



MAGNETOM Lumina – A BioMatrix System

Data sheet based on *syngo MR XA20*

siemens-healthineers.com/lumina



SIEMENS
Healthineers

Confidence to deliver

As the reimbursement landscape in the healthcare industry shifts from volume to value, the pressure for operational discipline grows on care providers. At the same time the market is becoming increasingly competitive as consumerism in healthcare has gained significant traction.

In this challenging environment, MAGNETOM Altea is the new 1.5T Open Bore system that gives you full confidence to deliver the productivity, reproducibility, and patient satisfaction that you demand. Powered by our premium MR technology, MAGNETOM Altea combines our unique BioMatrix technology, platform and our exclusive Turbo Suite to fundamentally transform care delivery for the better.

With a clear focus on financial sustainability, MAGNETOM Altea also gives you full confidence that your MR asset will deliver the expected returns on investment. Throughout the entire system life cycle, Siemens Healthineers provides you with tailored products and services that guarantee future security.



BioMatrix Technology



Anticipate motion for high-quality results with BioMatrix Sensors.



Adapt to challenging anatomies for reliable exams with BioMatrix Tuners.



Accelerate patient preparation for increased efficiency with BioMatrix Interfaces.

Confidence to deliver at 3T with MAGNETOM Lumina

- New 3T magnet with 70 cm Open Bore and large $55 \times 55 \times 50 \text{ cm}^3$ FoV
- Unique BioMatrix technology automatically adjusts to patient biovariability
- New Turbo Suite acceleration packages enable up to 50%¹⁾ faster clinical routine examinations
- GO technologies powered by artificial intelligence boost patient throughput
- Innovative service offerings including AI-based remote diagnostics secure your system availability
- BioMatrix dockable table streamlines room utilization
- Our 8 unique Dot Engines support highly standardized and reproducible scan procedures for more than 90%¹⁾ of all MRI exam requests
- Unique BioMatrix Tuners adapt to challenging anatomies for excellent homogeneity and fat saturation
- New *syngo* MR XA software platform offers simplified and intuitive system operation with one user interface across your system fleet
- *syngo* Virtual Cockpit provides game-changing remote scanning support for standardized results across your MR system fleet
- Our unique patient-centered coil portfolio powered by BioMatrix and Tim 4G technology puts patients at greater ease

¹⁾ Data on file



DirectRF Technology

General

The unique all digital-in/digital-out design integrates all RF transmit and receive components at the magnet

- Optical RF system improves SNR by reducing electrical noise and increasing signal detection
- Digital-in and digital-out design – optical links between magnet and equipment room to achieve highest RF stability
- Transmit path is integrated in the magnet housing
- Receive path is integrated in the magnet housing
- Dual-Density Signal Transfer technology enables ultra-high density coil designs by integrating key RF components into the local coil.
- Receiver with high dynamic range without adjustments

Transmit Technology

Frequency stability (5 min)	$\pm 2 \times 10^{-10}$	
Frequency control	32 bits (0.015 Hz)	
Phase control	16 bits (0.006 degrees)	
Body coil	Integrated whole-body no tune transmit / receive coil with 32 rungs and 4-port feeding	
	Optimized RF efficiency and signal-to-noise ratio (SNR)	
	Real-time Feedback loop for unmatched RF stabilization	
Transmitter path	Transmit amplitude	16 bit control 25 ns resolution
	Gain stability (after first minute)	< 0.05 dB (1 s)
		< 0.2 dB (5 min)
Transmit amplifier	Extremely compact, water-cooled solid state amplifier, fully integrated at the magnet as part of DirectRF technology	
	Transmit amplifier bandwidth	500 kHz
	Peak power	37.5 kW

RF Receiver Technology

The Total imaging matrix optimizes coil positioning and virtually eliminates coil changing times. It also features Dual-Density Signal Transfer technology in the local receive coils, which enables the high density design. All local coils are no tune coils. Further Tim 4G features are AutoCoilSelect for dynamic, automatic, or interactive selection of the coil elements within the FoV.

Receive path	Maximum number of channels ¹⁾	180
	Number of independent receiver channels that can be used simultaneously in one single scan and in one single FoV, each generating an independent partial image	32
	Quadrature demodulation and filtering	Digital
	Receiver bandwidth	500 Hz – 1 MHz (for each channel)
	Receiver signal resolution	32 bit
	ADC sampling rate	80 MHz
	Dynamic range at coil connector (referred to 1 Hz resolution bandwidth)	164 dB instantaneous at receiver 169 dB with automatic gain control at local coil connector

TimTX TrueForm

TimTX TrueForm includes innovative techniques in the RF excitation hardware as well as application and processing features enabling uniform RF distribution in all body regions. TimTX TrueForm for MAGNETOM Lumina consists of TrueForm excitation, which uses amplitude and phase transmission settings optimized for dedicated body regions. Feeding the 4 ports of the integrated body coil with an optimized weighting yields a homogeneous B1 distribution.

TimTX TrueForm is supported by:

- B1 Filter, which is an adaptive inline image filter that reduces any remnant B1 effects without affecting image contrast.

¹⁾ Channels (coil elements) that can be connected simultaneously

Patient Handling

General

BioMatrix Interfaces, Tim 4G and Dot help increase patient comfort and improve workflow efficiency.

- BioMatrix Interfaces simplify how the user interacts with the MRI scanner. One-touch positioning using the Select&GO touch display with the underlying BioMatrix Body Model accelerates patient positioning – powered by artificial intelligence. Delays due to incorrect positioning can now be avoided. The user simply selects the region or organ to be scanned on the touch display and the patient is automatically and precisely positioned for the respective scan.
- Set up the patient once, no repositioning, no changing of coils needed
- Scan range of 205 cm allows whole-body examinations with full usage of the surface coils, without the need for patient repositioning
- Imaging with optimized high coil element density ultra-light weight surface coils
- Remote table move
- Feet-first examinations for many applications (e.g. cardiac, liver, upper abdomen, pelvis, colonography, body angio) reduces the level of anxiety experienced by highly claustrophobic patients
- DotGO gives the user advice during the positioning process, on the Select&Go displays, – very helpful in the case of ECG, for example

Patient Positioning Aids

Standard set of cushions for comfortable and stable patient positioning together with safety straps.

Table

Comfortable patient table solution which fits the needs for patients up to 250 kg supporting full weight capacity in vertical and horizontal movement. Integrated coils for fast patient preparation and enhanced user comfort. Scan range up to 205 cm. Integrated infusion stand and paper roll holder.

Max. patient weight for vertical and horizontal table movement	250 kg (550 lbs)
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Max. scan range	2050 mm
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Users can adjust the table speed with two predefined speed mode buttons or accelerate continuously with the jog-wheel on the Select&GO Control Centers

Vertical table movement	Range	520–970 mm +50 mm ¹⁾ +13 mm ²⁾
	Speed	32 mm/s; one click table up

Horizontal table movement	Max. range	2810 mm
	Max. speed	200 mm/s
	Repositioning accuracy ³⁾	±0.5 mm

Capable of continuous table movement during scan

¹⁾ Including Heightening Kit, if necessary

²⁾ Depending on the floor conditions

³⁾ Accuracy for repositioning from one direction

Physiological Measurement Unit (PMU) – Wireless Physio Control

Synchronizes the measurement with physiological cycles (triggering to minimize motion artifacts caused by cardiac and respiratory movements). The physiological curves are visualized at the Select&GO Display.

Wireless Sensors	Wireless Vector ECG/respiration ¹⁾ and pulse ¹⁾ sensors for physiologically synchronized imaging, rechargeable battery-powered – for optimized patient handling
Physiological Signals	<ul style="list-style-type: none"> • ECG (3 channels) • Pulse¹⁾ • Respiration¹⁾
	<p>ECG Triggering:</p> <ul style="list-style-type: none"> • Acquisition of multiple slices, e.g. of the heart, at different phases of the cardiac cycle • Excellent image quality by synchronizing data acquisition with cardiac motion
	<p>Peripheral Pulse Triggering¹⁾:</p> <ul style="list-style-type: none"> • Reduces flow artifacts caused by pulsatile blood flow • Excellent image quality by synchronizing data acquisition to the pulsatile blood flow
	<p>Respiratory Triggering:</p> <ul style="list-style-type: none"> • Excellent image quality by synchronizing data acquisition with the respiratory motion
	<p>External Triggering :</p> <ul style="list-style-type: none"> • Interface for trigger input from external sources (e.g. Patient Monitoring System) inside the examination room • Interface for trigger input from external sources¹⁾ (e.g. pulse generator, trigger sources for fMRI) outside the examination room • Optical trigger output for fMRI
	Retrospective gating for ECG, peripheral pulse, and external trigger input

¹⁾ Optional

Patient Communication

Ergonomically designed patient communication unit – may be placed at any convenient location on the workplace table.

- Assistance call via squeeze-bulb for the patient
- Response to the patient's activation of the squeeze-bulb via communication unit
- Table stop
- Sequence stop
- Volume of speaker in control room
- Volume of speaker and headphones in examination room for voice commands
- Connection to external audio system
- Independent volume control of voice and music
- Pneumatic system of ergonomically designed headphones
- Loudspeaker
- Microphone
- Automatic and freely programmable voice commands for breath-hold examinations
- Automatic mute of music to ensure a proper patient communication
- Two-way intercom communication, i.e. the patient and user in the control room can speak and be heard by the other party simultaneously

Noise Reduction Features

General Features

- Acoustically optimized mountings for all components including gradient coil and body coil
- Minimized structure-borne noise transfer to building
- Noise attenuating foam between gradient coil and cover, and between magnet and cover
- Encapsulation of noise producing components

Gradient

- Special epoxy resin and casting technology for damping vibrations
- Reduction of gradient stray field to decrease eddy currents
- Noise-optimization of the MR system with an acoustically soft but mechanically rigid mounting of the gradient coil inside the magnet
- Force compensation for all axes

Magnet

- Encapsulation of the entire magnet
- Efficient floor decoupling for reduction of noise transferred to the building
- Noise-optimized cold head
- Unique design with thermally balanced materials to minimize physical interactions between core components.
- Acoustic decoupling between magnet and cover

Body Coil

Material of supporting tube of the body coil is optimized for low vibration and noise.

- In order to achieve maximum noise reduction, the body coil tube was extended beyond the gradient coil
- Copper structures are slotted and glued to the tube to reduce high frequency noise
- The Body coil is acoustically decoupled by special suspensions

General Sequence Design

Optimized sequence timing.

- Sequences automatically avoid parameter settings that cause the gradient coil to resonate
- No relevant application drawbacks – no increase in sequence parameters, e.g. full performance

“Whisper Mode”

The “Whisper Mode” is a user selectable mode that reduces the max. slew rate and max. amplitude of the gradients and enables very quiet imaging techniques.

Quiet Suite

A family of sequences for extremely quiet neuro and orthopedic imaging, with up to 93% reduction in sound pressure¹⁾:

- QuietX TSE, SE and GRE sequences for T1, T2, DarkFluid, SWI²⁾ and DWI contrasts
- PETRA, a 3D T1-weighted UTE sequence.

Quiet Suite sequences employ optimized gradient waveforms to achieve significant noise reductions and smoother, more tolerable sounds with no loss in image quality or substantial increases in scan times. Optimized pulse sequences for the imaging of the brain, spine and large joints are provided.

¹⁾ Data on file. Results may vary.

²⁾ Prerequisite: SWI license (Optional)

Acquisition Parameters

Acquisition Parameters ¹⁾	AWP	
2D	Number of slices	1 – 128 (steps of 1)
	Slice order	Sequential or interleaved
3D Slabs/Partitions	Number of 3D partitions for matrix 256 × 256	4 – 512
	Number of 3D Slabs (3D volumes)	1 – 128 (steps of 1)
Acquisition Matrix	Frequency encoding (true imaging matrix without interpolation or oversampling)	64 – 1024 (in steps of 2; sequence dependent)
	Phase encoding	32 – 1024 (in steps of 1)
Reduced Matrix	Phase resolution (rectangular matrix)	32×n ... n×n (steps of 1)
	Slice resolution (3D volumes)	50–100 %
Partial Fourier Imaging	Phase partial Fourier (Half Fourier)	4/8–1 (steps of 1/8)
	Read partial Fourier (asymmetric echo)	Selectable
	Slice partial Fourier (3D volumes)	5/8–1 (steps of 1/8)
Rectangular Field of View	In phase encoding direction	3–100%
Averaging	Number of data acquisitions	1–32 (steps of 1)
	Averaging mode	Short term, Long term (LOTA)
Oversampling	Read oversampling	100% standard
	Phase oversampling	0–100% (steps of 12.5%)
	Slice oversampling (3D volumes)	0–100% (steps of 12.5%)
Interpolation	In plane interpolation	Selectable (factor of 2)
	3D interpolation (3D volumes)	Selectable (up to factor of 2)
Serial Acquisitions	Number of repeated scans	With constant delay times 1–4096
		With different delay times 1–65
Swap	Exchange of read-out and phase-encoding direction	Yes
Slice Orientation	Slice orientation for 2D and 3D scans	Transverse, sagittal, coronal, oblique, double oblique (steps of 0.1°)
	Multi-slice multi-angle (simultaneously)	Yes

¹⁾ Combinations of the parameters stated are not always possible; some parameters may depend on optional application packages

Standard Acquisition and Reconstruction Techniques

Standard techniques

- True Inversion Recovery to obtain strong T1-weighted contrast
- Dark Blood inversion recovery technique that nulls fluid blood signal
- Saturation Recovery for 2D TurboFLASH, gradient echo, and T1-weighted 3D TurboFLASH with short scan time (e.g. MPAGE)
- Freely adjustable receiver bandwidth, permitting studies with increased signal-to-noise ratio
- Freely adjustable flip angle. Optimized RF pulses for image contrast enhancement and increased signal-to-noise ratio
- MTC (Magnetization Transfer Contrast). Off-resonance RF pulses to suppress signal from certain tissues, thus enhancing the contrast. Used e.g. in MRA
- Analysis Tools for addition, subtraction, division, multiplication, calculations of ADC maps and b-value images
- Image Filter
- 3D post-processing MPR, MIP, MinIP, VRT
- Data storage of images on CD/DVD with DICOM viewer
- Export of cine AVI files on external media
- Selectable centric elliptical phase reordering via the user interface
- Inversion Recovery to nullify the signal of fat, fluid or any other tissue
- Multiple Direction Diffusion Weighting (MDDW) – diffusion tensor imaging measurements can be done with multiple diffusion-weightings and up to 12 directions for generating data sets for diffusion tensor imaging.
- WARP – 2D TSE sequence combining optimized high-bandwidth pulse sequences and View Angle Tilting (VAT), tailored to reduce susceptibility artifacts caused by orthopedic MR Conditional¹⁾ implants.
- Advanced WARP – 2D TSE based Slice Encoding for Metal Artifact Correction (SEMAC) technique for the reduction of through-plane distortions from large MR Conditional¹⁾ implants.

Sequences

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| Spin Echo family of sequences | <ul style="list-style-type: none"> • Spin Echo (SE) – Single, Double, and Multi Echo (up to 32 echoes); Inversion Recovery (IR) • 2D/3D Turbo Spin Echo (TSE) – Restore technique for shorter TR times while maintaining excellent T2 contrast; TurboIR: Inversion Recovery for STIR, DarkFluid T1 and T2, TrueIR • 2D/3D HASTE (Half-Fourier Acquisition with single-shot Turbo Spin Echo) – Inversion Recovery for STIR and DarkFluid contrast • SPACE for 3D imaging with high isotropic resolution with T1, T2, PD, and DarkFluid Contrast • 2D Optimized high bandwidth TSE (T1, T2, and PD weighted and STIR) with WARP for the reduction of susceptibility artifacts caused by MR Conditional¹⁾ metal implants. |
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¹⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

Sequences (Continued)**Gradient Echo family of sequences**

- 2D/3D FLASH (spoiled GRE) – dual echo for in-/opposed phase imaging 3D VIBE (Volume Interpolated Breath-hold Examination) – quick fat saturation; double echo for in-phase/opposed phase 3D imaging; DynaVIBE: Inline 3D elastic motion correction for multi phase data sets of the abdomen; Inline Breast Evaluation
- 2D/3D MEDIC (Multi Echo Data Image Combination) for high resolution T2 weighted orthopedic imaging and excellent contrast
- 2D/3D TurboFLASH – 3D MPRAGE; single-shot T1 weighted imaging e.g. for abdominal imaging during free breathing
- 3D GRE for field mapping
- 2D/3D FISP (Fast Imaging with Steady State Precession)
- 2D/3D PSIF – PSIF Diffusion
- Echo Planar Imaging (EPI) – diffusion-weighted; single-shot SE and FID e.g. for BOLD imaging and perfusion-weighted imaging; 2D/3D Segmented EPI (SE and FID)
- RESOLVE (Readout Segmentation Of Long Variable Echo-trains) delivers high-resolution, low-distortion diffusion-weighted imaging (DWI) for accurate depiction of lesions.
- ce-MRA sequence with Inline subtraction and Inline MIP
- 2D/3D Time-of-Flight (ToF) Angiography – single slab and multi slab; triggered and segmented
- 2D/3D Phase Contrast Angiography
- BEAT Tool – TrueFISP segmented; 2D FLASH segmented; Magnetization-prepared TrueFISP (IR, SR, FS); IR TI scout; Retrogating

Turbo Gradient Spin Echo (TGSE)

- Hybrid Turbo Spin Echo/Gradient Echo used primarily for T2-weighted imaging
- Shorter measurement time
 - Decreased RF power deposition
 - High-resolution imaging of brain

Standard Fat/Water Imaging

- Fat and Water Saturation. Additional frequency selective RF pulses used to suppress bright signal from fatty tissue. Two selectable modes: weak, strong
- Quick FatSat
- SPAIR: robust fat suppression for body and thorax imaging using a frequency selective inversion pulse
- Fat/Water Excitation. Spectral selective RF pulses for exclusive fat/water excitation
- Dixon technique for fat and water separation – available on VIBE and Turbo Spin Echo sequences

Standard Flow Artifact Reduction

- LOTA (Long Term Data Averaging) technique to reduce motion and flow artifact
- Pre-saturation technique. RF saturation pulses to suppress flow and motion artifacts
- Tracking SAT bands maintain constant saturation of venous and/or arterial blood flow, e.g. for 2D/3D sequential MRA
- TONE (Tilted Optimized Non-saturating Excitation). Variable excitation flip angle to compensate inflow saturation effects in 3D MRA. TONE pulse selectable depending on the desired flow direction and speed
- GMR (Gradient Motion Rephasing). Sequences with additional bipolar gradient pulses, permitting effective reduction of flow artifacts

Standard Scan Time Reduction

Elliptical scanning reduces scan time for 3D imaging

iPAT – integrated Parallel Acquisition Technique high-performance and flexible Parallel Imaging with integrated AutoCalibration

Two algorithms – mSENSE and GRAPPA – for maximum quality for all applications

iPAT is compatible with all relevant sequence techniques (e.g. SE, TSE, SPACE, MEDIC, TIRM DarkFluid, HASTE, EPI, MPRAGE, 3D VIBE, FLASH, TrueFISP, TurboFLASH, FLASH Phase Contrast, etc)

iPAT is compatible with all multi-element coils, as well as coil combinations

T-PAT with mSENSE and GRAPPA for advanced parallel imaging provides fast high-resolution dynamic imaging

3 different calibration techniques are supported:

- AutoCalibration with an integrated reference (calibration) scan to additionally save on total scan time (RefScan: Integrated)
- TurboCalibration uses a separate measurement directly before the actual measurement (RefScan: External). Images measured using TurboCalibration are characterized by reduced PAT artifacts.
- T-PAT and PAT averaging for motion artifact suppression using Self-Calibration

iPAT²

More slices and coverage in the same breath-hold by applying PAT in 2 directions simultaneously (phase-encoding direction and 3D direction for 3D sequences)

The effective PAT factor can be maximized, and PAT applications are extended. Typical clinical applications are MR Angiography or ultrafast isotropic T1-weighted 3D imaging of the head

The iPAT² sequence technique named CAIPIRINHA (Controlled Aliasing In Parallel Imaging Results IN Higher Acceleration) is available. It can be applied to volumetric 3D imaging e.g. in the abdominal region

Standard Motion Correction

BLADE	<ul style="list-style-type: none"> Improves image quality by minimizing and correcting for the effects of motion during an MR sequence acquisition. e.g. head, spine, orthopedic imaging and the abdomen Motion insensitive Turbo Spin Echo sequence Can be used with all coils and in all planes Supports T2-weighted, T1-weighted, STIR, and DarkFluid pulse sequences Simultaneous in-plane motion correction for arbitrary slice orientations Versatile sequence e.g. supporting iPAT with GRAPPA, Restore pulses and supports respiratory triggered imaging of the abdomen using 2D PACE
1D PACE (Prospective Acquisition CorrEction)	<ul style="list-style-type: none"> Quick and easy acquisition control, e.g. for cardiac imaging Allows examination of patients with free breathing
2D PACE Precise Motion Correction	<ul style="list-style-type: none"> Detects respiratory motion of the heart, liver, etc. for free breathing high resolution 2D and 3D examinations Significantly increased image quality Improved tissue imaging in moving organs and precise gating for multi-breath-hold studies Data acquisition during free breathing for high resolution 2D and 3D examinations Eliminates the need for respiratory belt PAT averaging for motion artifact suppression using Self-Calibration

Standard Susceptibility Artifact Reduction

WARP & Advanced WARP	<ul style="list-style-type: none"> WARP – 2D TSE sequence combining optimized high-bandwidth pulse sequences and View Angle Tilting (VAT), tailored to reduce susceptibility artifacts caused by orthopedic MR Conditional¹⁾ metal implants. This helps in evaluation of soft tissue in proximity of the implant. Advanced WARP enables the reduction of gross artifacts (i.e. through-plane artifacts) caused by large MR Conditional¹⁾ implants. It contains the 2D TSE based SEMAC technique and is especially useful in the case of hip and knee joint replacements. Available pulse sequences include T1-weighted, T2-weighted, proton density and STIR contrast.
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Standard Workflow Enhancements

AutoCoilDetect	Detects the position and orientation of coils automatically. Shows coils in the user interface right within the graphical slice positioning.
AutoCoilSelect	Automatic detection and selection of all coil elements in the active Field-of-View.
syngo Scan Assistant	Shows parameter constraints and provides possible solutions.
scan@center	Automated movement of table so that the scan is performed in the magnet isocenter – can be activated or deactivated by the user. Additionally the “LocalRange” Positioning Mode can be used for regions like e.g. the Heart or the Brain, using a tolerance with a fix table position. This increases the scan efficiency by reducing Adjustment time. For support of the interventional workflow a dedicated positioning strategy is available which keeps the table position fixed regardless of the position of the scan field.
AutoVoiceCommands	These multi-language automatic voice commands during the scan assist the user in providing optimal timing of breathing, scanning, and contrast media injection.
Phoenix and PhoenixZIP	Exchange of pulse sequences data (e.g. via Internet) by drag & drop of clinical images. PhoenixZIP allows transfer of whole measurement programs.
Online Help Functions	Context sensitive and quick resource for questions about software operation or MR physics.
DirectConnect	Cable-less direct connection for Head / Neck 16, BioMatrix Head / Neck 20, BioMatrix Head/Neck 64 ¹⁾ , BioMatrix Spine 24, BioMatrix Spine 32, BioMatrix Spine 72, Pediatric 16 ^{1), 2)} , Foot/Ankle 16 ¹⁾
SlideConnect®	SlideConnect® cable connectors can be securely plugged-in with one hand only.

¹⁾ Optional

²⁾ MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures.

Standard Workflow Enhancements (Continued)**Recon&GO technology –
Zero-click post-processing**

Recon&GO technology encompasses a wide range of Inline functionalities to help streamline the clinical workflow by automating post-processing steps before image viewing.

