TOSHIBA
Leading Innovation »»»

Multislice HELICAL CT SCANNER

Product Data
No. MPDCT0434EAA

PRIME Aquilion

APPLICATION

Aquilion™ PRIME is a multislice helical CT system with an 80-row detector capable of generating 160 slices per rotation using the coneXact™ reconstruction algorithm. High-speed rotation allows rapid data acquisition and shortens scan times, while the fast reconstruction unit further improves throughput, reducing the time required for diagnosis.

FEATURES

Aquilion PRIME incorporates an 80-row 0.5 mm detector, a 7.5-MHU large-capacity tube, and 0.35 s scanning, enabling wide-range scanning with short scan times.

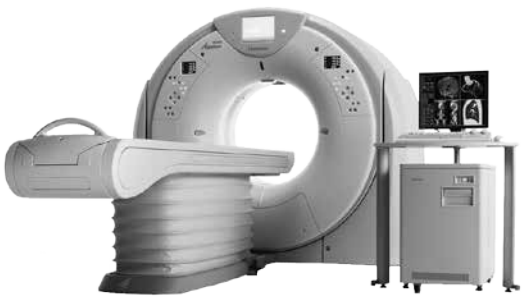
- **160 slices in a single rotation**
  Originally developed for Aquilion ONE™ dynamic volume CT, new proprietary algorithms using coneXact technology are incorporated in Aquilion PRIME. The system utilizes these algorithms to generate 160 highly detailed slices per rotation, achieving extremely accurate MPR and 3D rendered images.
- **Exposure reduction**
  Aquilion PRIME incorporates a variety of functions based on technologies that were developed for Aquilion ONE with the aim of significantly reducing the patient exposure dose, including Active Collimator, AIDR 3D* (Adaptive Iterative Dose Reduction 3D), SURE Exposure™ 3D, and Boost3D™.

  During helical scanning, Active Collimator blocks X-rays not required for image reconstruction by limiting the extent of the X-ray beam at the start and end of the helical scan range.

  AIDR 3D uses an iterative algorithm intended to reduce pixel noise while maintaining details and structural edges. AIDR 3D can be applied to all acquisition modes for routine clinical use and is able to reduce pixel noise magnitude, in a way that may result in dose reduction. It delivers an integrated solution to facilitate diagnostic decision-making with reduced radiation dose without compromising image quality.

  During helical scanning, SURE Exposure 3D continuously adjusts the exposure in the X, Y and Z direction based on the patient's body shape, reducing the patient dose to the lowest possible level.

  Boost3D allows the X-ray dose to be reduced for regions with high X-ray absorption, such as the shoulders and pelvis, while permitting acquisition of highly accurate images.



*: AIDR 3D has the potential to reduce CT patient dose depending on the clinical task, patient size, anatomical location and clinical procedure. Before adjusting the dose for a clinical procedure, please consult with a radiologist and a physicist in order to determine that the dose and image quality are appropriate for the particular clinical task.

- **Small Installation space**
  Innovative design of the Aquilion PRIME CT system has resulted in a small installation space of only 19.3 m^2 *1 which is smaller than competitive CT systems in a similar category.
- **Touch Panel Operation**
  Couch and gantry location information and scan countdown are displayed in interactive touch panels mounted on both sides of the gantry. In addition, the i-station is controlled from the same intuitive interface.
- **Gantry exposure controls**
  Exposure start and abort controls are located directly on the gantry control panel to provide superior patient care for pediatric and emergency patients. In addition, this function allows operators to monitor contrast media infusion during scan protocols with a fixed delay. The countdown until the start of x-ray exposure is shown on the touch panel display.
- **Large aperture**
  The gantry has a 780-mm aperture, the largest currently available in a high-end CT system. The combination of a couch with 300-kg patient weight capacity and large gantry bore makes Aquilion PRIME an ideal system for use in non-standard conditions, such as emergency scanning or bariatric patient studies.

*1: with short patient couch CBTB -031B

- **ⓘStation**
  Aquilion PRIME employs an ⓘStation, which can display patient information, an ECG signal, breath-holding and scan guidance, as well as relaxation movies.
  Using ⓘStation, patients can receive breath-holding instructions and practice breath-holding before scanning starts. In addition, scan procedures can be explained using animated movies. During scanning, a guide showing the remaining breath-holding time can be viewed by the patient. For children, animated movies are available to help put them at ease and to provide simple explanations of scan procedures.
- **ECG-gated scan and reconstruction*1**
  By using an ECG-gating signal, Aquilion PRIME can perform scanning and reconstruction for cardiac studies. With SURECardio™ Prospective, the patient dose is reduced by pulsing exposure according to the heart rate. This makes it possible to obtain cardiac images in the phase when the heart is relatively still, resulting in improved image quality for the cardiac region.

  Toshiba's SURECardio application automatically sets the scan procedure and optimal scan conditions based on the detected heart rate, ensuring the best possible image quality at the lowest possible dose for every patient.

  Furthermore, coronary arteries and cardiac function can be evaluated using sophisticated software such as SUREPlaque™*1 and cardiac function analysis software*1.
- **SUREFluoro™*1**
  SUREFluoro (Multislice CT fluoroscopy) permits realtime image reconstruction to display 3 images obtained by combining data from the area detector. Moreover, SUREFluoro employs volume ONE shot, which is CT fluoroscopy volumetric scanning with MPR oblique display. MPR and oblique image guidance ensures accurate needle positioning with complete confidence during complex biopsy procedures, saving time and improving patient safety.

COMPOSITION

PRIME Aquilion

Standard composition (Model: TSX-303A/2)

- Gantry 1
- Patient couch 1
- Console ..... 1 set
- Power distributor 1
- Accessories ..... 1 set
  – Inter-unit cables
  – Manuals
  – Set of phantoms
  – Acquisition support
  – Footswitch for the patient couch

Note: The console desk is not included in the standard composition.

Optional items

- Body organ perfusion (CSBP-002A)
- Cardiac function analysis software (CFA) (CSCF-002A)
- Cerebral blood-flow analysis system (CBP-study) (CSCP-002A)
- Colon view (CSCV-001A)
- Display system for dental application (CDP-07A)
- Lung volume analysis (CSLV-001A)
- SURECardio Scoring (CSCS-001A)
- SUREPlaque (CSPV-002A)
- Vessel view (CVV-001A)
- DICOM Storage SCP (COT-30D)
- DICOM MWM (COT-32D)
- DICOM MPPS (COT-33D)
- DICOM Q/R SCP (COT-34D)
- DICOM Q/R SCU (COT-35D)
- DICOM Storage Commitment SCU (COT-41D)
- DICOM PGP PROFILE (COT-44A)
- SUREXtension™ (COT-49D)
- Additional connection kit for rawdata strage system (COT-52D)
- Color printer interface (PS format) (CCP-03A)
- ECG-gated scan system (CHEG-005B)
- vHP (CHVH-001A)
- Injector synchronization system (CAN protocol) (CKIS-004A)
- Orbital synchronized scan system (CKOS-001A)
- Respiratory-gated scan system (CKRS-004A)
- Respiratory-gating system (CKRS-004B)
- Shuttle helical scan system (CHSH-001A)*7
- Display console kit (CGS-57A)
- DVD multi drive unit (CCBD-001A)
- Fast image reconstruction kit (CCFR-008A)
- HANDY SNAP (CAXS-001A)
- SUREFluoro (TSXF-003I)
- LCD monitor for SUREFluoro (CMM-004B)
- X-ray high voltage generator (CXGS-011A)
- Rear panel kit (CAGP-002A)
- Rear footswitches (CAFS-007A)*6
- Couch lateral movement unit (CALU-001A*4, *5/CALU-001B*2, *3)

Note: Please check with your Toshiba sales representative as some of these options may not be available in your country or region.

