New spectral benefits, proven low dose

Philips MicroDose mammography SI, technical data sheet

Philips MicroDose SI with single-shot spectral imaging is a full-field digital mammography solution that delivers proven dose efficiency, outstanding image quality, and novel spectral technology. Designed to delight physicians, patients, and mammographers, it helps deliver high-quality, efficient, patient-focused care. The foundation of MicroDose SI is Philips proven photon counting technology enabling users to capture outstanding images at low dose. MicroDose SI adds a new advancement to this remarkable technology: non-invasive spectral imaging capability that holds promise of providing new insights into breast composition.

Key advantages

- Proven: Experience outstanding image quality at a very low X-ray dose
- Objective: Refine your breast density assessment with spectral, volumetric, breast density measurement
- Non-invasive: Collect spectral data in a fast and comfortable mammogram

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1. Gantry

1.1 Mammography stand

Feature	Specification
Measures	See Figure 1, next page
Weight	260 kg (573.2 lbs.)
SID (Source Image Distance)	660 mm (2′ 2″)
Multi-slit scanning technology	
Scan-time	4 – 16.5 s
Scatter rejection	97% [1]
Movements	All movements are motorized
Height (from floor to patient support)	760 mm – 1380 mm (2′ 5.9″ – 4′ 6.3″)
Speed of vertical movement	50 mm/s
Rotation	-100° to +180°, isocentric
Speed of rotational motion	10°/second
Programmable auto positioning with automatic mirroring of angles. Can be controlled from acquisition workstation	• Dx CC • Sin CC • Dx MLO • Sin MLO • Dx LM • Sin LM
Control buttons	Adjustment of height and angle via buttons located on both sides of the tube head and the breast support table
Collision protection	Yes
Compression	Motorized movement controlled with foot pedals
Compression force	0 – 200 N, configurable first stop limit for compression force
Maximum distance breast support to paddle	180 mm (7″)
Maximum compression height at exposure	• High collimator – 120 mm (4.7″) • Low collimator – 100 mm (3.9″)
Automatic release of compression	• Automatic release after exposure • Release of compression force in case of power loss • Release of compression force if the emergency stop is activated
Light	Positioning light that automatically switches on when foot pedal is activated
Display	Display of compression force, compression height, and projection angle at the foot of the gantry

