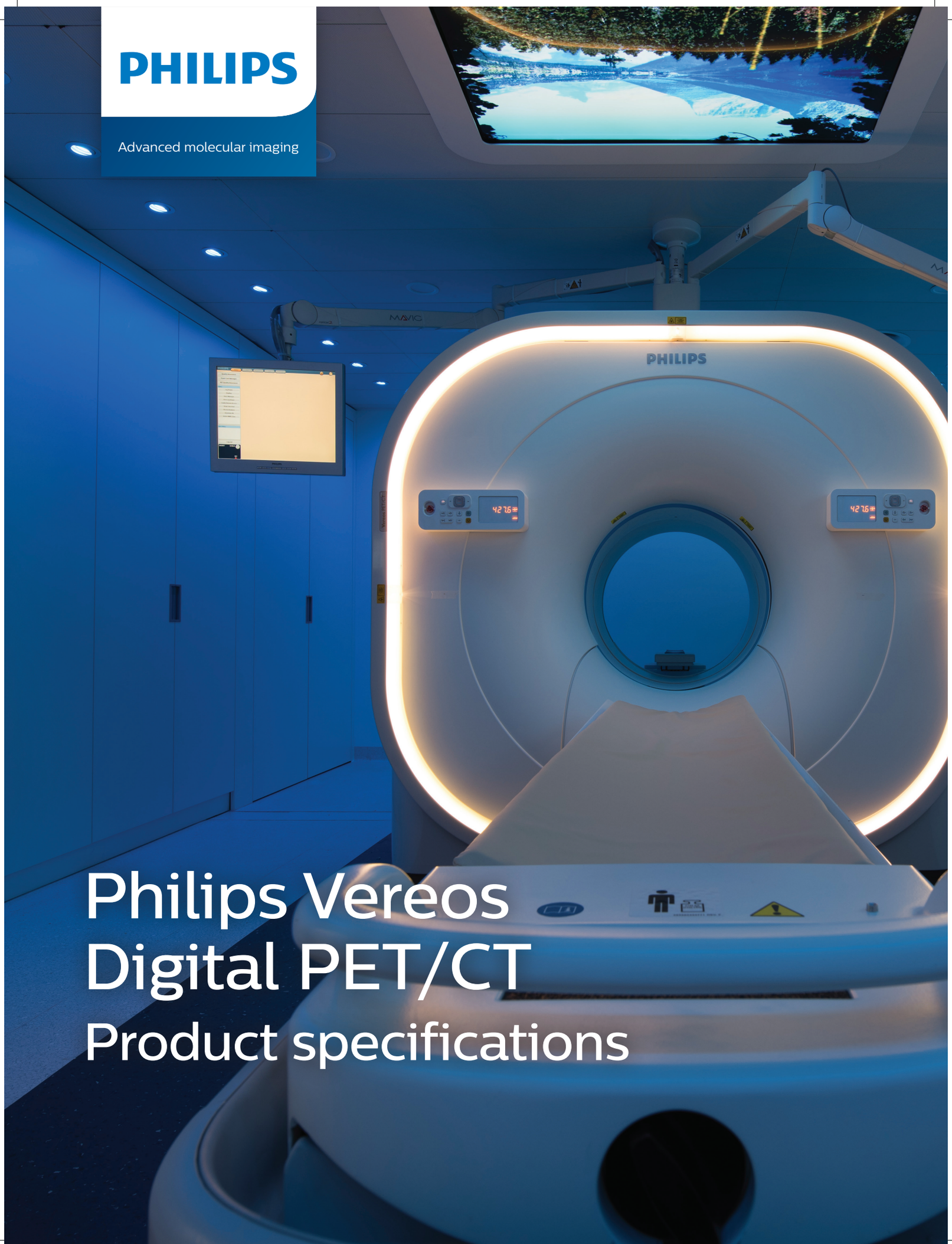
PHILIPS

Advanced molecular imaging



Philips Vereos Digital PET/CT

Product specifications

Contents

1. Introduction

Philips Vereos Digital PET/CT is the world's first and only fully digital, clinically proven PET/CT solution supported by rigorous clinical evidence measured in years, not months. With more than four years of investigational studies and over 100 published clinical studies, Vereos exemplifies an established total solution to reveal more to help you improve patient care and manage costs. With Vereos Digital PET/CT, **proven accuracy inspires confidence.**

