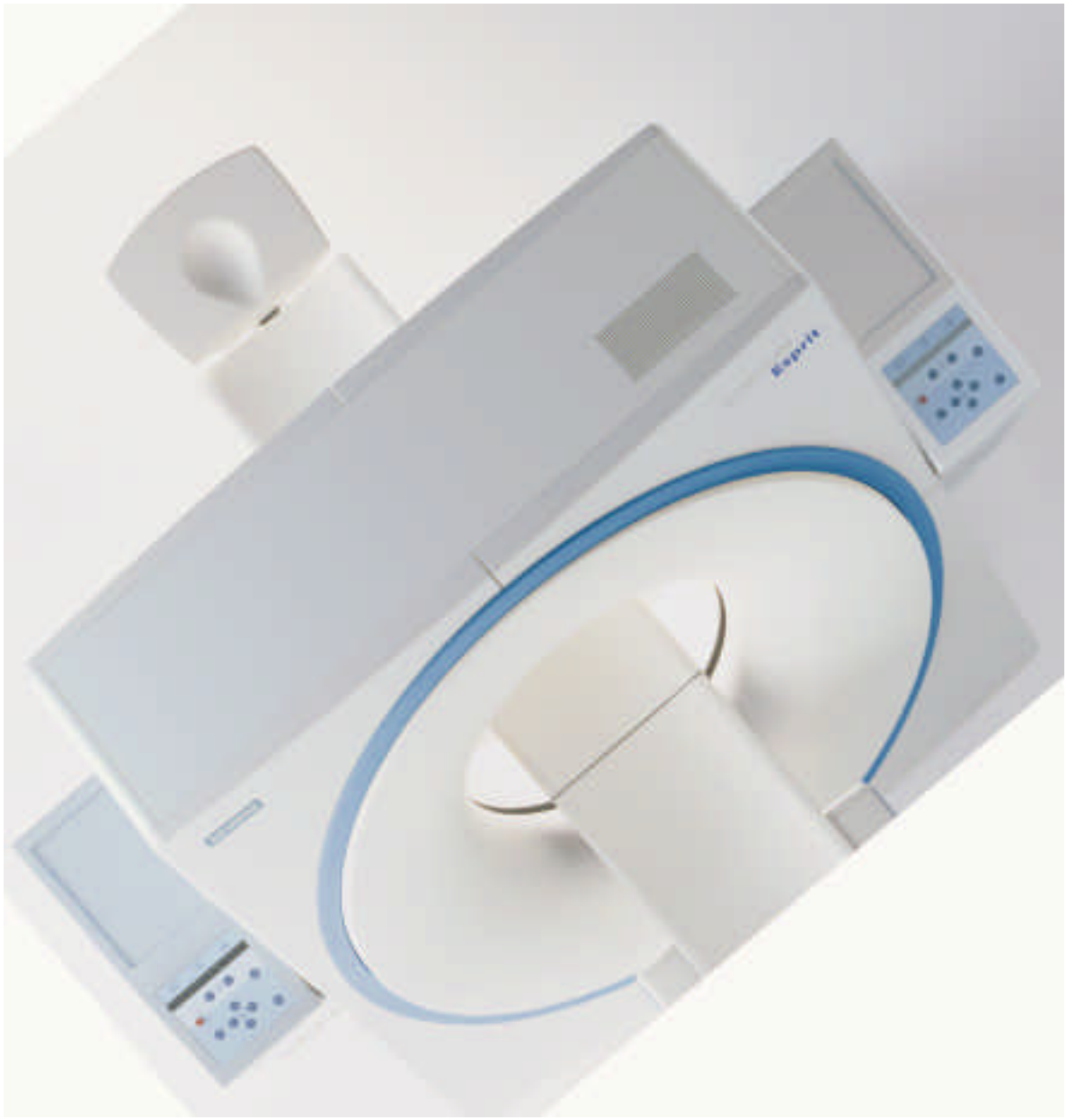
SIEMENS

SOMATOM Esprit

A Bundle of Energy



DATA

