

Excellence in Digital Healthcare

TOMTEC-ARENA single-seat workstation specifications



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1. Introduction



1.1 Technical description

The **TOMTEC-ARENA** single-seat workstation provides the basis for off-cart review and advanced analysis of Philips ultrasound images and 3D data sets.

Advanced analysis

- Perform advanced quantification using these applications
- AutoLV, AutoLA, AutoSTRAIN, AutoIMT
- · 4D RV-FUNCTION, 4D CARDIO-VIEW, 4D MV-ASSESSMENT

Presentations

Provides the ability to remove the patient information from images and save either image-only or full-screen edited files in AVI, BMP and JPG PC formats, for use in presentations and other software programs, and in DICOM Secondary Capture image formats.

Features and capabilities

- Software core
 - Data Center stand-alone single-seat workstation with patient database, patient exam list and DICOM connectivity tools
 - IMAGE-COM viewing environment
 - IMAGE-COM remote viewing using a web browser
 - Cardiac measurements
 - Review and quantification of image files from Philips EPIQ, Affiniti, iE33, CX50, iU22, and HD15 systems
 - View DICOM ultrasound images in one-up and four-up review
 - Removal of patient information prior to exporting PC format files
 - BMP, JPG, and AVI PC format file creation
- Export of quantification results data into Excel-compatible CSV format
- Export in DICOM SR format

Languages*	GUI	Manual	ISO_639-2/IETF**
English	•	•	ENG
German	•	•	DEU
Chinese, traditional	•	•	ZHO-Hant
Chinese, simplified	•	•	ZHO-Hans
Dutch	•	•	NLD
Italian	•	•	ITA
Japanese	•	•	JPN
Portuguese	•	•	POR
Swedish	•	•	SWE
French	•	•	FRA
Spanish	•	•	SPA
Russian	•	•	RUS
Finnish	•	•	FIN
Danish	•	•	DAN
Norwegian	•	•	NOR
Korean		•	KOR
Turkish		•	TUR
Serbian		•	SRP
Kazakh		•	KAZ
Latvian		•	LAV

1.2 Who will benefit from TOMTEC-ARENA?

- Clinicians interested in off-cart cardiac viewing, rendering and advanced quantification in 2D and 3D imaging modes
- Clinicians interested in advanced image analysis tools such as cardiac motion, structural heart and valve analysis
- Cardiology and ultrasound clinicians performing contrast studies
- Cardiac clinicians, surgeons, and anesthesiologists interested in assessing normal and abnormal mitral valve anatomy
- Clinicians interested in assessing the intima media thickness of peripheral vascular structures such as the carotid arteries
- Clinicians desiring to create graphic files for presentation
 purposes
- Clinicians interested in viewing, manipulating, and measuring 3D data sets

*Server and TMMS: English only.

**List: https://en.wikipedia.org/wiki/List_of_ISO_639-2_codes.

2. Core features and capabilities

2.1 ARENA Core

Single-seat solution to manage and archive patient and image data by connecting up to three ultrasound systems and including 2D image review and cardiac measurements as well as 2D and 3D clinical application launcher.

ARENA Core combines #1200 TTD Stand-Alone, #5200 DICOM Receive, #6100 IMAGE-COM and #6110 CARDIAC MEASUREMENTS into a single installation for one computer.

Additionally, ARENA Core provides access from a remote system to the Study List as well as the 2D image web-review. ARENA Core is installed remotely and you get access to TOMTEC ACADEMY for training. Remote access is mandatory.



2.2 IMAGE-COM

IMAGE-COM is a high performance DICOM viewer for ultrasound (US) examinations. Easy and rapid image review of individual images and sequences is supported by a variety of time-saving features. Prior studies can easily be compared with current examinations. In combination with 3D option IMAGE-COM multiplanar reconstruction, visualization and side-by-side comparison of 3D/4D US images are available.

