Elekta

ImagingRing

Specification sheet

System	ImagingRing m
Mounting	medPhoton robotic platform
Benefits	✓ Flexibility
	✓ Ultra-large gantry bore (121 cm) for extra-large field-of-view (FOV)
	✓ IORT, Brachytherapy, IGRT (particle), interventional radiology, surgical
	✓ Battery powered maneuverability
	✓ Wireless remote control
	✓ Robotic movements
	✓ Non-isocentric imaging and collimation
	✓ Movable lasers to define scan range and for incision planning
CE	EN ISO 13485, EN ISO 14971, EN 62304, EN 62366, IEC 60601-1, IEC 60601-1-2, IEC 60601-1-3, IEC 60601-1-6, IEC 60601-2-28, IEC 60601-2-43, IEC 60601-2-54, EN 1041:2008, EN ISO 15223-1:2016, ANSI/AAMI ES60601-1, CAN/CSA-C22.2 No. 60601-1

Imaging Capabilities	
Customizable Protocols	✓
Adaptive Protocols	✓
Dynamic Collimation	✓ Asymmetric, 4 independent jaws
Isocentric Imaging	✓
Non-Isocentric Imaging	✓

2D imaging	
2D Single Images	✓
2D FOV (in Isocentre) [cm]	25.4 x 25.4
2D Extended FOV (in isocentre) [cm]	25.4 x 65 (optional)
Scout View (Topogram)	✓ (optional)
2D Fluoroscopy (Radioscopy)	✓ (optional)
2D Scatter Correction	✓

3D imaging	
CBCT	✓
Full Scan (360°)	✓
Short Scan (180° + field divergency)	✓
Dual Short Scan (2x180°)	✓ (optional)
CBCT Acquisition Time Full Scan 360°	~ 60 s / 360° @ 7°/s
CBCT Acquisition Time Short Scan	~ 22 s (isocentric short scan 180° + field divergency)
Real Time Reconstruction (inline)	✓ (+60 s for iterative recon. and MAR)
3D Field of View [cm]	Depends on non-isocentric offset from gantry center. All variable sizes of non-circular (elliptic) trans-axial FOVs are individually adjustable per patient scan..:
LFOV (large field of view) [cm³]	43 x 43 x 25.4 cm^3
SFOV (small field of view) [cm³]	25.4 x 25.4 x 25.4 cm^3
Spine FOV (spine field of view) [cm³]	12 x 12 x 20 cm^3
limFOV (limited field of view) [cm³]	12 x 12 x 12 cm^3
miniFOV (mini field of view) [cm]	6 x 6 x 6 cm
USFOV (ultra-small field of view) [cm]	3 x 3 x 3 cm
3D Limited Field of View (Dynamic Collimation)	✓

Advanced 3D Imaging Features	
CT Mode (fan beam collimation - scatter reduction)	✓
Tomosynthesis	✓

Imaging Geometry	
Source Axis Distance (SAD) [cm]	74.25
Detector Axis Distance (DAD) [cm]	51.7
Source Detector Distance (SDD) [cm]	126 (opposing)
Patient Entrance Reference Point	Isocenter (due to non-isocentric options)

X-Ray System	
Fluoroscopy (Pulsed and Continuous)	✓
Last Image Hold	✓
Frame Integration	✓ (programmable averaging time)
Pulsed Mode	✓ Pulse length typical 10 ms, range 2 – 35 ms @ 12 Hz (2D and 3D)
Continuous Mode	✓ (2D and 3D)
Snapshot Mode	✓
Cine Mode	✓
Dose Modulation During Acquisition	✓ (by velocity modulation optional)
Bow-Tie Filter	✓ (optional) 1 motorized bow-tie filter with 0.3 mm Cu optimized for pelvis configuration
Fixed Filtration	4.4 mm Al eq. @75 kVp
Additional Filtration	**Variable filter wheel position for:** - 0.5 mm Cu (13.0 mm Al eq. @75 kVp) - 1.5 mm Al - no additional filtration - 0.2 mm Cu (5.2 mm Al eq. @75 kVp) **Variable filter carriage position for:** - no additional filtration - 1.5 mm Cu (31.3 mm Al eq. @75 kVp)
Cooling System / Features	Dielectric oil - fan assisted control (no turbulent air flow in surgical environment)