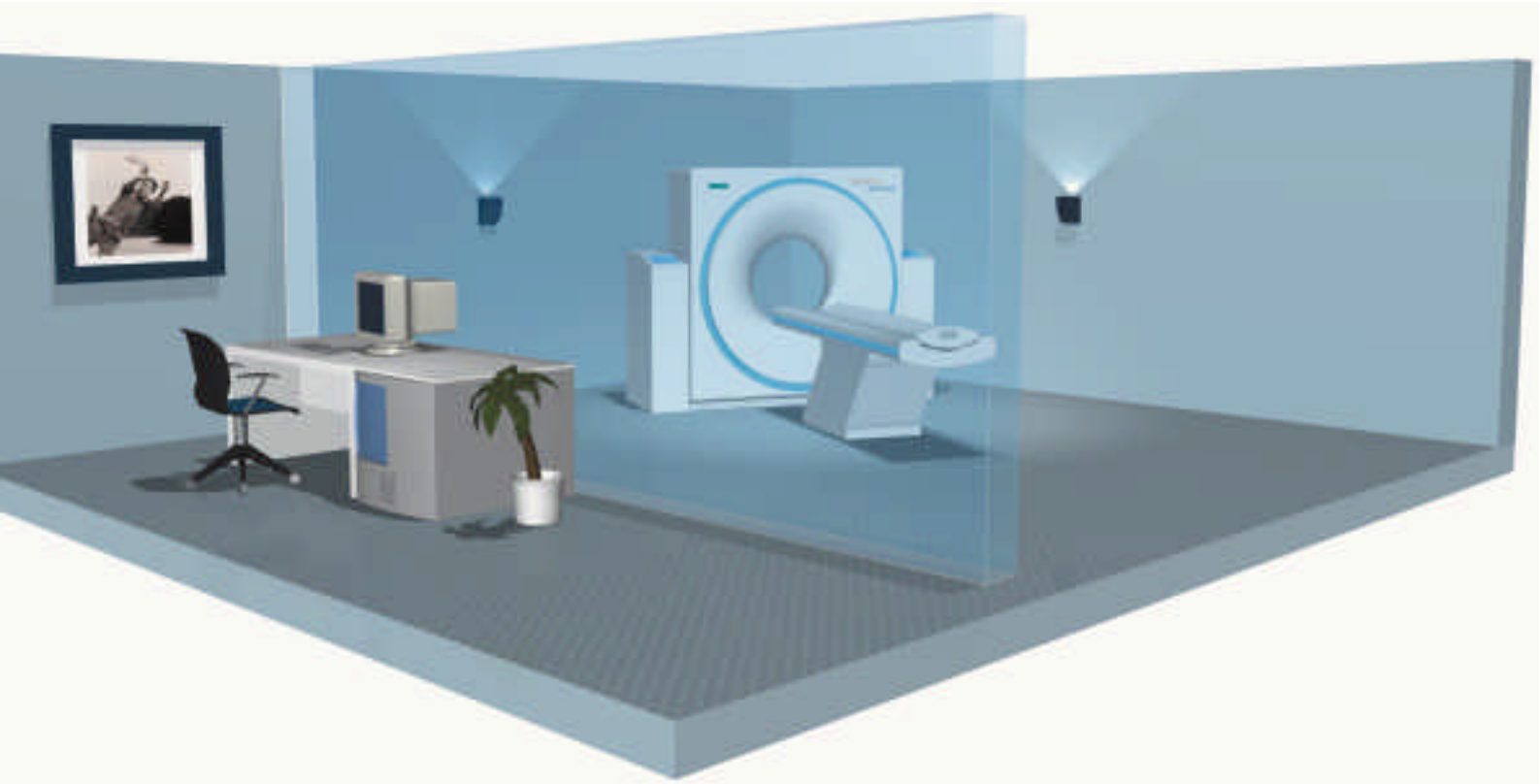
SOMATOM Esprit
An economical CT scanner designed for...