*1: Option
*2: For the 205 kg (452 lb) long patient couch version
*3: For the 205 kg (452 lb) short patient couch version
*4: For the 300 kg (661 lb) long patient couch version
*5: For the 300 kg (661 lb) short patient couch version
*6: Rear footswitches are available with the 300 kg (661 lb) patient couch version.
*7: Only for the system with 300 kg (661 lb) couch.

PERFORMANCE SPECIFICATIONS

Scan parameters

- Scan regions: Whole body
- Scan system: 360° continuous rotate/rotate
- Scan plan programming: More than 360 different sequences can be preprogrammed.
- Scan types
  - Scanoscopy
  - Conventional scan:
    - S & S: Mode with priority on time control between one scan and the next
    - S & V: Mode with priority on image display after the scan
  - Volume scan: Mode for scanning the volume
  - Dynamic volume scan: Mode for continuously or intermittently scanning a volume
  - Helical scan: Mode for continuously scanning while the patient couch moves
  - SURE Start™
  - SURE Fluoro (option)
  - Helical shuttle (option)
  - Jog shuttle
- Rotation time
  - Conventional scan, Volume scan

Half scan	0.23 s (conventional scan only)
Full scan	0.35, 0.375, 0.4, 0.45, 0.5, 0.6, 0.75, 1.0, 1.5, 2.0, 3.0 s

  - Dynamic volume scan, Helical scan, SURE Start
    Full scan: 0.35, 0.375, 0.4, 0.45, 0.5, 0.6, 0.75, 1.0, 1.5 s
- Scan cycle time
  - S & S mode: Min. 1.5 s
  - S & V mode: Min. 2 s

Note: The scan cycle time refers to the time between the start of one scan and the next.

- Scan field
  - CT scan:

SS	S	M	L	LL
ϕ180 mm	ϕ240 mm	ϕ320 mm	ϕ400 mm	ϕ500 mm

  - Scanoscopy:

Axial direction	Longitudinal direction
Up to 500 mm	Adjustable from 200 mm to 1,750 mm*1 (1,450 mm)*2 200 mm to 1,950 mm*3 (1,450 mm)*4

Note: The actual range that can be viewed is smaller than the couch-top movement range in scanoscopy.

- Slice thickness:
  - Conventional scans (S & S, S & V)
    0.5, 1, 2, 3, 4, 5, 8, and 10 mm
  - Volume scan, Helical scan
    0.5 and 1 mm
  - Dynamic volume scan
    0.5, 1, 8, and 10 mm

  These slice thicknesses are implemented by stacking the data acquired in one of the following acquisition modes.
- Acquisition
  - Conventional scan (S & S, S & V)

4-row scan	0.5, 1, 2, 3, 4, 5, 8, and 10 mm
1-row scan	1, 2, 4, 6, and 8 mm

  - Volume scan

80-row scan	0.5 mm
40-row scan	1 mm

  - Dynamic volume scan

80-row scan	0.5 mm
40-row scan	1 mm
4-row scan	8 and 10 mm

  - Helical scan

80-row scan	0.5 mm
64-row scan	0.5 mm
40-row scan	0.5 and 1 mm
32-row scan	0.5 and 1 mm
20-row scan	0.5 and 1 mm
16-row scan	0.5 and 1 mm
4-row scan	0.5 mm

- Gantry tilt angle: ±30°
  Remote control from the console is possible.
- Tube position for scanoscopy: 0°, 90°, 180°, and 270° (preset)
  A desired angle can be specified (in 5° increments).
- Gantry aperture: 780 mm in diameter
- Gantry wobbling at rotation center
  - Forward/Backward: Less than 480 µm (in 0.5 s/rot)
- Patient positioning projector: Laser, external and internal

*1: For the 205 kg (452 lb) long patient couch version
*2: For the 205 kg (452 lb) short patient couch version
*3: For the 300 kg (661 lb) long patient couch version
*4: For the 300 kg (661 lb) short patient couch version

Dynamic volume scan

- Scan time: 0.35, 0.375, 0.4, 0.45, 0.5, 0.6, 0.75, 1, 1.5 s/360°
- Programmable time: Max. 1 hour
  This refers to the maximum time in which a series of scans can be performed.
- Number of programmable scans: Max. 20
  Max. time of one continuous scan is 100 s.
- Scan plan
  – Scan interval: Min. interval is 1 s.
  Setting is possible in increments of 0.1 s in a scan interval of more than 1 s.

Note: When a scanning mode with patient couch movement is used, the minimum scan interval is limited by the time required for movement.

- Scan start time delay: Min. 0.5 s
  Setting is possible in increments of 0.1 s.
- Image reconstruction
  – Image interval: Reconstruction is possible in increments of 0.05 s.

Helical scan

- Rotation time: 0.35, 0.375, 0.4, 0.45, 0.5, 0.6, 0.75, 1, 1.5 s/360°
- Continuous scan time: Max. 100 s
- Scan start time delay: Min. 1 s
  Setting is possible in increments of 0.1 s.
- Active Collimator: To reduce the exposure dose, the collimator operates asymmetrically at the start/end of scanning (except in the case of 4-row scanning).
- Scan field in the longitudinal direction (including the headrest): Max. 1,750 mm/scan*2
  Max. 1,950 mm/scan*4
  (Max. 1,450 mm/scan)*3, *5
- Couch-top speed: 0.8 mm/s to 160 mm/s
- CT pitch factor and Helical pitch
  – For all rotation speeds

Scan rows	CT pitch	Helical pitch
80	0.563 to 0.95 1.1 to 1.4	45 to 76 88 to 112
64	0.625 to 0.907 1.11 to 1.5	40 to 58 71 to 96
40	0.625 to 0.898 1.153 to 1.575	25 to 35.9 46.1 to 63
32	0.625 to 0.907 1.125 to 1.5	20 to 29 36 to 48
20	0.650 to 0.945 1.155 to 1.55	13 to 18.9 23.1 to 31
16	0.625 to 1.0 1.125 to 1.5	10 to 16 18 to 24
4	0.625 to 0.875 1.125 to 1.5	2.5 to 3.5 4.5 to 6.0

Helical pitch = Couch-top movement (mm/rot.)/nominal scanning slice thickness (mm)
CT pitch factor = Helical pitch/number of slices per rotation

Note: Helical pitch setting is possible in increments of 0.1. (For 4-row scanning, setting is possible in increments of 0.5.)

- SURE Exposure 3D: Function for continuously varying the X-ray tube current to ensure the minimal X-ray dose during helical scanning
- Image reconstruction time: Up to 30 images/s with AIDR 3D (0.03 s/image)
  Up to 60 images/s*1 with AIDR 3D (0.02 s/image)*1
  (depending on the scan and reconstruction conditions)
- Real-time helical reconstruction time: 12 images/s (0.083 s/image)
  (1 slice, 512 × 512 matrix)
- Reconstruction position setting: Can be set in increments of a minimum of 0.1 mm by entering the couch-top position or using the scanogram.
- Reconstruction interval setting: Can be set in increments of a minimum of 0.1 mm.
- Reconstruction method
  – MUSCOT reconstruction (4-row scanning)
  – TCOT+ reconstruction (80-, 64-, 40-, 32-, 20-, and 16-row scanning; fast mode)
  – V-TCOT reconstruction (80- and 40-row scanning; high image quality mode)

*1: Option
*2: For the 205 kg (452 lb) long patient couch version
*3: For the 205 kg (452 lb) short patient couch version
*4: For the 300 kg (661 lb) long patient couch version
*5: For the 300 kg (661 lb) short patient couch version

SURE Start

- Scan start mode: Automatic, Manual
- Continuous scan time: Max. 100 s
- Acquisition mode: Intermittent, continuous, combination
- Region of interest (ROI): Max. 4 (1 ROI for VoiceLink)
- CT number measurement interval: 0.083 s
- Scan start time delay: Min. 3 s
- Display function: Mean CT number within the ROI, elapsed time

Voice-recorded instruction and scan system (VoiceLink)

As part of the eXam Plan, voice instructions to the patient can be recorded electronically by the operator and automatically played back during scan sequences.

