

New era of dental imaging

The revolutionary Planmeca ProMax X-ray unit provides a wide range of extraoral X-ray imaging modalities for the needs of modern dentistry; panoramic radiographs for imaging of the tooth arch, the jaw, the maxillary sinuses, and the temporomandibular joints, as well as dental tomographic slices and cephalometric studies.

The Planmeca ProMax platform uses robotic SCARA technology to provide utterly precise arm movements needed in digital rotational radiography for maxillofacial imaging. The three-axis SCARA robot arm moves freely without any mechanical restrictions, offering superior imaging capabilities for both existing and future radiographs.

The unique Planmeca ProMax platform makes upgrade of an existing digital Planmeca ProMax to 3D extremely easy, and new imaging programs can be added with software upgrades. The advanced design and functional concept ensure that the unit can acquire superior maxillofacial radiographs now and in years to come.

The design and the operating principles of the Planmeca ProMax maxillofacial X-ray unit are based on the latest scientific research and a clinical insight of the requirements of today's maxillofacial radiology. Planmeca ProMax offers a variety of imaging modalities in one intelligent X-ray unit.

- Panoramic radiography for general diagnostics of the tooth arch and the jaw
- Advanced panoramic radiography for specific diagnostics of the tooth arch, jaw, maxillary sinuses, and temporomandibular joints
- Dental tomographic slices for detailed morphologic diagnostics of facial bones
- Cephalometry for skull imaging

The configuration of the unit can be tailored to comply with user-specific needs. New features and imaging modalities can easily be added at a later date.

The Planmeca ProMax X-ray unit is 100% digital:

- Direct digital image capture with real-time image acquisition*
- Digital user interface on the colour TFT main display
- Digital exposure movement control, micro step motors with smooth, quiet, and accurate movements
- Digital control system of the X-ray generator providing high-quality and uniform radiation insensitive to any external disturbances
- Fast digital communications interfaces (Ethernet)

Each Planmeca ProMax incorporates a digitally controlled X-ray generator, allowing a fast pulse sequence and an Ethernet-based data path to its digital sensor for high capacity image data transfer. This technologically advanced design enables Planmeca ProMax to evolve into a state-of-the-art 3D imaging platform with Cone Beam Volumetric Tomography (CBVT). Thus the same X-ray unit can serve as a platform for film, CR-plate, direct digital, or 3D dental imaging.

* Planmeca ProMax is also available as a conventional film unit, which can later be fully digitalised.

Planmeca ProMax utilises unique SCARA technology (Selectively Compliant Articulated Robot Arm). SCARA is a revolutionary electro-mechanical construction, providing flexible, precise, and complex movements required in rotational maxillofacial radiography.

In Planmeca ProMax, SCARA technology is combined with real-time computation of dynamic rotation patterns. These enable optimised radiography of each patient's anatomy, meeting with virtually any diagnostic requirement in maxillofacial dentistry.

The whole Planmeca ProMax concept design declares the unit can perform superior maxillofacial radiography today and in decades to come.

- Rotational freedom the SCARA arm can produce any rotation pattern.
- Network connectivity the unit has an Ethernet connection for high-speed data communications.

- Graphical user interface the colour TFT display with GUI displays all and any required controls.
- Advanced collimation the four-blade collimator can flexibly shape the X-ray beam.
- Upgradeable software new imaging programs and features can be introduced with software upgrades.
- Upgradeable to 3D imaging all Planmeca ProMax units can be field upgraded to include threedimensional imaging (CBVT technology).

Direct digital radiography has numerous advantages both for the patient and for the X-ray imaging workflow.

Direct digital X-ray imaging saves time. Images appear on screen within seconds after the exposure and are immediately available for diagnosis anywhere in the practice network. Since film, film processing, and darkroom are no longer needed, the most common reasons for image retakes are eliminated.

Digital images can be enhanced in imaging software.
This gives new opportunities for diagnostics and allows adjustment of the image darkness and contrast to optimise diagnostically relevant regions.