X-ray Tube Anode	
Type	IAE RTM 780H 0.3/0.6
Maximum Output [kW]	Small focus: 6kW Large focus: 25 kW max (typical < 2 kW)
Heat Capacity Anode [kJ]	225
Heat Capacity System [kJ]	X-ray: 610; Total: 910
Cooling Anode [W]	750
Cooling System [W]	75
Focal Spot Size [mm]	0.3 / 0.6 mm depending on preset (both focal spots available in radiographic and fluoroscopic imaging)
X-ray Primary Aperture [degrees]	55 (asymmetrical)
Anode Angle	10° (the effective emission angle may be larger due to the mounting angle of the X-ray housing)
Tube power rating (kW@100 kVp)	max. 5.2 kW (Small focus), 22 kW (Large focus) (typical < 2 kW)
Frequency [Hz]	1 – 30 (typical 12)

X-ray Generator	
Type	IMD HF1 GMX-350/S2
Power Rating [kW@100 kVp]	max. 15 kW (typical < 2 kW)
Radiographic Mode	Pulsed or continuous frame averaging
Energy Range [kV]	40 – 120
Current Range [mA]	Small Focal Spot: 5 – 30 mA Large Focal Spot: 40 – 120* mA (* for 2D acquisition)
Automatic Exposure Control (AEC)	Topogram, planar test exposure
Pulse Length [ms]	2 – 35 (pulsed 12 Hz)
Exposure Time in Fluoroscopic Mode	After 5 min (warning buzzer), max. 10 min in one exposure (regulatory limit)
Voltage range [kV]	40 – 120
Current range [mA]	0.2 – 8

Detector System	
Detector Type	Varex XRD4343RF
Scintillator	CsI (Tl)
Panel Size [cm²]	43.2 x 43.2
Flat Panel Resolution	max. 2880 x 2880 @150 µm 1440 x 1440 fast binning mode 960 x 960 ultra fast binning mode
Internal Data Transmission	Glass Fibre

Image Characteristics	
Spatial Resolution (high resolution protocol)	up to 21 LP/cm (in 2 x 2 binning mode and 0° gantry tilt)
Pixel pitch	150 µm physical binned to 300 µm
Matrix	Configurable, user selectable resolution Ultra-Low (243³ Voxels) Low (307³ Voxels) Medium (386³ Voxels) High (487³ Voxels) Ultra-High (613³ Voxels) (for cubic volume, isotropic resolution)
Voxel Size	Dynamic Voxel size adapted to FOV dimension (ultralow – medium – ultrahigh resolution): LFOV 1.48 - 0.93 - 0.95 mm SFOV 1.05 - 0.66 - 0.41 mm Spine FOV 1.03 - 0.37 - 0.23 mm limFOV 1.03 - 0.35 - 0.20 mm ULFOV 2.25 - 1.41 - 0.89 mm miniFOV 1.03 - 0.35 - 0.12 mm USFOV 1.03 - 0.35 - 0.12 mm
Line pair resolution	tested max. 21 LP/cm (CatPhan) LFOV 3.4 - 5.3 - 8.5 LP/cm SFOV 4.8 - 7.6 - 12.1 LP/cm Spine FOV 4.9 - 13.6 - 21.5 LP/cm limFOV 4.9 - 14.3 - 25.5* LP/cm miniFOV 4.9 - 14.3 - 42.0* LP/cm ULFOV 2.2 - 3.5 - 5.6 LP/cm USFOV 4.9 - 14.3 - 42.0* LP/cm
HU Uniformity (SFOV CBCT phantom conditions)	2%
Geometrical Accuracy	< 0.5 mm (95% confidence interval, gantry inherent deflection compensated) < 1 mm (with external tracking)
Mechanical Flex Correction	✓ 9 + 3 DOF 3 source translations (x, y, z) 3 detector translations (x, y, z) 3 detector rotations (rx, ry, rz) 2 source central axes tilts