- 2D image review (US only)
- \cdot 3D/4D US image review
- Image examination in up to 12 different tiling modes
- Presentation in original image resolution
- 4D smart region navigation for fast and easy view management
- Easy 2D flip and rotate, zoom and pan smart region navigation capabilities
- Global and tile-specific adjustable brightness/contrast and level/window
- Video functions (start, stop, step forward, step backward, playback speed)
- Pin function to fix objects in tiles
- Synchronization of image sequences
- Trim function (definition of the start and end image in a loop)
- ECG display, R-wave to R-wave display
- Side-by-side comparison of current and previous examinations
- Dedicated DICOM PDF-encapsulated viewing management
- \cdot Dedicated DICOM SR viewing management
- Export capability for AVI, BMP, JPEG (includes de-identification), DICOM export
- DICOM Secondary Capture function

2.3 CARDIAC MEASUREMENTS

The **CARDIAC MEASUREMENTS** package is a functional extension of IMAGE-COM. It offers a comprehensive range of 2D, M-mode and Doppler measurements based on published ASE guidelines. All measurements including measurements imported from the ultrasound system are summarized in a Worksheet. Multiple measurements are supported and the user can choose whether the average, last, highest or lowest value is being documented.

Product features

- Import of measurements from current ultrasound devices through DICOM SR
- All standard Echo 2D, M-mode and Doppler measurements are available
- Generic measurements (distance, area, volume) can be assigned to a specific measurement value in a later stage
- Up to five entries are available for each measurement in the Worksheet
- Individual selection of the final value in the Worksheet (average, last, highest, lowest) as well as manual editing possibilities
- Link between measurement and image: one click to get from the measurement to the corresponding image
- Measurement export (manual or automatic) in different formats (DICOM TID5200 SR, XML)

2.4 DICOM Receive

The **DICOM Receive** service enables TOMTEC DATACENTER to receive and store DICOM data from up to three ultrasound systems.

Supported DICOM data types

- Ultrasound systems (US)
- Secondary captures (SC), DICOM PDFs (OT)
- Structured reports (SR)

3. 2D cardiac routine bundle



3.1 Stress Echo

The **Stress Echo** analysis package provides all functions for the rapid and easy analysis of stress echo examinations. Stress echo loops are either displayed by view or stage. In addition, two-stage exercise stress echo studies are displayed in the "Shuffle" mode. The segmental assessment of wall motion is performed using intuitive graphics which are updated automatically based on the current image selection.

Product features

- Dog-ear function: quick-browse through all selected clips in the review
- \cdot Different compare modes including individual compare
- Easy color-coded wall motion scoring (WMS) with quick assignment tools
- "Score all" function to easily score a normal study with one in every segment
- Different scoring models
- 16- and 17-segment model scoring options
- Different playback modes
- Different synchronization modes
- Automatic layout selection (adapted to clip selection)
- \cdot Multi heart cycle support

Colored, view-specific labeling

3.2 Adult Echo Report

Adult Echo Report is a comprehensive structured reporting package to generate high quality standardized echo-cardiographic reports. Measurements are automatically transferred from the US modality. The reporting content can be readily adapted to customer needs.

- Easy access to common findings
- \cdot Dynamic layout of report depending on content
- User-specific configuration options at various levels
- Graphical WMS
- Clinical workspaces for TTE, TEE and stress echo
- Measurement mapping for all major US systems
- Automated and configurable norm value range check based on the ASE standard
- Automated quality assessment of the measurements based on IAC echocardiography standards
- Auto summary
- · Side-by-side dynamic preview of the report content

4. 2D cardiac essentials bundle



4.1 AutoSTRAIN

AutoSTRAIN enables IMAGE-COM to automatically quantify global and regional left ventricular strain and function based on apical 4-chamber, 3-chamber and 2-chamber views of the left ventricle with a single mouse-click per view.

Product features

- Automatic contour detection and tracking of the endocardial border (user modification possible)
- Regional strain analysis
- Calculation of global longitudinal strain (GLS)
- Bull's-eye representation
- Display of color-coded regional strain parameters in motion on US image
- Chart display of segmental longitudinal strain
- Highly reproducible results

4.2 AutoLV

AutoLV enables IMAGE-COM to automatically quantify left ventricular function based on 4-chamber and 2-chamber views of the left ventricle (biplane Simpson) with a single mouse-click per view.