Digital archives and networks enable efficient image communications. Electronic image copies match the original in quality and thus the highest quality image is always accessible for on-site diagnostics as well as for remote consultation.

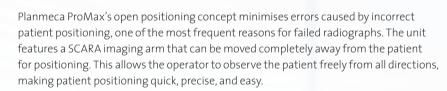












A triple laser beam system ensures proper alignment, as it accurately indicates the correct anatomical positioning points.

- The midsagittal plane positioning beam shows the correct sideways alignment of the patient's head, so that the resulting image is symmetric and undistorted in the left-right direction.
- The Frankfort horizontal plane positioning beam shows the correct forward tilt of the patient's head, so that the dental arch lines up straight in the radiograph.
- The focal layer positioning beam indicates the focal layer's position in the incisor region and ensures the patient is positioned fully inside the focal layer for sharp and clear images.

The side entry allows easy access for all types of patients. The exposure can be performed the patient standing – the recommended way for short procedures – or seated.

If necessary, the patient to be radiographed can even remain seated on a wheelchair.

With Planmeca ProMax, no mirrors are needed for positioning. Instead, the patient has an open and comfortable view and is relaxed by the personal contact. This also means a child can keep a direct eye contact with an accompanying adult during the procedure.

The unique Autofocus feature makes patient positioning practically error-free. Autofocus positions the focal layer automatically using a brief scout exposure, remarkably reducing retakes.

The unique digital Dynamic Exposure Control (DEC) optimises the whole imaging chain individually for each patient. All components from the X-ray generator to the digital sensor are tuned to produce optimum image quality.

The full colour TFT display and the graphical user interface (GUI) guide the operator with text and clear graphic symbols. All exposure settings are logically

grouped and easy to understand, which makes the imaging procedure quick, and allows the operator to fully focus on patient positioning and communication.

After taking a digital image, the user can see a preview image on the main display. The preview image can be zoomed in for observation before accepting the image. Once the image has been accepted, it is automatically stored in the image database.

Planmeca ProMax allows a selection of correct exposure formats, minimising the radiation dose for all types of patients and diagnostic purposes. The pediatric program automatically selects the narrow focal layer and reduces the exposed area from the top and the sides. This reduces the patient dosage by 35%, while providing full diagnostic information.

With the horizontal and vertical segmenting option, the exposed area can be limited only to the diagnostic

area of interest. With a simple selection on the GUI, the patient dosage can be reduced by up to 93%, compared to a full area panoramic exposure. This is highly advantageous and radiation hygienic when a follow-up image is needed on a limited part of the jaw.*

When purchasing a new imaging program to the Planmeca ProMax X-ray unit, the new feature is taken into use by entering an activation code on the GUI. This smart activation makes introduction of new features fast and trouble-free.

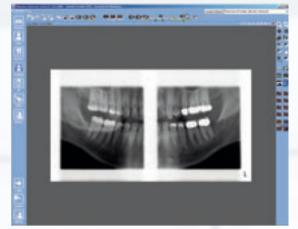
The self-diagnostic system continuously monitors the unit, and clear language help messages guide the operator enabling the correct use of the unit. In addition, the unit control system records an event log in case of abnormal operation. This helps both the operator and the technical service.

* Absorbed dose reduced by sliced exposure using sector selector system with rotational panoramic radiography, Y. Hayakawa, N. Kobayashi, Y. Kousuge, H. Fujimori and K. Kuroyanagi, Bulletin of Tokyo Dental College, Vol. 35, No. 3, pp. 127–131, August, 1994





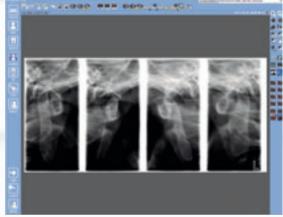




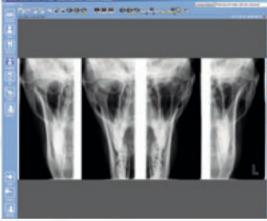
Bitewing Panoramic



PA and Lateral Non-Rotational Sinus



Lateral Double TMJ



PA Double TMJ

In a traditional panoramic image, the teeth interproximal contacts often overlap, which prevents diagnosis of interproximal caries. Planmeca ProMax's optional Improved Interproximal Angulation Panoramic program produces a panoramic image where the teeth interproximal contacts are open, making the radiograph useful for caries detection.