Powered by Philips proprietary Digital Photon Counting (DPC)
With DPC and digital technology across the imaging chain, Vereos Digital PET/CT provides breakthrough solutions including:

- **Clinically proven**
  - Improved detectability and characterization of small lesions[1]
  - IntelliSpace Portal provides an award-winning advanced visualization, review, and analysis platform
- **A positive experience that matters**
  - Fast scans, low PET dose
  - Ambient Experience provides a positive environment for patients and caregivers
- **Ready for the future**
  - Highest count rate in the industry for enhanced diagnostic confidence with emerging applications that use short half-life tracers
  - Illumeo with adaptive intelligence offers a connected solution for advanced visualization to remove barriers to efficiency

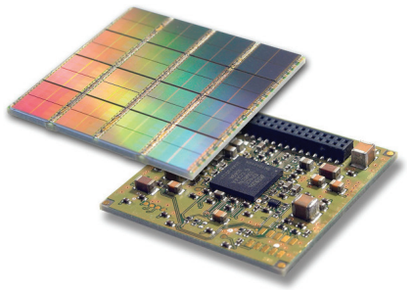
Key specifications

Detector design	Digital Photon Counting (DPC)
Number of PET detectors	23,040
PET timing resolution	310 ps FWHM
TOF localization accuracy	4.6 cm
PET effective sensitivity per cm	1,427 cps/MBq/cm
PET quantitative accuracy	+/- 5%

2. PET performance specifications

2.1 PET detector design

Detector design	Digital Photon Counting
Number of detectors	23,040
Number of crystals	23,040
Crystal size	4 x 4 x 19 mm
Crystal material	LYSO
Ring diameter	76.4 cm
Transaxial FOV	Up to 676 mm
Axial FOV	164 mm
Coincidence window size[1]	4.5 ns
Lower level discriminator	450 keV



2.2 PET performance*

Transverse spatial resolution @ 1 cm	4.1 mm FWHM
Transverse spatial resolution @ 10 cm	4.5 mm FWHM
Axial spatial resolution @ 1 cm	4.1 mm FWHM
Axial spatial resolution @ 10 cm	4.3 mm FWHM
Timing resolution	310 ps
Time-of-Flight localization accuracy	4.6 cm
Effective system sensitivity[2]	23.4 kcps/MBq at center 23.4 kcps/MBq at 10 cm
Effective peak NECR[2]	687 kcps @ 50 kBq/mL
Effective clinical NECR[2,3]	222 kcps @ 5.3 kBq/mL
Peak trues	>800 kcps
Scatter fraction	32%
System energy resolution	11%

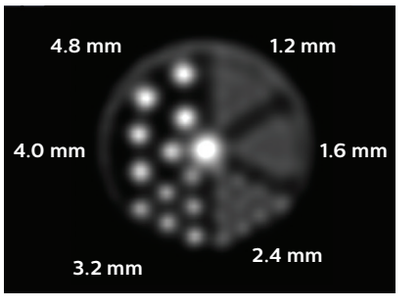


Image of high resolution micro Jaszczak phantom. DPC technology improves volumetric resolution compared to analog detectors due to 1:1 coupling.

[1] With 576 mm field of view.

[2] Effective gain defined as a ratio between patient size (20 cm diameter used in these specifications) and Time-of-Flight localization accuracy.

[3] NEC at a 10 mCi clinical imaging dose for FDG whole body studies in an average patient size (73 kg/160 lb).

*Preliminary PET performance specifications represent typical values measured following the methodology of NEMA standard publication NU 2 2012 unless otherwise noted. All performance measures are subject to change.

3. CT performance specifications

3.1 Spatial resolution

Spatial resolution	Cut-off (+/- 2 lp/cm)
Ultra-high mode (lp/cm)	24
High mode (lp/cm)	16
Standard mode (lp/cm)	13

3.2 Low-contrast resolution

Feature	Specification
Low-contrast resolution*	4 mm @ 0.3% contrast @ 25 mGy without iDose^4; 4 mm @ 0.3% contrast @ 14.1 mGy with iDose^4

* 20 cm Catphan phantom; 10 mm slice thickness

3.3 Other

Feature	Specification
Absorption range	-1,024 to +3,071 HU
Noise	0.27%

3.4 CT detector

Feature	Specification
Slices	64 or 128
Coverage	40 mm
Material	Solid-state GOS with 43,008 elements
Dynamic range	1,000,000:1
Slip ring	Optical – 5.3 Gbps transfer rate
Data sampling rate	Up to 4,640 views/ revolution/element
Slice thickness (helical mode)	0.67 mm – 5 mm
Slice thickness (axial mode)	0.625 mm – 12.5 mm
Scan angles	240°, 360°, 420°
Scan field of view	250 mm, 500 mm