Recon&GO provides Ready-to-Read results with zero clicks, even for advanced cases. Examples:

- Inline Composing: automatic composing of multiple adjacent coronal or sagittal images for anatomical or angiographic examinations.
- Inline Subtraction: Automatic subtraction of images, e.g. pre- and post-contrast enhancements
- Inline calculation of ADC and extrapolated b-values
- Inline MIP on-the-fly, e.g. MR Angiography with automatic image subtraction and following MIP in three orthogonal planes
- Prospective motion correction (1D and 2D PACE) on-the-fly
- Automatic perfusion and diffusion maps
- Automatic on-the-fly calculation of standard deviation, for better differentiation of arterial and venous phases
- Automatic launch of post-processing applications
- Inline Display: automatically shows reconstructed images. It offers immediate access to the results and opens automatically for e.g. interactive real-time scanning or Care Bolus examinations
- Inline Movie: automatically starts the cine image display

TimCT FastView

TimCT FastView is the “one go” localizer for the whole-body or large body regions such as the whole spine or the whole abdomen. It acquires the complete extended Field of View in one volume with isotropic resolution. Transverse, coronal and sagittal reformats of the volume are calculated in-line and displayed for planning subsequent exams.

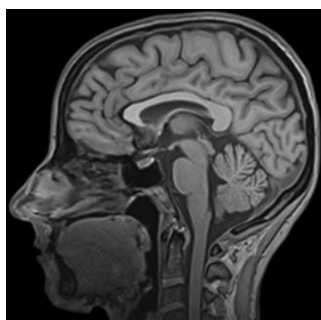
- Inline reconstruction of the localizer images during the scan
- Localizing images in three planes over the maximum Field of View available for subsequent planning in all orientations
- TimCT FastView runs without laser light positioning to further streamline the workflow for several indications

Tim Application Suite

The Tim Application Suite offers a complete range of clinically optimized examinations for all regions. The Tim Application Suite – allowing excellent head-to-toe imaging – is provided standard on MAGNETOM Lumina – A BioMatrix System.

- Neuro Suite
- Angio Suite
- Cardiac Suite
- Body Suite
- Onco Suite
- Ortho Suite
- Breast Suite
- Scientific Suite
- Pediatric Suite¹⁾

Neuro Suite



Comprehensive head and spine examinations can be performed with dedicated programs. High resolution pulse sequences and motion-insensitive pulse sequences for patients which have difficulties to lay still are provided. The Neuro Suite also includes pulse sequences for diffusion imaging, perfusion imaging, and fMRI.

General features

- Fast 2D imaging with TSE and GRE pulse sequences for high-resolution imaging
- BLADE for motion-insensitive TSE imaging
- EPI pulse sequences for diffusion imaging, perfusion imaging, and fMRI for advanced neuro applications. Diffusion-weighted imaging is possible with up to 16 b-values in the orthogonal directions. For reduced distortions and homogeneous signal intensity even in the presence of challenging susceptibility interfaces and at station boundaries, SliceAdjust (slice-by-slice adjustments) can be selected.
- 3D TOF for non-contrast-enhanced angiography
- 3D isotropic resolution volume imaging using T1 3D MPRAGE/3D FLASH, SPACE DarkFluid, T1 SPACE, and T2 SPACE pulse sequences
- High-resolution T2 SPACE pulse sequence optimized for inner ear examinations
- Double Inversion Recovery 3D pulse sequences (DIR SPACE) with two user-selectable inversion pulses for the simultaneous suppression of e.g. cerebrospinal fluid and white matter

¹⁾ MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures.

Neuro Suite (Continued)

General features

- TSE_MDME for acquisition of multi-contrast data with multiple delay times (MD) after preparation pulse and multiple echo times (ME). Magnitude and phase images suitable for synthetic contrast generation and myelin mapping are generated.
- MP2RAGE (Magnetization Prepared 2 Rapid Acquisition Gradient Echoes) provides homogeneous tissue contrast for segmentation and applications such as voxel-based morphometry. In combination with MapIt¹⁾, it also provides T1 mapping functionality.
- Whole-spine pulse sequences in multiple steps with software controlled table movement
- 2D and 3D MEDIC pulse sequences for T2-weighted imaging, particularly for C-spine examinations in axial orientation where reproducibility is difficult due to CSF pulsations and blood flow artifacts
- RESOLVE (Readout Segmentation Of Long Variable Echo-trains) delivers high-resolution, low-distortion diffusion-weighted imaging (DWI) for accurate depiction of lesions
- BioMatrix's CoilShim helps reduce patient-induced strongly localized B0 inhomogeneities as may arise in the neck region.
- 3D Myelo with 3D HASTE for anatomical details
- Dynamic sacro-iliac joint imaging after contrast administration using a fast T1-weighted FLASH 2D sequence
- PSIF sequence for diffusion-weighted imaging of the spine
- Precision filter for high spatial accuracy, e.g. for neuro intra-operative imaging and stereotactic planning
- 3D CISS (Constructive Interference in Steady State) for excellent visualization of fine structures such as cranial nerves. High resolution imaging of inner ear.
- TGSE sequence used primarily for T2-weighted imaging for shorter measurement time, decreased RF power deposition, and high resolution imaging of the brain
- AutoAlign Head LS providing a fast, easy, standardized, and reproducible patient scanning supporting reading by delivering a higher and more standardized image quality
- GOBrain^{2) 3)} is a set of optimized protocols for diagnostic neuroimaging developed by the board-certified neuroradiologists at Massachusetts General Hospital, USA. These protocols including T1 sag GRE, T2 tra TSE and TSE FLAIR, tra EPI Diffusion and T2* tra EPI-GRE aim to achieve a diagnostic brain examination and are optimized for short acquisition times.
- GOBrain+^{2) 3)} is based on the GOBrain protocol and additionally includes contrast agent injection and postcontrast imaging.

¹⁾ Optional

²⁾ The protocol is only available for download on MAGNETOM World: <https://www.siemens-healthineers.com/magnetic-resonance-imaging/magnetom-world/clinical-corner/protocols/neurology-neurography/gobrain-protocols>

³⁾ Prerequisite: Head/Neck coil with at least 20 channels

Angio Suite



Excellent MR Angiography can be performed to visualize arteries and veins.

- 3D MRA pulse sequences for carotid arteries, abdominal arteries, and peripheral arteries, with short TR and TE. The strong gradients make it possible to separate the arterial phase from the venous phase
- Dynamic MRA for 3D imaging over time
- Signal from Respiratory Sensors can be selected to actively trigger MR image acquisition, e.g. with NATIVE¹⁾

Contrast-enhanced MRA

- 3D contrast-enhanced MRA pulse sequences for dynamic, carotid, abdominal, and peripheral arteries, with the shortest TR and TE. The strong gradients make it possible to separate the arterial phase from the venous phase.
- TestBolus workflow for optimal bolus timing and excellent image quality
- CareBolus functionality for accurate determination of the bolus arrival time and the "Stop and Continue" of the 3D ce-MRA pulse sequence after the 2D bolus control scan
- Dynamic ce-MRA for 3D imaging over time

Non-contrast MRA and venography

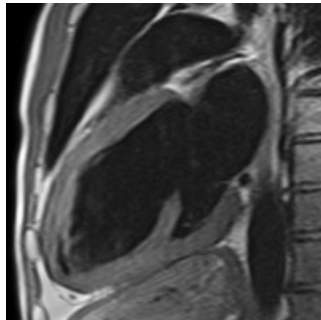
- Time-of-Flight (ToF) pulse sequences for MRA for the Circle of Willis, carotids and neck vessels; can be adapted for venography
- Triggered 2D ToF sequences for non-contrast MRA in the legs
- MR venography and arteriography with Phase-Contrast
- TONE (Tilted optimized non-saturating excitation) techniques for improved Contrast-to-Noise Ratio (CNR)

In-line image processing tools

- Inline MIP for immediate results
- Inline subtraction of pre- and post-contrast measurements
- Inline standard deviation maps of Phase-Contrast measurements for delineation of arteries and veins

¹⁾ Optional

Cardiac Suite



The cardiac suite covers comprehensive 2D routine cardiac applications, ranging from morphology and ventricular function to tissue characterization. It moreover features BEAT 2D in conjunction with iPAT, T-PAT, and ePAT techniques.

Cardiac views	<ul style="list-style-type: none"> • Fast acquisition of the basic cardiac orientations for further examination planning • Cardiac scouting provides users with a step-by-step procedure for the visualization and planning of typical cardiac views, e.g. based on TrueFISP or Dark Blood TurboFLASH: short-axis, 4-chamber, and 2-chamber views
BEAT	<ul style="list-style-type: none"> • Unique tool for fast and easy cardiovascular MR imaging • E.g. 1 click change from FLASH to TrueFISP for easy contrast optimization • 1-click to switch arrhythmia rejection on/off • 1-click change from Cartesian to radial sampling to increase effective image resolution (e.g. in pediatric patients)¹⁾ and avoid folding artifacts in large patients
Visualization of structural cardiovascular pathologies with CMR – BEAT	<ul style="list-style-type: none"> • Breath-hold and free-breathing techniques for strong contrast between the blood and vascular structures. Dark Blood TSE and HASTE imaging are available for the structural evaluation of the cardiothoracic anatomy, including vessels or heart valves. Cine techniques (FLASH & TrueFISP) for high-resolution valve evaluation. • Multiple contrasts such as T1- and T2-weighted imaging • Dark-blood TSE with motion compensation for high-quality vessel wall imaging in small or large vessels

¹⁾ MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures.

Cardiac Suite (Continued)

Tools for rapid evaluation of left or right ventricular function:

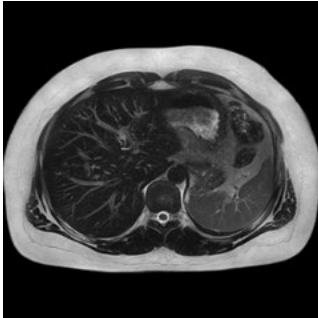
- Acquisition of a stack of short-axis slices (standard: advanced segmented TrueFISP)
- Automatic adjustment of the acquisition window to the current heart rate
- Use of the Inline ECG for graphical ECG triggering setup
- Retrospective gating with cine sequences (TrueFISP, FLASH)
- Pulse sequences for whole-heart coverage
- Real-time imaging in case the patient is not able to hold his breath

4D imaging and tissue characterization with BEAT Pulse sequences for high-contrast and high-resolution tissue characterization

- Pulse sequences for stress and rest imaging with TurboFLASH contrast support the acquisition of multiple slices with high resolution and arbitrarily adjustable slice orientation for each slice
- T-PAT and ePAT with mSENSE and GRAPPA for advanced parallel imaging provides fast high-resolution dynamic imaging
- Segmented IR TrueFISP/FLASH with TI scout for optimization of tissue contrast
- Advanced tissue characterization with 2D phase-sensitive IR (PSIR) pulse sequences with TrueFISP and FLASH contrast. Magnitude and phase-sensitive images with one acquisition.
- Simple: no adjustment of inversion time (TI) necessary with PSIR technique
- Motion correction/averaging of multiple measurements with iPAT or tPAT accelerated single-shot TrueFISP or GRE images of the heart, for free-breathing acquisition

¹⁾ Optional

Body Suite



The Body Suite is dedicated to clinical body applications. Ultra-fast high resolution 2D and 3D pulse sequences are provided for abdomen, pelvis, MR Colonography, MRCP, dynamic kidney, and MR Urography applications. 2D PACE technique makes body imaging easy, allowing multi-breath-hold examinations as well as free breathing during the scans. Motion artifacts are greatly reduced with 2D PACE Inline technology.

This package includes:

- Free breathing 2D PACE applications with 2D HASTE (RESTORE) and 2D/3D TSE – it is possible to use a phase navigator, which measures respiratory induced off-resonance effects. The positioning can be done automatically for most pulse sequences.
- Optimized fast single-shot HASTE pulse sequences and high-resolution 3D pulse sequences based on SPACE and TSE for MRCP and MR Urography examinations
- Diffusion-weighted (single-shot EPI) imaging for abdomen and whole-body exams. For reduced distortions and homogeneous signal intensity even in the presence of challenging susceptibility interfaces and at station boundaries, SliceAdjust (slice-by-slice adjustments) can be selected.
- In DWI pulse sequences with multiple b-values, individual numbers of averages may be specified per b-value. Inline calculation of ADC maps, exponential ADC maps and inverted b-value images can be selected. Inline calculation (extrapolation) of high b-values (up to $b=5000 \text{ s/mm}^2$) is possible.
- Signal from Respiratory Sensors can be selected to actively trigger MR image acquisition.

Body Suite (Continued)**Abdomen****2D:**

- T1 (FLASH) breath-hold scans with and without FatSat (SPAIR, Quick FatSat, in-/opp-phase)
- T2 (HASTE, TSE/BLADE, EPI) breath-hold scans with and without FatSat (SPAIR, FatSat, STIR)
- T1 (TFL) triggered scans (2D PACE free breathing) in-/opp-phase
- T2 (HASTE, TSE/BLADE, EPI) triggered scans (2D PACE free breathing) with and without FatSat (SPAIR, FatSat, STIR) as well as HASTE- and TSE-multi-echo
- Optimized fast single-shot HASTE pulse sequences and high-resolution pulse sequences based on SPACE and TSE for MRCP and MR urography examinations
- GOLiver¹⁾²⁾ is a fast and semi-automated MRI workflow for abdominal MR exams in approximately 12 minutes total examination time. The set of protocols including T2, DWI, T1 in/opp, and dynamic T1 protocols has been clinically validated in a number of clinical conditions, i.e. HCC, fatty liver disease, hemangioma, liver metastases, and others by Changhai University, Shanghai, China. Machine intelligence assists in efficiently planning and performing the scans with automatic positioning and adaptation of scan parameters.

3D:

- Dixon (VIBE 2pt-Dixon) breath-hold scans, following contrasts can be obtained: in-phase, opposed phase, fat and water image
- Dynamic VIBE (SPAIR, Dixon and Quick-FatSat) pulse sequences with Inline motion correction for visualization of focal lesions with high spatial and temporal resolution
- Colonography dark lumen with T1-weighted VIBE
- Diffusion-weighted imaging of the prostate, cervix, rectum and other organs with multiple b-values. Inline calculation of ADC maps, exponential ADC maps and inverted b-value images can be selected. Inline calculation (extrapolation) of high b-values (up to $b=5000 \text{ s/mm}^2$) is possible.

¹⁾ The protocol is only available for download on MAGNETOM World: <https://www.siemens-healthineers.com/magnetic-resonance-imaging/magnetom-world/clinical-corner/protocols/body-pelvis/goliver-protocols>

²⁾ Prerequisite: Optional Abdomen Dot Engine

Body Suite *(Continued)*

Pelvis	<ul style="list-style-type: none"> • High-resolution T1, T2 pelvic imaging • Isotropic T2 SPACE 3D pulse sequences • Dynamic volume examinations with 3D VIBE
Thorax	<ul style="list-style-type: none"> • High-resolution T1, T2 thorax imaging • Motion-insensitive pulse sequences (BLADE, HASTE) • TrueFISP pulse sequences for imaging of respiratory mechanics • Dynamic imaging with TWIST¹⁾, TWIST-VIBE¹⁾ • Non-contrast-enhanced vessel visualization with SPACE pulse sequences • STIR pulse sequences for the evaluation of lymph nodes • Diffusion-weighted imaging with single-shot EPI

¹⁾ Optional

Onco Suite



MR imaging provides excellent soft-tissue differentiation, multi-planar capabilities, and the possibility of selectively suppressing specific tissue, e.g. fat or water. The Onco Suite features a collection of pulse sequences and evaluation tools that may be used for a detailed assessment of a variety of oncological conditions.

b-value images can be selected. Inline calculation (extrapolation) of high b-values (up to $b = 5000 \text{ s/mm}^2$) is possible. For reduced distortions and homogeneous signal intensity even in the presence of challenging susceptibility interfaces and at station boundaries, SliceAdjust (slice-by-slice adjustments) can be selected.

General features

- STIR TSE, HASTE, and FLASH in-phase and opposed-phase pulse sequences for highly sensitive visualization of focal lesions
- Dynamic imaging pulse sequences for assessment of the kinetic behavior of tissue
- Quantitative evaluation and fast analysis of the data with colorized Wash-in, Wash-out, Time-To-Peak, Positive-Enhancement-Integral, MIP-time and combination maps with Inline technology
- Display and analysis of the temporal behavior in selected regions of interest with the included MeanCurve postprocessing application. This includes the capability of using additional datasets as a guide for defining regions of interest even faster and easier than before.
- Diffusion-weighted imaging using single shot EPI with multiple b-values.
- In pulse sequences with multiple b-values, individual numbers of averages may be specified per b-value. Inline calculation of ADC maps, exponential ADC maps and inverted b-value images can be selected. Inline calculation (extrapolation) of high b-values (up to $b = 5000 \text{ s/mm}^2$) is possible. For reduced distortions and homogeneous signal intensity even in the presence of challenging susceptibility interfaces and at station boundaries, SliceAdjust (slice-by-slice adjustments) can be selected.
- RESOLVE: high-resolution, low-distortion diffusion-weighted imaging (DWI). In pulse sequences with multiple b-values, individual numbers of averages may be specified per b-value. Inline calculation of ADC maps, exponential ADC maps and inverted b-value images can be selected. Inline calculation (extrapolation) of high b-values (up to $b=5000 \text{ s/mm}^2$) is possible.

Onco Suite (Continued)

Prostate pulse sequences

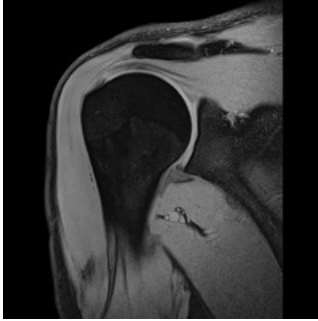
- Dedicated prostate pulse sequences for a variety of clinical scenarios
- T1-weighted 3D VIBE pulse sequences with high temporal resolution (VIBE, TWIST¹⁾ and TWIST-VIBE¹⁾) allow time course evaluation
- Prostate DWI imaging with single-shot EPI and RESOLVE
- Prostate spectroscopy (3D CSI¹⁾ volume scan) with up to 8 sat bands (suppression of water and fat signal)

Whole-Body imaging

- TSE STIR pulse sequences for head-to-toe and head-to-pelvis imaging
- Dedicated pulse sequences for focus regions head, neck, thorax, abdomen and pelvis
- Diffusion-weighted imaging with single-shot EPI including SliceAdjust

¹⁾ Optional

Ortho Suite



The Ortho Suite is a comprehensive collection of pulse sequences for joint imaging including the spine.

General features

- 2D TSE pulse sequences for PD, T1, and T2-weighted contrast with high in-plane resolution and thin slices
- 3D MEDIC, 3D TrueFISP pulse sequences with water excitation for T2-weighted imaging with high in-plane resolution and thin slices
- High resolution 3D VIBE pulse sequences for MR Arthrography (knee, shoulder, and hip)
- 3D MEDIC, 3D TrueFISP, 3D VIBE pulse sequences with Water Excitation having high isotropic resolution optimized for 3D post-processing
- T1 and PD SPACE 3D imaging with high isotropic resolution optimized for post-processing. The SPACE Sequence is also compatible with CAIPIRINHA acceleration technique.
- Single-step, and multi-step whole-spine pulse sequences
- Excellent fat suppression in off-center positions, e.g. in the shoulder due to high magnet homogeneity
- Dynamic TMJ pulse sequence (different joint positions)
- Dynamic ilio-sacral joint protocol for contrast dynamics
- Multi Echo SE sequence with up to 32 echoes for T2 mapping
- High resolution 3D DESS (Double Echo Steady State): T2/T1-weighted imaging for excellent fluid-cartilage differentiation
- 2-point Dixon technique for fat and water separation – Turbo Spin Echo sequence

Ortho Suite (Continued)

- WARP – 2D TSE sequence combining optimized high-bandwidth pulse sequences and View Angle Tilting (VAT), tailored to reduce susceptibility artifacts caused by orthopedic MR Conditional¹⁾ implants. This helps in evaluation of soft tissue in proximity of the implants. Available pulse sequences include T1-weighted, T2-weighted, proton density and STIR contrast.
- Advanced WARP enables the reduction of gross artifacts (i.e. through-plane artifacts) caused by large MR Conditional¹⁾ implants. It contains the 2D TSE based SEMAC technique and is especially useful in the case of hip and knee joint replacements. Available pulse sequences include T1-weighted, proton density, and T2 TSE STIR contrast.
- Compressed Sensing SEMAC²⁾ – Together with Compressed Sensing (CS), significant shorter acquisition time can be achieved and makes advanced WARP clinically viable. Compressed Sensing applies 8-fold undersampling of k-space in combination with an iterative reconstruction algorithm. As a result, images with very comparable diagnostic quality can now be performed in less than 6 minutes instead of 12 minutes.
- GOKnee2D³⁾⁴⁾ is a fast and semi-automated MRI workflow for knee MR exams in approximately 10 minutes total examination time. Established, standard TSE pulse sequences with 2-fold parallel imaging acceleration sequence types are combined with the features of the Knee Dot Engine (i.e. Auto-Coverage and AutoAlign). The set of protocols including PD sag, T2 fs sag, T1 cor, T2 fs cor and PD fs tra sequences has been clinically validated in a number of clinical conditions, i.e. Meniscal tear, cartilage defects, fractures and others by John Hopkins University School of Medicine, Baltimore, MD, USA.
- GOKnee2D^{SMS 3)4)5)} is a fast and semi-automated MRI workflow for knee MR exams in approximately 5 minutes total examination time. Established, standard TSE pulse sequences with 4-fold Simultaneous Multislice (SMS) acceleration sequence types are combined with the features of the Knee Dot Engine (i.g. Auto-Coverage and AutoAlign). The set of protocols including PD sag, T2 fs sag, T1 cor, T2 fs cor and PD fs tra sequences has been clinically validated in a number of clinical conditions, i.e. meniscal tear, cartilage defects, fractures and others by John Hopkins University School of Medicine, Baltimore, MD, USA.

¹⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

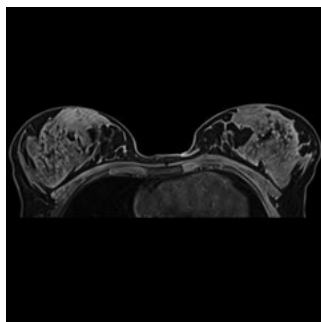
²⁾ Optional

³⁾ The protocol is only available for download on MAGNETOM World: <https://www.siemens-healthineers.com/magnetic-resonance-imaging/magnetom-world/clinical-corner/protocols>

⁴⁾ Prerequisite: Tx/Rx Knee coil

⁵⁾ Prerequisite: SMS license

Breast Suite



MR imaging provides excellent tissue contrast that may be useful in the evaluation of the breasts. Extremely high spatial and temporal resolution can be achieved in very short acquisition times by using iPAT with GRAPPA and CAIPIRINHA. Customized pulse sequences (e.g. with fat saturation or water excitation or silicone excitation), as well as flexible multiplanar visualization allow a fast, simple and reproducible evaluation of MR breast examinations.

General features

This package includes:

- High-resolution 2D pulse sequences for morphology evaluation
- High-resolution 3D pulse sequences covering both breasts simultaneously
- Pulse sequences to support interventions (fine needle and vacuum biopsies, wire localization)
- Pulse sequences for evaluating breasts with silicone implants
- Automatic and manual frequency adjustment, taking into account the silicone signal
- Detection of the silicone signal either to suppress the silicone signal, if the surrounding tissue is to be evaluated, or to suppress the tissue signal in order to detect an implant leakage
- SPAIR – robust fat sat (robust fat suppression using an adiabatic frequency selective inversion pulse)
- Dixon – 2-point Dixon with 3D VIBE. The following contrasts can be obtained: in-phase, opposed phase, fat and water image.
- iPAT with GRAPPA for maximum resolution in short time
- iPAT² with CAIPIRINHA that allows state-of-the-art sagittal breast imaging and further improvement of the temporal resolution in dynamic scans while maintaining spatial resolution
- Inline subtraction and MIP display
- Offline subtraction, MPR and MIP display
- Diffusion-weighted imaging with single-shot EPI for breast exams.
- In pulse sequences with multiple b-values individual numbers of averages may be specified per b-value.
- RESOLVE: Diffusion-weighted, readout-segmented (multi shot) EPI sequence for high-resolution susceptibility-insensitive DWI of the breast

Breast Suite *(Continued)*

RADIANT	Ultrasound-like reconstruction around the nipple
Siemens Technique: VIEWS (Volume Imaging with Enhanced Water Signal)	<ul style="list-style-type: none"> • Bilateral – both breasts are examined simultaneously • Axial – for visualizing the milk ducts • Fat-saturated or water-excited – fat complicates clinical evaluation and is suppressed • Near-isotropic 3D measurement – using the same voxel size in all three directions for reconstruction in any slice direction • Submillimeter voxel size – highest resolution for precise evaluation

Turbo Suite Essential

Turbo Suite Essential comprises established acceleration techniques to maximize productivity for all contrasts, orientations and all routine imaging applications from head-to-toe.