... Excellent spiral image quality

... A wide range of clinical applications

... Value performance and reliabilty

Contents



Spiral Performance

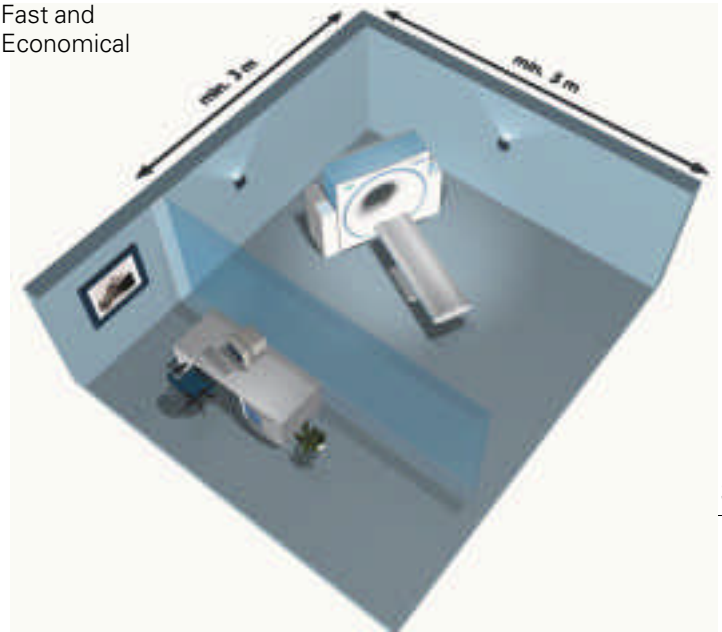
40 seconds of continuous spiral without any interruptions (60 seconds is optional)

World's Slimmest Gantry Design

User and Patient Friendly

Compact Installation

Fast and Economical



Spiral CT—Features and Data

Rapid volume scanning technique with continuous table feed

Optimized to all anatomic and pysiological needs

Acquisition of an entire anatomical volume without interruption

Complete anatomic region in a single breath-hold

Virtually no misregistration of minute details between individual slices due to patient motion

Reduced examination time in the gantry - crucial for trauma patients

Well suited basis for reconstructions of secondary views
- MPR
- 3D [optional]
- MIP [optional]
- VRT [optional]

Rapid continuous scanning technique without table feed

Flow studies for differential diagnostics

Motion studies (e.g. joints)

Application benefits

Optimal timing of contrast medium bolus

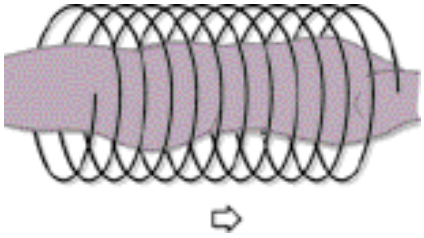
The contrast medium is more uniformly displayed throughout the images of the entire study

High temporal resolution

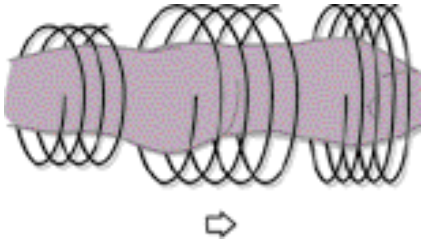
Improved detail recognition

Pitch. Pitch is the ratio of table feed per rotation to collimation
Increment. Increment is the spacing between adjacent images

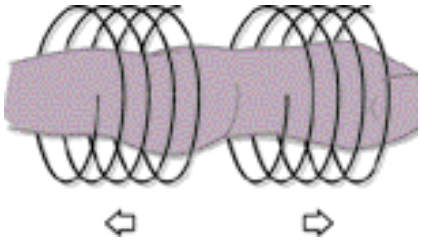
Spiral data	standard	optional
Rotation time	1.5 s 2.0 s	
Pitch	1–2	
Scan time	40 s	60 s
Scan length (pitch 2/rot. 1.5 s)	50 cm	80 cm
Interspiral delay	min. 5 s	