An image taken with the optional Bitewing Panoramic program, using the improved interproximal angulation geometry, resembles an intraoral bitewing image pair. The advantage is that the image has been obtained with one simple extraoral exposure, which produces a very low radiation dosage to the patient.

The assessment of the crestal alveolar bone height is a standard study in periodontal diagnostics. The optional

Improved Orthogonality Panoramic program produces an image where the alveolar crest is clearly visible for improved diagnostics of the periodontal condition. In addition, radiographs taken with this program are highly valuable for implant planning.

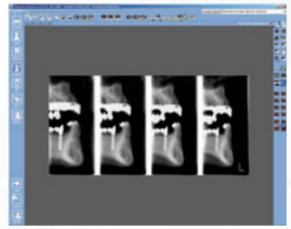
The TMJ imaging programs produce lateral or posteroanterior views of open or closed temporomandibular joints. The imaging angle and position can be adjusted to correspond to the individual anatomy of each patient.

The standard Double TMJ programs produce mouth open and mouth closed images of the TMJs on the same radiograph either from lateral or from posteroanterior view.

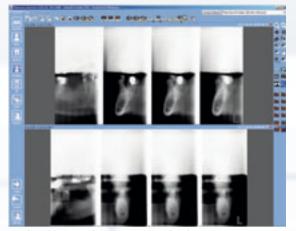
The optional Lateral-PA TMJ program produces lateral and PA views on the same radiograph. Multi-angle TMJ programs produce radiographs with images from three different angles either from the lateral or from posteroanterior view.

In Planmeca ProMax, the PA Rotational Sinus program is a standard program. The image layer is straight and the resulting radiograph gives a clear view of the maxillary sinuses.

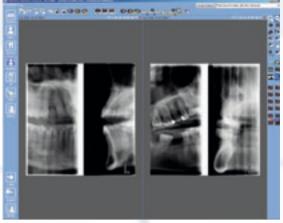
The optional advanced sinus programs produce lateral or posteroanterior transillumination sinus images by linear scanning. The resulting images are diagnostically similar to cephalometric projections of the sinus area.



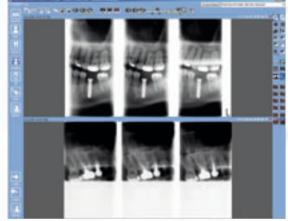
4 cross-sectional tomograms



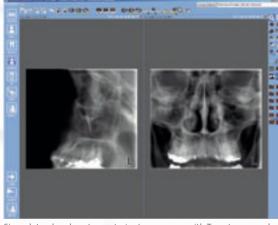
1 longitudinal tomograms



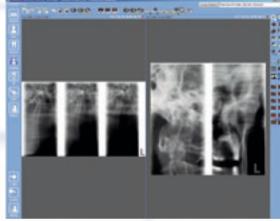
Combined tomography: 1 cross-sectional and 1 longitudinal tomograms



3 longitudinal tomograms



Sinus: lateral and posteroanterior tomograms with Transtomography® TMJ tomograms



With Planmeca ProMax, any maxillofacial radiographic examination can be carried out in the dental practice instead of sending patients to specialised radiologists. For example, all required images for the analysis, planning, and follow-up of implantology can be taken using the Planmeca ProMax tomography programs. This opens new high-value opportunities for the dental practices.

The pre-adjustment of the position and the angle of the tomographic exposure is done automatically according to the operator's program and target selection on the main display. Fine-alignment using the smart positioning joystick is highly practical and intuitive.

An impression model of the patient's tooth arch allows easy and reliable fine-alignment of the position and the angle of the desired tomographic image. The dual laser beams indicate the exact site and orientation of the tomographic cut.