General features	<ul style="list-style-type: none"> • iPAT and iPAT² • T-PAT (temporal iPAT) • CAIPIRINHA for advanced iPAT² supporting SPACE and VIBE sequences (see separate sections for details)
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Turbo Suite Excelerate¹⁾

Turbo Suite Excelerate comprises access to cutting edge acceleration techniques such as Simultaneous Multi-Slice and Compressed Sensing for static 2D and static 3D imaging applications in Neuro, MSK and Body MRI.

General features	<ul style="list-style-type: none"> • SMS for TSE and TSE DIXON • SMS for DWI and BOLD • SMS for RESOLVE • Compressed Sensing SPACE • Compressed Sensing ToF • Compressed Sensing SEMAC²⁾ <p>(see separate sections for details)</p>
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¹⁾ Optional

²⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

Scientific Suite

The Scientific Suite supports scientific users by providing easy access to application-specific data for further processing and advanced image calculus.

General features

- Support of USB Memory sticks
- Anonymization of patient data
- Easy creation of AVIs and screen snapshots to include in presentations or teaching videos
- Export of tables, statistics and signal time courses to communal exchange formats like e.g. tabulated text files (MeanCurve, Spectroscopy evaluation, DTI evaluation)
- Advanced image calculus including, addition, subtraction, multiplication, and division of images

Pediatric Suite²⁾

Tissue relaxation times and examination conditions in pediatrics are very different compared to those in adults. The reasons for these differences range from developing tissues, body size and faster heart rates to non-compliance with breath-hold commands. Pulse sequences can be easily adapted for imaging infants.

¹⁾ Optional

²⁾ MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures.

Further standard Tim Suites

Tim Whole Body Suite

MAGNETOM Lumina – A BioMatrix System features a full effective Field-of-View of 205 cm

General features	<p>MAGNETOM Lumina – A BioMatrix System features a full effective FoV of 205 cm. Table movement to its full extent can be controlled from the <i>syngo</i> Acquisition Workplace. The large FoV helps in imaging lesions across extended body regions with sequences such as TIRM (Turbo Inversion Recovery Magnitude). Whole-body MR Angiography is possible on the entire volume with iPAT.</p> <ul style="list-style-type: none"> • Max. scan range of 205 cm
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Tim Planning Suite

Easy planning of extended Field of View examinations in an efficient way using Set-n-Go pulse sequences. The Tim Planning Suite allows planning of several stations at once, e.g. on composed localizer images. The overlap of slice groups can be adjusted. All stations can have independent parameter settings although they are displayed together. A special coupling mode allows easy positioning of all stations at once according to the patient's anatomy. Fully supports scan@center and Phoenix functionality.

General features	<ul style="list-style-type: none"> • Ready-to-use Set-n-Go pulse sequences for different clinical questions • Integrated toolbar for fast advanced slice planning: FoV-Plus, FoV-Minus, AlignParallel, AlignFieldOfViews
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DotGO

Siemens set the benchmark in MR scanning and productivity by introducing Dot. Easily adapt to the patient's condition or clinical question, consistently achieve reproducible, high-quality results, and consequently reduce exam times and the number of rescans. DotGO – the latest generation of Dot – is setting the standard in exam configuration. For true flexibility, consistency and efficiency in every aspect of MRI.

Flexibility. Intuitive exam management.

One central user-interface for easy and flexible configuration and maintenance of all exams and Dot Engines. Intuitive, fast functionality results in 80%¹⁾ improved usability in exam configuration. DotGO empowers you to provide your MRI expertise for the entire department and to define a higher standard of care for more patients and referrers.

Consistency. Quality results for each exam.

Every patient is different. Every referrer's and radiologist's requirement is different. Imaging results need to be consistent and of high quality. Your daily schedule has to be met. DotGO partners you in meeting all of these different needs with dedicated functionality for the clinical question at hand.

Efficiency. Stay on time with less than 1 minute exam-time variation.²⁾

Time, quality and costs define the efficiency of your MRI exams. DotGO enables scheduling to be more predictable through reducing time-consuming software interaction by up to 46%³⁾, thus resulting in reduction of exam-time variations to less than a minute²⁾. Standardized procedures support quality results for each exam and help to reduce rescans. All in all the diagnostic turnaround time to the referrer is quicker, higher image quality is maintained, and MRI services are more efficient.

¹⁾ Compared to MR exam configuration without Dot Cockpit, Usability Study, 2013

²⁾ Zhongshang Hospital Fudan University, Fudan, CN, Abdomen Dot Engine Workflow Study

³⁾ University Hospital Essen, GER, Brain Dot Engine Workflow Study

Dot Cockpit

Intuitive exam management

by providing unprecedented flexibility in MRI configuration.

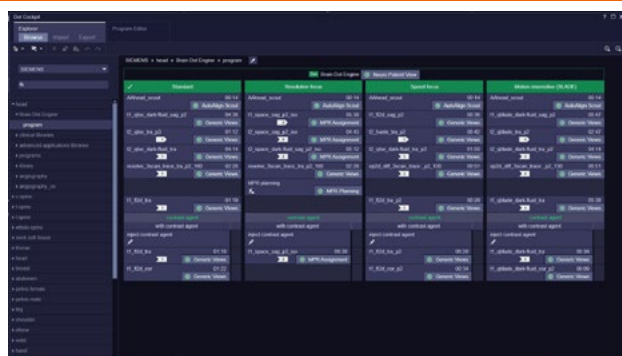
At the heart of this new flexibility is the Dot Cockpit. It is the central exam management platform enabling highly flexible and intuitive configuration, manipulation, organisation and updating of all exams. Whether you are using a Dot engine or not, the Dot Cockpit is the starting point for every exam.

MRI flexibility from the start:

- One central user-interface for every exam
- Fast and intuitive exam configuration (80% better usability)
- User-friendly functionalities like drag&drop, Dynamic Search
- Exam strategies created with one click
- Multiple strategies in one exam
- Change exams on the fly
- Update parameter changes to all or a selection of identically configured exams anywhere in the Dot Cockpit. (Identical Configurations)

Take the lead in defining the standard of MRI in your institution!

Dot Cockpit



Designed to realize the full potential of the Dot engines. The Dot Cockpit is your central interface for all exam management tasks. This includes flexible configuration of all Dot engines, according to your standards of care. In the following, we introduce the most important features of the new Dot Cockpit.

Configure all exams from one central interface

The Dot Cockpit enables you to configure and save all of your MRI exams and Dot engines.

Dot Explorer and Program Editor on one page

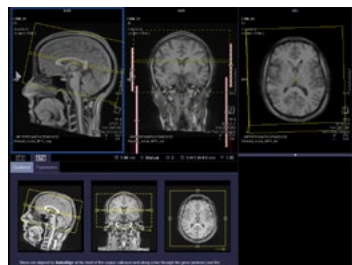
The Dot Cockpit offers two tasks: Dot Explorer and Program Editor. In the Dot Explorer you browse through exams and organize your exams. In the Program Editor, you modify them and you can find protocol histories and compare your exams.

Dot Cockpit *(Continued)*

A program overview	With the Dot Cockpit, you can see the whole exam workflow, the different User Trees, Exam, Strategies, Decisions, pulse sequences and AddIns are visualized together on one page.
Dynamic search delivers highlighted results	In the Dot Explorer, searching for pulse sequences is very quick. Just type in your search query, and results are highlighted instantly.
Editing exams instantly	In order to modify an exam opened in the Dot Explorer, you can immediately switch to the Program Editor with one click.
Adding a new Exam Strategy	In the Program Editor, just drag & drop or click on the strategy button in the sidebar, and a new Exam strategy is added to your exam workflow. This step automatically creates a new Dot Engine.
Drag & drop from the sidebar	In the Program Editor, you can add pulse sequences to a strategy by drag & drop from the sidebar.
User-friendly toolbar	Use the toolbar for opening and saving of programs, for Copy, Paste, Undo, Redo – in the same way as you are used to in Office programs.
MR Protocol Manager	<p>The MR Protocol Manager offers one central workspace for protocol configuration and management for a fleet of scanners. Protocol modifications are no longer done at each individual scanners manually. Protocol changes are distributed automatically from one workspace. Furthermore It supports the setup of consistent examination protocols and to maintain a common organ, exam, and program structure across an enterprise fleet of scanners for different clinical demands. Protocol modifications and their distribution do not disturb the examinations performed on the connected scanners.</p> <p>Requires customer IT to provide either PC hardware or virtual PC and open network connections to a central file share. Central file share connections are also required for all attached MR scanners.</p>
Hardware Requirements	<p>Quad-Core CPU with 32 GB RAM (up to 10 scanners), 64 GB (11–20), 128 GB (21–50)</p> <p>PC with Windows 10 Home 64 bit OS</p>

Dot Engines

Brain Dot Engine



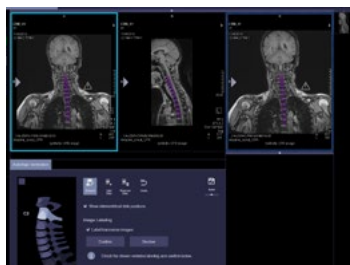
The Brain Dot Engine optimizes brain examinations with guided and automated workflows customized to your standards of care. The Brain Dot Engine supports the user to achieve reproducible image quality using automation tools and functionalities incorporated into the program.

Patient View	Within the Patient View the user can easily tailor examinations to an individual patient. Dot Exam Strategies allow you to choose the most appropriate strategy with one mouse click; the complete scan setup is then automatically prepared.
Guidance View	Step-by-step user guidance is seamlessly integrated. Example images and guidance text are displayed for each individual step of the scanning workflow to ensure perfect scanning even by non-expert operators. Both images and text are easily configurable by the user.
Parameter View	The new streamlined Parameter View displays a user-defined subset of parameters which are available for manual pulse sequence optimization. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
AutoPosition	Accurate positioning of the anatomy in the isocenter without need for laser light positioning.
AutoAlign Head LS	Automated positioning and alignment of slice groups to the anatomy, relying on multiple anatomical landmarks. Provides fast, easy, and reproducible patient scanning and facilitates the reading by consistently delivering high image quality with a standardized slice orientation, both for follow-ups and across patients. AutoAlign Head LS computes the central positioning for many routine brain structures such as AC-PC, Midbrain & Temporal Lobes. The inner ear, the orbits and the optic nerve are also standard positioning orientations with the AutoAlign Head LS. It delivers robust and consistent results independently of patient age, head position, disease or existing lesions.

Brain Dot Engine *(Continued)*

AutoCoverage	Maximizes the speed of the examination by automatically setting the number of slices and the FoV to fully cover the brain. This is performed based on the information delivered by AutoAlign, eliminating manual setting and the scanning of unnecessary slices.
Dot Exam Strategies	Examinations can be easily personalized to the individual patient condition and clinical need. The Brain Dot Engine comes with the following predefined examination strategies, which the user can select according to patient conditions or change at any time during the workflow, when conditions change: <ul style="list-style-type: none"> • Standard: Standard examination with 2D pulse sequences • Resolution focus: Examination with 3D pulse sequences (e.g. SPACE) for detailed views • Speed focus: Examination with fast 2D pulse sequences (e.g. HASTE) for further speeding up the exam • Motion-insensitive: Examination with BLADE pulse sequences to minimize and correct for the effects of motion automatically
BLADE	Motion insensitive Turbo Spin Echo sequence. Improves image quality by correcting for the effects of motion during an MR acquisition. BLADE can be used in head, spine, and other body regions.
Rerun	A sequence inside the examination Queue can be selected and a rerun of the corresponding series can be triggered with identical sequences or parameters.
Inline MPRs	Automatic multiplanar reconstruction for 3D datasets. The Multi Planar Reconstruction (MPR) tool can be easily configured to automatically generate any required 2D images from high resolution 3D acquisitions by using the position information from the AutoAlign algorithm.
Inline Diffusion	Automatic calculation of trace-weighted images and ADC maps with Inline Technology.
Customization	The Brain Dot Engine can be easily modified by the user to their individual standard of care. <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot exam strategies • Add clinical decision points • Add/remove parameters in the parameter viewing card • User-defined offsets to the standard positions delivered by AutoAlign • Customize within the Dot AddIn functionalities such as AutoCoverage, AutoFOV, InlineMPR reconstructions.

Spine Dot Engine



The Spine Dot Engine delivers optimized cervical, thoracic and lumbar spine imaging for all patients and provides guided and automated workflows customized to your standards of care. The Spine Dot Engine supports the user in achieving reproducible image quality with increased ease of use and time efficient exams.

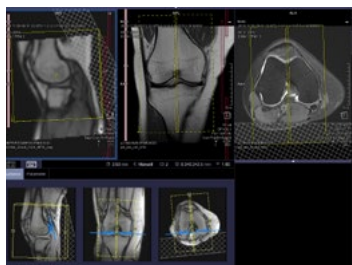
Patient View	Within the Patient View the user can easily tailor examinations to an individual patient. Dot Exam Strategies allow you to choose the most appropriate strategy with one mouse click, enabling automatic preparation of the complete MR examination.
Parameter View	The new streamlined Parameter View displays a user-defined subset of parameters which are available for manual pulse sequence optimization. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
AutoAlign Spine LS	Automated and highly reliable positioning and alignment of slice groups to the spine anatomy, based on multiple anatomical landmarks. Provides fast, easy, and reproducible patient scanning and facilitates the reading by consistently delivering high image quality with a standardized slice orientation, both for follow-ups and across patients. AutoAlign Spine LS automatically detects and labels vertebra and body disks as well as suggests and provides guided positioning for sagittal, coronal and double oblique axial slices in the spine. The anterior saturation band is automatically positioned to reduce imaging artifacts. All settings are open to user modifications.
AutoLabeling	Automatic labeling of vertebra for easier examination planning and faster reading
Interactive Snapping	Just drag the slice group over the sagittal plane. AutoAlign Spine LS delivers automatic double oblique positioning of axial slice groups to intervertebral disk layers.
AutoCoverage	Maximizes the speed of the examination by automatically setting the number of slices and the FoV to fully cover the C, T or L-spine. This is performed based on the information delivered by AutoAlign Spine LS, eliminating manual setting and the scanning of unnecessary slices.

Spine Dot Engine (Continued)

Dot Exam Strategies	Examinations can be easily personalized to the individual patient condition and clinical need. The Spine Dot Engine comes with the following predefined examination strategies, which the user can select according to patient conditions or change at any time during the workflow, when conditions change: <ul style="list-style-type: none"> • Standard: for fast routine spine examinations • Post surgery: for detailed evaluation of spine including fat saturation and Dixon techniques. • High Bandwidth (WARP) : Optimized strategy for the reduction of susceptibility artifacts¹⁾.
WARP	Susceptibility artifact reduction techniques. 2D TSE sequences combining high-bandwidth pulse sequences and the VAT (View Angle Tilting)-technique, tailored to reduce susceptibility artifacts (e.g. from MR Conditional ¹⁾ implants). Available pulse sequences include T1-weighted, T2-weighted, and STIR contrast.
Rerun	An image inside the examination UI can be selected and a rerun of the corresponding series can be triggered with identical sequences or parameters.
Inline Curved reconstructions	Automatic curved reconstruction from 3D acquisitions by using the position information from the AutoAlign Spine LS algorithm.
Customization	The Spine Dot Engine can be easily modified by the user to their individual standard of care. <ul style="list-style-type: none"> • Add/remove protocol steps • Add guidance content (images and text) • Change or add Dot Exam Strategies • Add clinical decision points • Add/remove parameters in the parameter viewing card • User-defined offsets to the standard positions delivered by AutoAlign Spine LS (also for the saturation region) • Inline curved and MPR reconstructions

¹⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

Large Joint Dot Engine



The Large Joint Dot Engine optimizes image quality of knee, hip and shoulder scans by proposing the most appropriate protocols according to the examination strategy chosen for the specific patient. It ensures reproducible image quality and streamlines large joint examinations to the greatest extent. The Large Joint Dot Engine features AutoAlign and AutoCoverage for knee, hip and shoulder. The WARP and Advanced WARP techniques (including high bandwidth pulse sequences, VAT and SEMAC) provide susceptibility artifact reduction functionality (e.g. from MR Conditional¹⁾ metal implants), and include optimized pulse sequences for knee and hip examinations. High resolution 3D imaging programs together with user-configurable automatic Inline MPR (Multi Planar Reconstruction) calculations provide increased efficiency, reproducibility and ease of use.

AutoPosition	Accurate positioning of the anatomy in the isocenter without need for laser light positioning.
Patient View	Within the Patient View the user can easily tailor examinations to an individual patient. Dot Exam Strategies can be integrated. With one mouse-click you simply choose the most appropriate scan strategy, and then the queue is automatically loaded and filled with the complete scan setup.
Guidance View	Step-by-step user guidance is seamlessly integrated. Example images and guidance text are displayed for each individual step of the scanning workflow. Both images and text are easily configurable by the user.
Parameter View	The new streamlined Parameter View displays a user-defined subset of parameters which are available for manual pulse sequence optimization. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
Dot Exam Strategies	<p>The workflow can be personalized to the individual patient condition and clinical need. The Large Joint Dot Engine comes with the following predefined strategies, which the user can select according to patient conditions or change at any time during the workflow, when conditions change:</p> <ul style="list-style-type: none"> • Standard: Achieve highest image quality in a reasonable scan time with 2D and 3D pulse sequences • Speed focus: Examine patients in the shortest possible time with pulse sequences being accelerated to the maximal extent • Motion Insensitive (BLADE): Compensate for the effects of motion with motion insensitive BLADE pulse sequences. • WARP: Optimized strategy for the reduction of susceptibility artifacts¹⁾.

¹⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

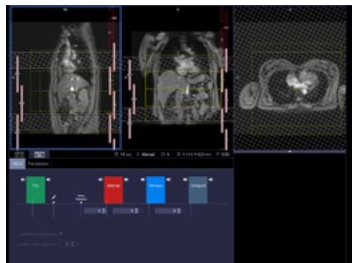
Large Joint Dot Engine (Continued)

AutoAlign	Automated, localizer based positioning and alignment of slice groups to the anatomy, relying on anatomical landmarks. Providing fast, easy, and reproducible patient scanning and supporting the reading by consistently delivering high image quality with a standardized slice orientation.
AutoCoverage	Maximizes the speed of the examination by automatically setting the number of slices and the FoV to fully cover knee, hip or shoulder anatomy. This is performed based on the information delivered by AutoAlign, eliminating manual setting and the scanning of unnecessary slices. This feature is configurable.
Inline MPRs	Automatic multiplanar reconstruction for 3D datasets. The Multi Planar Reconstruction (MPR) tool uses the position information from the AutoAlign algorithm and can be easily configured to automatically generate any required 2D images from high resolution 3D acquisitions.
GOKnee3D	GOKnee3D ¹⁾ is a fast, push-button examination for diagnostic imaging of the knee developed and clinically validated by the US board certified MSK radiologists at John Hopkins University Hospital. GOKnee3D exam consists of AutoAlign localizer in the knee, PD weighted contrast and T2 weighted contrast with fat suppression. The AutoAlign technology provides a push-button functionality and ensures consistency in imaging. The 3D protocols are high-resolution and isotropic, enabled by SPACE sequence with CAIPIRINHA technique.
WARP Susceptibility Artifact Reduction	WARP and advanced WARP (SEMAC) integrates different techniques tailored to reduce susceptibility artifacts caused by orthopedic MR Conditional ²⁾ implants. 2D TSE sequence combining optimized high-bandwidth pulse sequences and View Angle Tilting (VAT) technique, helps in evaluation of soft tissue in proximity of the implant. SEMAC (Slice Encoding for Metal Artifact Correction) is a technique to correct through-plane distortions by means of additional phase encoding in slice direction. It is especially useful in the case of hip and knee joint replacements. Available pulse sequences can be found in the library.
Customization	<p>The Large Joint Dot Engine can be easily modified by the user to their individual standard of care.</p> <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot exam strategies • Add clinical decision points • Add/remove parameters in the parameter viewing card

¹⁾ The protocol is only available for download on MAGNETOM World: <https://www.siemens-healthineers.com/magnetic-resonance-imaging/magnetom-world/clinical-corner/protocols/musculoskeletal-mri/goknee3d-protocols>. Prerequisite: Tx/Rx Knee coil

²⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

Abdomen Dot Engine¹⁾



The Abdomen Dot Engine offers standardized, efficient, and comprehensive workflows for the upper abdomen with excellent image quality. The workflow covers the liver, biliary and pancreatic system and, if slightly adapted, kidneys as well. The workflow is prepared for easy reading and reporting together with *syngo.via*.¹⁾

Patient View	Within the Patient View the user can easily tailor the exam to each individual patient. Several pre-defined Dot Exam Strategies can be integrated. The user just selects the appropriate strategy with one click, and the queue and the complete scan set-up are automatically updated. Furthermore protocols tailored for use of contrast media can be integrated.
Guidance View	Step-by-step user guidance is seamlessly integrated. Sample images and guidance text are displayed for each individual step of the scanning workflow. Both images and text are easily configurable by the user.
Parameter View	The new streamlined Parameter View displays the parameters that are really needed for the scan set-up. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
AutoPosition	Accurate positioning of the anatomy in the isocenter without need for laser light positioning.
AutoAlign and AutoCoverage	Automated adaptation of scanning parameters according to anatomical and physiological characteristics (including breath-hold adaptations)
AutoNavigator	Automatic breathing pattern detection and scaling of triggered scans
AutoFoV (automatic Field of View calculation)	Based on the localizer images the optimal FoV is automatically estimated. In case the patient moves during the examination, this step can be repeated at any time.
Abdomen Dot Library	A storage folder for individual sequences optimized with Dot functionality. StarVIBE ¹⁾ , TWIST-VIBE ¹⁾ pulse sequences are integrated into the Abdomen Dot library.
4D Movie toolbar	With the 4D Movie toolbar the user can navigate in an optimized way through space and time of multiphase data.

¹⁾ Optional

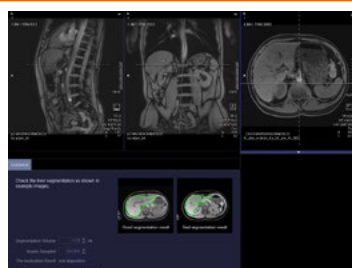
Abdomen Dot Engine (Continued)

Dot Exam Strategies	<p>The workflow can be personalized to the individual patient's condition and clinical need. The following predefined strategies are included. They can be changed at any time during the workflow:</p> <ul style="list-style-type: none"> • Breath-hold (fast with robust image quality) • Respiratory Synchronized (using PACE triggering, high image resolution) • Motion-insensitive (fast, using BLADE and PACE triggering)
Dot Decisions	<p>Decisions can be seamlessly integrated into the scanning workflow. The user just selects the queue, and the appropriate pulse sequence or set of pulse sequences are added automatically. For the abdomen, pre-configured decision points are offered for MRCP and Diffusion.</p>
MRCP decision point	<p>Dot provides comprehensive guidance, including positioning help. MRCP is measured and Inline Radial Ranges are generated in-line.</p>
Timeline monitoring	<p>For best overview of multi-phase breath-hold examinations, the contrast media enhancement curve is visualized.</p>
Automatic timing	<p>Liver dynamics is done using the Care Bolus approach. Auto Bolus Detection enables the system to monitor the arrival of contrast agent in a user defined ROI. When "Auto Bolus Detection" is enabled, Auto ROI can be enabled in the patient view, which allows the system to perform an automatic ROI positioning on the descending aorta at the level of the diaphragm. The ROI positioning can be confirmed and adjusted by the user.</p>
Bolus Timing	<p>An alternative way of performing liver dynamics. The optimal time window for data acquisition is derived by the system after the application of a test bolus. Visual guidance and interactive evaluation during the setup provide ease-of-use.</p>
AutoVoiceCommands	<p>Seamlessly integrated into the scanning workflow. The system plays them automatically at the desired time point. This assists the user in providing the optimal timing of scanning, breathing and contrast media. The user can monitor which breath-hold or pauses are actually played, and could add pauses between the automatic breath-hold commands if necessary.</p>
Inline Subtraction	<p>Within the contrast-enhanced abdomen exam, multiple phases are acquired: native, arterial phase, portal-venous phase and late-phase. The scanner automatically subtracts the native measurement from the arterial, portal-venous and late phase.</p>

Abdomen Dot Engine *(Continued)*

Inline Registration	For best visualization of lesions the system can be set to automatically perform a registration/alignment of the anatomy for the different dynamic phases. The importance of registration/correction can be seen when examining nodular enhancing pathologies.
Customization	<p>Taking full advantage of the new Dot configuration platform. Providing various guidance and customization options, featuring “AutoTiming”, “Auto Coverage”, “Local Voice Command”, etc.</p> <p>Existing Dot Engines can be adapted by the user to their individual standard of care.</p> <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot Exam Strategies and Decision Points • Modify the Parameter View • Dot Library – alternative pulse sequences with preconfigured add-ins. Only simple drag&drop needed.
LiverLab ¹⁾	<p>LiverLab is a system guided workflow to examine the hepatic fat and iron status, as part of the Abdomen Dot Engine.</p> <p>Main Features:</p> <p>The inline First look Dixon sequence gives the user a first overview of possible fat and/or iron overload in the whole liver. Based on the resulting images, liver segmentation runs without user interaction.</p> <p>If further evaluation is needed, the user can choose from two methods:</p> <ul style="list-style-type: none"> • Multi-echo Dixon VIBE is an image-based method to calculate maps such as water, fat, fat signal fraction, and R2*. • HISTO is a single-breath-hold single-voxel spectroscopy method to calculate fat fraction as well as water R2*.