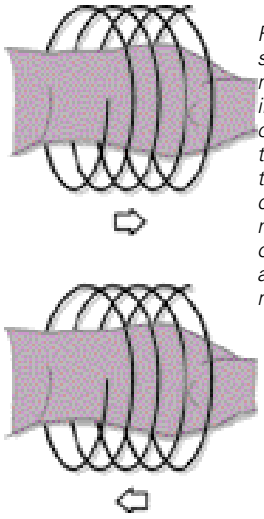
▲ *Single spiral—fast uninterrupted scanning of large anatomic volumes*



▲ *Multiple spirals with delays, acquired in any direction—patient breathing pauses, change of parameters or modes*



▲ *Multiple spirals started from any desired position with different directions—utilization of a contrast medium bolus in different anatomical regions*



Repeated acquisition of a region (scanned in same or opposite direction)— acquisition of different contrast medium phases of a bolus within an anatomic region

Esprit

Sequence

Spiral image reconstruction

METRO RECON: Simultaneous reconstruction parallel to spiral acquisition

Retrospective reconstruction of raw data

Freely selectable position

Freely selectable increment and number of images
- contiguous
- overlapping

Real-Time Display [optional]

Immediate image display parallel to spiral acquisition (e.g. for trauma and interventions)

CARE Bolus [optional]

Operating mode for contrast medium enhancement triggered data acquisition

Spiral performance Multispiral

Autorange

Spiral time	Spirals with full image quality
39 s/26 cm	3 spirals
Parameters:	130 kV, 105 mAs, 1.5 s pitch 1
50 s/23 cm (with 60 s optional)	3 spirals
Parameters:	130 kV, 110 mAs, 2.0 s pitch 1

Fast axial scan sequence

Acquisition with or without table feed

Multirotation scans to reduce motion artifacts

Automatic clustering of scans

Sequence data

Scan times full scan (360°)	1.5 s 2.0 s
partial scan (240°)	1.0 s
Number of uninterrupted scans	99
Number of ranges in autorange	9
Number of scans in autorange	99
Standard scan cycle time (scan time 1.5 s)	3.0 s (±10%)
Dynamic scan cycle time (scan time 1.5 s)	2.25 s (±10%)

Topogram

Survey radiograph with diagnostic image quality for planning the complete examination

Real-Time Topogram

CARE Topo: manual stop once desired anatomy has been imaged

Topogram data

Length	128 to 1,024 mm
Views	a.p. p.a. lateral

Image Quality

Low-contrast detectability

5 parameters to compare low-contrast detectability between systems

Low-contrast detectability is the ability to see
- a small object (mm)
- with a certain contrast difference (HU)
- on a particular phantom (∅)
- at a mAs value (mAs)
- with a particular patient dose (mGy)

Phantom	**CATPHAN (16 cm)**
Object size	4 mm
Contrast diff.	3 HU
Dose at the surface	28.1/26.8 mGy* at 105/100 mAs
Technique	1.5/2.0 s 10 mm 130 kV

*Air KERMA,
measured on the surface of the phantom

Phantom	**CATPHAN (20 cm)**
Object size	5 mm
Contrast diff.	3 HU
Dose at the surface	19.9 mGy* at 90 mAs
Technique	1.5/2.0 s 10 mm 130 kV

*Air KERMA,
measured on the surface of the phantom

High-contrast resolution

0% MTF ±10%	10.6 lp/cm 0.47 mm
2% MTF ±10%	9.5 lp/cm 0.53 mm
Technique	35 mA 130 kV 1.5/2 s 1.5 mm

Dose, $CTDI_{100}$ values

Phantom ∅		**130 kV [mGy/100 mAs]**
16 cm	A	24.5
	B	27.5
32 cm	A	8.2
	B	17.3

A: at center
B: 1 cm below surface

PMMA phantom,
Reference material is air
Max. deviation ±30%
Typ. deviation ±15%
Slice > 1.5 mm

