB full time system dynamic range
- 20,000 digitally-processed channels
- Multi-variate harmonic imaging including pulse inversion processing
- One-touch 2D optimization with broadband frequency compounding
- SonoCT real-time beam-steered compound imaging
- Advanced XRES adaptive image processing
- Continuously variable steering in 2D, color Doppler, and Doppler modes
- iSCAN one-touch intelligent optimization for 2D and Doppler
- Active native data manipulation
- Tissue specific imaging presets
- Gray shades: 256 levels (8 bit) in 2D, M-mode, and Doppler

The CX30 combines robust imaging capabilities and advanced optimization for diagnostic confidence.

2.2 Imaging modes

- 2D
- M-mode
- Anatomical M-mode
- Color M-mode
- Color Power Angio (CPA) imaging
- Directional CPA
- Pulsed wave (PW) Doppler
- HPRF PW Doppler
- Continuous wave (CW) Doppler
- Freehand 3D imaging
- QLAB advanced quantification software
- Invert and color invert
- Color compare mode
- Dual mode
- Duplex for simultaneous 2D and Doppler
- Triplex for simultaneous 2D, Doppler, and color or Color Power Angio
- 2D and flow optimization signal processing
- Intelligent Doppler – automatically maintains pre-selected 0/60 degree flow angle
- Live compare
- Tissues Harmonic Imaging (THI)
- Reconstructed zoom with pan (read zoom)
- High definition write zoom
- Trapezoidal imaging
- Pulse inversion harmonic imaging
- Adaptive Doppler
- Adaptive color Doppler
- Color tissue Doppler imaging
- Pulsed wave tissue Doppler imaging
- Active native data (allows manipulation of raw image data)
- SmartExam system-guided protocol capability

2D grayscale

- Smart TGC: pre-defined TGC curves optimized for consistently excellent imaging with minimal TGC adjustment
- User adjustable LGC control
- High definition zoom concentrates all image processing power into a user-defined area of interest; possible to combine high definition zoom with pan zoom
- Cineloop image review
- Selectable 2D compression settings
- Sector size and steering control for sector and curved array image formats
- Dual imaging with either independent cineloop buffers or split screen imaging
- Live compare
- Chroma imaging with multiple maps
- 256 (8 bits) discrete gray levels
- 2D acquisition frame rate up to 755 frames/sec (dependent on field-of-view, depth and angle)

M-mode

- Available on imaging transducers
- Selectable sweeping rates
- Time markers: 0.2 and 1.0 seconds
- Acquisition zoom capability
- Selectable display format prospective or retrospective (1/3-2/3, 2/3-1/3, side by side, full screen)
- Chroma colorization with multiple color maps
- Cineloop review for retrospective analysis

Anatomical M-mode

- Available for cardiac imaging transducers
- Uses 2D image as a basis for M-mode analysis at a defined line, independent of transducer orientation
- Makes it easy to keep the M-mode line perpendicular to the anatomy, even in abnormally shaped or positioned hearts
- Provides data on direction, position and timing of any single echo received from any point of the tissue for M-mode analysis in any direction, for examining cardiac chamber diameters, LV regional wall motion, and location of accessory pathways
- Anatomical M-mode trace can be generated or modified post Freeze

Tissue Doppler imaging

- Available on S4-2 transducer
- Allows high frame rate acquisition of tissue motion
- Color gain, TGC, and LGC
- 8 color maps
- Velocity (cm/s)

Pulsed wave Doppler

- Available on all imaging transducers
- Adjustable sample volume size: 0.8-24.6 mm (transducer dependent)
- Simultaneous or duplex mode of operation
- Simultaneous 2D, color Doppler or CPA, pulsed Doppler
- iSCAN optimization automatically adjusts scale, baseline, and Doppler gain

Continuous wave Doppler

- Available on cardiac sector array transducers and non-imaging transducers
- Steerable through 90° sector
- Maximum velocity range: 20 m/sec (transducer dependent)