LiverLab Dot Engine¹⁾



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- Multi-echo Dixon VIBE is an image-based method to calculate maps such as water, fat, fat signal fraction, and R2¹⁾.
- HISTO is a single-breath-hold single-voxel spectroscopy method to calculate fat fraction as well as water R2.

¹⁾ Optional

Whole-Body Dot Engine¹⁾



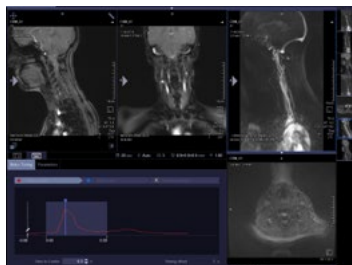
The Whole-Body Dot Engine allows easy, seamless planning of multiparametric multistation exams with automated recognition of individual anatomy and consistent settings for spatial resolution, image contrast, and breath-hold capacity.

- Landmark-based automatic segmentation of the anatomical regions based on FastView scan
- AutoCoverage: scan range across the chest, abdomen and pelvis can be easily defined with a coverage slider
- Automatic overlap of stations
- Additional stations for head and leg coverage can be added using the coverage slider
- Two exam strategies are available: Standard and Motion-insensitive
- Core Protocol with WB T2 HASTE, WB T1 Dixon VIBE, WB DWI with robust STIR fat suppression, and whole-spine exam
- Protocol can be extended with dedicated scans of the focus regions Chest, Abdomen, Pelvis with dynamic exams of the respective region
- AutoBolus detection for focus region Abdomen (liver)
- Supports 2D and 3D acquisitions in axial and coronal orientation
- Option to repeat stations flexibly (results are integrated accordingly during composing)

Guidance View	Step-by-step user guidance is seamlessly integrated. Example images and guidance text are displayed for each individual step of the scanning workflow. Both images and text are easily configurable by the user.
Parameter View	The new streamlined Parameter View displays the parameters that are really needed for the scan set-up. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
iPAT compatibility	Enabled by Tim 4G
Customization	Existing Dot Engines can be adapted by the user to their individual standard of care. <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot Exam Strategies and Decision Points • Modify the Parameter View • Use the Whole-Body Dot library (a set of optimized pulse sequences for alternative sequences)

¹⁾ Optional; prerequisites: Abdomen Dot Engine and FREEZEit+

Angio Dot Engine¹⁾



The timing of the contrast injection and scan is commonly regarded as the most challenging part of an angiographic exam. The Angio Dot Engine guides the user through angiographic single- or multi-station examinations by providing visualization of arterial and venous timing windows using a test bolus technique. This information is fed back into the next planning steps, so that scan parameters can be adapted to the individual patient and patient's condition. Where needed, automatic voice commands support the communication with the patient.

Guidance View	Step-by-step user guidance is seamlessly integrated. Sample images and guidance text are displayed for each individual step of the scanning workflow. Both images and text are easily configurable by the user.
Parameter View	The new streamlined Parameter View displays the parameters that are really needed for the scan set-up. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
Test bolus	Visual display of arterial/venous timing window
Feedback of bolus timing information	Timing information is fed back into planning steps, and parameters can be adapted automatically.
Automatic timing	The Angio Dot Engine can also be used with the Care Bolus approach. Auto Bolus Detection enables the system to monitor the arrival of the contrast agent in a user defined ROI and trigger sequence timing automatically.
AutoVoiceCommands	Integrated into the scanning workflow. The system plays them automatically at the right point in time. This ensures optimal timing of scanning, breathing, and contrast media. The user can monitor which breath-holds or pauses are actually played, and can add pauses between the automatic breath-hold commands if necessary.
Customization	Existing Dot Engines can be modified by the user to their individual standard of care. <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot Exam Strategies and Decision Points • Modify the Parameter View

¹⁾ Optional

Cardiac Dot Engine¹⁾



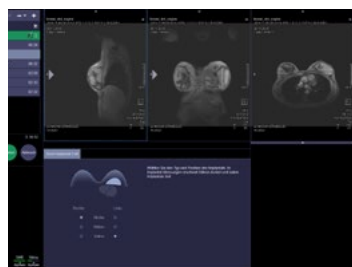
Cardiac examinations used to be the most complex exams in MR. Now the Cardiac Dot Engine supports the user in many ways. Using anatomical landmarks, standard views of the heart, such as dedicated long-axis and short-axis views, are easily generated, and can be reproduced readily using different scanning techniques. Scan parameters are adjusted to the patient's heart rate, and automatic voice commands are given. All of this helps handle the complexity of CMR examinations with confidence and supports customized workflows that are easy to repeat.

Patient View	Within the Patient View, the user can easily tailor the exam to each individual patient (e.g. patient with arrhythmia, limited breath-hold capability). Two pre-defined Dot Exam Strategies are integrated. The user just selects the appropriate strategy with one click, and the queue and the complete scan set-up are updated automatically to the users, pre-defined standard of care.
Guidance View	Step-by-step user guidance is integrated seamlessly. Example images and guidance text are displayed for the individual steps of the scanning workflow. Both images and text are easily configurable by the user.
AutoPosition	Accurate positioning of the anatomy in the isocenter without need for laser light positioning.
AutoFoV (automatic Field of View calculation)	Based on the localizer images, the optimal FoV is estimated automatically. In case the patient moves during the examination, this step can be repeated at any time.
Automated parameter adaptation	Scan parameters are adapted automatically to the patient's condition (heart rate etc.).
AutoAlign Heart	Based on the localizer images, automatic detection of five cardiac landmarks is obtained and used to optimally plan cardiac exams without user interaction. The fully automatic planning process results in 2-, 3- and 4-chamber views, a stack of short-axis views and specific valve orientations. In case the patient moves during the examination, this step can be repeated at any time.
Automated localization	Automated localization of short-axis views
Guided slice positioning	Easy way to match slice positions (short-axis) between cine, dynamic imaging, tissue characterization
Cardiac Views	Easy selection of cardiac views (e.g. 3-chamber view) during scan planning

¹⁾ Optional

Cardiac Dot Engine <i>(Continued)</i>	
Inline Ventricular Function Evaluation	Inline VF performs volumetric evaluation of cardiac cine data fully automatically right after image reconstruction. There is no user input necessary. If desired, the dataset for the inline calculated segmentation results can be loaded to in 4D Ventricular Function Analysis for further review or processing.
Inline Time Course Evaluation	Automatic, real-time and motion corrected calculation of a parametric upslope map with inline technology
Automatic display of images	Automatic display of image in dedicated cardiac image orientations instead of the standard DICOM orientations.
Adaptive triggering	Acquisition adapts in realtime to heart rate variations for non-cine applications.
Automated Naming	Automated naming of series depending on cardiac views and contrast
AutoVoiceCommands	AutoVoiceCommands are seamlessly integrated into the scanning workflow. The system plays them automatically at the desired time point. This ensures synchronized timing of scanning, breathing and contrast media. The user can monitor which breath-holds or pauses are actually played, and can add pauses between the automatic breath-hold commands if necessary.
Dot Exam Strategies	<p>The workflow can be personalized to the individual patient condition and clinical need. The following predefined strategies are included. They can be changed at any time during the workflow:</p> <ul style="list-style-type: none"> • Standard: Breath-hold (segmented acquisition) • Limited patient capabilities: Realtime (single-shot imaging if breath-hold is not possible or arrhythmias occur)
Customization	<p>Existing Dot engines can be modified by the user to their individual standard of care.</p> <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot Exam Strategies and Decision Points • Modify the Parameter View
Flow measurements	Blood flow measurements can be easily added to existing Cardiac Dot Engines using pre-defined Flow sequences from the Dot library.

Breast Dot Engine¹⁾



The Breast Dot Engine provides optimized protocols for tissue depiction, implant evaluation, and breast biopsy. For ease of use, different examination strategies (FatSat, non-FatSat, feet-first/head-first positioning, InterVIEWS) are available, with or without Care Bolus, for medium-channel and high-channel coils. Biopsy is supported with a dedicated workflow.

Patient View	The user simply tailors the exam to the condition of each individual patient (e.g. patient with implants) and defines the examination approach (CareBolus, AutoCoverage, Frequency Adjustment Confirmation Mode, Silicone Protocols, Inline MPR).
Implant situation	Based on an implant type identification scan, the user can visually select or modify the exam dependent on the actual implant type and laterality. The system automatically modifies the scan queue accordingly, and the frequency adjustment setting of the pulse sequences is changed (assume silicone). The user may change these modifications.
Guidance View	Sample images and a guidance text are displayed for each individual step of the scanning workflow. Both images and text are easily configurable by the user.
Parameter View	This view displays the parameters that are really needed for the examination. The displayed parameters are easily configurable by the user. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.
AutoPosition	Accurate positioning of the anatomy in the isocenter without need for laser light positioning.

¹⁾ Optional

Breast Dot Engine <i>(Continued)</i>	
Autocoverage (Automatic segmentation, AutoFoV, AutoSlice)	Based on the localizer data, an automatic segmentation is performed, which allows the estimation of the optimal FoV (entire FoV for both breasts, right or left breast, breast with chest) and which is used to automatically adapt the size of the adjust volume to the patient's anatomy. The user may modify this segmentation. The user can predefine for every pulse sequence individually which parameters shall be automatically adjusted, e.g. whether time or slice thickness shall remain constant.
MPR Planning	For user-selected pulse sequences, e.g. the high-resolution "delayed VIEWS", adjustable MPRs are calculated automatically.
Biopsy support	A Biopsy imaging workflow is provided for supporting interventions with the 2-/4-/8- channel Sentinelle Breast coil, the 2-/10-/16- channel Sentinelle Breast coil and the Breast BI 7 coil. The breast Biopsy imaging workflow seamlessly integrates with the separate Breast Biopsy Software ¹⁾ , which guides intervention planning and execution for both grid method and post/pillar method.
Single frequency adjust	The user can preselect to show the frequency adjustment dialogue only once for the exam queue. This preselection stays valid until a new coil combination or z-position is used.
Customization	Existing Dot engines can be modified by the user to their individual standard of care. <ul style="list-style-type: none"> • Add/remove protocol steps • Change guidance content (images and text) • Change or add Dot Exam Strategies and Decision Points • Modify the Parameter View

¹⁾ Optional

RT Dot Engine¹⁾



The RT Dot Engine supports the user in the acquisition of suitable RT planning images to be further processed in external RT applications. It provides guided and automated workflows customizable to the site-specific standards of care for RT imaging.

Dedicated protocols for RT Planning

- Brain and
- Head & Neck
- Special protocols in Head and Pelvis regions for creation of Synthetic CT images²⁾

Patient View

Within the Patient View the user can easily tailor examinations to an individual patient. Dot Exam Strategies allow you to choose the most appropriate strategy with one mouse click; the complete scan setup is then prepared automatically.

Guidance View

Step-by-step user guidance can be integrated seamlessly. Example images and guidance text can be displayed for each individual step of the scanning workflow. Both images and text are easily configurable by the user.

Parameter View

The new streamlined Parameter View displays a user-defined subset of parameters that are available for manual pulse sequence optimization. If desired, the user can switch to the conventional – fully loaded – parameter view at any time.

¹⁾ Optional

²⁾ Prerequisite: syngo.via RT Image Suite, Version VB30A or higher

RT Dot Engine *(Continued)*

Laser offset consideration	If an external laser bridge (optional) is installed, this laser can be used for positioning. The marked position is automatically moved to the isocenter. No need to use the system laser in addition.
Dot Exam Strategies	<p>The RT Dot Engine provides preconfigured examination strategies:</p> <ul style="list-style-type: none"> • Image quality focus: Examination with 3D pulse sequences for detailed views of challenging anatomical situations. • Speed focus: Examination with time-optimized 3D pulse sequences. • Head and Pelvis workflows for creation of Synthetic CT images using either external laser bridge or system laser.
Geometric integrity control	The RT Dot Engine takes care that the MR data is acquired in the right format and the right orientation for import into the RT planning software.
Customization	The imaging workflow can be personalized to the individual patient condition and clinical need. Several predefined strategies are included, which can be easily selected.
Further features	<ul style="list-style-type: none"> • Negative distance factors • Axial reconstruction • B1 value monitoring

syngo MR Software

syngo MR XA20 offers a single monitor acquisition workplace as default and dual monitor as optional with one keyboard and one mouse. This dual monitor setup¹⁾, with separated scan and viewing monitors, makes for a more natural working environment in which the technologist has a complete overview of the examination and results. Constant context switches are reduced, enabling multitasking for increased quality and productivity.

The scanning side is primarily responsible for the act of scanning and light quality assurance. The viewing side is responsible for additional results generation in the form of basic and advanced post processing as well as data handling (DICOM – Export, Import, Transfer, Record to media) Several applications can be opened in parallel. The acquisition workplace can host one MR View&GO and up to three post-processing applications in parallel. An attached MR workplace can host up to four additional applications.

syngo MR Examination

AutoScout

- Automatic start of localizer scan with very short acquisition time
- Arbitrary orientations (multi-slice multi-angle)
- Automatically loads images into Graphical Slice Positioning

Graphical Slice Positioning

- Simultaneous use of three arbitrary localizer images from possibly different measurements for graphically positioning slices and sat regions. Interactive modification of measurement parameters (slice thickness, distance factor, oversampling etc.):
- Automatic selection of relevant coil elements
 - Graphical selection of coil elements
 - Off-center positioning (shift of FoV within the selected slice position)
 - True multi-slice multi-angle, e.g. simultaneous measurement of multiple images (stacks with different orientation)
 - Recall of previous slice and/or sat region positioning
 - Paging through all images during graphical positioning
 - Inline Movie, allowing positioning of slices on e.g. the beating heart
 - Inline Display loads images immediately when they are available, e.g. during image reconstruction
 - Allows quick overview via image stamps. Loads entire series of planning images with drag-and-drop
 - Slice positioning (GSP) on 3D reconstructed images
 - Slice positioning (GSP) on 2D and 3D distortion corrected images
 - Slice positioning (GSP) on composed images
 - Multiselect GSP segments for synchronized interaction (e.g. scrolling)

¹⁾ Optional

MR View&GO – Image Viewing, basic post-processing, filming, and distribution

The MR View&GO is the central application for image viewing, quality assurance, basic post-processing, filming, and result distribution.

MR View&Go provides	<ul style="list-style-type: none"> • Overview of all available data with automatic loading of newly acquired or received images • Multi-modal image viewing and comparison • Specialized layouts for MPR, MIP, and VRT • Basic post-processing <ul style="list-style-type: none"> – Analysis, correction, and filter tools – Time Curve (spatial and temporal analysis of images) – Composing and combining of images from different table positions • Filming with preparation of virtual film sheets for DICOM printer • Distribution of selected data sets for archiving and DICOM transfer
Image Display	<ul style="list-style-type: none"> • Various display layouts selectable incl. time point comparison • Multi-modality viewing • Image rotation, zoom and pan • Image annotation and marker • Non-interpolated display • Free interactive definition of cut planes in axial, sagittal, coronal, oblique, and double oblique orientations • Mosaic View • Predefined Views of certain anatomical regions (AutoViews)¹⁾ • Free interactive image rotation of MIP and VRT • Interactive 3D reference point for spatial localization on different orientations • Interactive slice thickness adjustment • Interactive selection of relevant parts of MIP and VRT volumes by 3D shutters or freehand cut out • Fast scrolling through data sets (500 images) with 15 frames per second • 4D viewing with intuitive temporal (phase navigation in 4D data sets) and spatial scrolling extended by the 4D movie toolbar with phase tags • Movie Mode for cine display with spatial navigation during running movie
Windowing	<ul style="list-style-type: none"> • Freely selectable window width and center • Auto-windowing for optimized contrast • Saves window values • Various color LUTs incl inversion of gray-scale values

¹⁾Optional

MR View&GO – Image Viewing, basic post-processing, filming, and distribution (Continued)

Evaluation	Parallel evaluation of multiple regions of interest <ul style="list-style-type: none"> • ROI (Freehand, Circle) • VOI (Freehand, Sphere) • Statistical evaluation of ROI/VOI • Area or Volume • Standard deviation • Mean value • Min/max values • Number and sum of pixels or voxels • Interactive segmentation (Region Growing) • Pixel lens with position marker • Distance (line and polyline) • Angle
Range creation and curved reconstructions	Free definition (slice thickness, spacing, numbering, ...) of parallel, radial, radial sliced, MPR, MIP, MinIP, MIP thin, VRT, VRT thin, and Fusion are available as output display types <ul style="list-style-type: none"> • Configurable reconstruction presets • Anatomical Ranges Presets¹⁾ of certain body regions
Position display	Displays measured slice positions on localizer image or selected series
Corrections	<ul style="list-style-type: none"> • Motion Correction 3D elastic motion correction, for offline 3D correction in all directions over entire 2D and 3D data sets suitable for e.g. soft tissue MR exams • 2D and 3D distortion correction • Undo 2D distortion correction
Image filter	Smoothing or edge enhancement of image stacks
TimeCurve	Time-intensity analysis for contrast-enhanced examinations <ul style="list-style-type: none"> • on-the-fly analysis with pixel lens or ROIs • interactive mean curve segment to navigate to a specific phase and slice position of the 4D dataset
Spine Labeling	Automatic calculation of spine labels or take-over of labels from Spine Dot Engine

¹⁾ Optional

MR View&GO – Image Viewing, basic post-processing, filming, and distribution *(Continued)*

Filming	<ul style="list-style-type: none"> • Connection via DICOM Basic Print or with locally connected printer • Interactive filming • Support of virtual film sheets • Filming parallel to other activities • Independent scanning and documentation – no wait time due to camera delays • Simultaneous handling of multiple film jobs • Freely selectable positioning of images onto virtual film sheet • Selectable various film layouts • Windowing, image zoom and pan, and annotations on film sheet • Configurable image text
Analysis Tools	<p>Arithmetic operations on images and series (e.g. for evaluation of contrast media studies)</p> <ul style="list-style-type: none"> • Addition, subtraction, multiplication, division of single images and whole series • Arithmetic mean across a range of selected images • ADC maps and calculated b-values with interactive preview
MPR – Multi-Planar Reconstruction	Real-time multi-planar reformatting of secondary views
MIP – Maximum Intensity Projection	<p>3D reconstructions of vessels from a 3D data set, or a 2D sequential slice data set (acquired with dedicated MR Angiography sequences)</p> <ul style="list-style-type: none"> • MIP thin/MIP thick
MinIP – Minimum Intensity Projection	Similar to MIP but reconstructs the minimum intensity (e.g. for Dark Blood techniques)
VRT Volume Rendering Technique	<ul style="list-style-type: none"> • 3D rendering with free definition of multiple trapezes for opacity and color • User specific preset creation • VRT thick and thin
Cinematic VRT (CRT) ¹⁾	Cinematic Rendering Technique is a rendering technology based on a physically accurate simulation of how light interacts with matter. It aims at providing a photo-realistic rendering of anatomical regions
Image Fusion	MPR image fusion with interactive adjustment of mixing ratio and various (color) LUTs, as well as interactive adjustment of alignment (visual alignment)
Result Handling and sending (Distribution)	<ul style="list-style-type: none"> • Overview over all acquired data and easy selection of target DICOM nodes for archiving • 4D support with archiving of sub-sets of 4D data sets • Status information about distribution state for each data set • Series Saving: for data within a selected viewing segment the current representation can be saved as new result series. In case the segment contains MPR data, automatically parallel ranges are generated.