The tomographic imaging procedure is straightforward; the operator simply selects the target, the required view, and the slice thickness (1, 3, 6, 9, 18, 36 mm) on the GUI. Planmeca ProMax is delivered with a user guide DVD, which provides clear step-by-step instructions on taking successful tomograms as well as other radiographs.

The increasing use of osseointegrated implants has created a wider demand for radiographic techniques for pre-surgical and post-operative patient evaluation. Correct topographic information is required on the prospective site for planning the implant location.

The Planmeca ProMax tomography system produces clear tomographic slices of any part of the maxilla, mandible, or temporomandibular joints. The tomogram can be cross-sectional or longitudinal and is adjustable to any specific angle. The constant 1.5-fold magnification factor and combination programs enable exact measurements.

Transtomography® uses a multiple sweep method to produce linear tomography effect with a narrow X-ray beam. Transtomography® combines the translation movement with an oscillation movement where the centre of the rotation moves over the region of interest. The layer thickness can be adjusted like in film-based linear tomography. Thanks to the highly advanced imaging method, the image of the anatomies is truthful and layer separation is maximised.*

With cross-sectional tomography programs, the user can take 1–4 cross-sectional images on one radiograph either manually or using the versatile automatic programs. The automatic programs provide series of images with adjacent tomographic cuts (adjustable interval), multi-angle tomographic cuts, or special images of the sinus and the nasal cavity.

The longitudinal programs provide 1–4 longitudinal tomographic cuts on one radiograph either manually or with the versatile automatic programs. The automatic programs provide series of images with adjacent images (adjustable interval), multi-angle images, or special images of the sinus and the nasal cavity.

Longitudinal slices are highly useful for instance for third molar assessment and the diagnostics of the temporomandibular joints.

The combined tomography programs provide cross-sectional and longitudinal views on the same radiograph. This is highly valuable for implant planning since both the transversal and longitudinal views record the same vertical position. The level measurement tool of the Planmeca Dimaxis software can be applied to the combination radiograph, which gives a solid confirmation of the exact position of the images.





ProMax

New

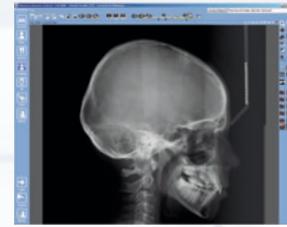
^{*} Transtomography: a new tomographic scanning technique, U. Welander, G. Li, W.D. McDavid and G. Tronje, Dentomaxillofacial Radiology (2004) 33, 188–195







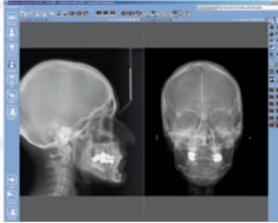
Distance and angle measurements



Lateral cephalometric image



All common cephalometric projections are possible



PA and lateral projections



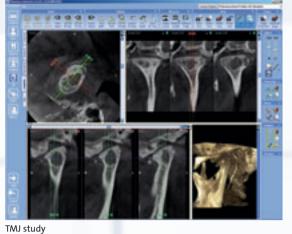
Lateral image and hand image

The Planmeca ProMax Cephalostat makes cephalometry easier and more accurate than ever before. The unit automatically aligns itself, and changing the place of the digital sensor easily turns over the imaging modality to cephalometric imaging. Optionally, the unit can be equipped with two fixed digital sensors.

The functionally designed, easy-to-use head positioner guarantees accurate patient positioning in all cephalometric projections. The carbon fibre ear posts and nasal positioner are extremely durable, hygienic, and fully transparent to radiation.

The digital cephalostat scans the patient's head horizontally with a narrow X-ray beam. This results in reduced scatter radiation, which improves the image clarity. Planmeca's unique design allows exceptional flexibility in image formats, with field sizes of up to 30×27 cm (11.8 x 10.6 in.). This facilitates digital lateral radiographs of the whole skull. The image format and orientation are selected on the GUI.

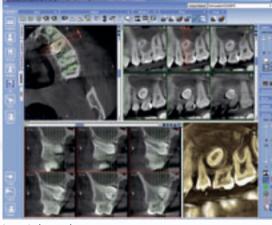
Thanks to digital imaging and the wide dynamic range of the digital sensor, the soft tissue filter is adjusted on the Planmeca Romexis imaging software. This means that the images can be viewed with or without the filter.