Motion	
Wireless System Positioning	✓ (optional - requires HMI)
Wireless Region-of-Interest (ROI) Definition	✓ (optional - requires HMI)
Patient Positioning System (PPS) Compatibility	any
Table Top Indexing	any
Gantry Clearance [cm]	121 (ring bore size), 101.2 (detector)
Gantry Width [cm]	28.5
Travel Range Source [degrees]	683,3 (1.90 turns)
Travel Range Detector	688,54 (1.91 turns)
Max. Rotational Speed [degrees/s] (source, detector)	16°/s, 7°/s typical
Longitudinal Motion Range	Unlimited
Gantry Tilt and Rotation	✓ tilt +90°/-90° (±30° for 360° CBCT, +60° for short scan CBCT, source below), N x 360° free yaw rotation

Guidance	
Source-sided Trans-axial Lasers (Class 1)	✓ (optional)
Source-sided Motorized Sagittal Lasers (Class 1)	✓ (optional)
Detector-sided Adaptive Lasers (Class 1)	✓ (optional)
Laser Crosshair Mode Pointer Planning	✓ (optional)
Laser Field-size Mode FOV Planning	✓ (optional)
Two Cameras inside gantry (prepared for stereoscopic computer vision applications)**	✓ (optional)
Two Cameras inside detector arm (prepared for stereoscopic computer vision applications)**	✓ (optional)

Industrial Computer	
Processor	Intel® Xeon® Processor E3-1275 v5 (8M Cache, 4.0 GHz)
Memory	32 GB ECC DDR4-2133
Graphics	NVIDIA® GeForce® RTX 2060 SUPER or newer (8 GB GPU RAM)
Built in Storage	5 TB HDD (1000 CBCT acquisitions) +256 GB internal SSD

Ports	
Interfaces	Ethernet – For navigation (length 5 m-) Ethernet – For hospital network (length 10 m) Ethernet – For WiFi extension (length 10 m) Power Supply (length 4m) PE (length 8m) 2x Multifunctional interfaces (refer IFU for more information)
Network	IEEE 802.3ab 1000BASE-T (internal) IEEE 802.11ac WiFi-5 1300 Mbps (HMI) IEEE 802.11n WiFi-4 450 Mbps (PACS)
Input Voltage	230 V +/- 10%, 50-60 Hz, 2 kVA (4 kVA Peak) 120 V +/- 10%, 50-60 Hz, 2 kVA (4 kVA Peak) Line Impedance ≤ 2 Ω @ 230 V / ≤ 0.43 Ω @ 120 V
Uninterruptable Power Supply	✓ (optional, external 6000 W power capacity, 208/220/230/240 VAC output, 40 – 70 Hz, 16x 12V/7Ah batteries
Built-in Transformer	✓ (optional, but max X-ray power will be limited to 1.56 kW on 120 V/13 A main supply.)

Physical Specifications	
Total Weight	517 kg (1139lbs) fully equipped with all options, excl. disconnected wireless controls
Gantry Weight w/o Carrying Structure	203 kg (447.54 lbs)
Transformer Weight	21.5 kg (47.4 lbs)
Surface Load (Under Wheels)	< 245 N/cm2 (51169.3 lbf/sqft) in parking position
Wheels (Diameter, Width, Hardness)	4 x 125 mm, 40 mm, 75°A
Minimum Space Requirement (Footprint)	min. 1.59 m² (17.11 sqft) 2.6 m² (22.99 sqft) in parking position with margin required due to moving components
Floor Pressure (weight / space required in parking position with additional space required for moving components)	193.46 kg/m² (39.62 lbs/sqft)
Dimensions (Width x Length x Height) [cm]	182 x 87 x 189

