

# Biograph™ TruePoint PET•CT

System Specifications

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**SIEMENS**

# Installation for Biograph 6

Featuring a compact footprint and low system weight for its capability, the Biograph 6 slice configuration is designed to meet stringent siting requirements and make best use of vital floor space. The operating efficiency of the Biograph is further enhanced by its low power requirements. A quiet system environment provides maximum patient comfort.

## Scanner Room

The scanner room accommodates the Biograph gantry and Patient Handling System.

Minimum interior size	5.03 m (16.5 ft) x 7.9 m (26 ft)
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## Operator's Room

The operator's room houses the syngo Acquisition Workplace and syngo MI Workplace, PET acquisition system (ACS III), PET Reconstruction System (PRS) control box, Image Reconstruction System (IRS), monitors, and other computer equipment as necessary.

Typical room size	3.2 m (10.5 ft) x 5.03 m (16.5 ft)
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## Equipment Room

The equipment room houses the Power Distribution Cabinet (PDC), and any auxiliary equipment for power and cooling (for example, facility water supply, electrical panels, etc.)

Minimum room size	1.83 m x 1.83 m (6 ft x 6 ft)
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## System Weight

The Biograph system weighs approximately 3212 kg (7079 lb).

## Floor Requirements

The Biograph is a precision aligned system that requires a rigid, level concrete floor for proper support. See the *Biograph TruePoint PET•CT Planning Guide* for further details.

## Climate and Cooling Requirements

Scanner room climate control must be provided 24 hours per day, 7 days per week. Heat dissipation into scan room for the Biograph 6 is 8.01 kW (27,331 BTU/hr).

The scanner room temperature should be maintained between 20° to 24° C (68° to 75° F) and should not vary more than  $\pm 1.5^\circ$  C (2.7° F) per hour. The air pressure needs to be maintained between 700 and 1060 mbar.

The constant temperature is maintained by air cooling. A two-stage temperature monitor must be installed to shut off the system in the event of excessive heat buildup in the utility room and scanner room.

## Power Supply and Consumption

PET	200 – 240 or 400 VAC single phase, 3.8 kVA 50, 60 Hz
CT	380 – 480 V, 3 phase, 50, 60 Hz, 70 kVA

An emergency power-off switch must be installed to disconnect the power in the event of an emergency.

# Installation for Biograph 40 / Biograph 64

Featuring a compact footprint and low system weight, the Biograph 40 and Biograph 64 slice are designed to meet stringent siting requirements and make best use of vital floor space. The operating efficiency of the Biograph is further enhanced by its low power requirements. A quiet system environment provides maximum patient comfort.

## Scanner Room

The scanner room accommodates the Biograph gantry and Patient Handling System.

Minimum interior size	4.6 m (15 ft) x 7.3 m (24 ft)
Recommended interior size	5.0 m (16.5 ft) x 7.9 m (26 ft)

## Operator's Room

The operator's room houses the *syngo* Acquisition Workplace, *syngo* MI Workplace, PET acquisition system (ACS III), PET Reconstruction System (PRS) control box, monitors, and other computer equipment as necessary.

Typical room size	3.2 m (10.5 ft) x 4 m (13 ft)
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## Equipment Room

The equipment room houses the Power Distribution Cabinet (PDC), Image Reconstruction System (IRS), CT Cooling System Cabinet and any auxiliary equipment for power and cooling (for example, facility water supply, electrical panels, etc.)

Minimum room size	3.2 m (10.5 ft) by 2.1 m (7 ft)
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## Gantry Weight

The Biograph gantry weighs approximately 3973 kg (8750 lb).

## Floor Requirements

The Biograph is a precision aligned system that requires a rigid, level concrete floor for proper support. See the *Biograph TruePoint PET•CT Planning Guide* for further details.

## Climate and Cooling Requirements

Scanner room climate control must be provided 24 hours per day, 7 days per week. Heat dissipation into scan room for the Biograph 40/64 is 4.4 kW (16650 BTU/hr).

The scanner room temperature should be maintained between 20° to 24° C (68° to 75° F) and should not vary more than  $\pm 1.5^\circ$  C (2.7° F) per hour. The air pressure needs to be maintained between 750 and 1060 mbar. The relative humidity is 15% to 75% without condensation, and the recommended range is 30% to 70%.

The constant temperature is maintained by both integrated and external chiller systems. Either air/water chillers or water/water chillers are available. A two-stage temperature monitor must be installed to shut off the system in the event of excessive heat buildup in the utility room and scanner room. The scanner room must be equipped with four shut-off valves close to the scanner to be able to interrupt the water flow between the water chillers and the scanner.