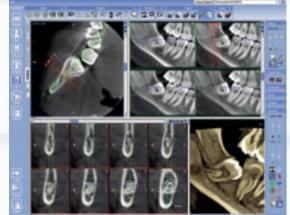
The condyle and the condition of the temporomandibular joint are clearly visible. Malignant finding can be seen inside the



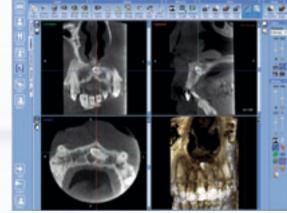
The lower right first molar is missing. The image clearly shows there is enough bone to place an implant.



Impacted premolar Impacted second premolar found in the left mandible.



Wisdom tooth extraction The extraction would be relatively difficult.



Supernumerary tooth An extra tooth found in maxilla.

Thanks to the technologically advanced design any Planmeca ProMax unit can be easily upgraded to 3D Cone Beam Volumetric Tomography (CBVT) imaging device by simply changing the imaging sensor and uploading software upgrades.

The 3D CBVT sensors are available in two sizes.

The larger 3D sensor captures images with volume sizes from 40 x 50 mm up to 80 x 80 mm. The 80 x 80 mm

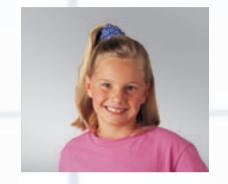
volume size is optimum when whole dentition, mandible, and maxilla are required in the same volume for accurate diagnosis. The 80 x 50 mm volume can be used for single views of the mandible or maxilla to decrease the radiation dose by nearly 40%. The small 40 x 50 mm volume is ideal for molar area studies and for planning of 3rd molar extractions. The volumes can also be stitched together to generate an image up to 140 mm in width or height. See examples above: TMJ study, Implant case, and Impacted canine.

The smaller 3D s sensor offers volume sizes from 50 x 50 mm up to 50 x 80 mm. The 50 x 80 mm size is optimum for most implantology applications, whereas the 50 x 50 mm size is perfect for single tooth cases. To generate an image up to 90 mm in width, volumes can be stitched together. See examples above: Wisdom tooth extraction and Supernumerary tooth.

Both sensors are also available with 3D face photo scan.











In order to get accurate and clear panoramic radiographs, the form of the X-ray unit's focal layer must follow the actual patient anatomy. In Planmeca ProMax, the form of the focal layer follows the scientifically defined shape of human dental arch and jaw, which results in panoramic radiographs with clearly superior clinical quality.*

The jaw size and shape varies between individuals according to size, gender, race, and age. Consequently, one fixed panoramic focal layer form cannot be optimal for all patient cases. In Planmeca ProMax, the operator may adjust the shape of the focal layer according to the jaw size and shape characteristic to the patient.**

Planmeca ProMax's imaging geometry efficiently eliminates redundant shadows and ghost images caused by objects outside the image layer. This significantly increases the diagnostic value of panoramic radiographs.

The shadow of the cervical vertebrae, which commonly disturbs the clarity of the anterior region, is automatically eliminated by adjusting the amount of radiation in the central incisor region. This computer-controlled correction ensures that there is no loss of image contrast

Each patient has an individual bone and tissue thickness, which varies according to size, race, and age. The optional Automatic Exposure Control (AEC) measures the patient's radiation transparency, and correctly adjusts exposure values to achieve the desired film darkness and contrast.

In Planmeca ProMax, the short and constant objectfilm distance minimises the image magnification in panoramic radiographs. Adding the magnification correction option to the film unit further improves accuracy of panoramic images, since the film is always parallel to the focal layer.

Autoprint is a fully automatic film marking system for panoramic radiography. During the exposure, Autoprint marks the exposure parameters, the chosen program, and all the information necessary for patient identification on the film. This provides an automatic way to document exposure values and to reproduce images at a later date. Autoprint functions are controlled on the main display or through an external keyboard.