Product features

- Automatic contour detection in end-diastolic and end-systolic frames (user modification possible)
- Left ventricular volumes (EDV, ESV and SV)
- Ejection fraction (EF)
- Reproducible results

4.3 AutoLA

AutoLA enables IMAGE-COM to automatically quantify left atrial volume based on 4-chamber and 2-chamber views (biplane Simpson) with a single mouse-click per view.

- Automatic contour detection of maximal volume (user modification possible)
- Frame of maximal volume is detected automatically
- Reproducible results

5. 2D vascular routine bundle

5.1 Vascular Report

Vascular Report is a comprehensive structured reporting package to generate high-quality standardized vascular reports. Measurements are automatically transferred from the US modality. The reporting content can be readily adapted to customer needs.

Product features

- \cdot Easy access to common findings
- Dynamic layout of report depending on content
- User-specific configuration options at various levels
- Clinical workspaces for vascular venous and arterial exam types
- Measurement mapping for all major US systems
- Automated and configurable norm value range check
- Automated quality assessment of the measurements based on IAC vascular ultrasound standards
- Auto summary
- Side-by-side dynamic preview of the report content

5.2 AutoIMT

AutoIMT is an automated TOMTEC solution for the quantification of the intima media thickness (IMT). By defining a Region of Interest on a vascular long axis view, AutoIMT automatically calculates the maximum and mean intima media thickness as well as the standard deviation and the quality index.

Product features

- Automatic contour detection of lumen-intima and media-adventitia vessel walls
- \cdot Calculation of max and mean value of IMT
- · Calculation of standard deviation and IMT quality index

5.3 VASCULAR MEASUREMENTS

The **VASCULAR MEASUREMENTS** package is a functional extension of IMAGE-COM. IMAGE-COM measurements offer a huge number of offline measurements. DICOM SRs from US carts are automatically imported into a comprehensive Worksheet for easy comparison, re-measuring and export. Findings can easily be transferred to report or EMR/HIS and are available for later data mining and further analysis. Export of multiple findings can be selected individually according to average, lowest, highest, first or last. Conformity to common guidelines as well as comparison to norm values is given.

VASCULAR MEASUREMENTS is a comprehensive vascular measurement package with labeled measurements for all major vessels.

- Re-measurement of complete studies
- All measurements, including measurements imported from US systems, are summarized in the Worksheet
- Link between measurement and image: one click to get from the measurement to the image
- Multiple measurements individual selection of the final value (value to use) in the Worksheet (average, lowest, highest, first or last)
- Generic measurements can be assigned to specific labels (first measure, then label)
- Generic measurements such as distance, area, time, acceleration/deceleration, VTI, velocity
- Measurement export (manual or automatic) in several formats:
- (EPICXML; XML; DICOM Structured Report: TID5100)

6. 3D cardiac advanced bundle

6.1 3D OPTION IMAGE-COM

The **3D OPTION IMAGE-COM** package enables IMAGE-COM to display 3D/4D cardiac ultrasound images side by side with 2D images. It can read and process proprietary 3D data formats of most vendors. With the unique navigation tool D↑art, 3D views of any anatomical structure can be created rapidly and easily with just two mouse-clicks. The display of multiplanar reconstructions in any orientation combined with the auto-sweep mode further helps to analyze complex morphologies in 3D.

Product features

- Real-time 3D rendering of black/white and color data
- D↑art navigation tool with "auto cropping"
- Orbit navigation
- Radiologic-oriented multiplanar reconstruction (MPR) navigation with reference images (LOI: lines of intersection) and center point navigation
- Auto-sweep through data set
- Color-coded 3D display for optimal depth display
- Setting of threshold and transparency
- All 2D measurements can be applied to MPRs

6.2 4D CARDIO-VIEW

4D CARDIO-VIEW is a vendor-independent review, analysis and quantification package for dynamic 3D ultrasound data. With the unique navigation tool D↑art, 3D views of any cardiac structure can be generated rapidly and easily with just two mouse-clicks. The display of multiplanar reconstructions in any orientation combined with the multi-slice mode further helps to analyze complex cardiac morphologies in 3D.