¹⁾ Optional

syngo MR Network Communication

DICOM Services (Digital Imaging and Communications in Medicine)

Interface for transmitting medical images and information in the DICOM 3.0 industrial standard. Allows for communication between devices from different manufacturers

- DICOM Send/Receive
- DICOM Query/Retrieve
- DICOM SC Storage commitment
- DICOM Basic Print
- DICOM Modality Worklist
- DICOM MPPS Modality performed procedure steps
- DICOM Structured Reports
- DICOM Study Split

Enhanced MR Images (Multiframe)

- Loading time decrease due to reduced header information redundancy
- Reduced object size
- Reduced memory consumption and archive (e.g. about 40%¹⁾ in case of whole spine) resulting in archive costs reduction, extended online period of exams in the STS and faster image availability at the target nodes.
- Better application support due to usage of DICOM standard attributes
- Color support within the MR modality image
- MR quantification by support of RealWorldValueMapping
- Archiving and application support of MR Spectroscopy objects
- Archiving support of DTI and other non-image data with Raw Data objects

¹⁾ Data on file, Results may vary

syngo MR Network Communication *(Continued)*

DICOM Study Split	<p>DICOM Study Split provides the mapping of one study acquired based on multiple requests to multiple studies directly at the scanner. For example, two requests for head and neck acquisition can be registered once, scanned once and immediately mapped to two separate studies for individual reading.</p> <p>Multiple requested procedures can be combined in a time saving manner by scanning a larger body region and then splitting them to individual billing relevant studies for separate reading.</p> <p>This package allows:</p> <ul style="list-style-type: none"> • Time saving simple mapping of multiple requested procedures to multiple acquired series with one scan • Simple creation of studies with individual billing based on one scan workflow • Improvement for departmental workflow by eliminating need to load/change and to request/execute splitting on a separate workstation after the scan • Immediate visual selection, check and correction of images to study assignments • Overlapping region images can be copied to both studies 	
DICOM interoperability	For remote DICOM nodes (e.g. PACS systems) which doesn't support the DICOM Enhanced MR Image format an conversion to DICOM MR Images can be activated.	
Expert-i	Interactive real-time access to imaging data and exam information from any PC within the hospital network during the MR exam.	
syngo MR Network Communication	Exchange Media Storage of images and additional data (e.g. AVI files) on CD/DVD	
DICOM Viewer	A viewing tool which can be stored together with images on a DICOM CD/DVD to be handed out to the patient	
Image Transfer	Local network	Ethernet
	Data transfer rate	Max. 1 Gbit/s
	Transfer rate (DICOM Enhanced MR Images with 80 frames per instance)	Approx. 160–250 frames/s

Computer System

syngo Acquisition Workplace

General	Full multi-tasking for simultaneous functionality, e.g.:	
	<ul style="list-style-type: none"> • Patient registration and pre-registration • Scanning • Reconstruction • Viewing • Post-processing • Filming • Data storage 	
Color LCD Monitor	<ul style="list-style-type: none"> • High resolution widescreen monitor, dual monitor configuration optional • Horizontally tiltable, forward and backward • Automatic backlight control for long-term brightness stability 	
	Screen size (diagonal)	24" (61 cm)
	Digital Signal Input: Horizontal input frequency	31–76 kHz
	Vertical input frequency	59–61 Hz
	Screen matrix	1920×1200
Host computer	Processor	Intel Xeon ≥ W-2133 (6 Core)
	Clock rate	3.6 GHz, or comparable
	RAM	64 GB
	Hard disk (DICOM Standard, ISO 9660)	SSD: ≥480 GB Approx. images ¹⁾ 256 ²
	Media drives	SDHC Card Reader
Advanced Host computer	Processor	Intel Xeon ≥ W-2145 (8 Core)
	Clock rate	3.7 GHz, or comparable
	RAM	96 GB
	Hard disk (DICOM Standard, ISO 9660)	SSD: ≥480 GB Approx. images ¹⁾ 256 ²
	Media drives	SDHC Card Reader

¹⁾ Using Enhanced DICOM > 2 200 000 image stacks with 25 slices and a matrix size of 256 x 256 can be stored

syngo MR Workplace¹⁾

General	Additional workplace connected to the AWP (Advanced Host)	
Color LCD Monitor	<ul style="list-style-type: none"> • High resolution widescreen monitor • Horizontally tiltable, forward and backward • Automatic backlight control for long-term brightness stability 	
	Screen size (diagonal)	24" (61 cm)
	Digital Signal Input: Horizontal input frequency	31–76 kHz
	Vertical input frequency	59–61 Hz
	Screen matrix	1920×1200
MRWP	Processor	Intel Pentium ≥ J5005 (4 core)
	Clock rate	1.5 GHz, or comparable
	RAM	8 GB
	Hard disk DICOM Standard, ISO 9660)	SSD: 128 GB Approx. 4000 images 256 ²
	CD/DVD writer	Not built in, but optionally connectable by USB
	Audio	On board
	Ethernet	On board, 1 Gbit

¹⁾ Optional

Installation

Radio Frequency Shielding

For shielding the examination room from external RF sources

RF attenuation factor	>90 dB
Frequency range	15–128 MHz

Magnetic Shielding

Room shielding	For additional reduction of the magnetic fringe field, suitable iron shielding can be installed in the walls of the examination room. The room shielding can be used to create a magnetic shielding enclosure
One-Floor Installation	A combination of active shielding and a special shielding (installed on the ceiling of the magnet room or below it) will keep the 0.5 mT line within the same floor as the MRI scanner installation, even in case of very low room heights

System Electronics Cabinets

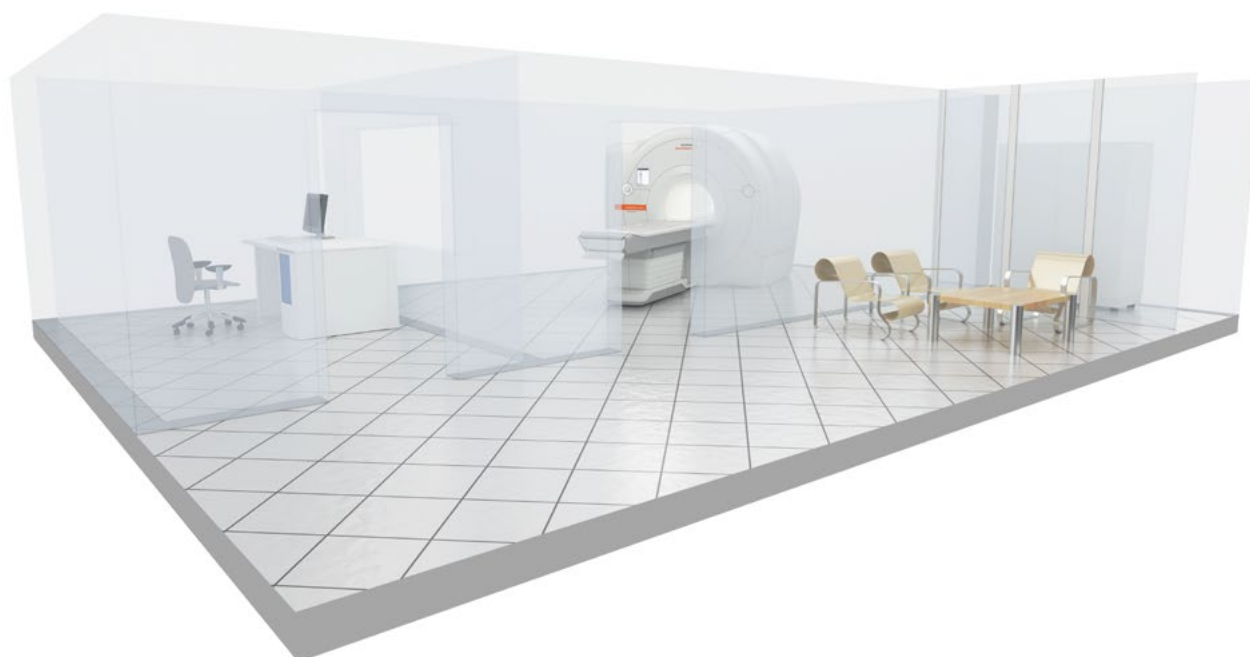
Two cabinets which may be placed directly against the wall or even in a corner

Require service access only from the front, saving considerable space

Integrated water cooling cabinet may eliminate the need for a dedicated computer room

Space Requirements

Min. total space requirement (for magnet, electronics, and console room): 31 m²



Dimensions					
		Width	Depth	Height	Weight
Examination Room	Magnet 3 Tesla AS (incl. Helium)	2.02 m	1.72 m	2.14 m	5500 kg
	Magnet in operation, incl. gradient coil, body coil, Tim Table and covers	2.45 m	4.49 m	2.15 m	7350 kg
	Tim Table	0.8 m	2.48 m	0.52 m – 0.97 m; +0.05 m ¹⁾ +0.013 m ²⁾	
	Required min. room height clearance			2.4 m ³⁾	
	Min. transport dimensions	2.45 m	2.05 m	2.3 m ⁴⁾	
Control Room	syngo Acquisition Workplace (table + monitor)	1.20 m	0.8 m	1.14 m – 1.28 m (0.72 m + min. 0.42 m / max. 0.56 m)	
	Host computer	0.17 m	0.45 m	0.43 m	
	syngo MR Workplace (optional)	1.2 m	0.8 m	1.14 m – 1.28 m (0.72 m + min. 0.42 m / max. 0.56 m)	
Equipment Room	Electronics cabinet, incl. system control, RF system, gradient power system, image processor	1.60 m	0.65 m	1.98 m ⁵⁾	1500 kg
	Heat dissipation	≤5 kW, only ventilation might be required			
	Cooling system	0.65 m	0.65 m	1.89 m	500 kg

¹⁾ Including Heightening Kit, if necessary

²⁾ Depending on the floor conditions

³⁾ Finished floor to finished ceiling

⁴⁾ Including transport pallet

⁵⁾ Without attachments

System Cover

White Design
with Fixed Table



White Design
with Dockable Table
and 2nd Select&Go



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MAGNETOM Lumina – A BioMatrix System

Tim [180 × 32] XK Gradients

siemens-healthineers.com/lumina



SIEMENS
Healthineers

Magnet System

General

Superconducting Magnet	Short bore, patient-friendly design, high homogeneity 3 Tesla with 70 cm Open Bore design
	Easy siting due to AS (Active Shielding) and E.I.S. (External Interference Shielding) magnet technology

Magnet Parameters

Operating field strength	3 Tesla
Magnet type	Superconductor
Field stability over time	<0.1 ppm/h
Weight (with cryogen)	5500 kg
Magnet length	1.72 m
Open Bore design ¹⁾	70 cm
System length cover to cover	1.86 m

Homogeneity (based on highly accurate 24 plane plot)

10 cm DSV	Guaranteed	<0.005 ppm
	Typical	0.002 ppm
20 cm DSV	Guaranteed	<0.04 ppm
	Typical	0.015 ppm
30 cm DSV	Guaranteed	<0.15 ppm
	Typical	0.07 ppm
40 cm DSV	Guaranteed	<0.45 ppm
	Typical	0.33 ppm
45 cm DSV	Guaranteed	<1.15 ppm
	Typical	0.83 ppm
50 cm DSV	Guaranteed	<3.0 ppm
	Typical	2.3 ppm
55×55×50 cm ² DEV	Typical	4.3 ppm

In compliance with the German "Qualifikationsvereinbarung".

Standard deviation Vrms (volume root-mean square) measured with highly accurate 24 plane plot method (20 points per plane).

Standard active shim with 3 linear channels

DSV = Diameter spherical volume (x, y, and z direction); DEV = Diameter elliptical volume.

¹⁾ Incl. shim coils, gradient coil, RF body coil

Shimming

Both: passive and active shimming. Passive shimming during installation

Standard active shim with 3 linear channels (1st order) and 5 non linear channels (2nd order)

3D Shim	Patient-specific automated shim
	Time to shim
	Approx. 15 s

Shielding

Active Shielding (AS)	5 th generation active shielding (AS) technology with counter coils	
Fringe field (axial × radial)	0.5 mT ¹⁾	4.65 × 2.65 m
	0.1 mT	6.8 × 3.8 m
External Interference Shield (E.I.S.)	Patented shielding system integrated into the magnet	
	Continuous compensation and automatic suppression of external magnetic field interferences during measurement (caused by moving ferromagnetic objects or nearby power lines)	

Magnet Cooling System

Zero Helium boil-off technology	
Refill interval (typical) ²⁾	Not applicable
Boil-off rate (typical) ²⁾	0.0 liter/year

¹⁾ Pacemaker safety limit

²⁾ For typical clinical use, depending on pulse sequences and operating time with running helium compressor. The system needs to be serviced at regular interval. Undisturbed magnet cooling for 24 hours and 7 days a week.

XK Gradients

General Features

- Actively shielded (AS) whole-body gradient coil system
- Extremely low eddy currents
- Water-cooled coil and amplifier for maximum performance
- All axes force compensated

Gradient Performance for Each Axis

Max. amplitude	36 mT/m
Min. rise time	180 μ s
Max. slew rate	200 T/m/s

Vector Gradient Performance

(vector addition of all 3 gradient axes)

Max. eff. amplitude	62 mT/m
Max. eff. slew rate	346 T/m/s
Gradient duty cycle	100%

Resolution Parameters

Min. FoV	5 mm
Max. FoV ¹⁾	550 mm
Slice thickness 2D	min. 0.1 mm, max. 200 mm
Partition thickness 3D	min. 0.05 mm, max. 20 mm
Slab thickness 3D	min. 5 mm, max. 500 mm
Max. matrix	1024
Highest in-plane resolution	12 μ m

Power Consumption²⁾

System Off	4.3 kW
System ready to measure ²⁾	8.4 kW
Scan ²⁾	23.1 kW

Gradient Amplifier

Water-cooled, highly compact, modular design

Ultra-fast solid-state technology with very low switching losses

Max. output voltage ³⁾	2250 V
Max. output current ³⁾	760 A
Max. power ³⁾	1.71 MW

Power Requirements

Line Voltage	380V, 400V, 420V, 440V, 460V, 480V
Stability tolerance	$\pm 10\%$
Line frequency	50/60 Hz, ± 1 Hz
Connection Value	84 kVA

Eco-Power Technology

Energy consumption is reduced by automatic deactivation of active system components if possible. E.g. the cold head compressor is periodically switched off during system standby or power off.

Cooling with separator

Water consumption	100 l/min, ± 10 l/min ⁴⁾
Heat dissipation to water	60 kW

¹⁾ Depending on the application, the maximum FoV in the z-direction can be up to 50 cm

²⁾ All values are typical values, applicable for 400V/50Hz. The power consumption measurement is based on the COCIR methodology – MRI – Measurement of energy consumption. Many variables impact power consumption, thus there can be no guarantee that each customer will achieve the same values.

³⁾ Values for each of the 3 gradient axes

⁴⁾ Water temperature 6–14 °C; allowed delta T: ± 2 K with max. 1K/30 s

Sequences

		Matrix			
		64	128	256	512
Spin Echo	min. TR [ms]	4.9	5	5.5	6.2
	min. TE [ms]	1.5	1.5	1.8	2.3
Inversion Recovery	min. TR [ms]	26	26	27	27
	min. TE [ms]	1.5	1.5	1.8	2.4
	min. TI [ms]	21	21	21	21
2D GRE	min. TR [ms]	0.58	0.69	1.07	1.16
	min. TE [ms]	0.22	0.22	0.22	0.22
3D GRE	min. TR [ms]	0.58	0.69	1.07	1.16
	min. TE [ms]	0.22	0.22	0.22	0.22
TrueFISP	min. TR [ms]	2.01	2.18	2.61	3.42
	min. TE [ms]	0.94	0.97	1.17	1.48
TSE (HASTE)	min. Echo Spacing [ms]	1.5	1.5	1.8	2.28
	min. TR [ms]	4.9	5	5.4	6.3
	min. TE [ms]	1.5	1.5	1.8	2.3
	max. Turbo Factor = 512				
Turbo GSE	min. Echo Spacing [ms]	0.7	0.96	0.96	1.38
	min. TR [ms]	7.5	7.8	8.1	8.9
	min. TE [ms]	4.5	4.5	5	5.5
	max. Turbo Factor = 65				
EPI (single-shot and multi-shot)	max. EPI Factor = 21				
	min. Echo Spacing [ms]	0.27	0.39	0.61	
	min. TR [ms]	10	10	10	
	min. TE [ms]	2.1	2.2	2.6	
	min. Measurement time	11	19	25	
Diffusion Imaging	max. EPI Factor = 256				
	Max. b-value [s/mm ²]	10 000	10 000	10 000	
	Min. TE [ms] with b = 1000 s/mm ²	46	47	49	

All matrices without interpolation. Combinations of the stated parameters are not always possible; some parameters may require optional application packages.

Coils

Standard Integrated Whole-Body Coil

- No-tune transmit/receive coil with 32 rungs and 4-port feeding
- Enabling TimTX TrueForm technology

3T BioMatrix Coils

A new BioMatrix coil (BioMatrix Spine 24) utilizes seamlessly integrated sensors to acquire and display the patient's respiration data without need for user interaction.

The BioMatrix Body 12 contains a seamlessly integrated Beat Sensor which is designed for automatic cardiac triggering¹⁾ – without the need for ECG leads.

3T Tim 4G Coils

The Tim 4G coils are designed for highest image quality in combination with easy handling. High element coils increase SNR and reduce examination times. DirectConnect and SlideConnect® technology reduce patient set up time. Light weight, ergonomically designed coils enable highest patient comfort.

- No coil changing with multi-exam studies saves patient setup time
- All coils are time-saving “no-tune” coils
- Low-noise preamplifiers
- AutoCoilSelect for dynamic, automatic, or interactive selection of the coil elements within the Field of View

Standard Coils

Head/Neck 16 (DirectConnect)	Application area	Head and neck	
	Dimensions (L×W×H)	440 mm × 330 mm × 370 mm	
	Weight	4.7 kg	
BioMatrix Spine 24 (with Respiratory Sensors ¹⁾ and DirectConnect)	Application area	Spine	
	Dimensions (L×W×H)	1200 mm × 489 mm × 63 mm	
	Weight	10.5 kg	
BioMatrix Body 12 ²⁾ (SlideConnect®)	Application area	<ul style="list-style-type: none">• Thorax• Heart• Abdomen	<ul style="list-style-type: none">• Pelvis• Hip
	Dimensions (L×W×H)	385 mm × 590 mm × 68 mm	
	Weight	1.5 kg	
Flex Large 4	Application area	Multi purpose	
	Dimensions (L×W)	516 mm × 224 mm	
	Weight	550 g	
Flex Small 4	Application area	Multi purpose	
	Dimensions (L×W)	366 mm × 174 mm	
	Weight	450 g	
Accessories	Flex Coil Interface 3T		

Combination of all coils possible for large Field of View exams.

¹⁾ The Respiratory Sensor functionality is a retrofittable software option.

²⁾ Available with exchangeable coil cables: 95cm (standard), 165cm (optional)

Computer System

syngo Acquisition Workplace – Tim [180×32]

Standard Measurement and reconstruction system	Processor	1×Intel Xeon ≥E3-1275v5 (4 Core)
	Clock rate	3.6 GHz, or comparable
	Main memory (RAM)	48 GB
	SSD for raw data	≥480 GB
	SSD for system software	≥240 GB
	Parallel Scan & Recon	Simultaneous scan and reconstruction of up to 12 data sets
	Reconstruction speed	16 949 recons per second (256 ² FFT, full FoV) 78 431 recons per second (256 ² FFT, 25% recFoV)
Highend Measurement and reconstruction system ¹⁾	Processor	2×Intel Xeon ≥ E5-2620v4 (8 Core)
	Clock rate	2×2.1 GHz, or comparable
	Main memory (RAM)	96 GB
	SSD for raw data	≥480 GB
	SSD for system software	≥240 GB
	Parallel Scan & Recon	Simultaneous scan and reconstruction of up to 12 data sets
	Reconstruction speed	40 404 recons per second (256 ² FFT, full FoV) 149 532 recons per second (256 ² FFT, 25% recFoV)
	GPGPU	1×Nvidia Quadro P2000

¹⁾ Optional

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Free page for better readability of the following two-pager in double-page mode (front and back on the same screen)

MAGNETOM Lumina – A BioMatrix System

BioMatrix Dockable Table¹⁾

siemens-healthineers.com/lumina



General

Comfortable patient table fitting the needs for patients up to 250 kg/550 lbs.

- Integrated coils for fast patient preparation and enhanced user comfort
- Integrated arm boards for IV injection
- Integrated infusion stand
- 360° maneuverability with integrated navigation wheel

General (Continued)

- Fast automated push-button AutoDock functionality
- Integrated safety rails
- Compatible with TimCT FastView (Continuous table move)
- Compatible with Tim 4G coils

¹⁾ Optional

BioMatrix Dockable Table



Technical Data

Max. patient weight for vertical and horizontal table movement		250 kg (550 lbs)
Max. scan range		2050 mm
User can adjust the table speed with two predefined speed modes or accelerate continuously via Select&GO Control Centers		
Vertical table movement	Range	560 mm – 1020 mm +13 mm ¹⁾
	Speed	32 mm/s; one click table up
Horizontal table movement	Max. range	2810 mm
	Max. speed	200 mm/s
Position accuracy ²⁾		±0.5 mm
Continuous table movement during scan capable		

¹⁾ Depending on the floor conditions

²⁾ Horizontal accuracy for repositioning from one direction

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MAGNETOM Lumina – A BioMatrix System

Head/Neck 16

siemens-healthineers.com/lumina



General

The Head/Neck 16 is part of the the Standard Coil Package Tim [180×32].

- Cable-less coil with DirectConnect technology
- Combined coil for head and neck examination for optimized workflow
- Upper coil part easily removable
- Lower coil part usable without upper part for highly claustrophobic patients
- Lower coil part may stay on the patient table for most of the examinations
- Smoothly integrated into the patient table with BioMatrix Spine 24
- Open patient-friendly design
- Cushioned head stabilizers (removable)
- No coil tuning
- iPAT-compatible in all directions
- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- Detachable double mirror

Applications

- Head examination
- Neck examination
- MR angiography of the head / neck
- Combined head / neck examination
- TMJ (temporomandibular joints)

Coil specifications

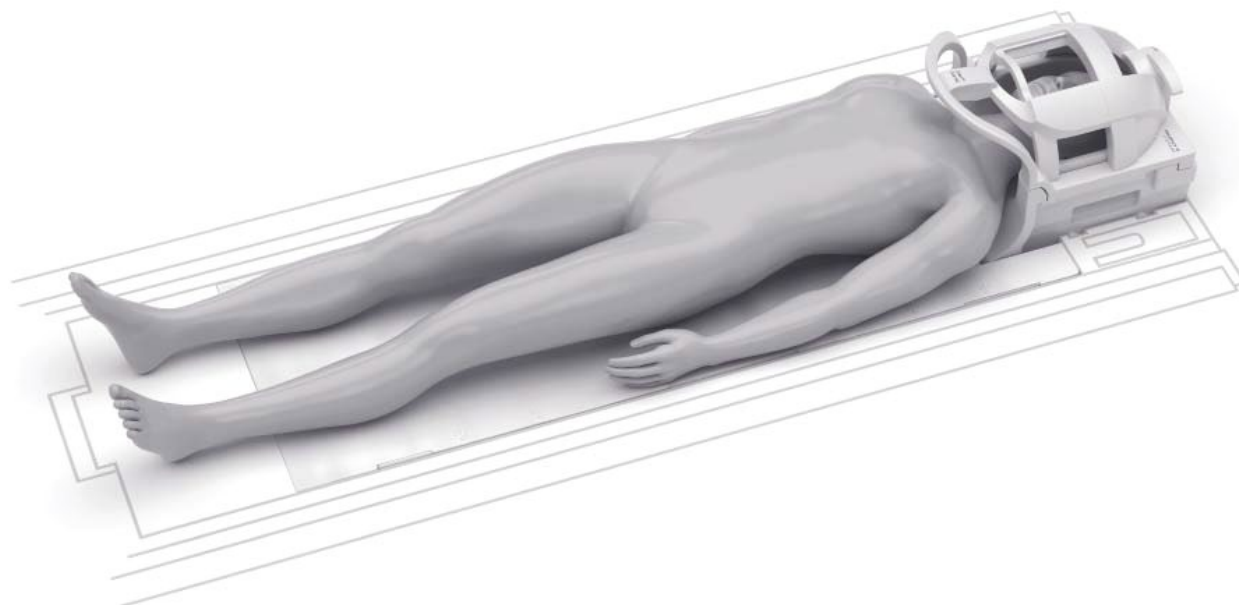
Max. number of independent channels in one single scan and one single FoV:

- 30 in combination with BM Spine 24 and BM Body 12

Head/Neck 16 only:

- 16 coil elements with 16 integrated pre-amplifiers
- Two rings of 6 elements each and one ring with 4 elements

Head/Neck 16



Possible combinations

Combination possible with all receive-only coils, e.g.:

- BioMatrix Spine 24
- BioMatrix Body 12
- Peripheral Angio 36¹⁾
- Flex Large 4
- Flex Small 4
- UltraFlex Large 18¹⁾
- UltraFlex Small 18¹⁾

Weight

Total	4.7 kg
Anterior part	1.7 kg

Dimensions (L x W x H)

440 mm x 330 mm x 370 mm

¹⁾ Optional

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MAGNETOM Lumina – A BioMatrix System

BioMatrix Head/Neck 20¹⁾²⁾

siemens-healthineers.com/lumina



General

- First cable-less tiltable coil with DirectConnect™ technology, with 3 different angular positions (0°, 9° and 18°)
- Integrated BioMatrix Tuners: First coil with CoilShim technology offering integrated shim elements
- Combined coil for head and neck examination for optimized workflow
- Upper coil part easily removable
- Lower coil part usable without upper part for highly claustrophobic patients
- Lower coil part may stay on the patient table for most of the examinations
- Smoothly integrated into the patient table with BioMatrix Spine 24²⁾
- Open patient-friendly design
- Cushioned head stabilizers (removable)
- No coil tuning
- iPAT-compatible in all directions
- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- Detachable double mirror

Applications

- Head examination
- Neck examination
- MR angiography of the head/neck
- Combined head/neck examination
- Cervical spine
- TMJ (temporomandibular joints)

Coil specifications

Max. number of independent channels in one single scan and one single FoV:

- up to 32 independent channels in combination with BM Spine 24 and a Body coil

BM Head/Neck 20 only:

- 20 coil elements with 20 integrated pre-amplifiers
- Two rings of 8 elements each and one ring with 4 elements

