GE HealthCare

OEC 3D

Technical Data

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Table of Contents

Availability of system and options varies by country.
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Precise and Efficient

The OEC 3D C-arm provides precise volumetric images, and familiarity of 2D imaging for efficiency in diagnostic, interventional, and surgical settings.

Precise

Detailed 3D and 2D images for procedural confirmation in the operating room.

- Large 19 cm x 19 cm x 19 cm volume - 67% greater volume than other 3D C-arms* - with a high resolution of 512^3 voxels.
- Selectable settings to optimize imaging: projection modes, metal artifact reduction, noise, and low dose.
- 200° isocentric sweep in a single smooth movement with a carbon-fiber C.
- Five 3D volume reconstructed images present a precise view in three cross-sectional planes as well as Volume Rendering and Maximum Intensity Projection.
- Volume Viewer, a suite of 3D imaging tools based on GE HealthCare proven AW image fabric technology, includes Multi-Oblique feature, scrolling through slices, rotate, zoom, and more.
- OEC Open: an open platform enables seamless integration with many navigation and robotics systems.
- Renown OEC 2D image processing with advanced features including:
  - Live Zoom: Cine or Fluoro 4X image size with no dose change
  - eNR** presents 30% less noise during Vascular and Cardiac imaging
  - Preset Profiles: anatomical image optimization
  - Digital Pen and measurements for procedure planning

*Compared to other 3D C-arm published specifications.
**Based on GE HealthCare study of OEC 3D imaging results with application of enhanced noise reduction algorithm

Efficient

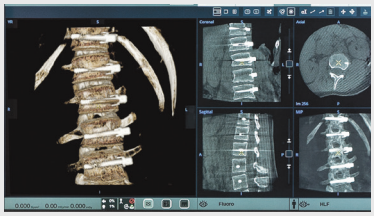
A true 3D/2D C-arm that performs both 3D and 2D imaging easily for overall C-arm utilization.

- Quickly perform and review 3D images from prescan to reconstruction and then proceed with 2D imaging with no need for a second C-arm.
- Increase asset utilization and use the OEC 3D for procedure imaging every day from general surgery and trauma to interventional cardiovascular procedures.
- Leverage Live View to position detector on patient anatomy with a real time view that minimizes the need for scout images and unnecessary X-ray while positioning the C-arm.
- Easy to manually move at a light weight of 740 lbs C-arm (336 kg) as well as sleek overall footprint for fitting into tight spaces.
- Position in a low lateral height of 39.4 inches (100 cm) aides detector placement and minimize table height adjustment.
- Modern motorized controls with orientation guidance, position memory recalls, and collision alert detections.
- Enhance viewing of images with 4K UHD display that easily positions for line of sight as well as remote displays via wireless or HDMI connections.
- Patient data security with data encryption, password protection, and Linux operating system.
- Peace of mind with training provided by dedicated clinical specialists and service support options.

3D Imaging

Volume	• 19 cm x 19 cm x 19 cm isometric volume • 512^3 voxels resolution
Technique	• Dose modulation based on anatomical density
Projections	• Selectable based on preference or anatomy: 200 or 400
Acquisition	• 200° motorized sweep in 30 seconds for typical scan
Reconstruction	• Processing completed in 30 seconds for typical scan
Retrospective	• Reconstruction of previously acquired scans with Noise Reduction Level adjusted or Metal Artifact Reduction selected
Metal Artifact Reduction	• Reduces the appearance of artifacts caused by metal in the imaging field. • Select prior to 3D acquisition or post-processed retrospective reconstruction
Noise Reduction	• Adjust noise with manual and/or automatic setting • Select prior to or post 3D acquisition

Volume Viewer

Image Perspectives 	• Five image perspectives automatically presented: Axial, Coronal, Sagittal, Volume Rendering, and Maximum Intensity Projection • Scroll through 512 slices in Axial, Coronal, or Sagittal perspectives • Adjust slice thickness in Axial, Coronal, and Sagittal perspectives with thickness value displayed • Pan, zoom, and rotate Volume Rendering and Maximum Intensity Projection
Multi-Oblique	• Display three oblique planes through adjustable color axis lines on images, with synchronized viewing in the Axial, Coronal, and Sagittal perspectives
Window Level and Width	• Adjust window level and window width for brightness and contrast changes in images • Selectable preset: Bone or Lung
Measurements and Annotations	• Measure distance, angle or area on image perspectives: Axial, Coronal, and Sagittal • Annotate with markers (left, right), arrows, and text comments
Volume Import	• DICOM import of preoperative MR/CT volume dataset into OEC 3D Volume Viewer • View Live fluoro with imported volume perspectives as reference image
Displays	• Image Perspectives viewable: - 32 inch 4K ultra-high definition color display on workstation - 40 cm 1366 x 768 resolution display on C-arm and rollstand* • Selectable layouts: full screen (5 view), half-screen (2x2, 1x1) • View 2D Fluoro and Volume Viewer simultaneously