Homogeneity

Cross-field uniformity in a 20 cm water phantom	max. ±4 HU typ. ±2 HU

Phantom positioned near center of rotation

Esprit

Computer System

Image Control System (ICS)

High performance Siemens proprietary computer platform designed for simultaneous scanner control and post-processing functionality

True multitasking environment achieved by combining state-of-the-art HW technology (CISC architecture) with highly efficient SW implementation

Patient data disk	54 GB 32,000 images and 21,000 raw data sets of 1.5 s scan

Image Reconstruction System (IRS)

Advanced image reconstruction computer designed to provide high processing speed and overall system reliability

High speed processor technology with performance of almost **2 GHz** (word length up to 128 bits) is employed to meet the extreme demands of medical imaging devices

Image Processing and Handling

Image reconstruction

Slice width	1.5, 3, 5, 8, 10 mm
Scan field	45 cm
Recon field	5–45 cm
Turbo Recon (optional)	1 s
Recon time	2 s

Recon matrix	512×512
HU scale	−1,024 to +3,071
Extended HU scale	−10,240 to +30,710

CARE Slice (VAR)

Volume Artifact Reduction by slice summation

CARE Slice (VAR) spiral

Image display

Monitor size	21″ (53 cm)
Monitor resolution	1,280×1,024
Image display matrix	max. 1,024×1,024
Flat screen monitor [optional]	18″

CINE Display. Display of image sequences
- interactively with mouse-controlled speed
- or automatically

Image rate	up to min. 10/s

Windowing

Windowing width and center freely selectable

Single window

Multiple window settings for multi-image display

Filming

Digital film documentation, if connected to a suitable digital camera Connection via DICOM Basic print

Automatic filming during scanning

Filming Interactive

Filming parallel to other activities

Independent scanning and documentation—no waiting time caused by camera delays

Freely selectable placement of images onto film sheet

Configurable image text

Archiving

CD-R	0.7 GB 1,100 images or 440 raw data of 1.5 s scan
MOD DICOM [optional]	2.3 GB min. 3,700 images or 1,300 raw data of 1.5 s scan
	4.1 GB min. 6,500 images or 2,400 raw data of 1.5 s scan

Image transfer/Networking

DICOM. Interface for transmitting medical images and information in the DICOM standard

Permits communication between devices of different manufacturers

Features
- DICOM Send/Receive
- DICOM Query/Retrieve
- DICOM Basic print
- DICOM Get worklist (HIS/RIS)
- DICOM Storage commitment
- DICOM MPPS (Modality Performed Procedure Step)

DICOM Conformance Statement: http://www.med.siemens.com/ med/e/dicom

DICOM=Digital Imaging and Communications in Medicine

Esprit

Evaluation

Image evaluations & annotation

Parallel evaluations of up to 4 Regions of Interest (ROI)
- Circle
- Irregular
- Polygonal

Statistical evaluation:
- Area/Volume
- Standard deviation
- Mean value
- Min/max values

Profile cuts
- Horizontal
- Vertical
- Oblique

Distance measurement

Angle measurement

Online measurement of a 5 × 5 pixels size ROI

Reference scales

Image annotation and labeling

2-D post-processing

Image zoom and pan

Image manipulations:
- Subtraction/Addition
- Averaging
- Reversal of gray-scale values
- Mirroring

Image filter functions

Dynamic evaluation to acquire time density curves

Real-time MPR

Real-time multiplanar reformatting of secondary views

Viewing perspectives:
- sagittal,
- coronal
- paraxial
- oblique
- freehand (curvilinear)

CT Angiography [optional]

Evaluation of spiral images and display of vessels, vascular anomalies, aneurysms, plaques, and stenoses

Further functions:
- MIP (Maximum Intensity Projection)
- Volume Editor (to eliminate interfering or irrelevant parts of the image)
- Sliding MIP

syngo 3D SSD [optional]

Shaded Surface Display

Three-dimensional display of surfaces with different density values:
- Soft tissues
- Bones
- Vessels filled with contrast media

syngo Dental CT [optional]