Possible combinations

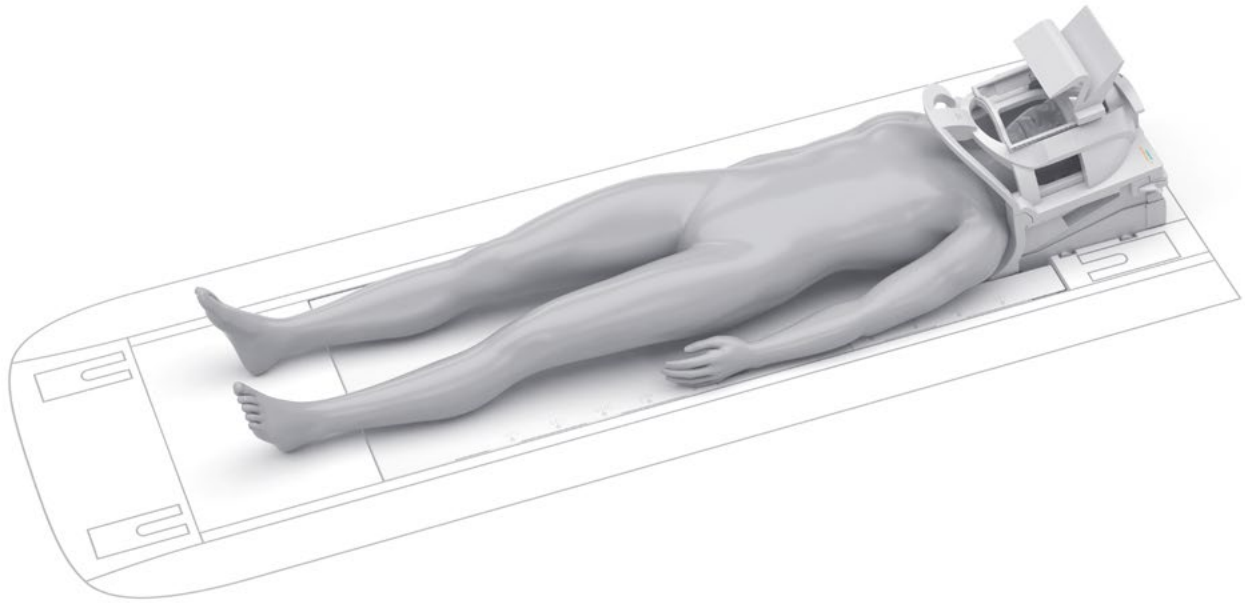
Combination possible with all receive-only coils, e.g.:

- Body 6²⁾
- BioMatrix Body 12
- Peripheral Angio 36²⁾
- Flex Large 4
- Flex Small 4
- UltraFlex Large 18²⁾
- UltraFlex Small 18²⁾

¹⁾ Also referred to as BM Head/Neck 20

²⁾ Optional

BioMatrix Head/Neck 20



Weight

Total	5.7 kg
Anterior part	1.7 kg

Dimensions (L x W x H)

425 mm x 370 mm x 385 mm (incl. baseplate)

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MAGNETOM Lumina – A BioMatrix System

Head 32¹⁾

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General

- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- Upper coil part removable
- Lower coil part usable without upper part (e.g. for highly claustrophobic patients),
- Coil design with comfortable open view for visual stimulation experiments and reduction of claustrophobic response
- Cushions (removable) for head stabilization
- No coil tuning
- iPAT-compatible
- Detachable mirror assembly

Applications

- High resolution head/neck proton imaging
- MR angiography of the head
- Functional imaging of the brain

Coil specifications

Max. number of independent channels in one single scan and one single FoV:

- 32 independent channels

Head 32 only:

- 32 coil elements with 32 integrated pre-amplifiers
- Lower coil part incorporates 20 elements
- Upper coil part incorporates 12 elements

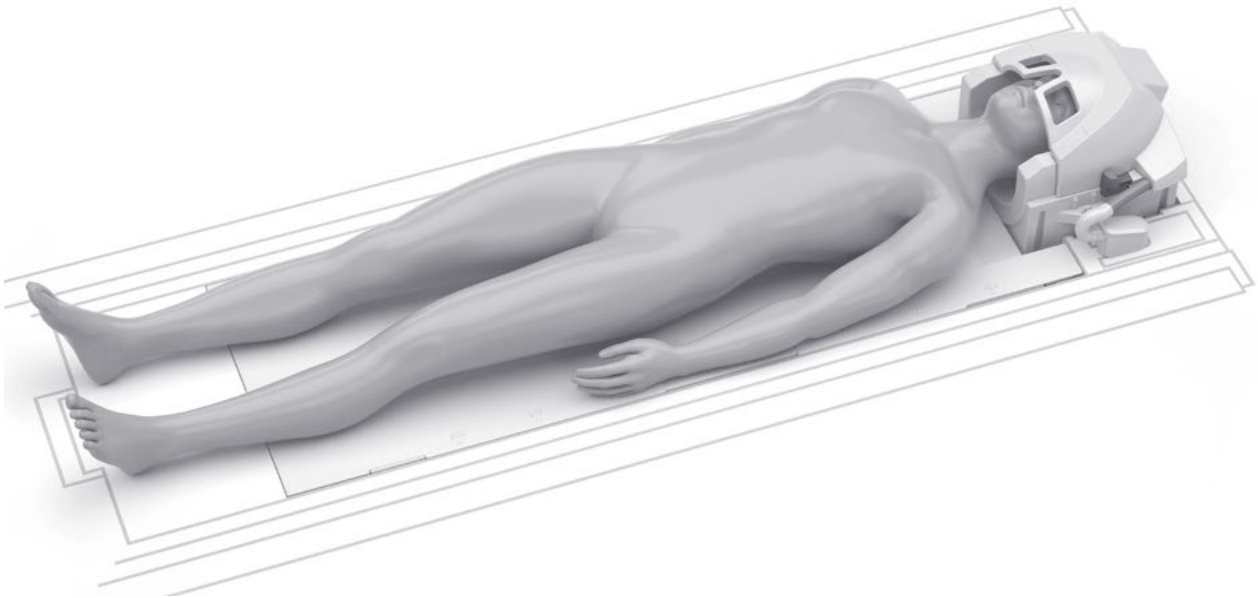
Possible combinations

Lower coil part can be combined with:

- Loop Coils¹⁾

¹⁾ Optional

Head 32



Weight

Total 5.6 kg

Dimensions (L x W x H)

300 mm x 390 mm x 315 mm

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MAGNETOM Lumina – A BioMatrix System

BioMatrix Spine 24¹⁾²⁾

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General

The BioMatrix Spine 24 with integrated BioMatrix Sensors²⁾ is part of the Standard Coil Package Tim [180×32].

- Cable-less coil with DirectConnect™ technology
- Integrated BioMatrix Respiratory Sensors²⁾: sensors measuring the patients respiratory signal in head-first and feet-first position
- Smoothly integrated into the patient table and streamlined with Head/Neck 16
- May remain on the patient table for nearly all exams
- No coil tuning
- iPAT-compatible in all directions
- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil

Applications

- High-resolution imaging of the whole spine
- Various applications in combination with additional coils

Coil specifications

Max. number of independent channels in one single scan and one single FoV:

- 32 independent channels in combination with two BM Body 12 coils

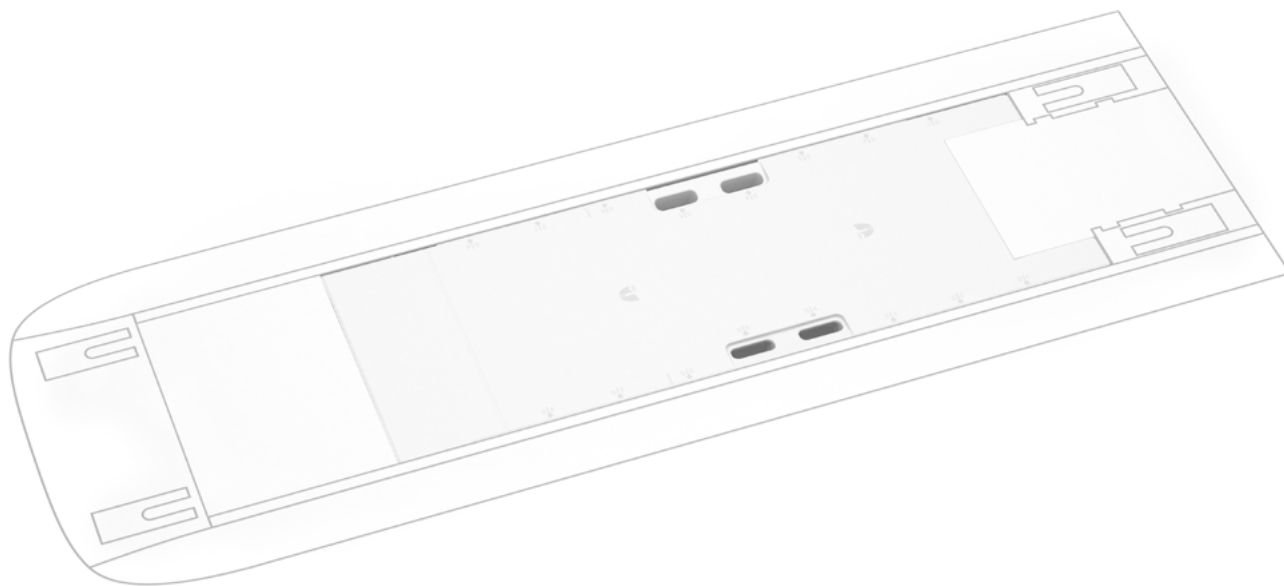
BioMatrix Spine 24 only:

- 24 coil elements with 24 integrated pre-amplifiers
- 8 rows of 3 elements each
- Specific coil density: 2.0 channels / 10 cm z-FoV

¹⁾ Also referred to as BM Spine 24

²⁾ The Respiratory Sensor functionality is a retrofittable software option.

BioMatrix Spine 24



Possible combinations

Combination possible with all receive-only coils, e.g.:

- Body 6¹⁾
- BioMatrix Body 12
- Head/Neck 16
- BioMatrix Head/Neck 20¹⁾
- Peripheral Angio 36¹⁾
- Flex Large 4/Flex Small 4
- UltraFlex Large 18¹⁾
- UltraFlex Small 18¹⁾

Weight

11.5 kg

Dimensions (L x W x H)

1200 mm x 489 mm x 63 mm

¹⁾ Optional

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MAGNETOM Lumina – A BioMatrix System

Body 6¹⁾

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General

- Operates in an integrated fashion with the spine coil
- Can be combined with further Body 6 coils for larger coverage
- No coil tuning
- iPAT-compatible in all directions
- Dual-Density Signal Transfer enables ultra-high density coil design by integrating key RF components into the local coil.
- SlideConnect® technology for easy coil set up

Applications

- Thorax
- Heart
- Abdomen
- Pelvis
- Hip
- Vascular
- MRI in the context of neuro-, cardiovascular and abdominal interventions

Coil specifications

Max. number of independent channels in one single scan and one single FoV:

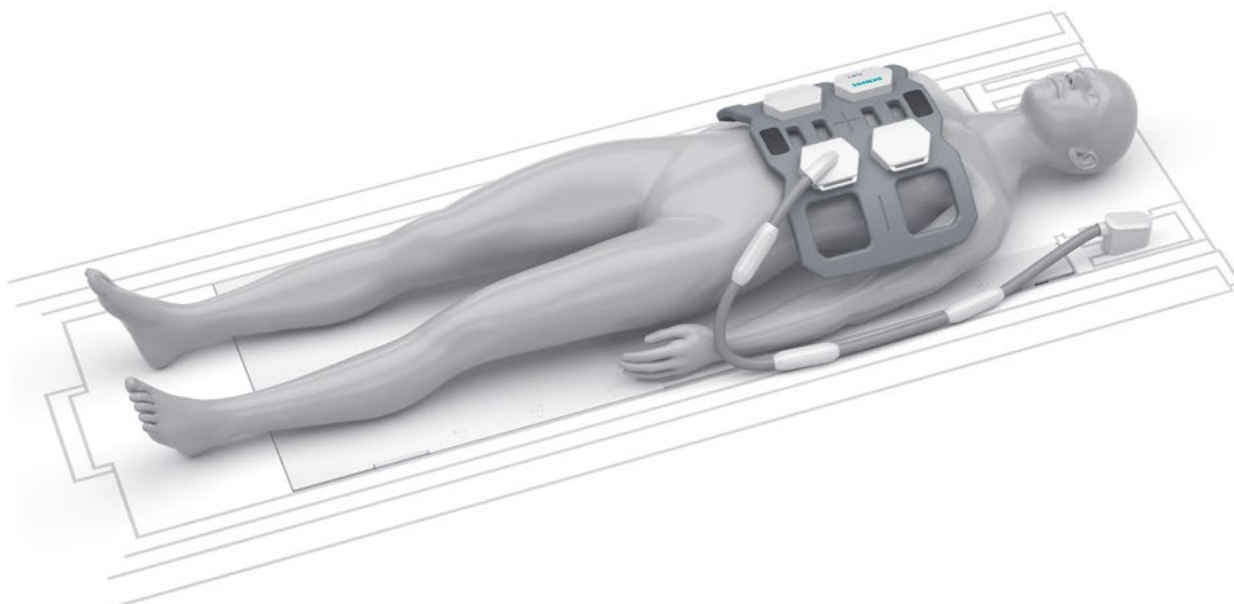
- 32 independent channels in combination with BM Head / Neck 20 and BM Spine 24

Body 6 only:

- 6 coil elements with 6 integrated pre-amplifiers
- 2 rows of 3 elements each
- Specific coil density: 1.9 channels / 10 cm z-FoV

¹⁾ Optional

Body 6



Possible combinations

Combination possible with all receive-only coils, e.g.:

- Additional Body 6 coils¹⁾
- BM Body 12
- Peripheral Angio 36¹⁾
- Flex Large 4, Flex Small 4
- UltraFlex Large 18¹⁾
- UltraFlex Small 18¹⁾
- BioMatrix Head/Neck 20¹⁾
- BioMatrix Spine 24

Weight

1.4 kg

"patient-felt" weight of coil only – 0.9 kg

Dimensions (L × W × H)

322 mm × 533 mm × 70 mm

¹⁾ Optional

International version.

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MAGNETOM Lumina – A BioMatrix System

BioMatrix Body 12¹⁾²⁾

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General

The BioMatrix Body 12 with Beat Sensor²⁾ is part of the Standard Coil Package Tim [180×32].

- Operates in an integrated fashion with the BioMatrix Spine 24
- The Beat Sensor²⁾ is seamlessly integrated into the BioMatrix Body 12.
- Can be combined with further Body coils for larger coverage
- No coil tuning
- iPAT-compatible in all directions
- Dual-Density Signal Transfer enables ultra-high density coil design by integrating key RF components into the local coil
- SlideConnect® technology for easy coil set up
- Exchangeable cable design allows a single coil to be used with either a standard-sized cable (95 cm length, standard) or a longer version (165 cm length, available as an option)

Applications

- Thorax
- Heart
- Abdomen
- Pelvis
- Hip
- Vascular

Coil specifications

Max. number of independent channels in one single scan and one single FoV:

- 32 independent channels in combination with BM Spine 24 and 2nd BM Body 12

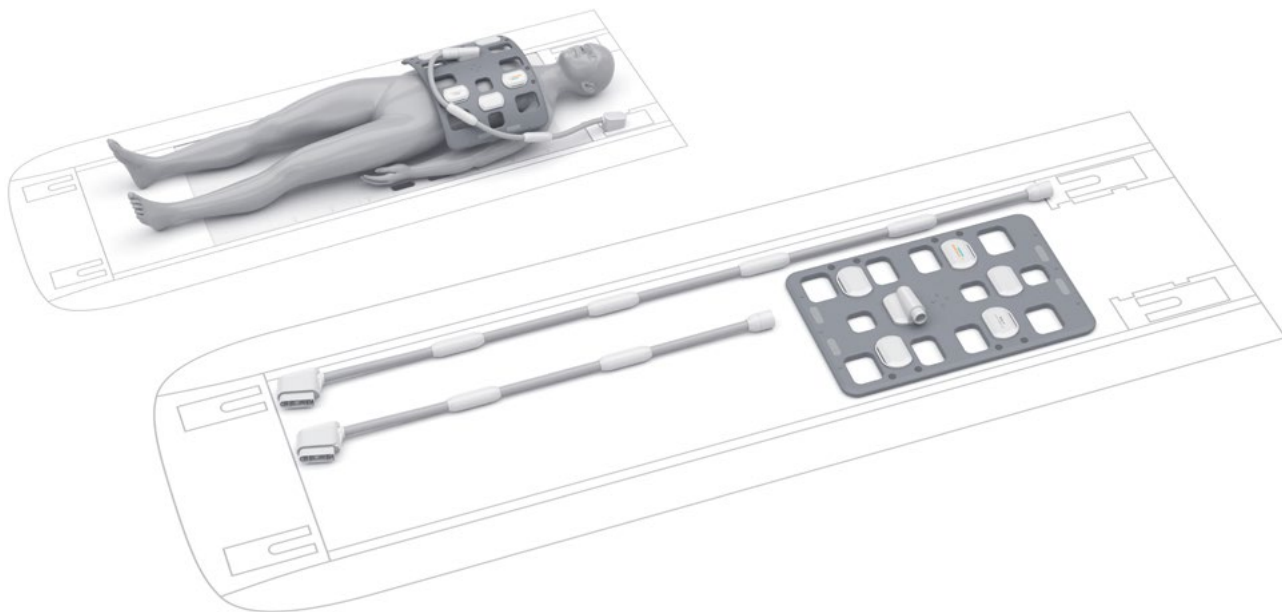
Body 12 only:

- 12 coil elements with 12 integrated pre-amplifiers
- 3 rows of 4 elements each
- Specific coil density: 3.1 channels / 10 cm z-FoV

¹⁾ Also referred to as BM Body 12

²⁾ The Beat Sensor is designed for automatic cardiac triggering. The Cardiac Triggering functionality is still under development and not commercially available yet. Its future availability cannot be ensured. The Cardiac Triggering functionality is planned to be activated with a software update.

BioMatrix Body 12



Possible combinations

Combination possible with all receive-only coils, e.g.:

- Head / Neck 16
- BioMatrix Head / Neck 20¹⁾
- BioMatrix Spine 24
- Additional BioMatrix Body 12 coils¹⁾
- Peripheral Angio 36¹⁾
- Flex Large 4, Flex Small 4
- UltraFlex Large 18¹⁾, UltraFlex Small 18¹⁾
- Loop coils¹⁾

Weight

Coil ²⁾	730 g
Cable	570 g
Cable long ¹⁾	850 g

Dimensions (L x W x H)

Coil ²⁾	385 mm x 590 mm x 63 mm
Cable	950 mm
Cable long ¹⁾	1650 mm

¹⁾ Optional

²⁾ Without detachable coil cable

International version.

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MAGNETOM Lumina – A BioMatrix System

Flex Large 4 Flex Small 4

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General

The Flex Large 4 and Flex Small 4 are part of the Standard Coil Package Tim [180×32].

- Four integrated low-noise preamplifiers
- Allows flexible coil positioning
- Only one interface necessary for all Flex coils
- Several Flex Coil Interfaces can be used simultaneously
- Connection via Flex Coil Interface 3T
- Wrap-around coil made from soft and flexible material
- iPAT-compatible
- No coil tuning

Applications

Flex Large 4	Imaging of large regions such as shoulder, hand, hip, knee, and ankle
Flex Small 4	Imaging of small regions such as wrist and elbow

Coil specifications

Flex Large / Small 4 only:

- 4 coil elements with 4 pre-amplifiers
- 2 rows of 2 elements each
- Specific coil density:
Flex Large 4: 1.8 channels / 10 cm z-FoV
Flex Small 4: 2.3 channels / 10 cm z-FoV

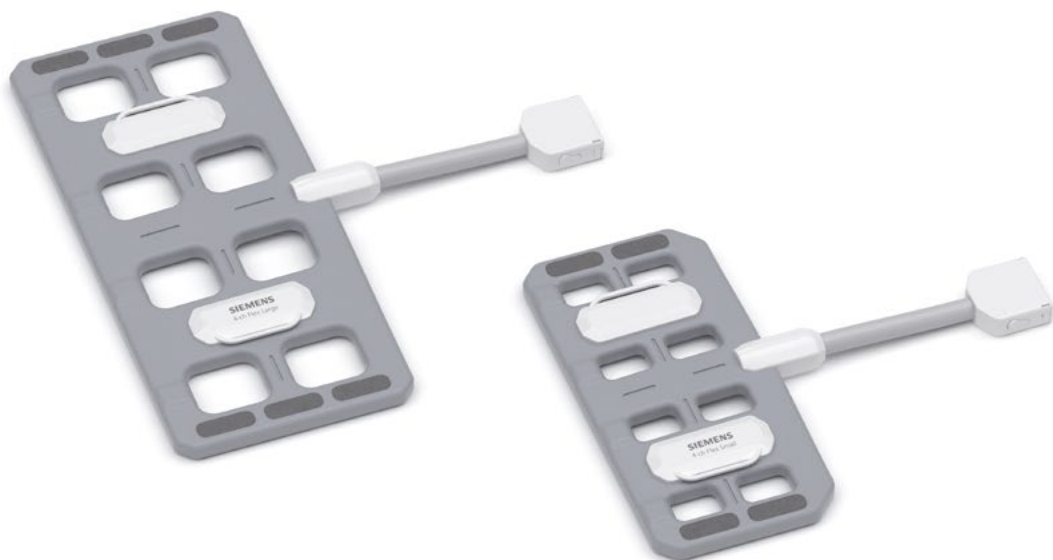
Possible combinations

- Head / Neck 16
- BioMatrix Head / Neck 20¹⁾
- BioMatrix Body 12
- Peripheral Angio 36¹⁾
- Flex Small 4²⁾, Flex Large 4²⁾
- UltraFlex Large 18¹⁾ / UltraFlex Small 18¹⁾
- Loop coils¹⁾

¹⁾ Optional

²⁾ Second Flex Coil Interface required (optional)

Flex Large 4 and Flex Small 4



Weight

Flex Large 4	550 g
Flex Small 4	450 g

Dimensions (L x W)

Flex Large 4	224 mm x 516 mm
Flex Small 4	174 mm x 366 mm

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MAGNETOM Lumina – A BioMatrix System

UltraFlex Large 18¹⁾

UltraFlex Small 18¹⁾

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General

- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- Positioning Aids for shoulder, knee, elbow and foot/ankle for easy and comfortable patient positioning
- Wrap-around coil made from soft and flexible material
- 18-channel design
- iPAT-compatible
- No coil tuning
- Dedicated positioning aids for foot, ankle, shoulder, elbow and knee imaging

Applications

UltraFlex Large 18	Imaging of large regions such as medium to large shoulder, hip, knee, ankle, and hand
UltraFlex Small 18	Imaging of small regions such as small to medium shoulder, elbow, wrist, and hand

Coil specifications

UltraFlex Large/Small 18 only:

- 18 coil elements with 18 integrated pre-amplifiers
- 3 rows of 6 elements each
- Specific coil density:
 - UltraFlex Large 18: 6.2 channels/10 cm z-FoV
 - UltraFlex Small 18: 9.5 channels/10 cm z-FoV

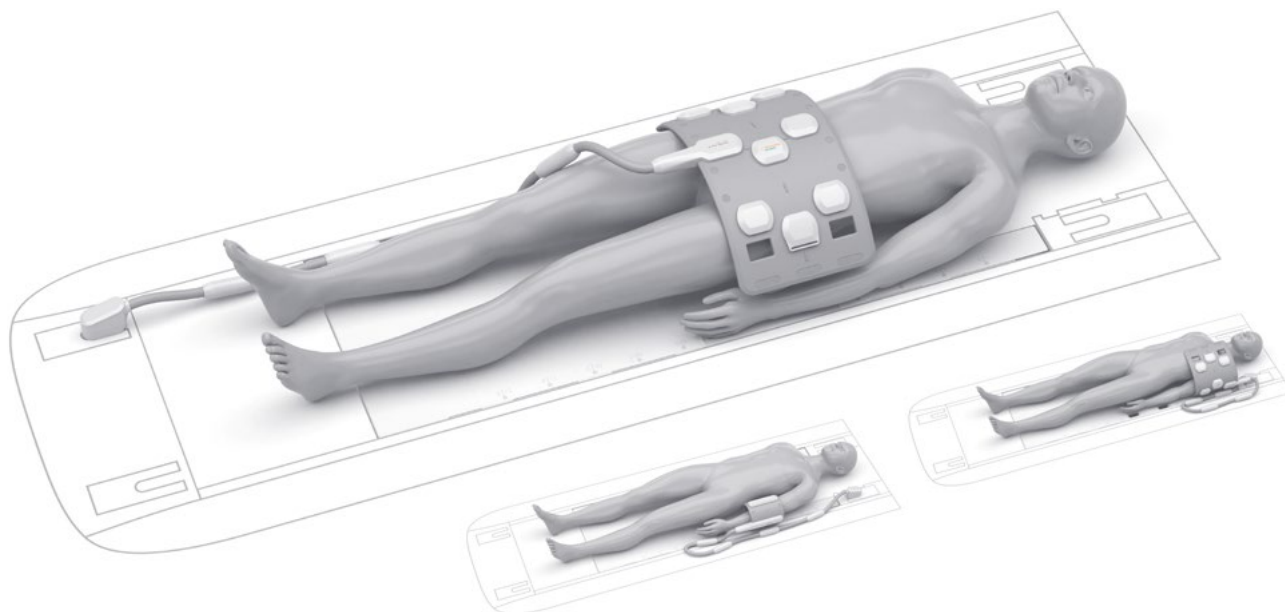
Possible combinations

Combination possible with all receive-only coils, e.g.:

- Head/Neck 16
- BioMatrix Head/Neck 20¹⁾
- BioMatrix Body 12
- Peripheral Angio 36¹⁾
- Flex Small 4, Flex Large 4
- UltraFlex Large 18¹⁾ / UltraFlex Small 18¹⁾
- Loop coils¹⁾

¹⁾ Optional

UltraFlex Large 18 and UltraFlex Small 18



Weight

UltraFlex Large 18	1.8 kg
UltraFlex Small 18	1.4 kg

Dimensions (L x W x H)

UltraFlex Large 18	290 mm x 590 mm x 14 mm
UltraFlex Small 18	190 mm x 410 mm x 14 mm

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MAGNETOM Lumina – A BioMatrix System

Peripheral Angio 36¹⁾

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General

- Operates in an integrated fashion with the Body 18 coil and the integrated Spine coil and for whole-body examinations also with the BioMatrix Head/Neck 20
- Can be utilized head and feet first
- Both legs are independently covered with coil elements, maximizing the coil filling factor and the signal-to-noise ratio
- No coil tuning
- iPAT-compatible in all directions
- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- SlideConnect® technology for easy coil set up
- One cable only for easy handling

Applications

- High resolution angiography of both legs with highest signal-to-noise ratio
- Bilateral examinations of long bones of the legs

Coil specifications

Max. number of independent channels in one single scan and one single FoV:

- 30 independent channels in combination with BM Spine 24

Peripheral Angio 36 only:

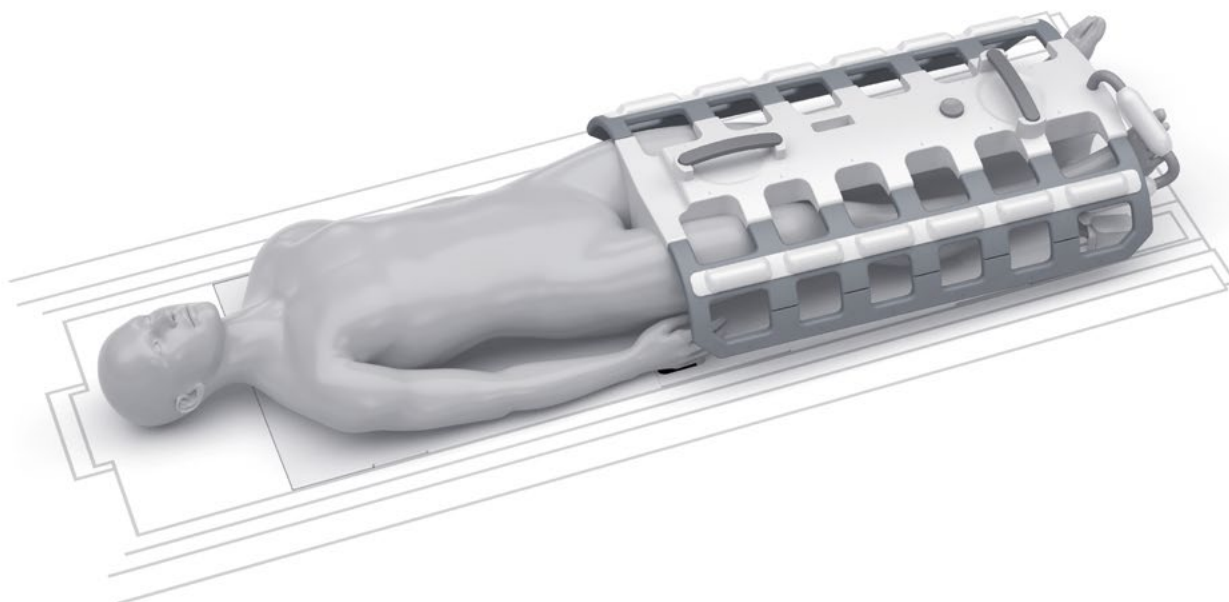
- 36 coil elements with 36 integrated pre-amplifiers
- 6 rows of 6 elements each
- Specific coil density: 4.2 channels / 10 cm z-FoV

Possible combinations

- Head / Neck 16
- BioMatrix Head / Neck 20¹⁾
- BioMatrix Body 12
- BioMatrix Spine 24
- Flex Large 4, Flex Small 4
- UltraFlex Large 18¹⁾, UltraFlex Small 18¹⁾

¹⁾ Optional

Peripheral Angio 36



Weight

8 kg

Dimensions (L × W × H)

860 mm × 300–640 mm × 280 mm

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MAGNETOM Lumina – A BioMatrix System

Hand/Wrist 16¹⁾

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General

- 16-channel coil with 16 integrated preamplifiers
- iPAT-compatible in all directions
- Hinged design of the upper part for quick and easy patient positioning
- Stabilization pads for comfortable positioning
- Holder allows off-center positioning to ensure a comfortable position for the patient
- No coil tuning

General (Continued)

- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- SlideConnect® technology for easy coil set up

Applications

High resolution hand and wrist imaging

¹⁾ Optional

Hand/Wrist 16



Weight

Coil	2.8 kg
Base plate	1.6 kg

Dimensions (L x W x H)

Coil	322 mm x 215 mm x 115 mm
Base plate	524 mm x 313 mm x 30.5 mm

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MAGNETOM Lumina – A BioMatrix System

Foot/Ankle 16¹⁾

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General

- 16-channel coil with 16 integrated preamplifiers
- iPAT-compatible in all directions
- Boot-like coil design
- Cable-less coil with DirectConnect™ technology
- Stabilization pads for comfortable patient positioning
- No coil tuning

General (Continued)

- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil

Applications

High resolution foot and ankle imaging

¹⁾ Optional

Foot/Ankle 16



Weight		Dimensions (L x W x H)	
Coil	3.2 kg	Coil	410 mm x 330 mm x 390 mm
Base plate	7.1 kg	Base plate	427 mm x 333 mm x 383 mm

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MAGNETOM Lumina – A BioMatrix System

Shoulder Shape 16¹⁾

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General

- A 16-channel coil with flexible wings to shape around small and large shoulder anatomy – with 16-channel coil design with 16 integrated preamplifiers
- Includes pads for high patient comfort
- No coil tuning
- iPAT-compatible in all directions

General (Continued)

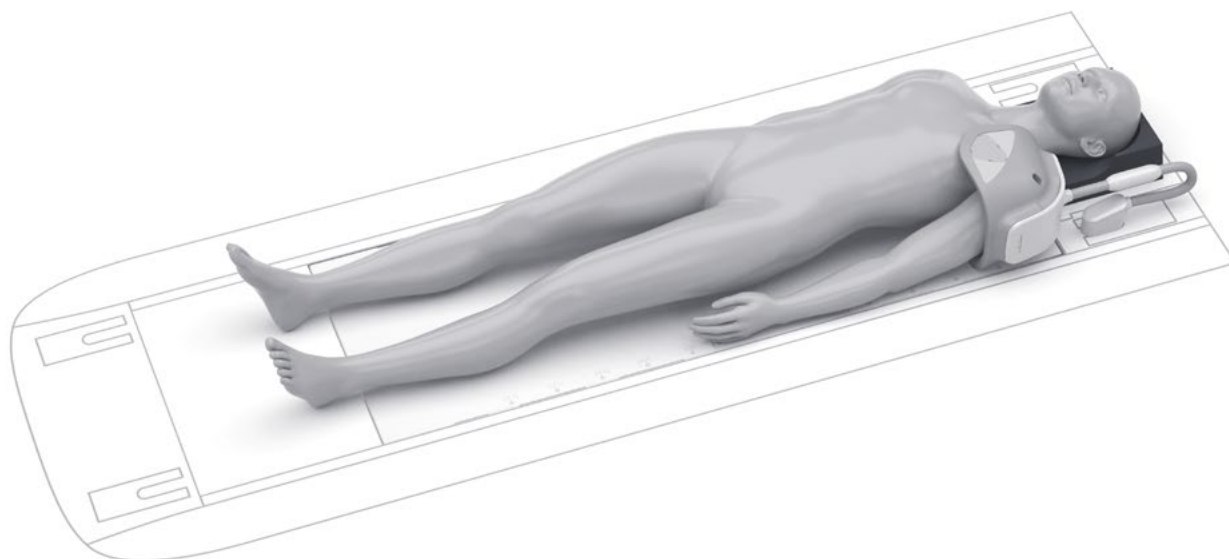
- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil
- SlideConnect® technology for easy coil set up

Applications

- Best visualization of small anatomic structures (e.g. labrum)
- Higher SNR and better field homogeneity
- Reduced slice thickness and measurement times

¹⁾ Optional

Shoulder Shape 16



Weight

1.5 kg

Dimensions (L x W x H)

214 mm x 214 mm x 262 mm

Opening

160–270 mm

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MAGNETOM Lumina – A BioMatrix System

Tx/Rx Knee 18¹⁾

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General

- 18-channel transmit/receive coil
- 18-channel coil with 18 integrated preamplifiers, elements arranged in 3 rungs by 6 elements
- iPAT-compatible in all directions
- Upper coil part removable
- Flared opening towards the thigh
- Holder allows off-center positioning to ensure a comfortable position for the patient
- Cushions for patient comfort and stabilization of the anatomy

General (Continued)

- No coil tuning
- One plug only
- SlideConnect® technology for easy coil set up

Applications

- Examinations of joints in the area of the lower extremities
- High resolution knee imaging

¹⁾ Optional

Tx/Rx Knee 18



Weight

6.0 kg

Dimensions (L x W x H)

282 mm x 528 mm x 262 mm (incl. baseplate)

Inner Diameter

170 mm; 190 mm flaring towards thigh

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MAGNETOM Lumina – A BioMatrix System

Breast BI 7¹⁾

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General

- 7-ch design for imaging and biopsy with high SNR both in diagnostic and interventional set-up
- Height-adjustable head rest
- Compact design
- Single-plug connect
- Plug parking position
- Can be positioned on top of the BioMatrix Spine 24
- Head or feet first measurement possible
- iPAT compatible in all directions
- Abdominal cushion with mechanical lock to coil
- Supports cranio-caudal compression¹⁾
- Biopsy kit¹⁾ for grid and post/pillar biopsy, including lateral and medial grids, a post/ pillar fixation unit, markers, and a needle kit for training purposes
- LED lights provide excellent visibility for breast positioning and biopsy

Applications

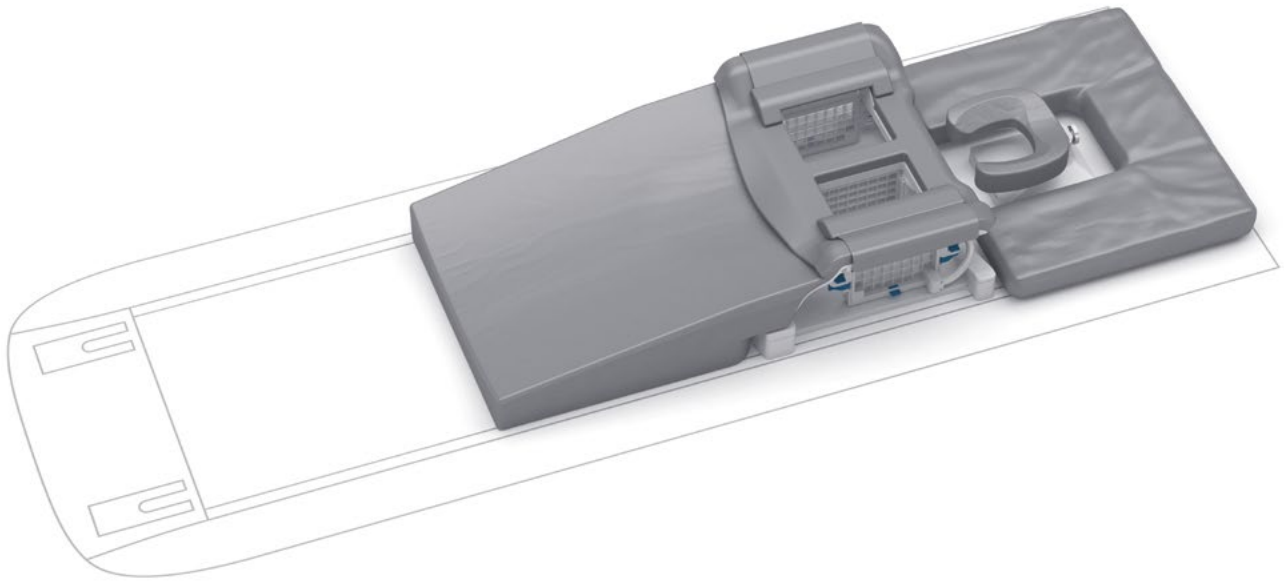
- Simultaneous imaging of both breasts in all directions
- Biopsy imaging for lateral and medial access
- High-resolution 2D and 3D imaging
- For quantitative spectroscopy (SVS¹⁾) a reference bottle can be inserted.

Typically combined with

- BioMatrix Body 12

¹⁾ Optional

Breast BI 7



Weight

10.7 kg

Dimensions (L x W x H)

566 mm x 499 mm x 223 mm

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MAGNETOM Lumina – A BioMatrix System

2-/4-/8-Channel Sentinelle Breast Coil¹⁾

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General

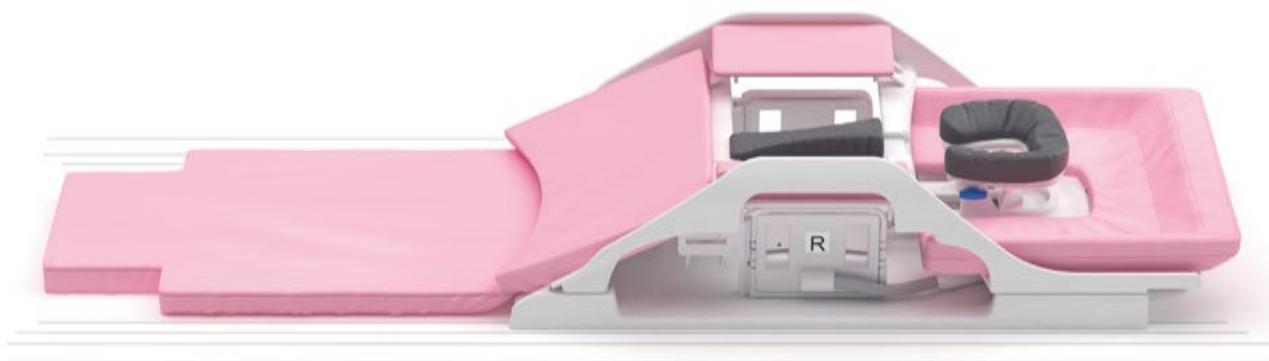
- Patient frame
- Immobilization plate
- Slider
- Two 3-channel diagnostic insert coils, two 1-channel biopsy insert coils, one 2-channel medial coil
- The coil can be used in the following configurations:
 - 8-channel diagnostic imaging,
 - 4-channel biopsy (bilateral/lateral),
 - 2-channel biopsy (unilateral/medial)
- Breast cushion set
- Height adjustable head rest
- iPAT compatible in all directions
- Contra-lateral support plate for use in unilateral biopsy
- Tim Coil Interface 3T¹⁾ needed to connect coil with scanner
- Biopsy set for training purposes (grid, marker and training needle kit)

Applications

- Simultaneous imaging of both breasts in all directions
- Biopsy imaging for lateral and medial access
- High-resolution 2D and 3D imaging
- For quantitative spectroscopy (SVS¹⁾) a reference bottle can be inserted.

¹⁾ Optional

2-/4-/8-Channel Sentinelle Breast Coil



Weight

16 kg without riser
22 kg with riser

Dimensions (L × W × H)

1097 mm × 582 mm × 279 mm

International version.
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MAGNETOM Lumina – A BioMatrix System

8-Channel Sentinelle Breast Coil¹⁾ / Upgrade to Biopsy Configuration^{1) 2)}

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8-Channel Sentinelle Breast Coil (Imaging Configuration)¹⁾

General

- Patient frame
- Immobilization plate
- Slider
- Two 3-channel diagnostic insert coils, one 2-channel medial coil
- The coil can be used for 8-channel diagnostic imaging
- Breast cushion set
- Height adjustable head rest
- iPAT compatible in all directions
- Tim Coil Interface 3T¹⁾ needed to connect coil with scanner
- Coil configuration functionally upgradable for biopsy¹⁾

Applications

- Simultaneous imaging of both breasts in all directions
- High-resolution 2D and 3D imaging
- For quantitative spectroscopy (SVS¹⁾) a reference bottle can be inserted.

8-Channel Sentinelle Breast Coil Upgrade to Biopsy Configuration²⁾

General

- Two 1-channel biopsy insert coils
- The coil can be used in the following configurations:
 - 4-channel biopsy (bilateral/lateral),
 - 2-channel biopsy (unilateral/medial)
- Contra-lateral support plate for use in unilateral biopsy
- Biopsy set for training purposes (grid, marker and training needle kit)

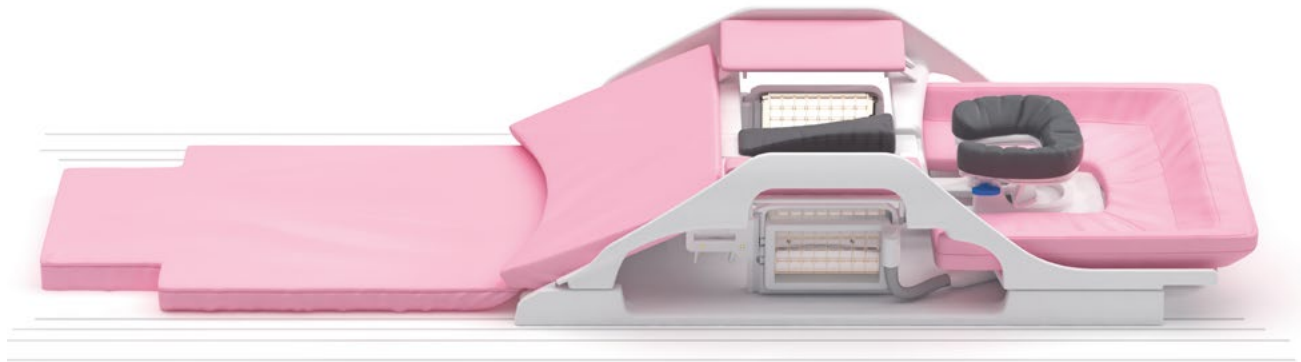
Applications

Biopsy imaging for lateral and medial access

¹⁾ Optional

²⁾ Prerequisite: 8-Channel Imaging Configuration

8-Channel Sentinelle Breast Coil / Upgrade to Biopsy Configuration



8-Channel Sentinelle Breast Coil (Imaging Configuration)

Weight

16 kg without riser; 22 kg with riser

Dimensions (L x W x H)

1097 mm x 582 mm x 279 mm

8-Channel Sentinelle Breast Coil Upgrade to Biopsy Configuration¹⁾

Weight

16 kg without riser; 22 kg with riser

Dimensions (L x W x H)

1097 mm x 582 mm x 279 mm

¹⁾ Prerequisite: 8-Channel Imaging Configuration

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MAGNETOM Lumina – A BioMatrix System

2-/10-/16-Channel Sentinelle Breast Coil¹⁾

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General

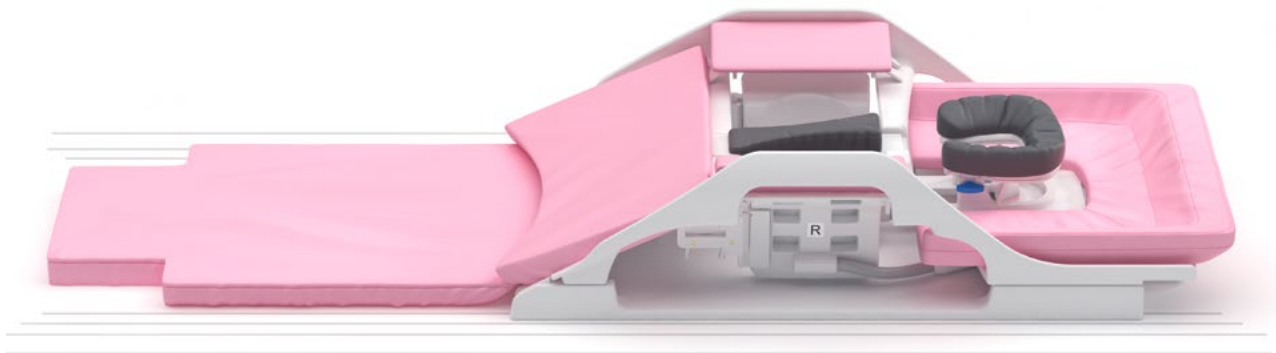
- Patient frame
- Immobilization plate
- Slider
- Two 4-channel diagnostic insert coils, two 1-channel biopsy insert coils, one 8-channel medial coil
- The coil can be used in the following configurations:
 - 16-channel diagnostic imaging,
 - 10-channel biopsy (bilateral/lateral),
 - 2-channel biopsy (unilateral/medial)
- Breast cushion set
- Height adjustable head rest
- iPAT compatible in all directions
- Contra-lateral support plate for use in unilateral biopsy
- Biopsy set for training purposes (grid, marker and training needle kit)
- Connection with two Tim Coil Interfaces 3T¹⁾

Applications

- Simultaneous imaging of both breasts in all directions
- Biopsy imaging for lateral and medial access
- High-resolution 2D and 3D imaging
- For quantitative spectroscopy (SVS¹⁾) a reference bottle can be inserted

¹⁾ Optional

2-/10-/16-Channel Sentinelle Breast Coil



Weight

16 kg without riser
22 kg with riser

Dimensions (L x W x H)

1097 mm x 582 mm x 279 mm

International version.
Not for distribution or use in the U.S.

Siemens Healthcare Headquarters

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siemens-healthineers.com

Legal Manufacturer

Invivo Corporation
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Gainesville, FL 32608
USA
Phone: +1-352-336-0010
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MAGNETOM Lumina – A BioMatrix System

Breast 18¹⁾

siemens-healthineers.com/lumina



General

- 18-channel design with 4 frontal elements, 4 elements around the breast and 1 axillary element, for each side
- Height-adjustable head rest
- Compact design
- Single-plug connect
- Plug parking position
- Head or feet first measurement possible
- iPAT compatible in all directions
- Abdominal cushion with mechanical lock to coil
- Pedals for convenient l-r fixation of the breast
- Volume per breast 2200 ml

Applications

- Simultaneous imaging of both breasts in all directions
- Axillar imaging elements
- High-resolution 2D and 3D imaging
- For quantitative imaging spectroscopy (SVS¹⁾)
a reference bottle can be inserted

Possible combinations

- BioMatrix Body 12

¹⁾ Optional

Breast 18



Weight

5.5 kg

Dimensions (L x W x H)

575 mm x 410 mm x 205 mm

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MAGNETOM Lumina – A BioMatrix System

Loop Coils¹⁾

siemens-healthineers.com/lumina



General

Loop Coils

- No coil tuning
- iPAT-compatible in combination with other coils

Typically combined with:

- Head/Neck 16
- BioMatrix Head/Neck 20¹⁾
- BioMatrix Body 12
- BioMatrix Spine 24
- All flexible coils²⁾

Flex Coil Interface 3T

- 4 integrated low-noise preamplifiers
- Allows flexible coil positioning
- Only one interface necessary for all Loop coils
- Several Flex Coil Interfaces can be used simultaneously
- Flex Coil Interface 3T¹⁾ needed to connect coil with scanner
- Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil

Applications

Loop Coil, large

Examination of upper or lower extremities (e.g. shoulder, axilla)

Loop Coil, medium

Examination of inner ear, structure of wrist and fingers, pediatric examinations³⁾

Loop Coil, small

Examination of small structures near the surface (e.g. joints of fingers and toes, wrist, skin, temporo-mandibular joints (TMJ))

¹⁾ Optional

²⁾ Second Flex Coil Interface required (optional)

³⁾ MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures.