Clinical Offerings* (optional)

Spine Suite	• Review pedicle screw location with auto-detection • Ability to visualize centerline or midline oblique view of spine • Label vertebrae manually
Lung Suite	• Augmented Fluoroscopy overlays 3D points of interest on a 2D fluoro • Set range limits for 3D scan during collision check (start, end, and tilt) • After initial collision check, may bypass subsequent collision checks
OEC Open	• Dedicated interface to transfer 3D reconstructed volume data set • Designed to seamlessly connect with navigation or robotic systems

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3D Setup and Acquisition

Setup Assistant	Four guided steps: • Patient orientation and imaging selections • Center detector to anatomy • Collision check • Acquisition
Settings	• Projections: Standard (200), HD (400), and HD+ (400 plus technique) • Low Dose • Metal Artifact Reduction • Noise Reduction: manual and/or automatic
Orientation and Centering	• Orientation: patient and C-arm • Align with green laser aimers: Lateral and Anterior-Posterior • Center with AP and Lateral X-ray with a 3D preview outline
Collision Check	• 200° rotation to ensure no obstruction or collision • Area of collision detected presented on OEC Touch display • After initial collision check, subsequent collision checks may be bypassed (optional)
Acquisition	• Activate via X-ray handswitch or footswitch (wireless option*)

Detector

CMOS Detector

- CMOS - complementary metal-oxide semiconductor detector
- DQE(0): 72%
- Active amplification inside pixel for ultra-fast electron mobility
- Active Matrix: 1548 x 1524 pixels
- Pixel Pitch: 198.0 µm
- Nominal resolution (at display):
  - 31 cm: 2.7 lp/mm
  - 21 cm: 2.8 lp/mm
  - 15 cm: 2.9 lp/mm
- Quad-mode magnification
  - Live Zoom fluidly from 1 to 4X with no change in dose
  - Fixed tri-mode Mag settings: 31 cm / 21 cm / 15 cm
- Grid removable by hand with status detection on display

X-ray Tube and Generator

X-ray Tube	• 0.3 mm and 0.6 mm nominal focal spots • Anode - Heat capacity: 300,000 HU - Cooling rate: 85,000 HU/min • Housing - Heat capacity: 1,800,000 HU - Cooling rate: 68,000 HU/min • Anode heat capacity indicator displayed • Active cooling technology
X-ray Generator	• 60 kHz high frequency • 15 kW power (30 kW power equivalent image with Vascular and Cardiac profiles) • kVp Range: 40 - 120 kVp for all imaging modes • Full power from a standard wall outlet • Battery buffered design provides additional stored power when needed

Additional Features

Live View	• Preview 2D Field of View without camera to guide detector positioning and minimize X-ray shots • FOV preview dynamically adjusts to depth changes from detector to patient anatomy • Save Live View pictures to patient record

2D Imaging

Image Resolution	• 1.5 k x 1.5 k x 16 bit
Motorization	• Control available at: C-arm, RUI, and Tableside (optional) • Directional Alert displayed if collision detected to aid collision clearance • Multiple speed control for lateral and orbital rotation: - Variable up to 9° per second - 3D sweep 7.5° per second - Micro-adjustment 2° per second • C-arm angle displayed in real time and on saved images • Six preset positions: AP, Lateral, and four user defined • Emergency motion stop
Enhanced Noise Reduction (eNR)	• Automatically adjusts vascular and cardiac imaging presenting 30% less noise for an equivalent appearance of 30 kW* power
Motion Tolerant Subtraction	• Dynamically adjusts image quality based on presence of motion in the image in select configurations and profiles
Minimal Difference Spatiotemporal Filter (MDST)	• Advanced averaging algorithm that dynamically adjusts noise filter when no motion is present in the image
Smart Metal	• Minimizes the effect of metals on image sharpness or quality • Automatically adjusts brightness and contrast and allows user to adjust sensitivity levels for optimum image quality when metal is present in the imaging field
General Purpose Dynamic Range Management (GDRM)	• Precision imaging to enhance anatomy of interest while attenuating background features
AutoTrak Automatic Brightness Stabilization (ABS)	• Automatically seeks the subject anatomy anywhere within the imaging field • Selects the optimum imaging technique by varying mA, kVp, and gain • Adjusts to anatomical size and location • Provides uniform image quality throughout the entire image