3.5 iDose^4 Premium Package

iDose^4 Premium Package includes two leading technologies that can improve image quality – iDose^4 and metal artifact reduction for large orthopedic implants (O-MAR). iDose^4 improves image quality through artifact prevention and increased spatial resolution at low dose. O-MAR reduces artifacts caused by large orthopedic implants. Together they produce high image quality with reduced artifacts.

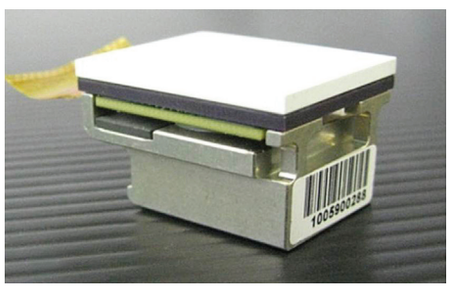
iDose^4 reconstruction speed	Up to 18 IPS
Standard reconstruction speed	Up to 25 IPS

3.6 Generator

Feature	Specification
Effective power with iDose^4	105 kW
Power rating	60 kW or 80 kW
kVp setting	80, 100, 120, 140
mA range (step size)	20–665 (1 mA steps)

3.7 X-ray tube

Feature	Specification
Focal spot sizes, quoted to IEC 336/93 standard	Small: 0.5 mm x 1.0 mm Large: 1.0 mm x 1.0 mm
Anode effective heat capacity	25 MHU
Anode heat capacity	8.0 MHU
Maximum anode cooling rate time	1,608 kHU/min
Anode diameter	200 mm
Anode rotation speed	105 Hz (6,300 rpm)
Target angle	7°
Focus-isocenter distance	570 mm
Focus-detector distance	1040 mm
Maximum helical exposure time	100 s



Philips continues to lead in CT detector design with the NanoPanel Elite – our latest tile-detector technology – that has been re-engineered for low-noise, high-fidelity imaging.

4. DoseWise

Philips DoseWise is a holistic approach to dose management that is active in every level of product design. It encompasses a set of techniques, programs and practices based on the ALARA (As Low As Reasonably Achievable) principle and supports outstanding image quality at low dose.

4.1 DoseRight Index

DoseRight Index (DRI) is a single number used to specify the image quality required for the diagnostic task at hand. DRI includes organ-specific DRI for the liver and the head/neck to provide appropriate dose and image quality within a single acquisition. 11 weight-based protocols can be generated for ExamCards, including 1 infant, 7 child and 3 adult reference sizes.

4.2 CT Dose Check

Supports an operator notification in each ExamCard that will be shown if an acquisition is planned that exceeds a specified $CTDI_{vol}$ or DLP. In addition, an alert is available such that, if an acquisition is planned and the total exam will exceed a specified $CTDI_{vol}$ or DLP, the operator will be required to enter his or her name and (if configured) a password to proceed, or the operator can adjust the scan parameters. Compliant with NEMA XR-25 and XR-29.

4.3 DICOM structured reporting/ IHE REM profile

DICOM radiation dose structured report that can be transferred to external systems such as HIS/RIS, PACS, or dose registries.

4.4 DoseRight automatic current selection

Personalizes dose for each patient by automatically suggesting tube current settings according to the estimated patient diameter in the scan region.

4.5 DoseRight angular dose modulation

Angular dose modulation varies the tube current during helical scans according to changes in patient shape (eccentricity) and tissue attenuation as the tube rotates. For each rotation, projections are processed to determine the maximum and minimum patient diameter. The tube current for the next rotation is then modulated between these limits.

4.6 DoseRight Z-DOM (longitudinal dose modulation)

Longitudinal dose modulation (Z-DOM) aids in adapting dose to an individual patient's size and shape. In particular, Z-DOM adjusts the tube current-time product (mAs) in the craniocaudal or caudocranial (z-axis) direction based on the Surview by comparing the actual patient's attenuation at each longitudinal location to a reference.

4.7 3D-DOM

3D-DOM combines angular and longitudinal information to modulate dose in three dimensions.