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
- Angle correction with automatic velocity scale adjustment
- Adjustable velocity display ranges
- Normal/invert display around horizontal zero line
- Selectable sweep speeds
- Selectable low-frequency signal filtering with adjustable wall filter settings
- Selectable grayscale curve for optimal display
- Selectable Chroma colorization maps
- Selectable display format prospective or retrospective (1/3-2/3, 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 in PW frozen mode includes map, baseline, sweep speed, invert, compress, reject, and Chroma

Color Doppler

- Adaptive mode adjusts Doppler frequency and sensitivity based on color ROI placement within image available on all imaging transducers
- 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
- 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
- User selectable smoothing control
- User selectable persistence control
- Color/2D line density control

Tissue harmonic imaging

- Second harmonic processing to reduce artifacts and enhance image clarity
- 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
- Supports SonoCT (harmonic SonoCT) and XRES modes

Color Power Angio imaging

- Highly sensitive mode for small vessel visualization
- Available on all imaging transducers
- Cineloop review
- Multiple color maps
- Individual controls for gain, PRF, baseline, filters, sensitivity, echo write priority and color invert
- Dynamic motion differentiation
- Adjustable CPA region of interest: size and position
- User-selectable persistence
- User-selectable blending
- Directional Color Power Angio (DCPA) mode

Freehand 3D

- Qualitative grayscale volume acquisition supported on all imaging transducers
- Volume display with surface rendering (transparency, threshold, smoothing, brightness, and opacity controls)
- Multiplanar view display
- Specialized algorithms and maps increase three-dimensional display
- Trim tools on both volume and multiplanar reconstructed (MPR) views
- Supported by SonoCT and XRES modes to reduce noise artifacts
- Resize control adjusts for different sweep speeds
- Sculpt/erase control of volume
- Advanced QLAB volume analysis tools:
  – iSlice precision tomographic volume imaging capability

Controls are logically placed on the CX30 control panel for quick selection during every exam.

3. System controls

The CX30 was designed to make portable exams easy and efficient. Featuring sophisticated imaging controls to help you acquire superb images and an easy to use control panel.

3.1 Advanced imaging controls

iSCAN image optimization

- One-touch image optimization
- In 2D mode, one button automatic adjustment of:
  - TGC and receiver gain to achieve optimal uniformity and brightness of tissues
- In Doppler mode, one button automatic adjustment of:
  - Doppler PRF based on detected velocity
  - Doppler baseline based on detected flow direction
  - Gain to achieve optimal brightness of spectral waveform
- Available on all imaging transducers
- Operates in conjunction with SonoCT and XRES imaging

SonoCT real-time compound imaging

- Available on all curved transducers and linear array
- Decreases virtually all clutter and artifact
- Automatic selection of the number of steering angles (up to 9) based on the user-selected resolution/frame rate (Res/Speed) condition
- Operates in conjunction with Tissue Harmonic Imaging, volume modes, imaging, and duplex Doppler
- Operates in conjunction with XRES imaging

Advanced XRES adaptive image processing

- Available on all imaging transducers
- Decreases virtually all speckle noise and enhances border definition

Expanded field of view

- Trapezoidal imaging
  - Expands field of view on linear array transducers up to 15° on each side in vascular and general imaging applications

Active native data

- 2D image controls that can be changed in review include: gain (overall gain, TGC, LGC), compress, gray map, Chroma map, orientation (L/R, U/D), display zoom/pan, XRES
- PW and CW Doppler controls that can be changed include: gain, baseline, invert, angle correct, angle 60/0/60, sweep speed, grayscale and Chroma maps compress and reject, PW trace (High Q controls), display format
- Color image controls that can be changed in review include: gain, baseline, color map, invert, write priority, smoothing, suppress, variance, directional Color Power Angio
- Physio controls that can be changed: sweep speed, position, gain
- Images can be acquired in prospective and retrospective timing sequences
- Images are acquired at acoustic data frame rate
- Available in cineloop and quick review modes