Imaging Acquisition Modes

Mode	Description	mA Range	Pulse Rate	Pulse Width	AutoTrak (ABS, mA, kVp)	Low Dose	Auto or Manual
Continuous Fluoroscopy	Standard fluoroscopy mode optimizes image quality while minimizing overall dose with low continuous mA	0.2 – 10 normal 0.2 – 20 HLF	N/A	N/A	●	●	●
Pulsed Fluoroscopy	Selectable based on user preference	0.2 – 28 normal 0.2 – 50 HLF	4, 8, 15 pps	19 ms–34 ms	●	●	●
Digital Cine Pulse	Reduces image motion artifact caused by fast moving anatomies, usually applied to cardiovascular (vessels of the heart) procedures	up to 150 mA	15, 30 pps	9 ms	●	N/A	●
Digital Spot	A short-duration, high-mA exposure to produce a high-quality single image with automatic exposure termination and image save	up to 75 mA	N/A	N/A	N/A	N/A	N/A

N/A : non-applicable

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2D Features	
Live Zoom	• Digitally zoom up to 4X larger during a fluoro shot, Cine run, subtraction, or roadmap • Same dose rate as normal images, and less dose compared to images in Mag mode • Full image picture-in-picture in Live Zoom, with reference 2D or 3D on right • Zoom view can be changed back to normal view after the image is saved • Minimize repositioning C-arm by panning to area of interest on image
Digital Pen	• Draw lines on image display for planning or educational purposes • Bright blue color marks remain present until deleted from image
Measurements	• Measure distance, angles, and percent stenosis on images • Unit of measurement configurable to mm or French
Annotations	• Annotate with markers (left, right), arrows, and text comments
Reference Image Hold	• Prior images can be selected as a reference and viewed on the right side of the display
Preset Imaging Profiles	• Ten profiles designed to enhance view of anatomy based on procedure type: General, General HD, 9900, Orthopedic, C-Spine, Spine, Pediatric, Vascular, Bolus Chase, and Cardiac
Cine Runs	• Automatic image playback • Play/pause and forward/back • Frame by frame or multiple frame review
Peak Opacify	• For observing contrast flow in subtracted and un-subtracted runs • When selected, image displayed presents the darkest pixels acquired for each point of a Cine run
Mask	• For use as a baseline image in Cine, Subtraction, and Roadmap imaging
Landmarking	• For seeing the position of vessels in relation to certain background anatomies during subtraction and roadmapping • Landmarking enables ability to vary the percentage of background anatomy that displays in a subtracted image
Subtraction	• Primarily used for contrast studies such as angiography • Contrast type selectable: positive (e.g. Iodine) or negative (e.g. Carbon Dioxide) • Presents the difference between fluoroscopic images and mask image obtained at the start of the subtraction process
Roadmapping	• Used for providing anatomical location of pathology for placement of a catheter, balloon, or stent in cardiovascular procedures • View a modified subtracted image showing difference between current fluoroscopic image and a roadmap mask image
Image Adjustments	• Noise filter, Negate, Save and Auto-save, Swap and Auto-Swap, Last Image Hold
Image Orientation	• Rotate Live and Last Image Hold orientation in 1 degree increments while orientation setting selected continues for subsequent images • Auto repeat button for quick rotation and degrees of rotation displayed on screen • Reverse image left-to-right or invert image top-to-bottom
Collimation	• PreView indicates collimator positions on image display • Collimators include Iris and rotatable double leaf tungsten

Workstation Display

- Medical grade display
  - 4K 32 inch (81 cm) Ultra high definition (UHD) Color Display
  - Displays two split screens for equivalent view of two 20 inch displays
  - 3840 x 2160 display resolution
  - 600 cd/m² maximum brightness
  - Touchscreen interface with anti-reflection, anti-fingerprint
  - Integrated PIP window to display color DVI-D input
  - Medical Grade: IEC 62563 Standard
- Easily position to surgeon's surgical line of sight with:
  - Forward, horizontal, vertical, and tilt movements
  - 360° positioning around workstation
  - 170° viewing angle (horizontal and vertical)
  - 60% increase viewing perspective with 27 inch forward display travel

Patient Exam

- Patient exam features at the workstation include:
  - New exam entry and edit
  - Schedule exams review
  - Deletion of exam(s)
  - Display multi-modality exams
  - View older exams
  - Search saved/scheduled exams
- Patient Privacy control blanks screen
- HIPAA SecureView with password protection, blank screen function, and delete all patient information