Environmental Conditions	
Temperature (Operation)	15°C – 32°C
Temperature (Storage)	0°C - 40°C
Temperature (Transport)	-10°C - 50°C
Relative Humidity (Operation)	30% – 60% (no condensation)
Relative Humidity (Storage)	10% – 75% (no condensation)
Relative Humidity (Transport)	5% – 75% (no condensation)
Air Pressure (Operation) [mbar]	800 – 1100
Air Pressure (Storage) [mbar]	750 – 1100
Air Pressure (Transport) [mbar]	750 – 1100
Peak Heat Output	250 W Standby 1600 W during CBCT acquisition

Accessories	
RingPad (Human Machine Interface, HMI) - wireless control, handheld with joysticks to control motion of system and buttons to start/stop pre-planned motion and irradiation, with tablet Microsoft Surface Pro 7 touch screen	✓ Microsoft Surface Pro 7 Display: 12,3" at 2736 x 1824 px (267 PPI) 10-Punkt-Multi-Touch Intel® Core™ i5-1035G4 Quad-Core Processor 16 GB LPDDR4x RAM 256 GB SSD
Interfaces on RingPad (HMI)	1 x USB-C (+ additional Hub to connect monitor and input devices)
Wired Footswitch - with functions to acquire planar or fluoroscopic images	✓ (optional)
Wireless Footswitch	✓ (optional)
External Workstation - desktop PC with monitor, keyboard and mouse, storage, CPU and GPU graphics card performance sufficient for image acquisition and visualization tasks. PC can be used in a radiation protected area as a viewing console for images.	✓ (optional)
CC2 Control Console - wired control console with buttons to start / stop motion and exposures, including a wired safe emergency stop button - to be used in radiation protection areas in connection with the desktop PC	✓ (optional)
Cylinder Phantom for Flexmap Calibration - to be used by service engineers or physicists in system calibration or QA	✓ (optional)
Diagnostic Monitor - large flat screen with high contrast and resolution to display acquired images in a larger format, for image review	✓ (optional)
DICOM conformance	✓
PACS interfaces	✓ wired (optional wireless)