## Power Supply and Consumption

PET	200 – 240 or 400 VAC single phase, 3.8 kVA 50, 60 Hz
CT	380 – 480 V, 3 phase, 50, 60 Hz, 111 kVA with air chiller, 104 kVA with water to water chiller

An emergency power-off switch must be installed to disconnect the power in the event of an emergency.

# System Specifications

## PET System Specifications

Patented PET Detector Assembly	Biograph 6, 40, 64
Detector material	Lutetium Oxyorthosilicate (LSO)
Crystal dimensions	4.0 x 4.0 x 20 mm
Crystals per detector block	169
Number of detector blocks	144 (192 with TrueV option)
Photomultiplier tubes (PMTs)	4 per block
Detector ring diameter	842 mm
Detectors per ring	624
Number of detector rings	39 (52 with TrueV option)
Total number of detectors	24336 (32448 with TrueV option)
Transaxial FOV	605 mm
Axial FOV	162 mm (216 with TrueV option)
Number of image planes	81 (109 with TrueV option)
Plane spacing	2 mm

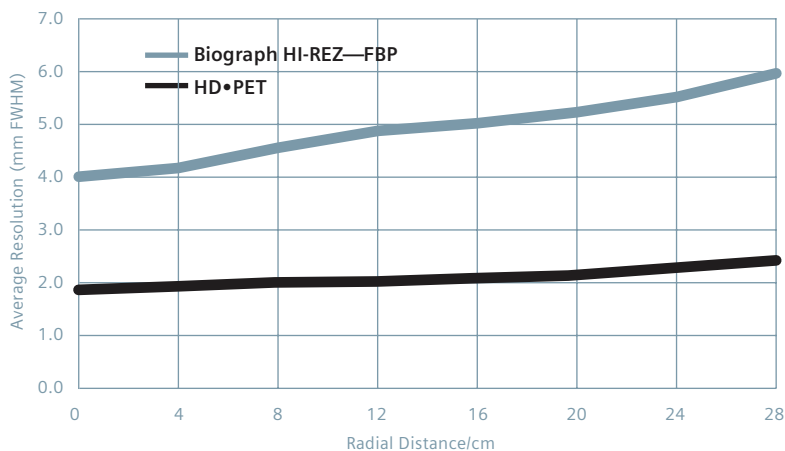
PET Data Acquisition/Processing	Biograph 6, 40, 64
Coincidence time resolution	500 psec
Coincidence window	4.5 nsec
Acquisition mode	Static, multibed (dynamic, gated optional)
Scatter fraction	<38% @435 keV LLD
Scatter correction	TrueC Single scatter simulation

PET Performance <sup>1</sup>	Biograph 6, 40, 64
Count rate peak NECR	96 kcps@35 kBq/cc (165 kcps@32 kBq/cc with TrueV option)
Sensitivity	4.2 cps/kBq @ 435 keV (7.6 with TrueV option)
Energy resolution	<14%
Uniformity	≤5% variation

PET Resolution Specifications <sup>1</sup>	Biograph 6, 40, 64	HI-REZ Option
Transaxial resolution (NEMA 2001)		
FWHM @ 1 cm	5.9 mm	4.2 mm
FWHM @ 10 cm	6.0 mm	4.8 mm
Axial resolution (NEMA 2001)		
FWHM @ 1 cm	5.5 mm	4.7 mm
FWHM @ 10 cm	6.0 mm	5.7 mm

HD•PET Option <sup>2</sup>	
Average resolution	
FWHM @ 1 cm	2.0 mm
FWHM @ 10 cm	2.0 mm
FWHM @ 20 cm	2.1 mm
FWHM @ 28 cm	2.4 mm

HD•PET Option — Resolution with TrueX<sup>2</sup>



1) Performance specifications represent average values measured following the methodology of NEMA standard publication NU 2.2001, Performance Measurements of Positron Emission Tomographs, except where noted. Sensitivity and uniformity were measured with <sup>68</sup>Ge sources.

2) Measurements were taken with a line source suspended in air at radial positions from the center to 28 centimeters in 4 centimeter steps. The data were reconstructed with a standard filtered back-projection algorithm using FORE rebinning and with the TrueX algorithm using six iterations and 14 subsets.