- Number of messages: Max. 200 messages
- Recording time: Max. 29 s per message
- Delay time setting: The delay time between the end of the message and the start of scanning can be set for up to 10 s, in increments of 1 s.

Patient couch

- Load limit
  - Max. allowable load: 205 kg (450 lb)*1, *2; 300 kg (661 lb)*3, *4
  - Sag of couch-top (135 kg load): Less than 12 mm (X-ray path)*1, *2
    (100 kg load): Less than 2 mm (X-ray path)*3, *4
- Vertical movement System: Motor-driven
  - Speed of vertical movement: Max. 60 mm/s*1, *2 (fast mode); Max. 65 mm/s*3, *4 (fast mode); Min. 10 mm/s (slow mode)
  - Stroke: Approx. 554 mm*1, *2; Approx. 568 mm*3, *4
  - Minimum couch-top height: Approx. 330 mm

    Note: When the couch lateral movement unit (CALU-001A/CALU-001B)*5 is used, the minimum couch-top height value is 87 mm higher.
  - Maximum couch-top height: Approx. 960 mm
- Couch-top movement System: Motor-driven or manual
  - Speed of movement: 160 mm/s*1, *2 (fast mode); 200 mm/s*3, *4 (fast mode); 10 mm/s (slow mode)
  - Stroke: 2,190 mm*1 (1,890 mm)*2; 2,390 mm*3 (1,890 mm)*4
  - Scannable range (with headrest): 1,800 mm*1 (1,500 mm)*2; 2,000 mm*3 (1,500 mm)*4
  - Step feed pitch: 0.5 to 600 mm in 0.5-mm increments
  - Reproducibility (Accuracy): ±0.25 mm, maximum couch load 205 kg (450 lb) and 230 kg (507 lb)*3, *4; ±1.0 mm, couch load over 230 kg (507 lb) to 300 kg (661 lb)*3, *4; Repeatable over a 600-mm range
- Lateral movement*6: Electrical movement
  - Movement speed: 10 mm/s
  - Stroke: 42 mm each to the left and right
  - Reproducibility: ±0.25 mm
- Couch-top width: 470 mm
- Remote control from the console is possible.

  Note: This function allows the user to check the image on the console and adjust to the couch top without leaving the console.
- Footswitch: Vertical movement (UP/DOWN) or AutoSet/AutoHome can be selected.

X-ray generation

- X-ray beam shape
  - Fan beam
  - Channel-direction angle (fan angle): 49.2°
- X-ray exposure: Continuous
- X-ray tube voltage: 80, 100, 120, and 135 kV
- X-ray tube current: 10 mA to 500 mA (10 mA to 600 mA)*7 (adjustable in 5-mA increments from 10 to 50 mA, and in 10-mA increments over 50 mA.)
- X-ray tube heat capacity: 7.5 MHU
- X-ray tube cooling rate: Max. 1,386 kHU/min (16.5 kW) Actual 1,008 kHU/min (12.0 kW)
- Focal spot size
  - IEC 60336: 2005, nominal: 0.9 mm × 0.8 mm (small) 1.6 mm × 1.4 mm (large)

X-ray detection

- Detection system: Solid-state detectors
- Main detector: 896 × 80 elements
- Data acquisition: 896 channels × 80 rows
- Reference detector: 1 set
- View rate: Max. 2,572 views/s

*1: For the 205 kg (452 lb) long patient couch version
*2: For the 205 kg (452 lb) short patient couch version
*3: For the 300 kg (661 lb) long patient couch version
*4: For the 300 kg (661 lb) short patient couch version
*5: Option
*6: Lateral movement is available with the couch lateral movement unit.
*7: When the CXGS-011A is used.

Data processing

- Reconstruction matrix: 512 × 512 (axial image)
- Picture element (pixel) size
  - CT image: Unit: mm

Scan field	SS	S	M	L	LL
Pixel size	* to 0.35	* to 0.47	* to 0.63	* to 0.78	* to 0.98

*: Depending on the Vari-Area or Zoom factor

  - Scanogram: Unit: mm

Scan field	S	M	L	LL
Standard	0.5	1.0	2.0	4.0

- Dose reduction functions
  - Adaptive iterative dose reduction 3D (AIDR 3D)
  - Quantum denoising software (QDS)
  - Boost3D
- Reconstruction filter functions
  - Abdomen with BHC
  - Abdomen without BHC
  - Brain with BHC
  - Brain without BHC
  - Inner ear and bone
  - Lung
  - High-resolution mode for evaluation of resolution parameters
  - Auditory ossicles and the spine with high-resolution processing
  - Maintenance
- Post-scan filters
  - Standard: 2 types (fixed parameters)
  - User: 10 types (settable parameters)
- Number of reconstructed images: Max. 160 images/rot.
- Reconstruction time: Min. 0.03 s
  Min. 0.02 s*1
- Real-time scanoscopy
- Data processor (scan console)
  - Central processing unit: 64-bit processor
  - Memory size: 12 Gbytes or more
  - Magnetic disk unit: Raw data, 550 Gbytes or more
    Image data, 365 Gbytes or more

Data storage

- Magnetic disk
  - Raw data: 4,000 rotations or more (for volume scan with 80 rows at 0.35 s)
  - Image data: 500,000 images or more (when converting to 512 × 512 pixel image)
- DVD-RAM: 4.7 Gbytes
  - DICOM images: 8,000
- DVD-R: 4.7 Gbytes
  - DICOM images: 7,500

Image display

- Display monitor: 48.1 cm (19-inch) color LCD
- Monitor matrix: 1,280 × 1,024
- Image matrix: 1,024 × 1,024 (max.)
- CT number
  - Display range: -32,768 to +32,767
- Window width/level: Continuously variable
- Preset windows: 3/image
- Window types: Linear, non-linear (6 user-programmable), and double windows
- Image retrieval
  - Method: On-screen menus and keyboard
  - Mode: Image, series, and patient
- Multi-frame display: Reduction/cut-off display, ROI processing
- Inset scanogram display
- Information display: User selectable
- Cine display: Variable speed
- Scanogram/CT image switching: Show/hide scano line, zoom
- Slice-feed playback (CineView): High-speed image feeding using the mouse or keyboard

Image processing

- Scanogram processing
  - Slice position display (Planned slice, preset slice, and last scanned slice)
  - Anatomical scale (display of position, relative to selected zero position)
  - Slice position setting
  - Enlargement
- CT image processing
  - ROI
    - Shape: Point, rectangular, polygonal, elliptical, irregular
    - Processing: Mean value, standard deviation, area, number of pixels, maximum value, minimum value
    - Display: Max. 10/image
    - Control: Size, position, rotation
  - Measurement of distance and angle between two points
  - Profile (oblique profile also available)
  - Histogram
  - CT number display
  - Mark display (grid display, scale display)
  - Volume calculation
  - Enlargement, reduction, panning
  - Addition/subtraction between images
  - Band display (non-linear windowing)
  - Comment and arrow insertion
  - Top/bottom, right/left, black/white reversal of image
  - Image filtering
  - Image rotation (arbitrary rotation)
  - Screen save