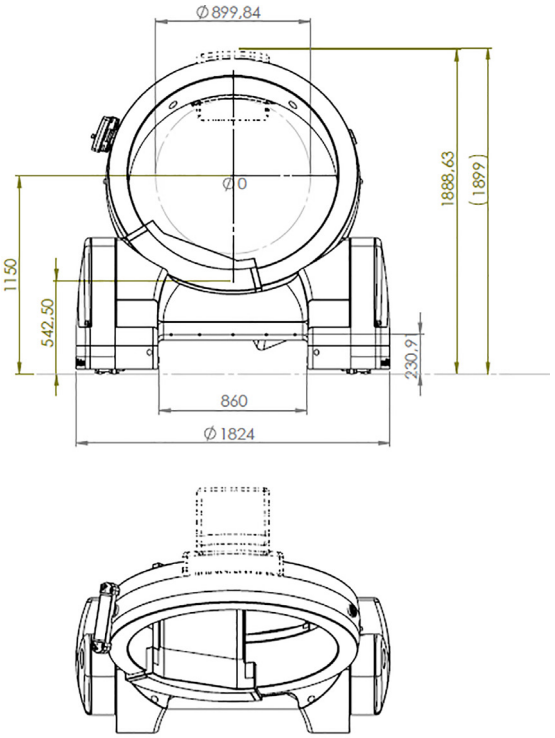
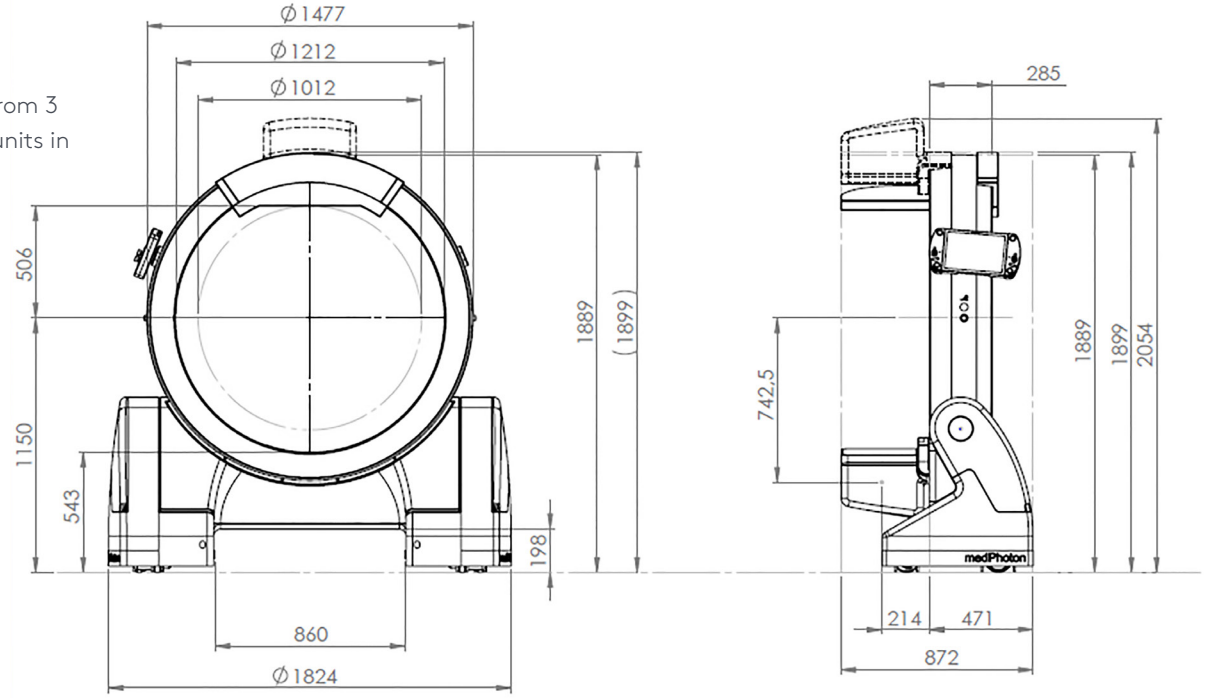
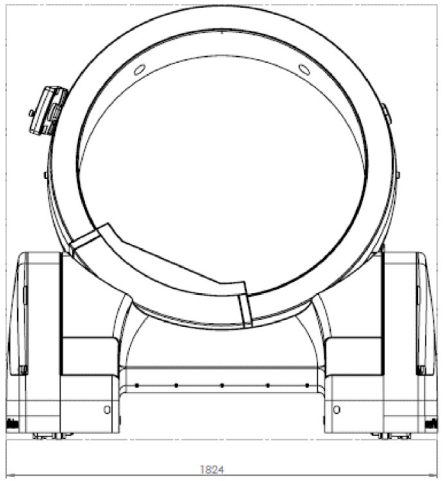


Figure 1.
IRm in parking position, shown from 3 perspectives. All units in mm.





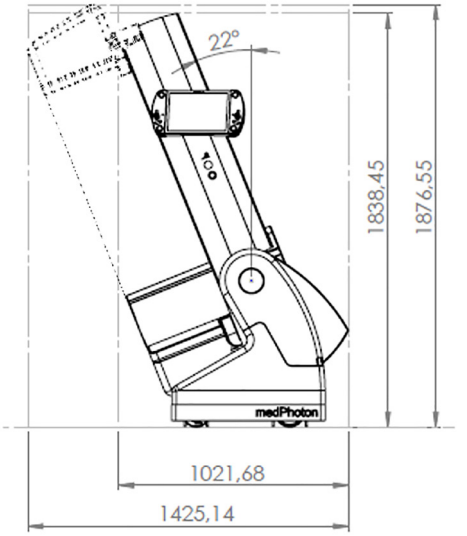


Figure 2
IRm with 0° gantry tilt. All units in mm.

For almost five decades, Elekta has been a leader in precision radiation medicine.

Our more than 4,000 employees worldwide are committed to ensuring everyone in the world with cancer has access to—and benefits from—more precise, personalized radiotherapy treatments.

Elekta is the authorized Exclusive Distributor of medPhoton in Brachytherapy. ImagingRing is a product manufactured by medPhoton GmbH.

ImagingRing-m may not yet be available in all markets.

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