Patient Handling	Biograph 6	Biograph 40	Biograph 64
Width	42 cm (16.5 in)	42 cm (16.5 in)	42 cm (16.5 in)
Length	379 cm (149 in)	379 cm (149 in)	379 cm (149 in)
Weight	726 kg (1600 lb)	726 kg (1600 lb)	726 kg (1600 lb)
Maximum patient weight	204 kg (450 lb)	204 kg (450 lb)	204 kg (450 lb)
PET•CT horizontal co-scan range	190 cm (74.8 in)/ 185 cm (72.8 in) with TrueV	190 cm (74.8 in)/ 185 cm (72.8 in) with TrueV	190 cm (74.8 in)/ 185 cm (72.8 in) with TrueV
Horizontal bed travel	264 cm (104 in)	264 cm (104 in)	264 cm (104 in)
Vertical bed travel	53 – 101 cm (21 – 40 in)	53 – 101 cm (20 – 40 in)	53 – 101 cm (20 – 40 in)

Gantry	Biograph 6	Biograph 40	Biograph 64
Height	202 cm (79.5 in)	202 cm (79.5 in)	202 cm (79.5 in)
Width	239 cm (94 in)	239 cm (94 in)	239 cm (94 in)
Depth	156 cm (61.5 in)	156 cm (61.5 in)	156 cm (61.5 in)
Patient port diameter (continuous)/aperture	70 cm (27.5 in)	70 cm (27.5 in)	70 cm (27.5 in)
Gantry weight	3212 kg (7079 lb)	3973 kg (8750 lb)	3973 kg (8750 lb)

## CT Volume Acquisition System

CT Data Acquisition System	Biograph 6	Biograph 40	Biograph 64
Max. No. of CT slices	6	40	64
Number of detector rows	16	40	40
Elements	11776	26880	26880
Channels per slice	1472	1344	1344
Number of projections	up to 1875 (1/360°)	4640 (1/360°)	4640 (1/360°)
CT Transverse Scan Field	50 cm, 70 cm Extended FOV	50 cm, 70 cm Extended FOV	50 cm, 70 cm Extended FOV
CT Rotation times	0.6, 0.8, 1.0, 1.5s	0.37, 0.5, 1.0 s	(0.33 with optional CT high speed rotation package), 0.37, 0.5, 1.0 s
CT Temporal resolution	down to 150 ms	down to 0.92 ms	down to 0.83 ms

Tube Assembly	Biograph 6	Biograph 40	Biograph 64
Maximum generator power	50 kW	70 kW	80 kW
Tube	DURA 422MV	Straton	Straton
Tube current	20 – 345 mA	28 – 580 mA	28 – 665 mA
Tube voltages	80, 110, 130 kV	80, 100, 120, 140 kV	80, 100, 120, 140 kV
Tube anode heat storage capacity	5.0 MHU	0 MHU (30 MHU equivalent)	0 MHU (30 MHU equivalent)
Focal spot size according to IEC 60 336	0.8 x 0.5 mm/7° and 0.8 x 0.7 mm/7°	0.6 x 0.7 mm/7° and 0.8 x 1.1 mm/7° and 0.7 x 0.7 mm/7°	0.6 x 0.7 mm/7° and 0.8 x 1.1 mm/7° and 0.7 x 0.7 mm/7°

CARE Filter	Biograph 6	Biograph 40	Biograph 64
Al equivalent	6.3 mm	6.8 mm	6.8 mm
Beam limiting device	0.5 mm	0.5 mm Al, 0.6 mm Ti equivalent to 5.5 mm Al	0.5 mm Al, 0.6 mm Ti equivalent to 5.5 mm Al

SureView Multislice Spiral Image Reconstruction	Biograph 6	Biograph 40	Biograph 64
Reconstruction time	4 slices/second	20 slices/second	20 slices/second
Reconstructed slice widths	1.0, 1.25, 2, 2.5, 3, 4, 5, 6, 8, 10 mm (0.63, 0.75 mm with optional high resolution CT package)	0.6, 0.75, 1.0, 1.5, 2, 3, 4, 5, 6, 7, 8, 10 mm	(0.4, 0.5 with z-UHR option), 0.6, 0.75, 1.0, 1.5, 2, 3, 4, 5, 6, 7, 8, 10 mm
Slice increment	0.1 – 10 mm	0.1 – 10 mm	0.1 – 10 mm
Pitch Factor (Volume Pitch)	0.42 – 1.8 (1-10.8)	0.45 – 2.0	0.45 – 2.0
Spiral scan time	100 s	100 s	100 s

## CT Examination Functions

CT Technology and Data – Topogram	Biograph 6	Biograph 40	Biograph 64
Length	128 – 2000 mm	128 – 2000 mm	128 – 2000 mm
Views	a.p., p.a., lateral	a.p., p.a., lateral	a.p., p.a., lateral