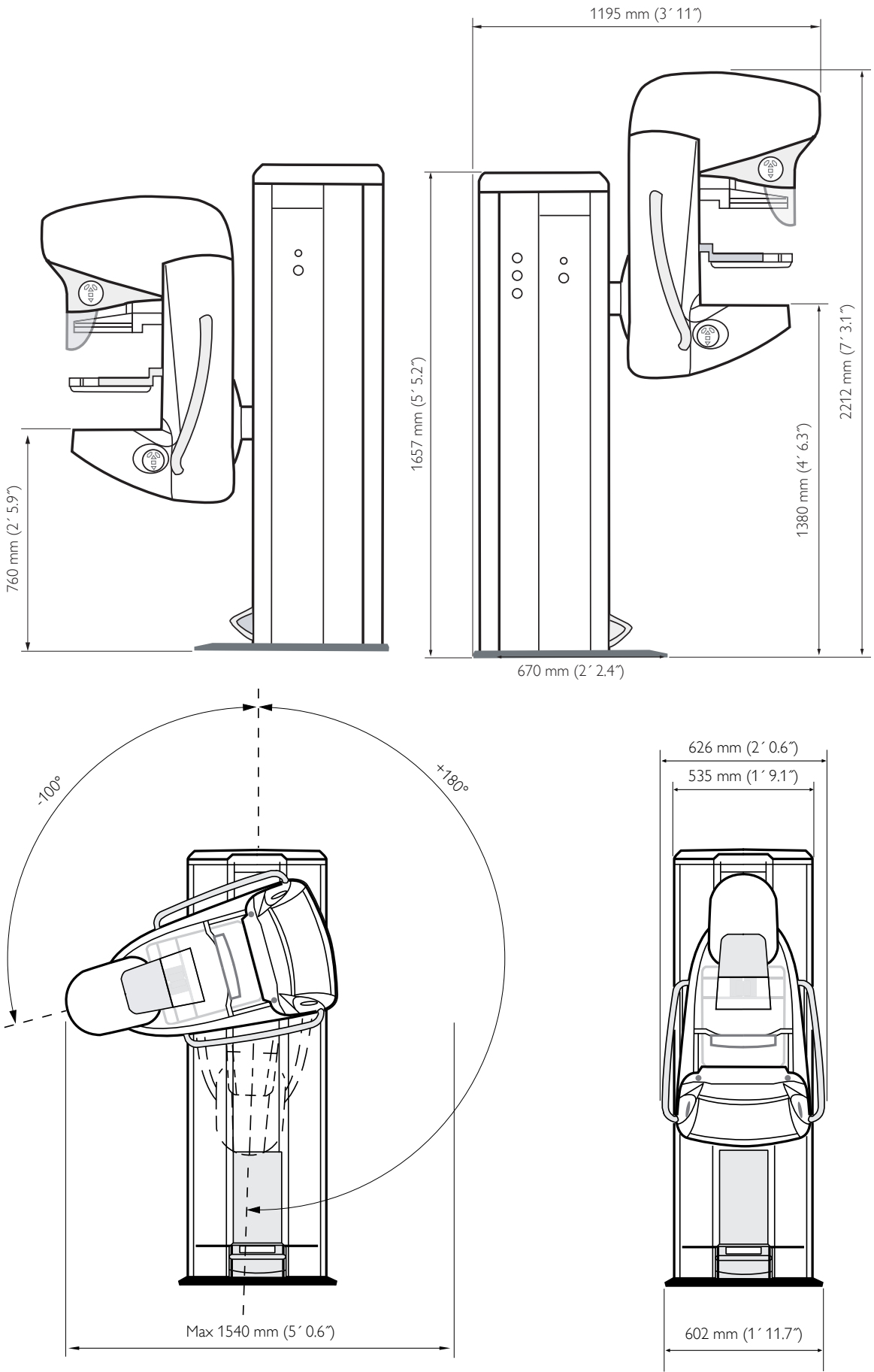

1195 mm (3´ 11″)
760 mm (2´ 5.9″)
1657 mm (5´ 5.2″)
1380 mm (4´ 6.3″)
2212 mm (7´ 3.1″)
670 mm (2´ 2.4″)
-100°
+180°
Max 1540 mm (5´ 0.6″)
626 mm (2´ 0.6″)
535 mm (1´ 9.1″)
602 mm (1´ 11.7″)

Figure 1

2. Detector

2.1 Direct digital detector

Feature	Specification
Detector technology	Photon counting with single-shot spectral imaging capability
Detector material	Crystalline silicon
Pixel size	50 µm
Field Of View (FOV)	24 x 26 cm (9.4″ x 10.2″)
Dynamic range	15 bits
Image size (data)	50 Mb (uncompressed)
Nyquist frequency	10 lp/mm
DQE	>0.70 at 1 mm-1 (measured according to the standard IEC 62220-1-2)
MTF	• >0.45 at 4 mm-1 on patient support • >0.47 at 4 mm-1 45 mm above patient support

3. Tube and generator

3.1 X-ray tube

Feature	Specification
Maximum tube voltage	40 kVp
Maximum power to the anode	6.8 kW (at 38 kVp, 180 mA)
Anode material	Tungsten
Anode rotation speed	10800 RPM
Focal spot size	0.3 mm (0.012″) according to IEC 60336
Filter	0.40 mm (0.016″) Al
Total filtration (including collimator cradle)	0.46 mm (0.018″) Al equivalent at 30 kVp

3.2 High-voltage generator

Feature	Specification
Power	9 kW
kV range	20 – 40 kVp
Maximum mAs	4000 mAs
Ripple	Max. 1%

3.3 Exposure control

Feature	Specification
Exposure settings	• SmartAEC™, Automatic or Manual • SmartAEC exposure mode continuously adjusts the exposure, during the image scan, according to feedback from the detector[2]