Planmeca ProMax film units can be transformed fully digital any time in the future. This applies to all imaging modalities – panoramic, tomographic, and cephalometric imaging – as well as to all imaging programs.

For Planmeca ProMax film units, two alternative versions of the cephalometric system are available:

- Planmeca ProMax Cephalostat CA features the automatic selection of the correct cephalometric aperture according to the cassette size and its position on the cassette holder, and an automatic laser beam assisted soft tissue filter positioning.
- Planmeca ProMax Cephalostat CM features a motorized adjustment of cephalometric apertures and the soft tissue filter according to the operator's selection on the GUI.

A cephalometric system – film or digital – can easily be added to the Planmeca ProMax unit any time in the future.

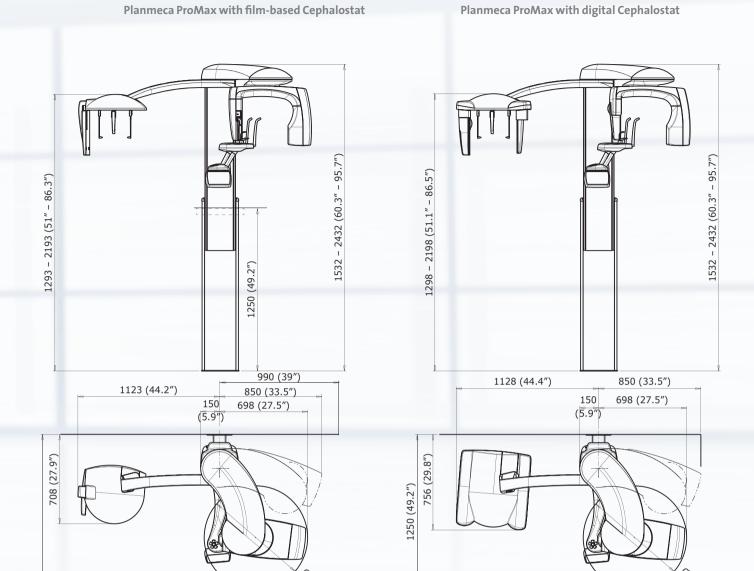


^{*} Standard Forms of Dentition and Mandible for Applications in Rotational Panoramic Radiography, U. Welander, P. Nummikoski, G. Tronje, W.D. McDavid, P.E. Legrell and R.P. Langlais, Dento-Maxillofacial Radiology, 1989, Vol. 18, May

^{**} Dental and Mandibular Arch Widths in Three Ethnic Groups in Texas: A Radiographic Study, P. Nummikoski, T. Prihoda, R.P. Langlais, W.D. McDavid, U. Welander and G. Tronje, Oral Surgery & Oral Medicine & Oral Pathology 1988; 65:609–17

Feature	Options			Digital	Required construction	
Pocontor	Film		•			
Receptor	Digital			•		
	Basic panoramic prog	Basic panoramic programs (standard):				
	• Standard Panoramio	Standard Panoramic			SCARA2	
	Standard Pediatric				2 joint robot arm	
	Lateral Double TMJ				or	
	• PA Double TMJ				SCARA3	
	PA Rotational Sinus			3 joint ro	3 joint robot arm	
	Vertical Segmenting (optional)			•		
	Magnification Correction Panoramic program (optional)				SCARA2 or SCARA3 and cassette rotation	
	SCARA3 construction required for advanced and tomographic programs			•	Adds 3 rd joint	
	(SCARA3 is not possi	· · ·				
	Advanced panoramic					
Imaging mode	Horizontal Segment					
3 3	Improved Orthogon					
	Improved Interproximal Angulation Panoramic Province Panoramic					
	Bitewing PanoramicLateral-PA Double T					
	 PA Multi-angle TMJ 	נויו	•		SCARA3	
	Lateral Multi-angle	TM1			3 joint robot arm	
	PA Non-Rotational S				3 Joint Tobot aim	
	Lateral Non-Rotational Sinus					
	Midsagittal Lateral Non-Rotational Sinus					
	Digital tomography incl. Transtomography®			•		
	Tomography (optional)	Wide beam linear tomography	•	•		
		Wide beam true linear tomography	•		SCARA3 and cassette rotation	
User interface	Graphic colour TFT display			•		
Film marking	Autoprint					
Tilli Tildi Kilig	Extra Autoprint keyboard (PS2)					
Panoramic cassette format	15 x 30 cm					
Cephalostat	Ceph CM		•			
	Ceph CA		•			
	Disital Canh (Dissay)	2 fixed sensors		•		
	Digital Ceph (Dimax)	1 movable sensor		•	•	
Ceph cassette format	18 x 24 cm		•			
	24 x 30 cm				Available for both SCARA2 and SCARA3 constructions	
	8 x 10 in.					
AEC	Pan AEC					
	Ceph AEC					
DEC	Pan DEC			•		
	Ceph DEC					
	Accessory cabinet					
Additional features	External user interface					
	Wall					
Column support						
	Free standing					