Reformatting of panoramic slices and paraxial sections through the lower and upper jaw for analysis in connection with implantation surgery

syngo Osteo CT [optional]

Quantitative determination of bone mineral density (BMD) of the vertebra

syngo Pulmo CT [optional]

Quantitative evaluation of the lung tissue density

User Interface

The SOMATOM Esprit comes standard with *syngo*, the revolutionary Siemens Medical multimodality user interface

DICOM is included and is the basis of all connectivity functions of the system

syngo VRT [optional]

Advanced 3D application package including Volume Rendering Technique (VRT) and advanced 3D editing functions—contour creation, thresholding and volume growing.

syngo Fly Through [optional]

Virtual endoscopy software for perspective visualization of vessels, airways and intestinal organs.

Application only available for the Wizard console.

CARE Solutions

CARE Dose [optional]

CARE Dose is the ultimate technological leap developed by Siemens for the reduction of CT patient dose.

Advanced computing technique is used to instantly follow the shape of the patient's body, during the whole CT scanning. The X-ray attenuation is measured "on-the-fly" and the tube current is modulated in real-time.

A substantial dose reduction is achieved with CARE Dose — up to 50% dose reduction, according to the scanned body region.

Ultra Fast Ceramic Detector UFC

Low patient dose. Up to 30% dose reduction in relation to conventional CT detectors

More power. More or longer spirals due to low mAs requirements for full image quality

More speed. Ultra short afterglow. Specially developed for sub-second and multislice applications.

Pediatric Protocols

Special low dose clinical protocols with multiple kV selection and a wide range of mAs settings. The X-ray exposure is adapted to the child's (and small adults) weight and age, substantially reducing the effective patient dose.

CARE Bolus [optional]

Scan mode for contrast bolus triggered data acquisition.

Patient Handling

Patient table

Max. table load	200 kg/450 lbs
Table feed	1–100 mm/s
Vertical table travel range	45–83 cm (at table top)
Scannable range (metal-free)	max. 153 cm*

*Configurable from 120 to 153 cm, according to room size

Intervention with C-arm. Table top allows use of a mobile C-arm during examination

Distance between gantry front and table base	42 cm
Scannable range with head holder	max. 123 cm*

*Configurable from 93 to 123 cm, according to room size

Lateral light marker

Positioning aid for horizontal patient positioning

Patient communication

Integrated patient intercom

Automatic Patient Instruction (**API**)
- Freely recordable

Number of API text pairs	30

Patient registration

Online registration

Preregistration of patients

Clinical Applications

Overview of all options for customizing your system

CARE Dose

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A substantial dose reduction is achieved by CARE Dose – up to 50 % dose reduction, according to the scanned body region.

syngo VRT

Advanced 3D application package including Volume Rendering Technique (VRT) and advanced 3D editing functions—contour creation, thresholding and volume growing.

60 s Spiral

Spiral scan time upgrade

Real-Time Display

Instant image reconstruction for Spiral and Multiscan acquisition

Allows image display concurrent to the acquisition at a speed of 1 image/rotation

syngo Pulmo CT

Quantitative evaluation of the lung tissue density

syngo Fly Through

Virtual endoscopy software for perspective visualization of vessels, airways and intestinal organs.

Application only available for the Wizard console.

CT Angiography

Evaluation of spiral images and display of vessels, vascular anomalies, aneurysms, plaques, and stenoses

Further functions:
- MIP (Maximum Intensity Projection)
- Volume Editor (to eliminate interfering or irrelevant parts of the image)
- Sliding MIP

syngo Osteo CT

Quantitative determination of bone mineral density (BMD) of the vertebrae

syngo 3D SSD

Three-dimensional display of surfaces by using different thresholds

syngo Dental CT

Reformatting of panoramic slices and paraxial sections through the lower and upper jaw for analysis in connection with implantation surgery

syngo Perfusion CT

Evaluation of dynamic multiscan data of the brain following contrast bolus injection. Aids in the assessment of cerebral perfusion disturbances