4. Acquisition workstation

4.1 Acquisition workstation

Feature	Specification
Measures	See Figure 2
Acquisition workstation table options	• Standard table with integrated lead glass • Optional height adjustable table for ergonomic working positions
Weight of standard acquisition workstation table	• 75 kg (165.35 lbs)
Weight of optional acquisition workstation table	• 75 kg (165 lbs) • Stand alone lead glass: 30 kg (65 lbs) • Optional larger radiation protection shield available
Protective lead glass	• 0.5 mm Pb equivalent at 55-120kVp
PC	• Intel® Core™ i5 or better • Storage capacity up to 10000 images • Operating system: Microsoft Windows® 7 Professional
Monitor	Standard Display: • Min 19″ (482.6 mm) with 1 Mpx (1280 x 1024) Optional DICOM Displays: • Min 19″ (482.6 mm) with 1 Mpx (1280 x 1024) • Min 21″ (533.4 mm) with 3 Mpx (2048 x 1536)
Short-cut keypad	Yes
Exposure	Exposure buttons on acquisition workstation table or optional foot pedal
Time to display	<20 s
DICOM Compliance	• Verification as SCU (Service Class User) • Basic Grayscale Print Management Meta as SCU • Modality Performed Procedure Step (MPPS) as SCU • Digital Mammography Image Storage – For Presentation as SCU • Digital Mammography Image Storage – For Processing as SCU • Digital X-Ray Image Storage – For Presentation as SCU • Digital X-Ray Image Storage – For Processing as SCU • Modality Worklist as SCU • Storage Commitment Push Model SOP Class as SCU

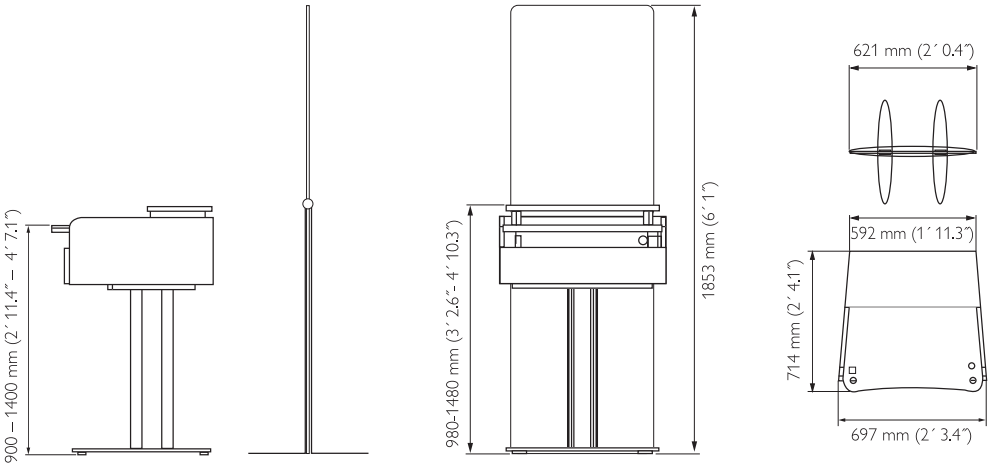
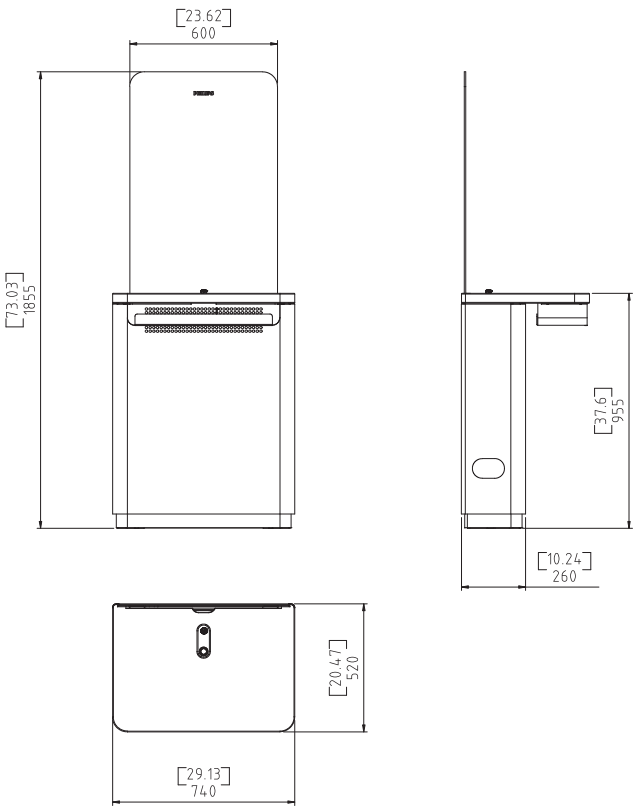