Live compare

- Allows recall of current or previous exam image data for direct side-by-side comparison with current image data

3.2 Control panel and user interface

- Easy-to-learn graphical user interface
- Ergo-centric design of primary controls readily accessible and logically grouped
- Tri-state control panel lighting (active, available, and unavailable)
- Automatic ambient lighting sensing for exceptional image viewing in both light and dark environments
- Dual function mode switch and independent gain controls for 2D, CPA, M-mode and color, PW, CW Doppler
- Eight-slide pot control adjustment of TGC curve
- Two-slide pot control adjustment of LGC curve
- iSCAN control for 2D/Doppler/color Doppler automatic optimization
- High definition/pan zoom control
- Freeze control
- Programmable print control
- Transducer selection and tissue specific imaging control
- Report and review controls
- Protocol selection control

4. Workflow

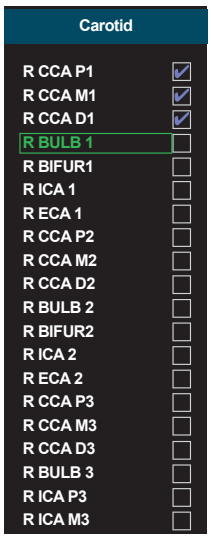
The CX30 system adapts to your workflow, whether you're in the ICU, at the bedside, in the ED, or at a remote location. With easy-to-use tools designed for your needs, you're ready to scan wherever your patients are located.

4.1 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 or user ID, institution name, and performed by
- Annotation data and patient name can be turned off (hidden) for generating images used in publication and presentation
- Scan plane orientation marker
- User selectable depth scale display
- Real-time display of mechanical index (MI)
- Real-time display of thermal index (TIb, TIc, TIs)
- Multiple trackball-driven annotation arrows
- Pre-defined body markers, supported in single and dual imaging formats
- Doppler baseline invert in live and frozen imaging
- TGC curve (user selectable On/Off display)
- TGC values (On/Off display)
- Tool Tips provides a brief description of the abbreviated on-screen image parameters
- Informative trackball arbitration prompts
- Thumbnail display of images printed/stored
- Calculations results and analysis labels
- User friendly menus that allow navigation to other analysis features
- Network and connectivity icons to allow instant feedback about network and printer conditions
- Cineloop frame display
- Cineloop bar with trim markers
- Prompt region for informational message display
- Protocol procedure list with status

SmartExam protocols

- Exam guide with on-screen display
- Required views based on exam type
- Fully customizable protocol capability for clinical applications supported on the system with flexibility to conduct the examination protocol in any sequence
- Preset protocols for abdominal, vascular, and gynecological exams based on industry and accreditation guidelines
- Automatic launching of annotation and body marker icon on required views
- Automatic launching of calculations
- Ability to pause and resume SmartExam function at any time
- System analysis capabilities supported in all defined protocols
- Custom protocol transfer between CX30 systems



SmartExam's on-screen display provides immediate visibility of exam status.

4.2 Image presentation

- Up/down
- Left/right
- Multiple duplex image formats (1/3-2/3, 2/3-1/3, 50/50, and full screen)
- Depth from 1 to 30 cm (transducer dependent)

4.3 Cineloop review

- Acquisition, storage, and display in real time and duplex modes of up to three minutes in quick review of 2D and color images
- Dual imaging (single and dual buffer)

SmartExam protocols allow you to focus on your patients while confident you are capturing the required views.