4.8 Dedicated pediatric protocols

In the iPatient approach, size-specific ExamCards can be easily generated. ExamCards can be based on one of eight (1 infant, 7 child) midpoint reference diameters that are directly related to weight based intervals. iPatient includes reference pediatric protocols for a number of clinical indications.

4.9 Locking protocols

Unauthorized protocol modifications may be prevented through password-protected access.

4.10 Dose display and reports

Philips CT scanners include intuitive reporting and recording of estimated dose indices and dose efficiency. Dose estimates are displayed on the operator's console for all scan protocols prior to and throughout the examination. Volume computed tomography dose index ($CTDI_{vol}$) and dose-length product (DLP) are automatically updated as the operator plans the scan. Also, a dose report may be included as a DICOM dose structured report and/or DICOM secondary capture with the reconstructed data set.

4.11 Dose performance data

$CTDI_{vol}$	Measurement
Head	12.9 mGy/100 mAs
Body	6.6 mGy/100 mAs

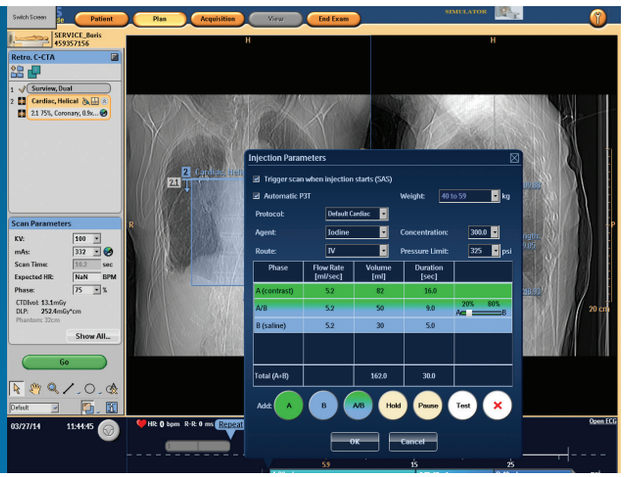
Measured on head and body CTDI phantoms (IEC 60601-2-44 ed.3) at 120 kVp.

5. Clinical enhancements

Optional

5.1 SyncRight

The Philips CT SyncRight option enables easy and efficient communication between the CT system and the injector in order to facilitate delivering appropriate contrast dose and consistent image quality.



5.2 Clinical applications

- Comprehensive PET/CT review tools
- Multi-modality Fusion Viewer
- Automated registration with CT, MR, and SPECT
- Automated 3D contouring
- Exam Cards
- 1 mm and 2 mm voxel reconstruction
- High definition PSF reconstruction
- 4D Time-of-Flight pulmonary gating
- Cardiac gating
- Cardiac perfusion and viability analysis
- iDose[4]
- O-MAR
- Quantitative brain analysis
- Advanced brain perfusion
- CT Reporting
- Functional CT
- Rate responsive CV toolkit
- Calcium scoring
- Step & Shoot Complete

Optional

5.3 IntelliSpace Portal

IntelliSpace Portal is a highly scalable multi-modality server client based processing and review environment with a comprehensive suite of applications that are accessible virtually anywhere, anytime. Use the Web Collaborator* tool to share images and findings with colleagues and referring physicians in real time. Now with access to molecular imaging applications you can process, analyze and review SPECT, SPECT/CT, PET/CT and PET/MR studies.

* Web Collaborator enables viewing and sharing – not intended for diagnosis.

6. User interface (workflow)

iPatient

Philips iPatient is an advanced platform that puts you in control of enhancing your PET/CT system today, while preparing you for the challenges of tomorrow. While you're working to boost return on investment now, you're also accessing a flexible platform that will support future innovations.

6.1 iPatient key benefits

- Plan the results, not the acquisition
- Up to 24%* faster time to results; up to 66%* fewer clicks
- Facilitates optimal** management of image quality and radiation dose with patient-specific methods
- Easy and efficient communication between the CT system and the injector in order to facilitate delivering appropriate contrast dose and consistent image quality with SyncRight option
- Optimizes collimation, pitch, and rotation time automatically
- Automates routine tasks
- Frees up time so you can focus on the more complex and advanced procedures

6.2 ExamCards

ExamCards are the evolution of the scanning protocol. With ExamCards, the results are planned, not the acquisition; this reduces decision points and clicks, saves time, and is a means to share protocols among colleagues to allow for scan-to-scan consistency. ExamCards can include axials, coronals, sagittals, MPRs, MIPs, and other results, all of which will be automatically reconstructed and can be sent to where they will be read with no additional work required by the operator.