OEC Touch Control Panel

C-arm Control Panel

- Intuitive user interface with OEC recognizable icons, colors, and layout
- Easily access functions during procedures, including X-ray controls, Live Zoom, Digital Pen, laser aimer, image directory and more
- 7.1 in (18 cm) Live image mirrors Live image displayed on workstation
- Overall panel: 15.6 in (40 cm) touchscreen with 1366 x 768 resolution
- Panel positioning: 270° base swivel, 60° tilt range, 160° viewing angle

OEC Touch Tableside*

- Easy to position rollstand for advanced control within reach

Dose Management

- Live View provides preview of 2D Field of View with a camera to aid in detector positioning and minimize unnecessary X-ray positioning shots
- Low dose mode provides 50% dose reduction from standard fluoroscopy
- Low dose combined with pulsed fluoroscopy can provide up to 90% reduction from standard fluoroscopy
- Live Zoom enables up to 4X increased imaging size with no change in technique
- Pediatric preset imaging profile automatically reduces dose in all image modes
- Choice of fluoroscopy modes and pulse rates
- DQE(0): 72% from CMOS flat detector provides superb image quality at low dose
- Beam filtration reduces skin entrance dose while managing image quality
- Anti-scatter grid removable by hand, no tools needed
- Green laser aimer integrated (Class II) with accessible on/off controls
- Preview virtual collimator
- Skin spacer accessory
- Dose rate, accumulative dose, and Dose Area Product (DAP) displayed
- Radiation Dose Structured Report transfer via DICOM

Image Management

Storage	• 1,400 Volumes • 40,000 static image storage • 30 min to 480 min Cine run storage, depending on fps and configuration
Image Directory	• Retrieve, review, copy, and delete • Accessible on OEC Touch control or workstation
3D Data Export	• Select volume orientations (Axial, Coronal, Sagittal, MIP and/or VR), secondary image captures, and slice thickness (1mm default)
USB Export	• 3D mesh in STL, 3MF, VRML or OBJ format • Full-size or half-size, Web viewable, JPEG and BMP, DICOM compatible, OEC compatible, De-identify DICOM images, Remove patient information • Transfer data to media storage devices: USB or DVD drive (optional)
DICOM	• Image Storage Commit with PACS confirmation • Image Query and Retrieval to view different modality images • Image Print • Export of detailed Radiation Structured Report • Queue images for storage when not currently connected to the network • Modality Worklist (MWL) and Modality Performed Procedure Step (MPPS) • On-board DICOM troubleshooting User Interface • TLS (Transport Layer Security) available with OEC Secure

Connectivity

Video	• Output: Two DisplayPort interfaces (configurable to left, right, or full screen) • Input: One DVI-D interface (PIP displays on right screen)
USB	• Three Ports
Ethernet	• Two port for DICOM and OEC Open
Navigation	• One OEC Open port
Room-in-Use	• One Interface for Room-in-use indicator system
Injectors	• One Interface available
Live Cast (optional)	• Wirelessly transmit workstation display to in room displays
Wireless Data Transfer (optional)	• Dual Band (2.4GHz and 5GHz) • Enterprise security - WPA, WPA2, PEAP, EAP/TLS for in-transit encryption
Printers (optional)	• Thermal hard copy

Security

User Identity Management	• Password management features
Operating System	• Linux-based operating system (SUSE)
System Security	• Solid state drive, encryption at rest, secure erase patient data • Hardened USB ports accept GE Service Access Key, physical keyboard, and media storage devices. DICOM USB transfers can be disabled. • Audit logs of operating system and application • FIPS 140-2 encryption compliance • OEC Secure, includes additional advanced cyber security risk management