*1: Option

– High-speed axial interpolation
– MultiView (Auto MPR)
– Z-sharpening
• Raw data processing
– Zooming reconstruction
– Half-view reconstruction of helical scan raw data
– High-resolution reconstruction for raw data acquired by helical scanning
– ECG-gated half reconstruction, ECG-gated segmental reconstruction*1
– Respiratory-gated reconstruction*1

System management
• Warm-up function
• Calibration data acquisition
• Patient data input
• eXam Plan editing
• Modification of related information
• Operation environment settings
• Slice counter
• Rotation counter

Dose management
• $CTDI_{vol}$ (or $CTDI_{w}$)/DLP/Geometric efficiency in z-direction
• Dose check (NEMA XR-25)
• DICOM SC Exposure summary
• DICOM SR compliant Dose report

Clinical applications
• Dynamic study
• 3D color image processing (surface rendering, volume rendering, MPR, curved MPR, MIP, cine)
• Automatic MPR (MultiView)

Image transfer
• 1000BASE-T, 100BASE-TX, 10BASE-T
• Toshiba protocol
• DICOM storage SCU
• Enhanced DICOM
• TIFF conversion

IMAGE QUALITY

Noise	
Standard deviation	Less than 0.5%
Scan parameters	
Tube voltage	120 kV
Tube current	500 mA*
Scan time	1 s
Slice thickness	8 mm (4 mm × 4 rows : 2 stack)
Reconstruction function	FC70
Scan field	S
Phantom	ϕ24 cm water

*: Corresponds to 400 mA at a 10-mm slice thickness.

Spatial resolution	
Resolution	14.5 lp/cm at MTF 2% 8.0 lp/cm at MTF 50%
Scan parameters	
Tube voltage	120 kV
Tube current	200 mA
Scan time	1 s
Slice thickness	2 mm (0.5 mm × 4 rows : 4 stack)
Reconstruction function	FC90
Scan field	S
Phantom	IRIS QA phantom

High contrast resolution	
X-Y plane	ϕ0.35 ±0.05 mm FC90: high-resolution mode ϕ0.55 ±0.05 mm FC30: standard mode
Scan parameters	
Tube voltage	120 kV
Tube current	250 mA
Scan time	0.5 s
Slice thickness	0.5 mm
Scan field	S
Phantom	Toshiba high-contrast measuring phantom (acrylic/air)
Z-direction	0.35 ±0.05 mm FC13: standard mode
Scan parameters	
Tube voltage	120 kV
Tube current	300 mA
Scan time	0.5 s
Slice thickness	0.5 mm × 80
Helical pitch	51
Phantom	Toshiba ladder phantom

*1: Option

High-contrast detectability	
X-Y plane	0.31 mm
Scan parameters	
Tube voltage	120 kV
Tube current	250 mA
Scan time	1.5 s
Slice thickness	0.5 mm
Reconstruction method	MUSCOT
Reconstruction function	FC90
Scan field	S
Phantom	Catphan 500 phantom (CTP528 module)
Z-direction	0.31 mm
Scan parameters	
Tube voltage	120 kV
Tube current	250 mA
Scan time	1.5 s
Slice thickness	0.5 mm
Reconstruction method	TCOT+ with 0.5 mm SR
Reconstruction function	FC70
Scan field	S
Phantom	Catphan 500 phantom (CTP528 module)

Low contrast detectability	
Object size (A)	2 mm at 0.3%
$CTDI_{vol}$	17.2 mGy
Object size (B)	3 mm at 0.3%
$CTDI_{vol}$	8.6 mGy
Scan parameters	10 mm (with AIDR 3D)
Phantom	Catphan 412 (CTP263 module)

- $CTDI_{vol}$ (Unit: mGy/100 mAs)
  - Head mode: 22.1 mGy*
  - Body mode: 10.1 mGy*

*: Measured using standard head and body CTDI phantoms.

SYSTEM COMPONENTS AND THEIR FUNCTIONS

Gantry

The scanner is composed of the gantry and the patient couch. The scanner uses a continuous X-ray beam to scan the region to be examined. Transmitted X-rays are detected and converted into electrical signals by the area detector.

The gantry includes the main body and its support mechanism. The X-ray tube and the area detector are mounted facing each other on either side of the gantry aperture, and the X-ray tube and detectors rotate continuously around the aperture of the gantry. A slip ring is employed to transmit power between the gantry and the rotating X-ray high-voltage generator assembly.

The gantry can be tilted forward and backward in order to perform tilted scanning.

Three-dimensional alignment lights are provided for setting slice positions. Gantry and patient couch operating controls are provided on the left and right sides of both the front and the rear*1 of the gantry housing.

The monitor (ⓘStation) indicates information to the operator and the patient, such as the patient name and the scan status.

The X-ray high-voltage generator is built into the gantry, and the system employs a high-frequency inverter for generating and stabilizing the high voltage supplied to the X-ray tube. The generator includes electronic circuits for controlling the speed of the rotating anode in the X-ray tube. Use of a high-frequency inverter system results in high power output combined with excellent stability.

X-ray generator

This unit supplies stable high voltage to the X-ray tube unit. The high-frequency inverter method is employed, resulting in a light and compact design. This unit is incorporated in the gantry.

- Max. Power: 72 kW

X-ray tube

This is a large-capacity, high-cooling-rate X-ray tube that is able to withstand continuous operation as in helical scanning.

- Heat capacity: 7.5 MHU
- Cooling rate: Max. 1,386 kHU/min

Patient couch

The patient couch is positioned in front of the gantry and supports the patient. The entire unit moves vertically and the top moves longitudinally. In an emergency, the couch top can be pulled out manually with very little effort. The couch top can also be lowered to a minimum height of 330 mm from the floor, facilitating transfer of the patient from a low bed or stretcher.

Console

The console is provided with a hybrid keyboard, a monitor, and a mouse.

- Functions of the console for scanning
  - Selection of scan parameters
  - Scanoscope control
  - Scan control
  - Remote control of couch-top movement
  - Remote control of gantry tilt
- Functions of the console for image processing
  - Window level and window width adjustment
  - Other mouse-operated image processing functions

*1: Option

OPERATING FEATURES

Patient handling and positioning

- Alignment lights are provided in the gantry aperture for fast and accurate patient positioning.
- High-precision couch-top positioning is possible from the integrated console or by manual operation from the control panel and clear digital readouts are provided on the gantry.
- The couch top can be pulled out manually in an emergency.

Scanning

- Toshiba's Scanoscope function provides a projection image of the patient for high-precision advance planning of scan areas.
- On the scanogram, the length of the scan area can be adjusted over a range of up to 1,750 mm*1, 1,950 mm*3, 1,450 mm*2, *4. Because the images are reconstructed in real time, the scan can be aborted at any time. This allows the patient exposure dose to be minimized.
- The auto index function allows automatic incremental couch-top movement based on the slice positions determined through the scanogram.
- The eXam Plan function allows simple selection of preprogrammed scanning parameters for routine examinations, maximizing patient throughput.
- The Vari-area function allows the user to preselect a region of interest for zooming using raw data, permitting immediate post-scan analysis. Zooming using raw data yields higher resolution than enlarging an image that has already been reconstructed.
- Dynamic and rapid sequence scan modes are provided.
- Multislice Helical Scan acquires raw data by rotating the X-ray tube continuously while moving the patient continuously through the scanner. The volume data acquired can be used to reconstruct axial slices at any desired position. This scan mode is best used for rapid patient scanning during a single breath-hold and for high-definition three-dimensional and MPR imaging.
- InstaView™ technology provides near-instant display and review with full-matrix images.
  Based upon real time helical reconstruction mode this technology may be useful for emergency patients, where every second to diagnosis counts.
- The SURE Start function allows the operator to start helical scanning at the timing of maximum enhancement in contrast studies. SURE Start monitors the CT number in real time to detect the arrival of contrast medium in the image. When the CT number reaches the predefined threshold, helical scan automatically starts. This technique ensures optimal contrast enhancement, independent of individual differences in blood flow velocity, and at the same time minimizes the dose of contrast medium.