6.3 ScanRuler

An interactive timeline of the study that provides the operator a quick overview of important events such as Surview, acquisition, bolus tracking, AutoVoice, and injection.

* In a study done using multiphasic liver CT exams, the iPatient software platform reduced time-to-results by 24% and clicks per exam by 66%. Impact of workflow tools in reducing total exam and user interaction time – four-phase liver computed tomography exams. Nicholas Ardley, Southern Health; Kevin Buchan, Philips Healthcare; Ekta Dharaiya, Philips Healthcare.

** Optimal refers to the use of strategies and techniques that facilitate the management and control of both image quality and dose.

7. Gantry and patient table

7.1 Gantry

Feature	Specification
Aperture	700 mm
Rotation times	0.42, 0.5, 0.75, 1, 1.5; 0.28, 0.33 seconds for partial angle 240° scans; Effective cardiac rotation time 0.3 seconds
Intercom system	Two-way connection between the gantry and console area
Dimensions and weight, installed gantry with table	Length: 484.9 cm (190.9”); Width: 220.5 cm (86.7”); Height: 206.5 cm (81.3”); Weight: 3,420 kg (7,539 lb)

7.2 Gantry control panels

- Multi-directional control for fast movement
- Fine movement in/out control
- Start button
- Pause button
- Visual countdown
- Zero table location
- Lasers

Audio notification 10 seconds before X-ray On so that operator and staff can exit room before X-ray On.

7.3 Operator’s console control panel

- Table in/out/up/down
- Emergency stop
- X-ray indicator
- Start button
- Pause button

7.4 AutoVoice

A standard set of commands for patient communication before, during, and after scanning. Customized messages can also be created.

7.5 Patient table

Maximum patient weight	195 kg (430 lb)
Patient scan range	190 cm
Horizontal speed	185 mm/s

8. Site planning

8.1 Environmental requirements

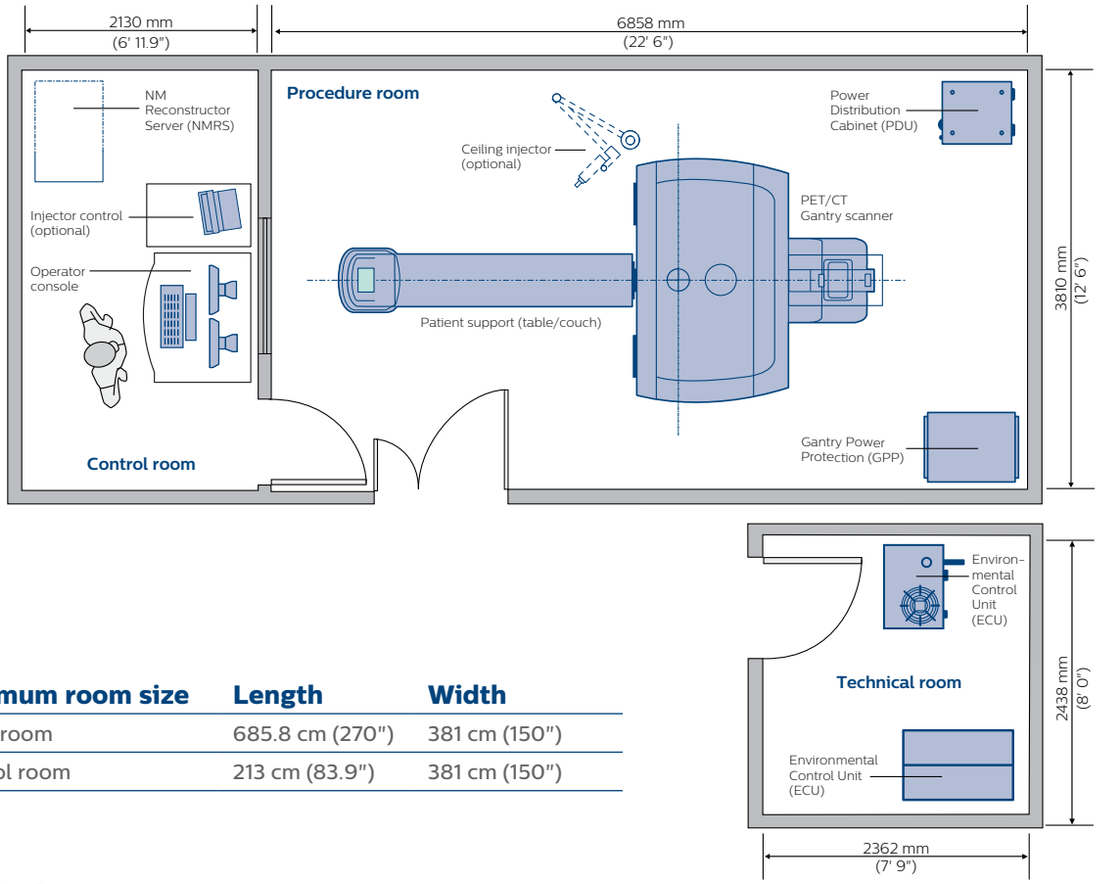
Temperature	
Gantry room	18° to 24°C (64° to 75°F)
Control room	15° to 24°C (59° to 75°F)
Technical room	15° to 22°C (59° to 72°F)
Humidity	
Gantry/Control	35% to 70% non-condensing
Heat dissipation*	
Gantry	16,500 BTU/hr scanning 8,700 BTU/hr standby
NM recon server (NMRS)	1,300 BTU/hr
Control console/CRC host	1,800 BTU/hr
Power distribution unit	1,100 BTU/hr
Environmental control unit	15,000 BTU/hr
Gantry power protection (GPP)	1,300 BTU/hr
Full system UPS (optional)	7,000 BTU/hr (60Hz) 8,900 BTU/hr (50Hz)