4.4 Connectivity

- Two USB ports on control panel
- 80 GB hard drive space
- Internal slot-load CD/DVD RW drive
- DICOM print, store, and storage commitment
- DICOM structured reportig for cardiac, obstetrics, and gynecology
- Performed procedure step (PPS)
- Modality worklist
- DICOM reader saved onto media
- Export data as PC-compatible or DICOM files
- Ethernet at 100 Mb/second
- Wireless "B and G" networking
- USB to serial converter adapter for serial measurement transfer
- Support for optional small B/W or color printers

4.5 Ergonomics

- Philips common user experience control panel with central track ball and easy-access mode keys
- Tri-state lighting allows immediate feedback of active and available controls in all modes
- High-resolution LCD display with wide viewing angle and automatic ambient light compensation
- Quick keys and active mode
- System-guided exam protocol capability

4.6 Stress echo protocols

- Acquisition of single-frame or full-motion digital clips in any mode (including 2D, color Doppler, color TDI); type of image to be acquired may be changed on the fly by the operator as needed through pause protocol feature
- Gain Save adjusts automatically to different views
- Automatically saves your preferred control settings – such as MI (Mechanical Index), gain and depth – for each view while acquiring resting images
- At immediate post-exercise, system automatically retrieves saved settings for each view
- Allows different gain profiles for parasternal LAX and SAX views, AP4 and AP2 views
- Systole or full heart cycle acquisition
- Default stress protocols
  - May not be edited but may be used as the basis of a user-defined protocol
  - Factory-provided protocols include:
    - Two-stage exercise stress
    - Four-stage pharmacological stress
    - Three-stage exercise stress
- User-defined stress protocols
  - Utility for creation of user-defined protocols and editing of existing protocols for acquisition of stress and routine images, allows protocols to be defined to do any or all of the following:
    - Support between 1 and 8 stages
    - Support user-defined stage names
    - Support between 1 and 8 views per stage
    - Support user-defined view names
    - Prompt for a particular stage and view
    - Assign stage and view names
    - Set the number of cycles/beats for each view
    - Define prospective or multi-cycle/full disclosure acquisition
    - Save user-defined protocols within a preset
    - Save user-defined protocols to removable media for import onto other CX30 systems at the same software level
    - Modify protocols during use
    - Add stages at any point after the current stage
    - Change the name of a stage at any point up to acquisition of the first image of the stage
    - Save the modified protocol (it will not be automatically saved)

5. Transducers

The CX30 ultrasound system offers a range of transducer options for high performance imaging anywhere you need it.

The CX30 includes a versatile family of transducers that can handle all routine and some specialty imaging.

5.1 Transducer selection

- Automatic parameter optimization of each transducer for exam type through Tissue Specific Imaging (TSI) software
- User-customizable imaging presets for each transducer
- Dedicated connector for continuous wave Doppler (pedoff) transducers
- Continuous dynamic receive focusing on all imaging transducers

Curved arrays

C6-2 curved array

- 6 to 2 MHz extended operating frequency range
- Curved array transducer with 128 elements and 72° field of view
- 2D, steerable PW Doppler, High PRF and color Doppler, and Color Power Angio, SonoCT, advanced XRES, and multi-variate harmonic imaging
- General purpose abdominal, obstetrical, gynecological, musculoskeletal, small parts, renal and fetal echo applications
- Supports biopsy guide capabilities

C9-4v curved array

- 9 to 4 MHz extended operating frequency range
- 128 element transducer with 10 mm radius of curvature and 140° field of view
- Steerable PW, High PRF, and color Doppler, Color Power Angio, SonoCT, advanced XRES, and multi-variate harmonic imaging
- Endovaginal applications
- Supports biopsy guide capabilities

Linear array

L12-4 linear array

- 12 to 4 MHz extended operating frequency range
- Fine pitch, high resolution linear array, 128 elements
- 2D, steerable PW, High PRF, and color Doppler, Color Power Angio, SonoCT, advanced XRES, and multi-variate harmonic imaging
- Vascular, small parts, musculoskeletal, regional anesthesia, and acute care applications
- Supports biopsy guide capabilities