CT Technology and Data – Sequence	Biograph 6	Biograph 40	Biograph 64
Reconstructed slice widths	1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 9.0, 10.0, 12.0, 18.0 mm	0.6, 1, 1.2, 1.8, 2.4, 3, 3.6, 4.8, 5, 6, (7.2 with optional syngo Neuro CT Perfusion) 9.6, 10, 12, 14.4 mm	0.6, 1, 1.2, 1.8, 2.4, 3, 3.6, 4.8, 5, 6, 7.2, 9.6, 10, 12, 14.4 mm
Scan times full scan (360°)	0.6, 0.8, 1.0, 1.5 s	0.37, 0.5, 1 s	(0.33 with optional CT high speed rotation package), 0.37, 0.5, 1 s
Partial scan times (240°)	0.4, 0.53 s	0.25, 0.33, 0.67 s	(0.22 with optional CT high speed rotation package), 0.25, 0.33, 0.67 s
Number of uninterrupted scans per range	100	100	100
Number of ranges in autorange	19	19	19
Scan cycle time	2 - 60 s ( $\pm 10\%$ ) @ 0.8 s scan time	0.75 - 60 s ( $\pm 10\%$ ) @ 0.5 – 1.5 s scan time	0.75 - 60 s ( $\pm 10\%$ ) @ 0.5 – 1.5 s scan time

Image Quality	Biograph 6	Biograph 40	Biograph 64
Low contrast detectability <sup>3</sup>	Technique: 20 cm Ø Catphan, 120 kV, 10 mm	Technique: 20 cm Ø Catphan, 120 kV, 10 mm	Technique: 20 cm Ø Catphan, 120 kV, 10 mm
Spiral	5 mm / 3 HU / 14.2 mGy+ at 90 mAs	5 mm / 3 HU / 19 mGy+ at 180 mAs	5 mm / 3 HU / 19 mGy+ at 180 mAs
High contrast resolution	Technique: 60 mA, 130 kV, 0.8 s, 1 mm	Technique: 160 mA, 120 kV, 1.0 s, 0.6 mm	Technique: 160 mA, 120 kV, 1.0 s, 0.6 mm
	0% MTF $\pm 10\%$ , 17.5 lp/cm 0.29 mm	0% MTF $\pm 10\%$ , 30 lp/cm 0.17 mm	0% MTF $\pm 10\%$ , 30 lp/cm 0.17 mm
	2% MTF $\pm 10\%$ , 15.1 lp/cm 0.33 mm	2% MTF $\pm 10\%$ , 24 lp/cm 0.21 mm	2% MTF $\pm 10\%$ , 24 lp/cm 0.21 mm
Cross-field uniformity in a 20 cm water phantom positioned near center of rotation	typical $\pm 2$ HU max $\pm 4$ HU	typical $\pm 2$ HU max $\pm 4$ HU	typical $\pm 2$ HU max $\pm 4$ HU
Isotropic resolution performance	0.4 mm x 0.4 mm x 0.4 mm	0.33 mm x 0.33 mm x 0.33 mm	0.33 mm x 0.33 mm x 0.33 mm (0.24 mm x 0.24 mm x 0.24 mm with z-UHR option)

## CT Dose Index, CTDI100 Values; PMMA Phantom Ø

	Biograph 6		Biograph 40				Biograph 64			
	110 kV	130 kV	80 kV	100 kV	120 kV	140 kV	80 kV	100 kV	120 kV	140 kV
16 cm A	14.4	21.7	4.2	8.9	13.2	20.2	4.2	8.9	13.2	20.2
16 cm B	15.7	23.3	4.5	9.2	13.5	21.0	4.5	9.2	13.5	21.0
32 cm A	4.2	6.7	1.2	2.7	4.3	7.0	1.2	2.7	4.3	7.0
32 cm B	8.4	12.8	2.3	5.0	7.8	12.0	2.3	5.0	7.8	12.0

CTDI100 Values; PMMA Phantom Ø

A: at center, B: 1 cm below surface

Technique: 160 Ma, @120 Kv, 1 sec. rotation, 0.6 mm slice thickness

Biograph 40 is field upgradeable to Biograph 64.

3) Low contrast detectability is the ability to see a small object (mm) in a particular phantom (Ø); with a certain contrast difference (HU); at a given value (mAs); with a given dose (mGy).

The Biograph family conforms to the Medical Device Directive Quality System and the Essential Requirements of the Medical Device Directive. The product is designed and tested for safety in accordance with IEC 60601-1 and for Electro-Magnetic Compatibility (EMC) in accordance with the European Union's EMC Directive, 89/336/EEC. Labeling for this requirement as well as ISO 13485 appears at appropriate locations on the product and in its literature. The software is DICOM compliant. The scanner is CSA compliant and ISO 13485 certified, meeting internationally recognized quality standards for good manufacturing practices.

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Product performance depends on the choice of system configuration.

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