Data processing

- A variety of reconstruction algorithms are available and can be selected according to the anatomical region examined and the clinical objective of the study. These include algorithms for the abdomen, head, bones, lung, small structures, soft tissues, etc.

Image display and processing

- Reconstructed images are automatically displayed according to the window settings preset in the eXam Plan.
- The window save function allows the user to store an image with window settings different from those set in the eXam Plan.
- Filter parameters can be customized through simple on-screen menu selections. These parameters include the number of filtering passes, matrix size, and filter coefficients.
- Images can be rotated and reversed either right/left, top/bottom, black/white.
- The Multi-frame feature allows up to 16 images to be displayed simultaneously on the screen.
- The three-dimensional image display function allows color three-dimensional and real-time MPR images to be generated from the volumetric scan data acquired by dynamic volume scanning or helical scanning.

Image filming

- Filming of images can be performed manually or automatically from the console.
- Automatic filming sends an entire study to the laser camera. Filming is performed in background mode so that other scanner and image processing functions can be performed without interruption or delay.
- When T-mode is used, related information items displayed together with an image (surrounding the image, in a small font) are displayed in the footer area using a larger font, permitting not only easier reading but also simpler film management.

  Note: To use T-mode, the laser imager must support 2,048 pixels × 2,404 pixels for a 1 × 1 frame layout.

Patient throughput

Patient throughput and cost effectiveness were major objectives in the design and production of the Aquilion PRIME.

- The system incorporates a 7.5-MHU X-ray tube with a very fast cooling rate of 1,008 kHU/min in actual use.
- Real-time scanoscopy.
- CT images can be reconstructed in 0.03 seconds (min.).
- The routine scan cycle time is as short as 2.0 seconds (Conventional S & V mode)

*1: For the 205 kg (452 lb) long patient couch version
*2: For the 205 kg (452 lb) short patient couch version
*3: For the 300 kg (661 lb) long patient couch version
*4: For the 300 kg (661 lb) short patient couch version

- Ease of operation is ensured through the incorporation of a hybrid keyboard, mouse-driven menus, and large color LCD screens.
- The couch top can be lowered to a height of 330 mm to simplify patient transfer.

COMPLIANCE

Council Directive 93/42/EEC and subsequent amendments

- IEC:
  IEC 60601-2-44: 2001 + AMD.1: 2002
  IEC 60601-2-44: 2009
  IEC 60601-1: 1988 + AMD.1: 1991 + AMD.2: 1995
  IEC 60601-1: 2005
  IEC 60601-1-1: 2000
  IEC 60601-1-2: 2001 + AMD.1: 2004
  IEC 60601-1-2: 2007
  IEC 60601-1-3: 1994
  IEC 60601-1-3: 2008
  IEC 60601-1-4: 1996 + AMD.1: 1999
  IEC 60601-1-6: 2006
  IEC 60601-1-6: 2010
  IEC 60601-1-9: 2007
  IEC 60601-2-28: 1993
  IEC 60601-2-28: 2010
  IEC 60601-2-32: 1994
  IEC 60825-1: 2007
  IEC 62366: 2007
  IEC 62304: 2006
  NEMA XR-25
  NEMA DICOM PS 3.1-3.18: 2009

DIMENSIONS AND MASS

	Unit	Dimensions W × L × H mm (in)	Mass kg (lb)
Gantry		2,150 × 870 × 1,870 (84.7 × 34.3 × 73.6)	1,800 (3,968)
Patient couch	Long patient couch version	630 × 2,690 × 485 (24.8 × 105.9 × 19.1)	530 (1.168)
	300 kg (661 lb) Long patient couch version	660 × 2,890 × 470 (26.0 × 113.8 × 18.5)	700 (1,543)
	Short patient couch version	630 × 2,390 × 485 (24.8 × 94.1 × 19.1)	500 (1,102)
	300 kg (661 lb) Short patient couch version	660 × 2,390 × 470 (26.0 × 94.1 × 18.5)	655 (1,444)
Console	CPU BOX	450 × 815 × 700 (17.7 × 32.1 × 27.6)	100 (221)
	REC BOX	590 × 955 × 1,250 (23.2 × 37.6 × 49.2)	270 (595)
Power distributor		860 × 700 × 1,330 (33.9 × 27.6 × 52.4)	600* (1,323)

*: Including the anchor plate.

SITING REQUIREMENTS

Power requirements

- Phase: Three-phase
- Line voltage: 380, 400, 415, 440, 460, or 480 VAC
- Frequency: 50 Hz or 60 Hz ±1 Hz
- Power capacity: 100 kVA (110 kVA)*
- Voltage fluctuation due to load variation: Less than 5%
- Power voltage fluctuation: Less than 10%**

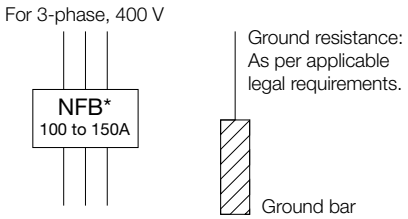
*: When the CXGS-011A is used.

**:Represents the total voltage fluctuation due to load and power variation.

Grounding

Grounding must be provided in accordance with local regulations for medically used electrical equipment.

Power distribution board



*: Recommended breakers are the following models or equivalent.
NV125-SVU 3P 100A (Mitsubishi Electric)
NV125-SVU 3P 125A (Mitsubishi Electric)
NV250-SVU 3P 125A (Mitsubishi Electric)
NV250-SVU 3P 150A (Mitsubishi Electric)

Ambient conditions

	Temperature	Humidity	Heat generation
Scan room			
Gantry	20°C to 26°C Tolerance: ±2°C	40% to 80% No condensation	Approx. 14,400 kJ/h * 36,000 kJ/h **
Patient couch	20°C to 26°C Tolerance: ±2°C	40% to 80% No condensation	Approx. 1,080 kJ/h * 1,800 kJ/h ***
REC BOX	20°C to 26°C Tolerance: ±2°C	40% to 80% No condensation	Approx. 6,126 kJ/h
Control room			
Console	16°C to 28°C	40% to 80% No condensation	Approx. 4,684 kJ/h
Power distributor	16°C to 28°C	40% to 80% No condensation	Approx. 2,883 kJ/h

*: When scanning is not performed.