Sector array

S4-2 sector array

- 4 to 2 MHz extended operating frequency range
- Sector array with 80 elements
- 2D, steerable PW, CW, High PRF, and color Doppler, tissue Doppler, advanced XRES and multi-variate harmonic imaging
- Adult cardiac, pediatric cardiac, general purpose abdominal, transcranial Doppler (TCD) and acute care clinical applications
- Supports biopsy guide capabilities

Non-imaging

D2cwc CW transducer (Pedoff)

- Dedicated 2 MHz continuous wave Doppler
- Adult cardiac applications

D5cwc CW transducer (Pedoff)

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

5.2 Transducer application guide

Transducers				
Name	**C6-2**	**C9-4v**	**L12-4**	**S4-2**
Type of array	Convex	Convex	Linear	Phased
Number of elements	128	128	128	80
Scanplane aperture	63.2 mm	26.2 mm	38.4 mm	16.3 mm
Field of view	72°	140°	38 mm	90°
Broadband frequency range	6-2 MHz	9-4 MHz	12-4 MHz	4-2 MHz
Application				
Abdominal	●		●	●
Cardiac				●
Pediatric cardiac				●
Vascular			●	
Obstetrics	●	●		●
Gynecology	●	●		●
Endovaginal		●		
Small parts	●		●	
Musculoskeletal	●		●	
TCD				●

6. Measurements and analysis

6.1 Comprehensive measurement tools

- Cardiac analysis
- High Q automatic Doppler analysis
- QLAB quantification

6.2 QLAB advanced quantification

Region of Interest (ROI) quantification plug-in

- Pixel intensity analysis, data types: echo, velocity (color) or power (angio)
- Up to 10 user-defined regions
- Thumbnail display of frames for easy trimming
- TDI velocity timing measurement
- Log/linear data display selection
- Smoothed data display option
- Vascularization Index, Flow Index and Vascularization Flow Index results on color mode files
- Motion compensation for multiframe objects

2D Quantification (2DQ) plug-in

- 2D cardiac quantification
- Assess global and annular (valve) cardiac function
  - Non-directional (Area cm2, Volume ml)
  - Tissue motion annular displacement (TMAD) quantification

Intima Media Thickness (IMT) measurement plug-in

- Automated assessment of the IMT on user selected frames
- For carotid and other superficial arteries

GI 3D Quantification (GI 3DQ) plug-in

- Includes iSlice, thick slice, and MPR and volume visualization
- 3D/4D viewer for Ob/Gyn and general imaging including interventional applications
- Review 3D/4D and color 3D volumes
- Multiplanar reconstruction (MPR)
- iSlice precision volumetric slicing capability
  - Displays 2D/color slices from static or live volume
  - User-selectable slice display: 4, 9, 16 or 25
  - User-selectable interval spacing, slicing depth, and slicing source (x, y, or z)
- Free rotation of any source
- Full cineloop review control
- 2D grayscale display adjustments
- Color display adjustments
- Zoom control
- Cine/pan slice control through volume
- User-selectable image storage
- Compatible with freehand volumes
- Thick slice imaging
  - User-adjustable slice thickness and depth
  - Variable thick slice display adjustments with preset vision settings
- Advanced XRES speckle noise reduction of MPR and volume displays
- Edge detection selection for hypoechoic or high contrast targets

7. Physical specifications

System dimensions

Length	14 in/35.6 cm
Width	16.25 in/41.3 cm
Height	3 in/7.6 cm
Weight	13.6 lb/6.17 kg
Display	15.4 in/39.1 cm high-resolution display with wide viewing angle

Physical features

- High-resolution display with wide viewing angle
- Laptop style alphanumeric QWERTY keyboard
- Ergonomic integrated carrying handle
- USB footswitch
- Multiple transducer module option multiport adaptor connects up to three transducers