900 – 1400 mm (2´ 11.4" – 4´ 7.1")
980-1480 mm (3´ 2.6"- 4´ 10.3")
1853 mm (6´ 1")
621 mm (2´ 0.4")
592 mm (1´ 11.3")
714 mm (2´ 4.1")
697 mm (2´ 3.4")

Figure 2


[23.62]
600
[73.03]
1855
[37.6]
955
[10.24]
260
[20.47]
520
[29.13]
740

5. Side cabinet

5.1 Side cabinet containing cooling system and electronics

Feature	Specification
Measures	See Figure 3
Weight	100 kg (220 lbs)

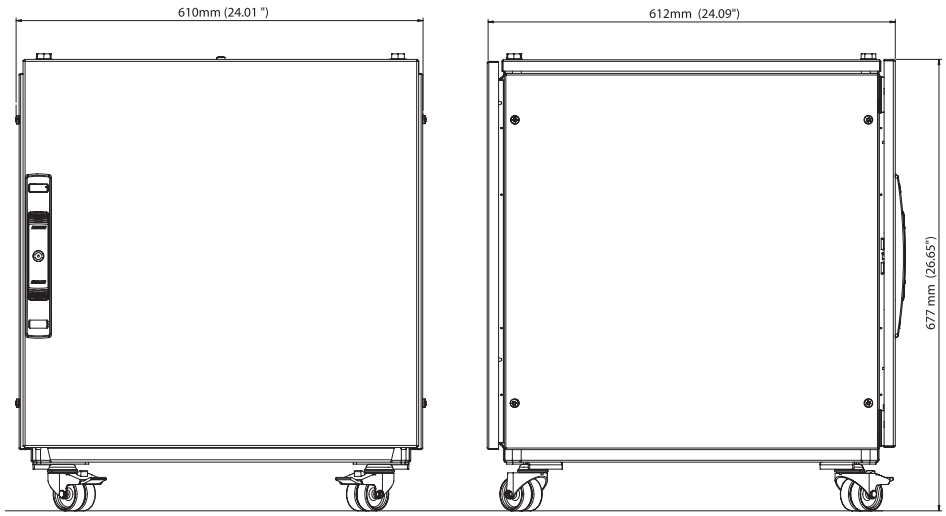


Figure 3

6. Dose configurations

6.1 Dose levels

Feature		Specification		
Breast thickness	**C100 dose setting**	**C120 dose setting**	**Acceptable level***	**Achievable level***
3cm (1.18″)	0,31 – 0,38	0,55 – 0,68	<1.2	<0.9
5cm (1.97″)	0,37 – 0,45	0,63 – 0,77	<2.3	<1.8
8cm (3.15″)	0,83 – 1,01	1,11 – 1,29	<5.7	<4.6
Table 1: Measured AGD (mGy) and limiting values from European Guidelines. Confidence intervals are 2 standard deviations.				
C100		The C100 dose configuration corresponds to a set of target image quality figures that meet the so-called Acceptable limiting values in the European Guidelines[3]		
C120		This dose configuration corresponds to a set of image quality figures that provide 20% higher SDNR (a.k.a. CNR) than the C100 setting. This is equivalent to being able to see 20% thinner objects of the same size		