Planmeca ProMax is a configurable product. Each unit is individually configured according to the customer's selections. When selecting features, please refer to the table above.



	Physical space requirements			Minimum operational space requirements			Weight
	Width	Depth	Height*	Width	Depth	Height*	
Planmeca ProMax Panoramic	96 cm	125 cm	153 - 243 cm	150 cm	163 cm	243 cm	113 kg
	(38 in.)	(49 in.)	(60 - 96 in.)	(59 in.)	(64 in.)	(96 in.)	(lbs 248)
Planmeca ProMax Panoramic with	194 cm	125 cm	153 - 243 cm	215 cm	163 cm	243 cm	128 kg
Cephalostat	(76 in.)	(49 in.)	(60 - 96 in.)	(85 in.)	(64 in.)	(96 in.)	(lbs 282)

 $\ ^*\! The\ maximum\ height\ of\ the\ unit\ can\ be\ adjusted\ for\ offices\ with\ limited\ ceiling\ space.$

Planmeca Romexis software

Planmeca Romexis is a complete dental imaging software, including all dental imaging modalities: intraoral, panoramic, cephalometric, 3D imaging, dental tomography as well as intraoral video and still camera imaging. With a complete set of tools for image viewing, enhancement, measurements, and annotations, Planmeca Romexis also improves the diagnostic value of radiographs. Printing, image import and export, and DICOM functionalities are also included.

Planmeca Romexis platform fully integrates digital imaging with the patient's other clinical data. The system provides direct image capture from Planmeca's X-ray equipment, and interfaces with 3rd party devices via TWAIN. Together with Planmeca's X-ray equipment, Planmeca Romexis provides a unique safety feature especially useful for teaching environment: the X-ray image capture is inhibited until the supervisor has approved the student's image capture request.

Planmeca Romexis computer recommendations

	Planmeca Romexis client work station	Planmeca Romexis server	
Processor	1 GHz	2 GHz	
RAM	1 GB	2 GB	
Hard disk space	40 GB	160 GB	
Monitor	1280 x 1024	1024 x 768	
Peripherals	CD R/W or DVD R/W drive	CD R/W or DVD R/W drive	
Backup medium	None necessary	DAT or equivalent	
Operating system	Windows XP Windows 2003 Server Windows Vista Windows 7 Mac OS X	Windows XP Pro Windows 2003 Server Windows Vista Windows 7	
Other	Java platform (Java Virtual Machine 1.6 or later)	Java platform (Java Virtua Machine 1.6 or later)	

The disk space requirements are determined by digital images. Thus the space requirements vary, but a rough estimate is in the order of 1 MB per 2D X-ray image, 7–9 MB per extraoral image, depending on a variety of image specific factors, and 250 MB per 3D image.

It is recommended to use the same computer as an application server and as a database server. If Planmeca Romexis server computer is also used for client activities, the hardware should meet both client and server specifications.