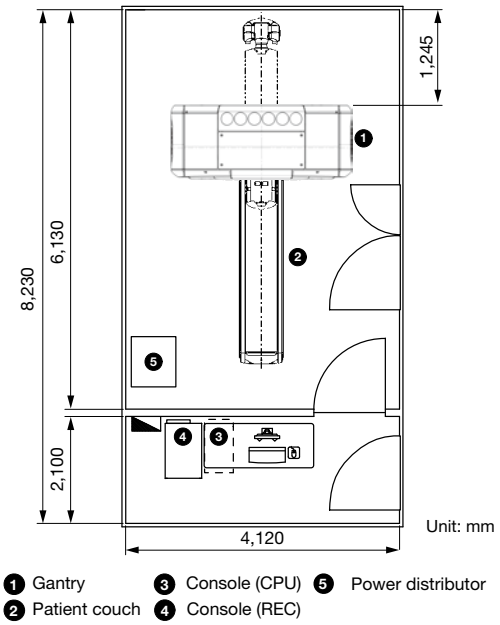
**: When scanning is performed continuously at maximum rated output (system with MegaCool™ tube).

***: When scanning is performed continuously at the maximum rated output of the system.

Minimum area for installation

Long patient couch version	21.3 m² (22.5 m²) *1
Scan room area	16.8 m² (18 m²) *1
Control room area	4.5 m²
Short patient couch version	19.3 m²
Scan room area	14.8 m²
Control room area	4.5 m²

Room layout example
(For the 205 kg (452 lb) long patient couch version)

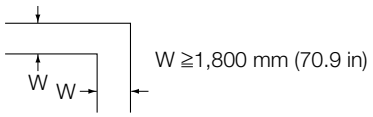


Installation requirements

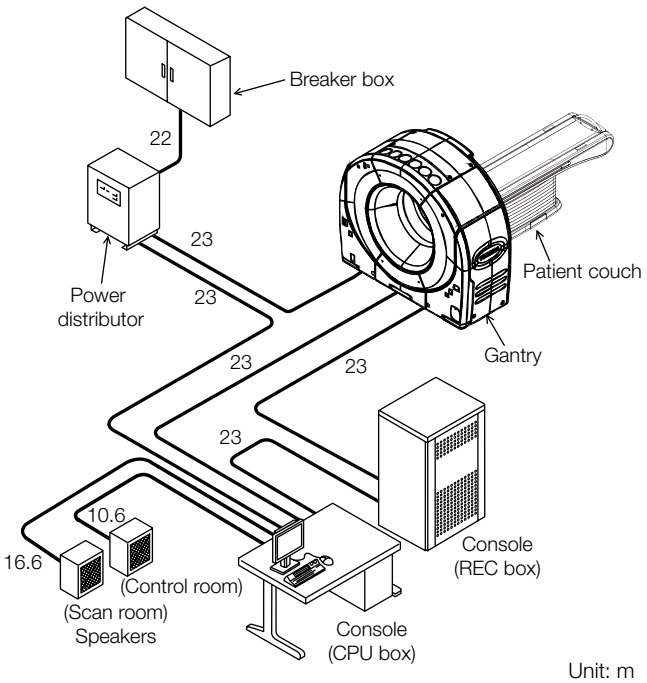
Scan room
- Before installing the gantry, check the maximum permissible floor load.
- The scanner emits radiation. X-ray shielding must be provided around the scan room and the entrance in accordance with all local requirements and regulations.
- The ceiling height should be at least 2,500 mm when a ceiling mounted contrast injector is installed.
- Wiring pits and ducts are required for routing cables that connect the various units.

Control room
- An observation window is required for monitoring the scan room. X-ray shielding of the window glass must be provided in accordance with all local requirements and regulations, and the bottom of the window frame should be 900 mm from the floor.
- Wiring pits and ducts are required for routing cables that connect the various units.
- The control room should have entrances for access to the corridor and the scan room.

Checks before bringing in the unit
- Check in advance the width of the corridor, the dimensions of the entrance, and the dimensions and maximum allowable load of the stairs and elevators to ensure that it is possible to bring in the unit safely and without difficulty.
- The minimum dimensions of the entrance used for bringing in the unit are as follows:
  Width: 900 mm (35.4 in)
  Height: 1,900 mm (74.8 in)
- The corners of corridors should be as illustrated below.
- Elevator load rating: At least 2,000 kg (4,409 lb)