7. Operating conditions

7.1 Electrical requirements

Feature	Specification
Main input connection three-phase	• 190/200/208/220/230/240/380/400/415/440/480 VAC ±10%, 50/60 Hz • Additional power stabilizer for 190/200/208/220/230/240/380/400/415/440/480 VAC
Max peak power (max 15 s)	• 12.85 kVA
Max average power consumption	• 2.8 kVA
Standby power	• 2.5 kVA

7.2 Operating environment

Feature	Specification
Temperature	+10°C to +30°C
Temperature change	3°C / hour
Humidity	30% to 75% (non-condensing)
Atmospheric pressure	700 hPa to 1060 hPa

7.3 Transport and storage environment

Feature	Specification
Temperature	• +5°C to +30°C • -10°C to +50°C, less than 1 day
Humidity	• 10% to 75% (non-condensing) • 95% max, less than 2 weeks
Atmospheric pressure	500 hPa to 1060 hPa

7.4 Heat dissipation

Feature	Specification
Gantry and acquisition workstation	• 0.7 kW (maximum workflow) • 0.4 kW (stand-by mode)
Side cabinet	• 2.5 kW (maximum workflow) • 1.5 kW (stand-by mode)
Cooling air supply	Shall comply with specified operating environment

8. Accessories

8.1 Compression paddles

Feature	Specification	
Compression paddles	• Standard, Figure 4	• High edge, Figure 5
	• Small, Figure 6	• Medium (optional), Figure 7
	• Spot (optional), Figure 8	• Low Spot (optional), Figure 9
Accessory shelf	Easy accessible storage for MicroDose compression paddles and calibration phantoms.	

8.2 Spectral breast density measurement

Feature	Specification
Spectral Breast Density Measurement tool uses spectral information obtained during the MicroDose SI standard mammogram to differentiate between adipose and fibroglandular tissue to provide objective volumetric breast density measurement[4]	
Data provided	• Volumetric percentage of glandular tissue • Volume of glandular tissue • Total breast volume • MicroDose density score (correlated to BI-RADS breast composition score)
Output format	The calculated breast density data is available in DICOM header and DICOM Structured Report for easy integration with diagnostic workstations

8.3 Diagnostic Scan

Feature	Specification
Diagnostic Scan is a faster, low dose alternative to geometric magnification using spot compression in combination with a focused scan and digital magnification	• Field of view 24 x 12.6 cm (9.45″ x 4.96″) • SDNR doubled compared to C100 dose configuration.

8.4 Needle examination package

Feature	Specification
Philips laser-based needle guidance system facilitates localization of non-palpable lesions with a hook wire solution	The Needle examination package consists of: • Laser guidance system, Figure 10 • A Window compression paddle – 8 x 4cm (3.15″ x 1.57″), Figure 11 • A Matrix compression paddle – 6 x 11cm (2.36″ x 4.33″), Figure 12 • Needle examination software

8.5 Four pedals foot switch

Feature	Specification
Foot switch controlling	• Compression force and Compression done as well as C-arm height.

8.6 Mobile kit

Feature	Specification
Specially designed mobile kit provides a proper and secure installation of MicroDose Mammography on the mobile setting	The Mobile Kit/System attachment kit is composed of: • Radiation shield mounting kit • Main cabinet mounting kit • Side cabinet mounting kit • AW table mounting kit • AW table conversion kit

Figure 4

Figure 5

Figure 6

Figure 7

Figure 8

Figure 9

Figure 10

Figure 11

Figure 12

References
1. Åslund, M. et al., 2006. Scatter rejection in multislit digital mammography. *Medical Physics*, 33(4), pp. 933-40.
2. Åslund, M. et al., 2005. AEC for scanning digital mammography based on variation of scan speed. *Medical Physics*, 32(11), pp. 3367-74.
3. Perry, N. et al., 2006. European Guidelines for quality assurance in breast cancer screening. Luxemburg: Office for Official Publications of the European Communities.
4. Ding H, Molloi S., 2012. Quantification of breast density with spectral mammography based on a scanned multi-slit photon-counting detector: A feasibility study. *Phys Med Biol.* 57: 4719–4738.

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