Mobility cart

- Weight: 97 lb/44 kg
- Width: 19.4 in/49.3 cm
- Depth including handle: 23.3 in/59.2 cm
- Height: adjustable from 42.5 in/107.9 cm to 32 in/82.8 cm
- Rear-mounted handle; side-mounted grips for micro-positioning
- Casters: 5 in; casters provide total locking (directional and rotational) engaged by the foot pedals
- Quick release tray
  - Simple latch system to secure CX30 system in place
  - System's integrated handle accessible from front for secure maneuverability
- Storage
  - With multiport adaptor
    - Two rear mounted storage trays
    - Cable catch tray below transducer connector
  - Without multiport adaptor
    - Three shelf options – two for printers, one storage, 9.9 in/25.2 cm x 13.4 in/34 cm (L x W)
    - One sliding drawer, 9.8 in/24.9 cm x 9.2 in/23.5 cm x 2.4 in/6 cm (L x W x D)
  - Integrated four transducer connector holders
  - Cable management hooks
- Transducer holders accommodate six transducers
- Input power to B/W printer or color printer
- USB hub with cables to:
  - B/W printer
  - Color printer
  - CX30 USB

Travel case

- Dimensions: 22.5 in/57 cm x 16.5 in/42 cm x 12.5 in/32 cm (H x W x D)
- Weight: 15.4 lb/7 kg when empty
- Features:
  - Accommodates CX30 system and AC adapter
  - Removable transducer bag stores three transducers and one gel bottle
  - Wheels and retractable handle allow easy transport

Power requirements

System/AC adapter	100-240V, 50/60 Hz, 250 VA
System with cart and peripherals	100-240V, 50/60 Hz, 500 VA

Power management

- Internal lithium-ion polymer battery
- Fully charged new battery yields approximately 45 minute battery life under continuous use without AC. Actual time varies with age and condition of battery.
- Quick-charge battery technology
- Advanced battery/AC monitoring circuitry includes on-screen graphics, and low battery warning
- Suspend mode for instantaneous boot-up between exams

Environmental

Heat dissipation	700-1100 BTUs/hour (fully loaded)
Operation range	10–40°C operating in 15–95% relative humidity

ECG and physio

- One three-lead ECG input
- One external ECG input
- Two physio input channels (1V, p-p)
- Selectable ECG triggered skipping between 1 and 20
- Respiration

Electrical safety standards

- CSA C22.2 No. 601.1
- IEC 60601-1
- UL 60601-1
- EN 60601-1

Safety requirements

- Electromechanical standards met
  - C22.2 No. 601.1, Canadian Standards Association, Standard for Medical Electrical Equipment
  - JIS T 0601-1, Japanese Standard for Medical Electrical Equipment
  - EN 60601-1, European Norm, Safety of Medical Electrical Equipment
  - EN 60601-1-2 European Norm, Collateral Standard: Electromagnetic compatibility
  - EN 60601-2-37 European Norm, Particular requirements for the safety of ultrasonic medical diagnostic and monitoring equipment
  - UL 60601-1 Underwriters Laboratories Standard for Medical Electrical Equipment
- Agency approvals
  - Canadian Standards Association (CSA)
  - CE Mark in accordance with the European Medical Device Directive issued by British Standards Institute (BSI)
  - Japanese Ministry of Health, Labor and Welfare

Maintenance and serviceability

- Remote access for clinical and technical support*
- Flexible service agreements
- Clinical application and educational support
- Scheduled preventative maintenance and system optimization

The CX30 is a laptop-sized ultrasound system you can hand carry or use on a specially designed cart.

* Remote Services Network – requires Philips service contract and internet access

Philips Healthcare is part of Royal Philips Electronics

How to reach us
www.philips.com/healthcare
healthcare@philips.com

Asia
+49 7031 463 2254

Europe, Middle East, Africa
+49 7031 463 2254

Latin America
+55 11 2125 0744

North America
+1 425 487 7000
800 285 5585 (toll free, US only)

For more information visit www.philips.com/CX30

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