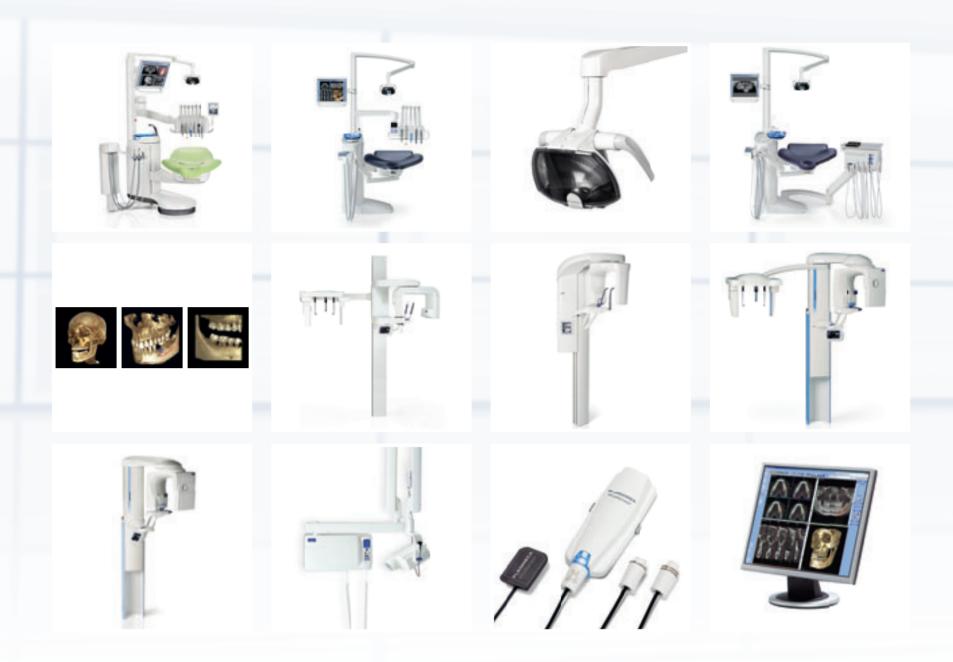
These specifications are recommended minimum requirements. Not meeting them may lead to degraded performance.

DICOM compatibility

- Media Storage saving images into removable DICOM media
- Print printing images on film or paper with a DICOM medical printer
- Storage saving images into DICOM image archive
- Query/ Retrieve importing digital images from DICOM image archive
- Worklist importing a patient list from DICOM patient management
- Storage Commitment confirmation of a successful image storage

Planmeca ProMax

Generator	Constant potential, resonance mode high frequency 80–150 kHz		
X-ray tube	D-054SB-P		
Focal spot size	0.5 x 0.5 mm (IEC 336)		
Total filtration	min. 2.5 mm Al equivalent		
Anode voltage	50-84 kV		
Anode current	0.5-16 mA DC		
Exposure time	Pan	2.7-16 s	
	Ceph	0.2-19 s	
	Tomo	3–24 s / frame	
SID	Pan	500 mm (19 in.)	
	Ceph	163-170 cm (64-67 in.)	
Magnification	Pan	constant 1.2	
	Ceph	1.08-1.13	
CCD pixel size	33 μm		
Image pixel size	66/99/132 μm selectable		
CCD active surface	Pan	9 x 136 mm	
	Ceph	9 x 270 mm	
Resolution (digital)	Pan	max. 9 lp/mm	
	Ceph	max. 5.7 lp/mm	
Image field (digital)	Pan	14 x 30 cm (5.5 x 12 in.)	
	Ceph	24/27 x 18/30 cm (9/10.6 x 7/11.8 in.)	
File size, uncompressed	Pan	4.5-7.7 MB	
(digital)	Ceph	5-12 MB	
Line voltage	100-240 V, 50 or 60 Hz		
Regulation	Automatic, ± 10%		
Line current	8-16 A		
Colour	White (RAL 9016)		



Planmeca Oy designs and manufactures a full line of high technology dental equipment, including dental care units, panoramic and intraoral X-ray units, and digital imaging products. Planmeca Oy, the parent company of the Finnish Planmeca Group, is strongly committed to R&D, and is the largest privately held company in the field.



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