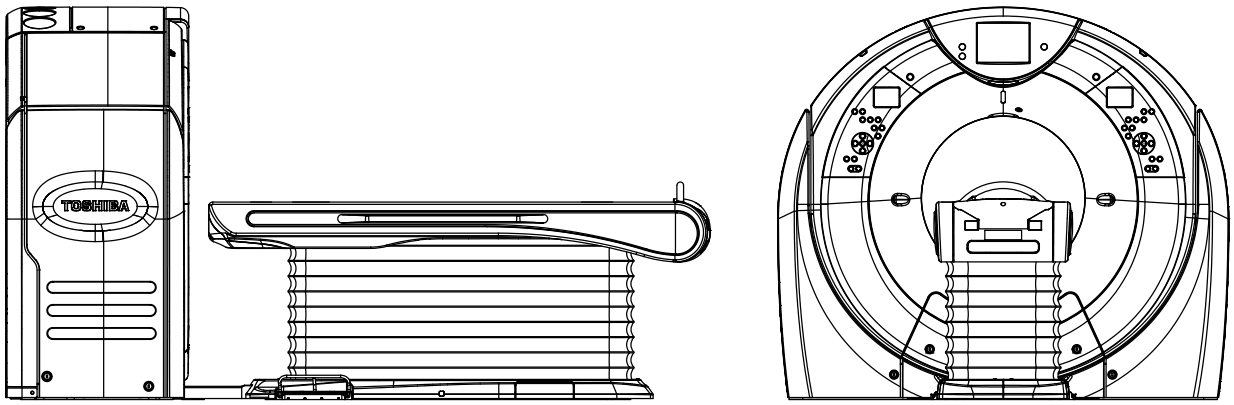


Cable connection between units

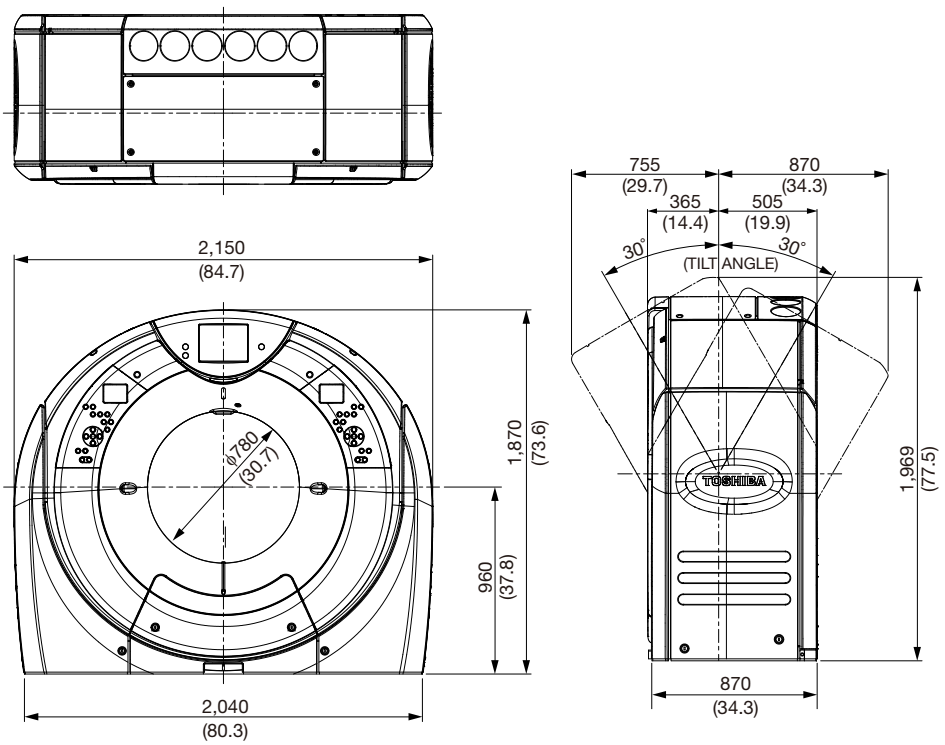


*1: For the 300 kg (661 lb) long patient couch version

OUTLINE DRAWINGS



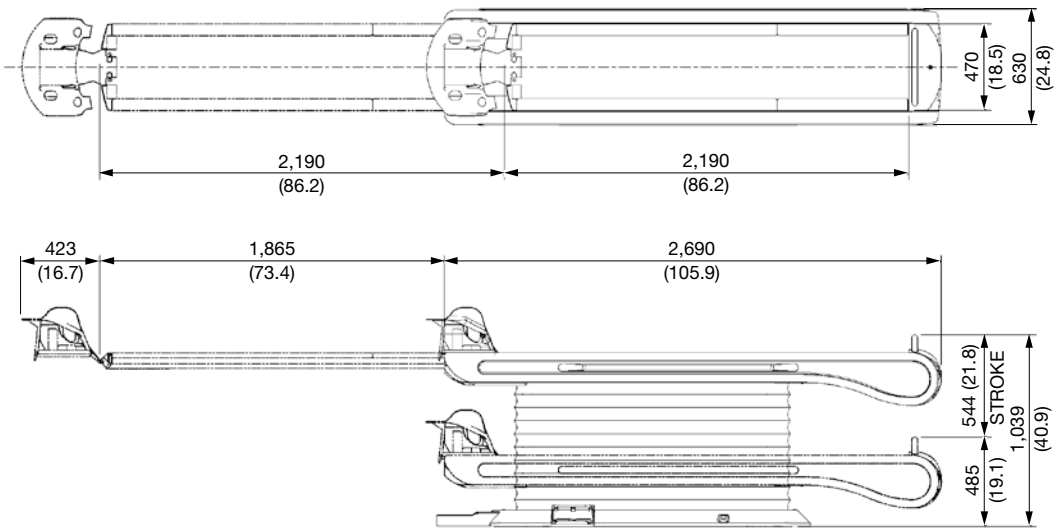
Gantry and Patient Couch



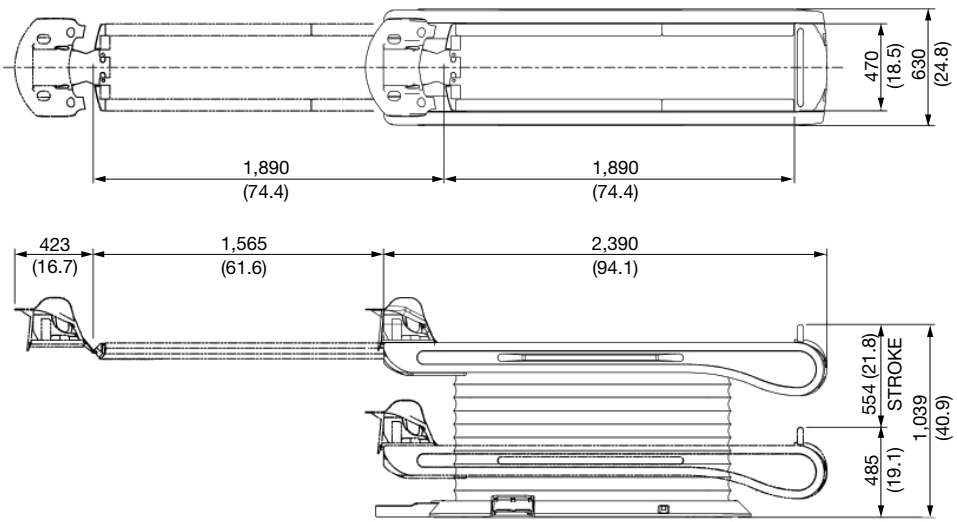
Gantry

Unit: mm (in)

OUTLINE DRAWINGS



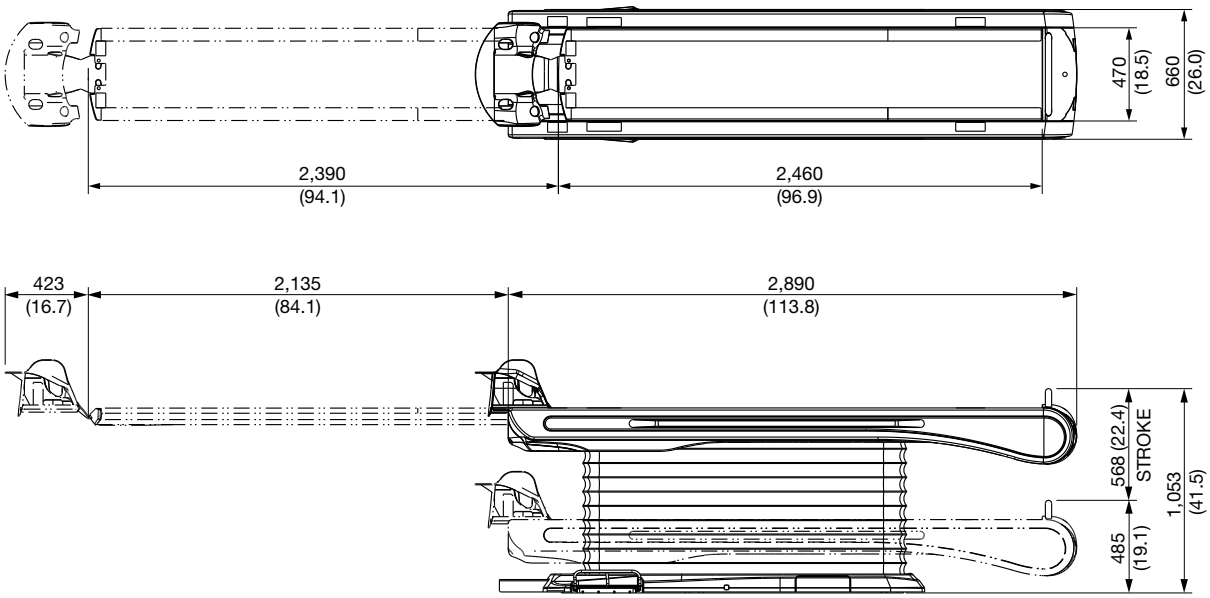
Patient Couch (for the 205 kg (452 lb) long patient couch version)



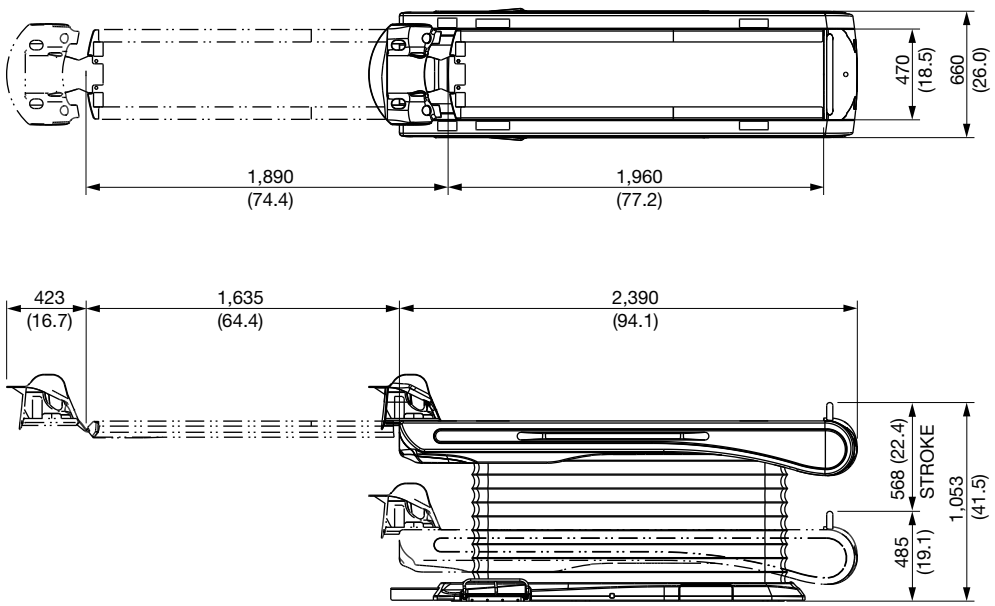
Patient Couch (for the 205 kg (452 lb) short patient couch version)