*Values provided are preliminary and subject to change

8.2 Power requirements

- Three-phase distribution source
- Room supply voltage 200-500 VAC
- System operating:
  480 VAC 3 PH +/- 10%
  230 VAC 1 PH
- 50/60 Hz/, nominal

8.3 Minimum room layout



Minimum room size	Length	Width
Exam room	685.8 cm (270")	381 cm (150")
Control room	213 cm (83.9")	381 cm (150")

Technical room

A technical room is required to house the Environmental Control Unit (ECU). Requires plumbing for condensation removal via an in-floor drain. Thermal control equipment shall be within 60 cable feet of gantry and reside on same floor. Thermal control lines are 82' maximum. Usable length approximately 60' from gantry to thermal control. Minimum area may be configured in a minimum compact area of 236.2 cm (7'9") x 243.8 cm (8'0"). Remote technical room location limited by cable and hose routing lengths.

Notes

NMRS cabinet and GPP may be remotely located within 1,828 cm (60 cable feet) of the workstation assemblies and the gantry. Detailed site planning requirements are documented in the Planning Reference Data (PRD) and Standard Reference Drawings (SRD) are available through the Philips local Site Planning offices.

This Philips product is intended to be installed, used, and operated only in accordance with the safety procedures and operating instructions given in this document for the purposes for which it was designed. The purposes for which the product is intended are given within this document. However, nothing stated in this document reduces users' responsibilities for sound clinical judgment and best clinical procedure.

The Philips Vereos PET/CT system is a diagnostic imaging device that combines Positron Emission Tomography (PET) and X-Ray Computed Tomography (CT) systems. The CT subsystem images anatomical cross-sections by computer reconstruction of X-Ray transmission data. The PET subsystem images the distribution of PET anatomy-specific radiopharmaceuticals in the patient. The PET/CT system is used for the purposes of detecting, localizing, diagnosing, staging, re-staging, and follow-up for monitoring therapy response of various diseases in oncology, cardiology, and neurology.

The system is intended to image the whole body, heart, brain, lung, gastrointestinal, bone, lymphatic, and other major organs for a wide range of patient types, sizes, and extent of diseases. Both subsystems can also be operated as fully functional, independent diagnostic tools, including application of the CT scanner for diagnosis and for use in radiation therapy planning. Installation, use, and operation of this product is subject to the law in the jurisdictions in which the product is used. Users must only use and operate the product in such ways as do not conflict with applicable laws or regulations that have the force of law.

Uses of the product for purposes other than those intended and expressly stated by the manufacturer, as well as incorrect use or operation, may relieve the manufacturer (or his agent) from all or some responsibility for resultant non-compliance, damage, or injury.

The images and descriptions contained herein provide technical specifications and optional features which may not be included with the standard system configuration. Contact your local Philips Representative for complete specific system details.

Some or all of the products, features, and accessories shown or described herein may not be available in your market. Please contact your local Philips Representative for availability.

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