Productivity Options

Keyboard

- English
- German
- French
- Spanish

Archiving devices

- MOD DICOM
  (for 2.3 GB and 4.1 GB media)

CARE Bolus

Scan mode for contrast bolus triggered data acquisition

Flat Screen Monitor

For the main console and 2nd (Wizard) console

Monitor size	18″
Monitor resolution	1,280×1,024
Image display matrix	1,024×1,024

Additional Monitor

Remote display of diagnostic information

Monitor size	18″ flat or 21″
Distance from host	max. 120 m

Turbo Recon

Reduce the recon time to 1 s

Second gantry panel

Second gantry control panel for in-room operation of the gantry and patient table.

Foot switch

Radiation release directly at the gantry

Wizard Console

The Wizard Console can be installed in parallel with the main operator's console (Navigator) via a shared patient database link.

When the 2nd console is on site, only the basic scan functions are limited to the main console. Dedicated *syngo* task cards for filming, image review and 3D post-processing are displayed on both consoles.

Optional task cards might also be displayed in the Wizard console if the related applications are licensed for the CT scanner.

Components

Gantry

Continuously rotating tube–detector unit with optimized geometry for high-resolution data acquisition throughout the entire scan field

Aperture	65 cm
Tilt	±25°
Scan times	1.5 s, 2.0 s, 1.0 s (240°)

Patient accessibility

Distance gantry front to scan plane	24 cm

Data acquisition

Ultra Fast Ceramic Detector UFC

Low patient dose. Up to 30% dose reduction in relation to conventional CT detectors

More power. More or longer spirals due to low mAs requirements for full image quality

More speed. Ultra short afterglow. Specially developed for sub-second and multislice applications.

Elements	416
Measuring channels	832

Design effectively suppresses scattered radiation for precision quantitative CT

X-ray generator

High-frequency generator DURAMATIC

Max. power	22 kW
Continuous power	1.8 kW

Tube assembly

Siemens DURA®
high-performance CT x-ray tube

Multifan principle with Flying Focal Spot

Computer-controlled monitoring of anode temperature

Tube	DURA181-MV
Tube current range	20–160 mA
Tube voltages	80, 130 kV
Tube assembly heat storage capacity	3.6 MHU
Anode heat storage capacity	1.75 MHU
CARE Filter (Al equivalent)	6.4 mm

Anode heat dissipation

max.	400 kHU/min
cont.	1.8 kW

Focal spot size according to IEC 336/1993

1.1×0.7 mm/8°

Esprit

Installation

Dimensions

Component	Height mm	Width mm	Length mm	Weight kg
Gantry	≤1,780	≤770/660	≤2,300	≤1,150
Patient table	≤890	≤680	≤2,260	≤400
Control console	≤700	≤800	≤1,400	≤65
UPS	≤158	≤358	≤137	≤15
ICS/IRS				≤20/20

Room environment

Temperature range	18–30 °C
Relative air humidity without condensation	20–85 %
Heat dissipation scanner	≤ 3.5 kW scanning ≤ 0.85 kW standby
Heat dissipation computer	≤ 0.7 kW

Surface area for installation

	minimal*	recommended
System	17.0 m^2	21.0 m^2
Gantry & table	13.0 m^2	15.7 m^2

* Full performance in terms of gantry tilt and 120 cm scannable range

Power supply

Voltage nominal ±10%	190–480 V
Line frequency nominal ±10%	50; 60 Hz
Power connection	≤ 30 kVA
Power consumption	≤ 1.0 kVA standby
Mean power consumption	≤ 4.0 kVA scanning

Protection against input power instability

X-ray	30 ms
Controllers	300 ms
Computer, IRS, and ICS	3 min
Frequency stability ±5%	50; 60 Hz

Electromagnetic compatibility

This product is in compliance with IEC60601-1-2 and fulfils CISPR 11 Class A

This product bears a CE marking in accordance with the provisions of directive 93/42/EEC of June 14th, 1993 for medical products.

CE 0123

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CAPE design

Siemens **medical**
Solutions that help

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