Unit: mm (in)

OUTLINE DRAWINGS



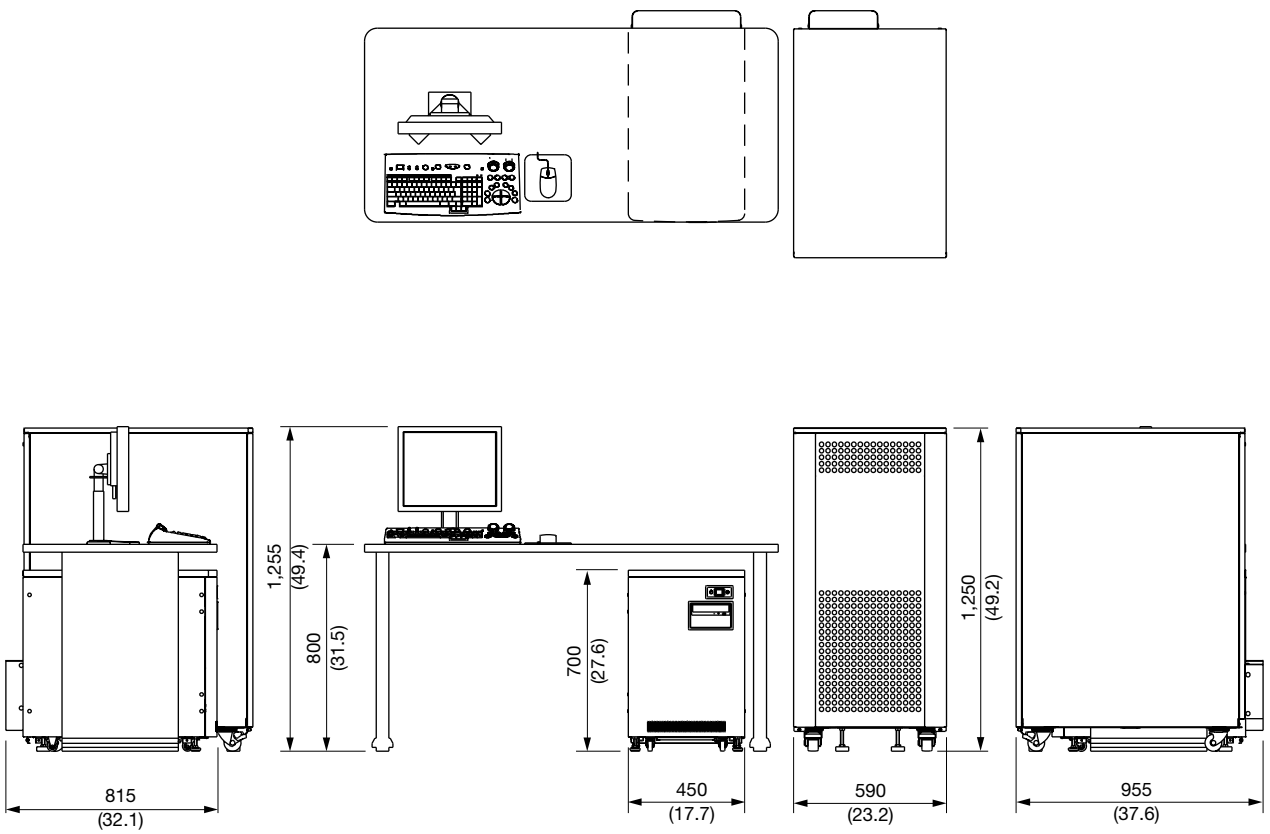
Patient Couch (for the 300 kg (661 lb) long patient couch version)



Patient Couch (for the 300 kg (661 lb) short patient couch version)

Unit: mm (in)

OUTLINE DRAWINGS

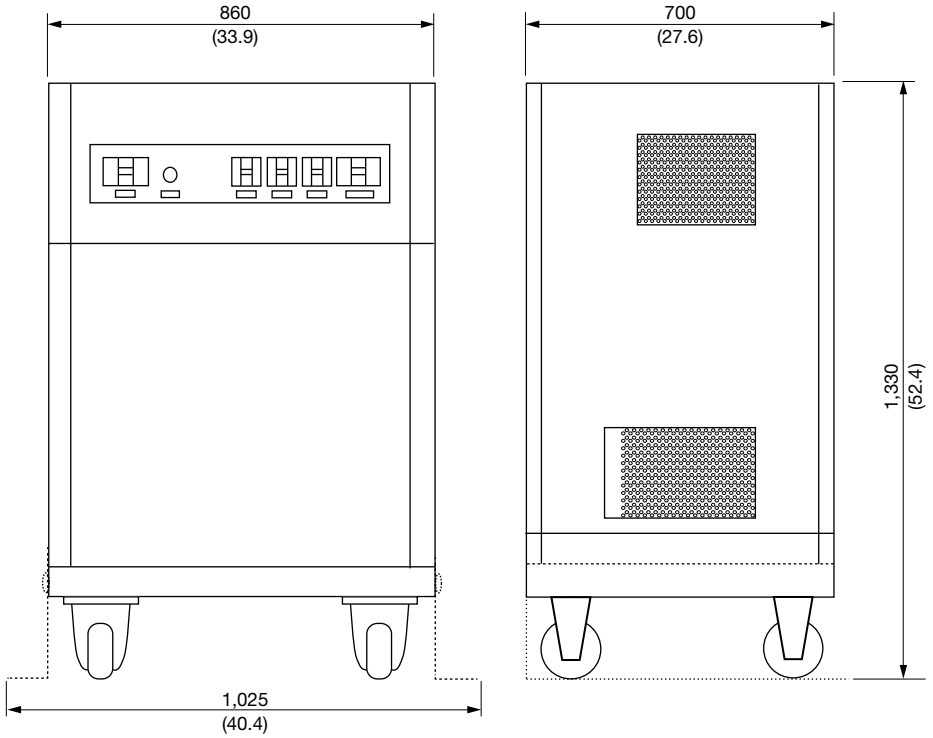


Console

Note: The console desk is not included in the standard composition.
Some of the units shown in the photograph on the front page differ from those shown in the drawings above.

Unit: mm (in)

OUTLINE DRAWINGS



Power Distributor

Unit: mm (in)

TOSHIBA MEDICAL SYSTEMS CORPORATION
1385, Shimoishigami, Otawara-shi, Tochigi 324-8550, Japan
http://www.toshibamedicalsystems.com

Model number: TSX-303A 2013-09 TME

Toshiba Medical Systems Corporation meets internationally recognized standards for Quality Management System ISO 9001, ISO 13485.

Toshiba Medical Systems Corporation Nasu Operations meets the Environmental Management System standard ISO 14001.

Produced in Japan