Operations

System Setup	• Quick system startup, takes less than a minute to boot-up • SmartConnect allows workstation to operate independently of C-arm and connect/ disconnect C-arm when needed without having to reboot system
Workstation Setup	• Setup tab provides access to system information, default settings, and configuration management including: System, Acquisition, Profile, Patient, Position, Touchpad/Audio, DICOM, Network, Regional preferences, Security settings, Utility power, User Manual, Quality control calibration test, and Service access
Uninterruptible Power	• Controlled shutdown with power monitoring displayed • Accidental power loss protection provides 20 seconds battery back-up power to workstation and C-arm
X-ray Controls	• Activation button physically on C-arm • Footswitch with multi-function control (wireless optional) • Handswitch with multi-function control
Workstation Keyboards	• Physical alphanumeric keyboard with integrated touchpad, sealed silicone design for dust-free, contaminant-free and water-resistant use, connects via USB port • On-screen virtual keyboard and image control keypad on workstation display • Physical image control keypad on workstation
C-arm Key Switch	• Three positions: - Enabled X-rays and powered movement - Disabled X-rays and powered movement - Disabled X-rays, enabled powered movement • Emergency stop button located on C-arm
Operating Range	• Temperature Range 10° to 35° C (50° to 95° F) • Humidity Range 10% to 80%
Electrical	• Input AC Power (50 Hz or 60 Hz) - 115 V/120 V(1)/127 V(2) @ 20A - 200 V/220 V/230 V/240 V @ 10A (1) In North America, 120 VAC systems are required to have a 20% de-rating from the service or outlet rating on the system rating labels for current. Therefore, systems designed for use with 120 VAC @ 20A service are labled as 16A (2) 127 VAC tolerance of -10% to +5%
Regulatory Compliance	• U.S. 21 CFR Subchapter J • ANSI/AAMI 60601-1 (CSA/NRTL) • IEC 60601-1 (plus relevant Collateral and Particular Standards) • NEMA XR 27-2013 with Amendment 1, X-ray Equipment for Interventional Procedures User Quality Control Mode

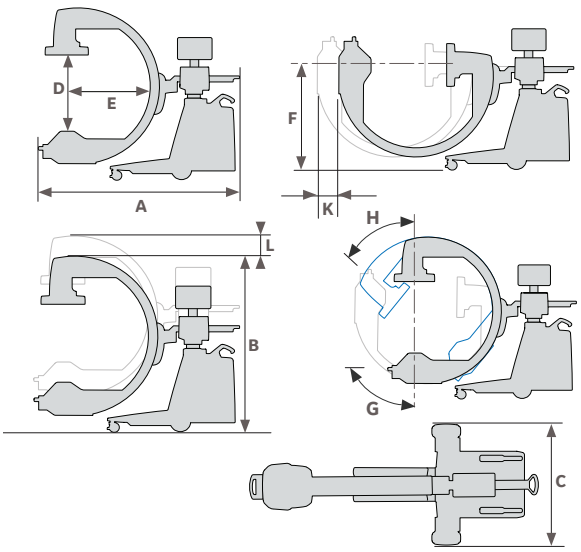
Dimensions

C-arm

Length	**A**	83.3 in (212 cm)
Height	**B**	73.2 in (186 cm)
Width	**C**	33.2 in (84 cm)
Free space in arc	**D**	33.4 in (85 cm)
Depth in arc	**E**	29.5 in (75 cm)
Lateral height	**F**	39.5 in (100 cm)
Source to image distance		42.5 in (108 cm)
Weight		740 lbs (336 kg)

Movement

Horizontal travel	**K**	6.0 in (15 cm)
Vertical travel	**L**	18.0 in (46 cm)
Orbital rotation	**G/H**	200° (100°/100°)
Lateral rotation		360° (90°/270°)
3D scan tilt		20° (10°/10°)

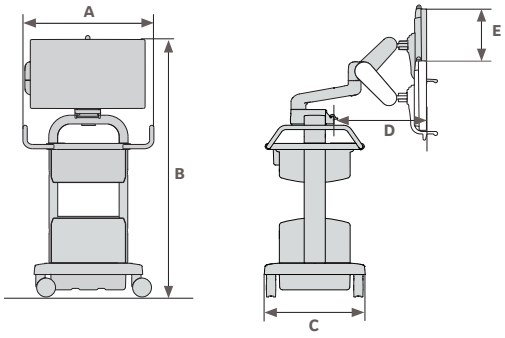


Workstation

Width	**A**	34.1 in (87 cm)
Height	**B**	68.1 in (173 cm)
Depth	**C**	26.2 in (67cm)
Weight		428 lbs (194 kg)

Display Movement

Forward travel	**D**	26.5 in (67 cm)
Vertical travel	**E**	13.5 in (34 cm)
Position range		360°
Tilt range		20° (10°/ 10°)



OEC Touch Tableside (optional)

Height	53.5 in (136 cm)
Width	20.3 in (52 cm)
Depth	19.6 in (50 cm)
Vertical Travel	6.3 in (16 cm)
Weight	60 lbs (27 kg)
Cable Connect Length	20 ft (6 m)

Display

Display Size	15.6 in (40 cm)
Image Height	7.1 in (18 cm)
Tilt Range	35°
Swivel	90°/90°

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