Product features

- Real-time 3D rendering of black/white and color data
- D∱art navigation tool with "auto cropping"
- Multi-slice display mode
- 3D landmark system to help with navigation and orientation in complex structures
- Color-coded 3D display for optimal depth display
- · 3D measurement of cardiac structures: volume, mass
- Basic 2D measurements: distance, spline, angle, area
- Export of AVI/BMP, screenshots and measurements

6.3 4D RV-FUNCTION

4D RV-FUNCTION is a vendor-independent analysis package for the quantification of volume and function of the right ventricle using dynamic 3D ultrasound data. Based on a complex 3D surface model, 4D RV-FUNCTION provides a reproducible analysis for pediatric and adult patient populations.

Product features

- Automatic calculation of relevant MPR views
- Semi-automatic contour-finding algorithm
- Quantification of volumes (EDV, ESV, SV and EF) without geometric assumptions
- Index values based on BSA
- Additional 2D measurements on MPR views
- Calculation and graphical display of global volume-time curves throughout the entire cardiac cycle
- Export of AVI/BMP, screenshots, measurements, coordinates of the volume curve and coordinates of the RV surface model

6.4 4D MV-ASSESSMENT

4D MV-ASSESSMENT is a vendor-independent analysis package for the visualization and functional analysis of the mitral valve using dynamic 3D ultrasound data. Based on semi-automatic contour detection of mitral annulus and leaflets, a model of the MV apparatus is displayed. A variety of clinical parameters are calculated automatically to support pre- and post-operative assessment of the mitral valve.

Product features

- 3D visualization of valve morphology, function and pathologies
- Display model of mitral valve apparatus (annular ring, MV leaflets, coaptation line)
- Automatic calculation of annular and leaflet dimensions
- Definition and display of "surgical view"
- Standardized manual 2D analysis on MPR
- Bookmark storage of MPR and 3D views
- Dynamic tracking of MV structures through systolic phase
- Export of automatically generated measurements

6.5 Multi-vendor 4D option

• Provides the ability to analyze 3D/4D volumes on images from most non-Philips images

7. Minimum hardware requirements

Processor

• Intel i5 or greater, i7 recommended

Operating system

- Windows 7 SP1, 64-bit
- Windows 10

Memory

- 8 GB RAM required, 32 recommended
- Graphics processing unit
- Nvidia, AMD, Intel using DirectX 9.0c or higher

Monitor

Minimum 1280 x 1024 resolution; 1920 x 1080
 recommended and capable of 32-bit color display

Hard drive

- MSSQL + TT application: 100 MB
- TT database: min 500 GB

MS SQL Express versions

- SQL
- 2008 R2
- · 2012
- 2014

Network

- 100 Mbps, 1 GB recommended
- Port 51080 must be accessible from all client workstations
- The virus scanner must be disabled for all directories used by TOMTEC-ARENA server for the exchange of DICOM data files (e.g., temporary folder of DICOM service and folder of working archive).

Page file

- The operating system's page file must not be disabled.
- It is recommended to keep the default settings in the system properties/performance options/virtual memory/ automatically manage paging files size for all drives

Computer name

 The name of the computer shall not exceed 15 characters. For details see: https://technet.microsoft.com/en-us/library/cc731383.aspx

https://technet.microsoft.com/en-us/library/cc731383.aspx https://technet.microsoft.com/en-us/library/cc726016 (v=ws.10).aspx

Browser compatibility to support remote access to DATACENTER, IMAGE-COM ZERO, Worksheet and REPORTING

- Microsoft Edge x86, x64 build >=15
- Google Chrome x86, x64 build >=58

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