Loop Coils



Weight

Loop Coil, large	225 g
Loop Coil, medium	200 g
Loop Coil, small	175 g

Diameter

Loop Coil, large	110 mm
Loop Coil, medium	70 mm
Loop Coil, small	40 mm

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MAGNETOM Lumina – A BioMatrix System

MEDRAD Endorectal Coil Kit¹⁾

siemens-healthineers.com/lumina



General

- The MEDRAD Endorectal Coil Kit includes the MEDRAD Endo Interface 3T²⁾ and the Endo Adapter for MEDRAD 3T, and connects to the Tim Coil Interface 3T¹⁾
- Interface device for connecting the disposable MEDRAD prostate receive coil²⁾ (to be ordered separately)
- No coil tuning

Applications

- Excellent visualization of the prostate
- Non-invasive preoperative diagnostic evaluation and treatment planning

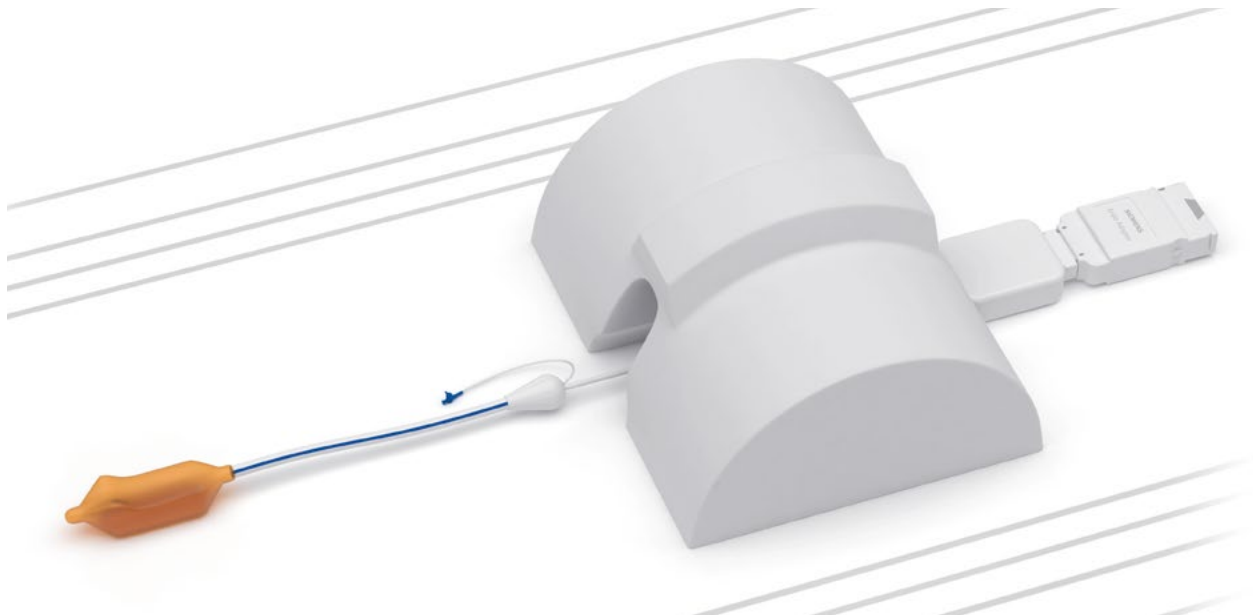
Typically combined with

- BioMatrix Body 12
- BioMatrix Spine 24

¹⁾ Optional

²⁾ Legal Manufacturer: Bayer Medical Care Inc. (1 Bayer Drive Indianola, PA 15051-0780, U.S.A., Phone: +1 800-633-723, www.mvs.bayer.com)

MEDRAD Endorectal Coil Kit



Weight

200 g

International version.
Not for distribution or use in the U.S.

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MAGNETOM Lumina – A BioMatrix System

Tx/Rx CP Head Coil¹⁾

siemens-healthineers.com/lumina



General

- CP Send/Receive head coil with integrated preamplifier
- Upper coil part removable
- Open patient-friendly design
- No coil tuning
- Cushions for patient comfort and stabilization of the head

General (Continued)

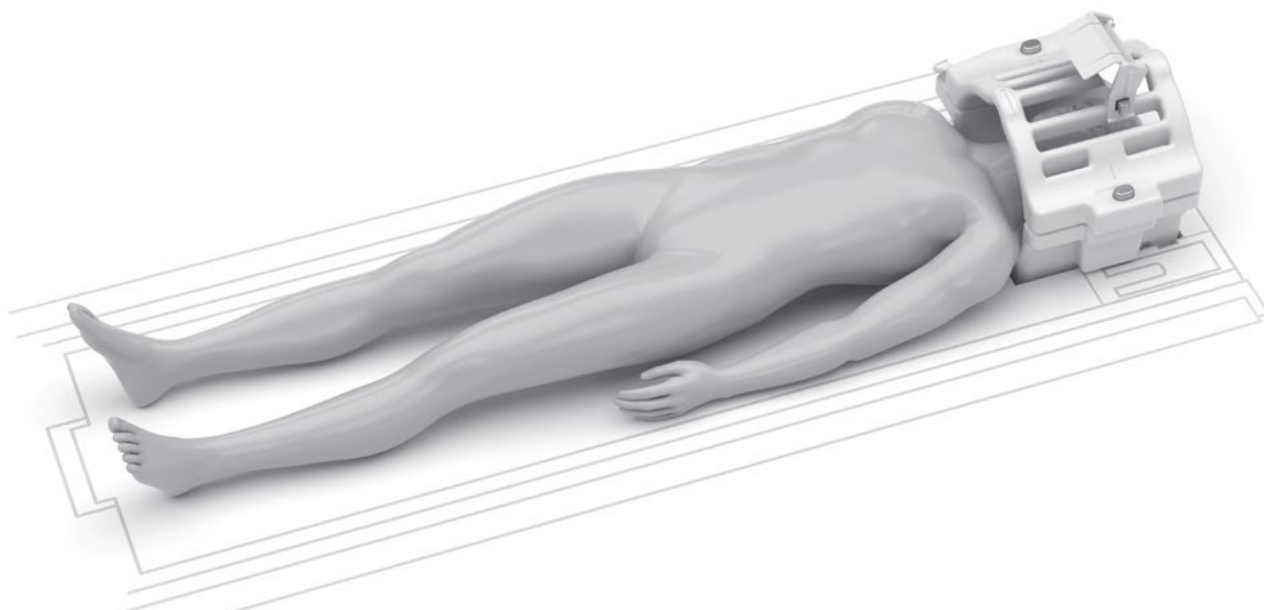
- Detachable mirror
- SlideConnect® technology for easy coil set up

Applications

- Head examinations
- High resolution brain spectroscopy

¹⁾ Optional

Tx/Rx CP Head Coil



Weight

5.2 kg

Dimensions (L x W x H)

315 mm x 475 mm x 360 mm

International version.
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USA
Phone: +1 440-638-5106
www.qualifiedyn.com

MAGNETOM Lumina – A BioMatrix System

Pediatric 16^{1) 2)}

siemens-healthineers.com/lumina



General

- 16-channel Head/Neck design with 16 integrated pre-amplifiers, with 13 elements for head imaging (a ring of 7 and a ring of 6 elements) and 3 elements for neck imaging
- Head and neck elements can be used separately for head-only and neck-only imaging
- Neck elements can be switched off when only scanning the brain
- Smooth integration into the table with the Spine coil
- Can be used in combination with other Tim 4G coils (e.g. Spine and Body) for whole body imaging
- Cable-less with DirectConnect™ technology
- Upper coil part easily removable
- Cushioned head stabilizers (removable)
- No coil tuning required
- iPAT compatible in all directions

General (Continued)

- Dual-Density Signal Transfer technology with key RF components integrated into the coil
- Comes with a cradle (optional for imaging) which can be used to safely and efficiently transport and position children up to 5 months of age and 10 kgs in weight.
- Features a recess at the bottom of the anterior coil for easier, better positioning of intubation tubes
- 4 cm aperture at the top of the coil to ensure good ventilation

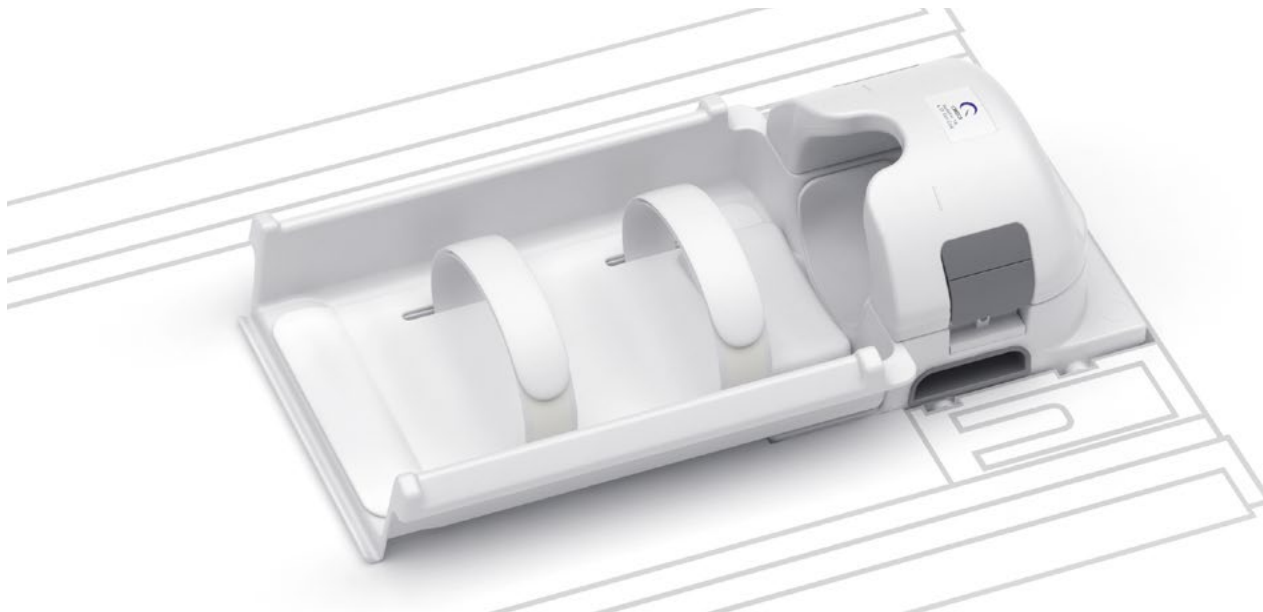
Applications

- For head and neck examinations of children up to 18 months of age
- Can be combined with other Tim 4G coils for whole body imaging

¹⁾ Optional

²⁾ MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures

Pediatric 16



Typically combined with

- BioMatrix Spine 24
- BioMatrix Body 12
- Flex Large 4, Flex Small 4
- UltraFlex Large 18¹⁾, UltraFlex Small 18¹⁾
- 4-Channel Special-Purpose Coil¹⁾

Weight

Total Coil	4.4 kg
Anterior Coil	1.4 kg
Cradle	2.3 kg

Dimensions (L x W x H)

Coil	315 mm x 475 mm x 360 mm
Cradle	685 mm x 319 mm x 123 mm

¹⁾ Optional

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MAGNETOM Lumina – A BioMatrix System

4-Channel Special-Purpose Coil¹⁾

siemens-healthineers.com/lumina



General

- 4-channel
- iPAT compatible
- No coil tuning

Applications

- Carotids
- Examinations with small field-of-views
- Small structures near the surface

¹⁾ Optional

4-Channel Special-Purpose Coil



Weight

200 g

Dimensions (L x W x H)¹⁾

Coil	90 mm x 143 mm x 20 mm
Coil, cable and plug	470 mm x 143 mm x 20 mm

¹⁾ without Flex Coil Interface 3T

International version.
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MAGNETOM Lumina – A BioMatrix System

Application Packages

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Preliminary Edition - 7/2019

Application Packages

Quiet Suite

Quiet Suite enables complete, quiet examinations of the brain, spine and large joints. Quiet Suite includes QuietX, an algorithm which enables intelligent gradient optimization to substantially reduce noise without significant compromise to image quality or scan time.

In addition, Quiet Suite includes PETRA, a 3D T1-weighted sequence which is barely audible above background noise. When used with a Tx/Rx coil, PETRA is inaudible.

- Quiet prescan normalize and quiet localizers
- QuietX TSE and GRE sequences for T1, T2, and DarkFluid contrasts
- QuietX SWI¹⁾
- QuietX Diffusion
- PETRA (Pointwise Encoding Time Reduction with Radial Acquisition) for inaudible 3D T1-weighted imaging
- Optimized Quiet pulse sequences for the brain, spine and large joints

FREEZEit+²⁾

FREEZEit+ combines the applications TWIST, TWIST-VIBE and StarVIBE.

FREEZEit+ facilitates high quality diagnostic body MR imaging. Based on the excellent soft tissue contrast that MRI inherently offers, FREEZEit+ now adds imaging speed and motion compensation to body MRI and beyond. This allows i.e. imaging the entire arterial phase of the liver with multiple 3D datasets within seconds while maintaining a high spatial image resolution. Furthermore, the motion compensation of FREEZEit+ enables contrast-enhanced MR imaging during free breathing. Next to that, FREEZEit+ includes the high spatiotemporal dynamic imaging of TWIST.

TWIST	TWIST is an advanced, very fast GRE acquisition technique for time-resolved (4D) MR angiography and dynamic imaging in general with high spatial and temporal resolution. TWIST supports comprehensive dynamic MR angio exams in all body regions.
TWIST-VIBE	TWIST-VIBE is a fast, high-resolution 4D imaging sequence for i.e. multi-arterial liver imaging and for thoracic, abdominal and pelvic application. It is a VIBE sequence with CAIPIRINHA capability providing high spatial resolution. The view-sharing mode provides temporal information to ensure the right contrast timing for different lesions. Dixon is used for fat-water separation.
StarVIBE	StarVIBE is a motion insensitive VIBE sequence using a stack-of-stars trajectory. It allows abdominal, head, head neck, spinal, thoracic and pelvic imaging in free breathing mode, providing a solution for patients without breath-hold capabilities.

¹⁾ Prerequisite: SWI license (optional)

²⁾ Optional

Compressed Sensing SPACE¹⁾

Highly accelerated 3D imaging based on the SPACE pulse sequence with Compressed Sensing and Iterative Reconstruction.

- Spatial and/or temporal resolution can be improved and scan time substantially reduced
- Optimized protocols are available for Musculoskeletal imaging (knee, hip, shoulder, and foot-ankle), Neuro imaging (head), Body imaging (triggered and breath-hold 3D MRCP)
- all typical contrasts (T1, T2, PD) are supported

Compressed Sensing TOF¹⁾

Highly accelerated MR angiography based on the BEAT pulse sequence with a combination of Time-of-Flight (ToF) MR angiography and Compressed Sensing and Iterative Reconstruction to reduce measurement time.

- Spatial and/or temporal resolution can be improved and scan time substantially reduced
- Optimized protocols are offered for TOF MR angiography of the head (intracranial vasculature)

Compressed Sensing SEMAC¹⁾²⁾

Highly accelerated musculoskeletal imaging in patients with whole joint replacements based on SEMAC (slice encoding for metal artifact correction) with Compressed Sensing and Iterative Reconstruction.

- SEMAC supports Compressed Sensing acceleration with fixed acceleration in addition to conventional GRAPPA acceleration with selectable acceleration factor
- SAR optimization feature is included, which reduces the energy applied by the SEMAC pulse sequence
- Optimized protocols are offered for hip and knee

LiverLab³⁾

LiverLab is a system guided workflow to examine the hepatic fat and iron status. LiverLab is available as dedicated Dot Engine and also as part of the Abdomen Dot Engine. The Inline First-Look Dixon sequence gives the user a first overview of possible fat and/or iron overload in the whole liver. Based on the resulting images, liver segmentation runs without user interaction. If further evaluation is needed, the user can choose from two methods:

- Multi-echo Dixon VIBE is an image-based method to calculate maps such as water, fat, fat signal fraction, and R2¹⁾.
- HISTO is a single-breath-hold single-voxel spectroscopy method to calculate fat signal fraction as well as water R2.

¹⁾ Optional

²⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

³⁾ Optional, prerequisite: Abdomen Dot Engine (optional)

WARP Susceptibility Artifact Reduction

WARP and Advanced WARP (SEMAC) integrates different techniques tailored to reduce susceptibility artifacts caused by orthopedic MR Conditional¹⁾ implants.

2D TSE sequence combining optimized high bandwidth pulse sequences and View Angle Tilting (VAT) technique, helps in evaluation of soft tissue in proximity of the implant. SEMAC (Slice Encoding for Metal Artifact Correction) is a technique to correct through-plane distortions by means of additional phase encoding in slice direction. It is especially useful in the case of hip and knee joint replacements.

Available pulse sequences include T1-weighted, T2-weighted, proton density and STIR contrast.

Advanced Diffusion

RESOLVE (Readout Segmentation Of Long Variable Echo-trains) delivers high-resolution low-distortion diffusion-weighted imaging (DWI) for accurate depiction of lesions. Additionally, this technique is largely insensitive to susceptibility effects, providing detailed anatomy-true diffusion imaging for brain, spine, breast and prostate. In combination with the DTI Tractography package, RESOLVE enables excellent white-matter tract imaging even in the most challenging areas, such as the cervical spine.

RESOLVE and QuietX DWI together make up the Advanced Diffusion package.

- Diffusion-weighted, readout-segmented (multi-shot) EPI sequence for high-resolution susceptibility-insensitive DWI
- Variable number of readout segments for greater flexibility
- 2D navigator-based phase correction for pulsation artifact reduction and automatic reacquisition of corrupted data
- Inline calculation of diffusion tensor (DTI) and diffusion parameter maps

¹⁾ MR imaging of patients with metallic implants brings specific risks. However, certain implants are approved by the governing regulatory bodies to be MR conditionally safe. For such implants, the previously mentioned warning may not be applicable. Please contact the implant manufacturer for the specific conditional information. The conditions for MR safety are the responsibility of the implant manufacturer, not of Siemens.

Tim Whole Body Suite

MAGNETOM Lumina features a full effective Field of View of 205 cm.

General features	Table movement to its full extent can be controlled from the <i>syngo</i> Acquisition Workplace. The large FoV helps in imaging lesions across extended body regions with sequences such as TIRM (Turbo Inversion Recovery Magnitude). Whole body MR Angiography is possible on the entire volume with iPAT.
	<ul style="list-style-type: none"> • Max. scan range of 205 cm

Tim Planning Suite

Easy planning of extended Field of View examinations in an efficient way using Set-n-Go pulse sequences. It allows planning of several stations at once e.g. on composed localizer images. The overlap of slice groups can be adjusted. All stations can have independent parameter settings although they are displayed together. A special coupling mode allows easy positioning of all stations at once according to the patient's anatomy. Fully supports scan@center and Phoenix functionality.

General features	<ul style="list-style-type: none"> • Tim Planning UI with optimized layout for slice positioning • Ready to use Set-n-Go pulse sequences for different clinical questions • Integrated toolbar for fast advanced slice
------------------	---

MapIt¹⁾

MapIt provides pulse sequences and Inline calculation functionality to obtain parametric maps of T1, T2, T2*, R2 and R2* properties of the imaged tissue. The application range includes cartilage evaluation of joints and also the evaluation of other organs such as liver, kidney or prostate.

- 3D VIBE sequence for Inline T1 mapping
- Multi-echo spin echo sequence for Inline T2/R2 mapping
- Multi-echo gradient echo sequence for Inline T2*/R2* mapping
- Pulse sequences for fully automated Inline parametric mapping

SWI (Susceptibility Weighted Imaging)¹⁾

Siemens-unique sequence technique for Susceptibility Weighted Imaging

- Visualization of local changes of the magnetic field due to tissue properties in general and due to the presence of deoxygenated blood or blood decomposition products
- 3D GRE sequence with full flow compensation to support venous angiography
- Enhanced susceptibility weighting of the magnitude images by phase images

¹⁾ Optional

Inline BOLD Imaging (Blood Oxygen Level Dependent)¹⁾

Examination of intrinsic susceptibility changes in different areas of the brain, induced by external stimulation (e.g. motor or visual). Automatic real-time calculation of z-score (t-test) maps with Inline Technology, for variable paradigms

- Compatible with single-shot EPI with high susceptibility contrast for fast multi-slice imaging
- ART (Advanced Retrospective Technique) for fully automatic 3D retrospective motion correction, for 6 degrees of freedom (3 translations and 3 rotations)
- 3D spatial filtering
- Inline calculation of t-statistics (t-maps) based on a general linear model (GLM) including the hemodynamic response function and correcting for slow drifts
- Overlay of inline calculated statistical results on the EPI images

Simultaneous Multi-Slice (SMS)¹⁾

Simultaneous Multi-Slice is a revolutionary method to significantly reduce imaging times for diffusion (with EPI (Echo Planar Imaging) as well as RESOLVE (Readout Segmentation Of Long Variable Echo-trains), BOLD, TSE and TSE DIXON imaging through excitation and readout of multiple slices simultaneously. It is the only acceleration technique that does not result in SNR-related losses due to sub-sampling. Implementation includes a multi-band pulse coupled with the blipped CAIPIRINHA technique to minimize g-factor related SNR penalties.

Simultaneous Multi-Slice (SMS) (Continued)

- For diffusion-weighted imaging with EPI and RESOLVE, slice acceleration can be used to reduce scan time and/or achieve higher spatial / diffusion resolution
- For BOLD, slice acceleration can be used to increase temporal sampling of BOLD data, for higher sensitivity to BOLD signal changes, and/or to increase slice coverage/resolution.
- For TSE and TSE DIXON pulse sequence, SMS is available for reducing scan time, and/or to increase slice coverage/resolution.
- SMS accelerated BOLD and diffusion-weighted protocols for the brain are provided
- SMS accelerated TSE and TSE DIXON protocols for MSK imaging are provided
- SMS accelerated RESOLVE protocol for breast imaging is provided

Inline Perfusion¹⁾

Automatic real-time calculation of Global Bolus Plot (GBP), Percentage of Baseline at Peak map (PBP) and Time-to-Peak map (TTP) with Inline technology

¹⁾ Optional

3D PACE¹⁾

3D PACE (Prospective Acquisition CorrEction) enhances Inline BOLD imaging with motion correction during the acquisition of a BOLD exam.

In contrast to a retrospective motion correction that corrects previously acquired data, the unique 3D PACE tracks the head of the patient, correcting for motion in real time during the acquisition. This increases the data quality beyond what can be achieved with a retrospective motion correction.

- Fully automatic 3D prospective motion correction during data acquisition, for 6 degrees of freedom (3 translations and 3 rotations)
- Motion correction covering the complete 3D volume
- Provides high accuracy
- Substantially reduced motion-related artifacts in t-test calculations
- Significantly increased signal changes in the activated neuronal volume
- Increased functional MRI (fMRI) sensitivity and specificity

DTI (Diffusion Tensor Imaging)¹⁾

Acquisition of data sets with multi-directional diffusion weighting to assess anisotropic diffusion properties of brain tissue

- Measurement of up to 256 directions of diffusion weighting with up to 16 different b-values
- Inline calculation of the diffusion tensor
- Inline calculation of Fractional Anisotropy (FA) maps (grey-scale as well as color-coded for principle diffusion direction), Apparent Diffusion Coefficient (ADC) maps and trace-weighted images based on the tensor
- Measurement of user defined diffusion directions (Free Mode)

DSI (Diffusion Spectrum Imaging)

Diffusion Spectrum Imaging (DSI) is a type of diffusion weighted imaging. This technique allows for more accurate fiber tracking than conventional diffusion techniques due to a higher sensitivity to intra-voxel diffusion caused by crossing fiber tracks. The DSI acquisition technique comes as part of the DTI package.

- Cartesian sampling approach performed in q-space
- Measure multiple directions with independent b-values
- Up to 514 different directions

TWIST²⁾

This package contains Siemens-unique pulse sequences for advanced time-resolved (4D) MR angiography and dynamic imaging in general with high spatial and temporal resolution. TWIST supports comprehensive dynamic MR angio exams in all body regions. It offers temporal information of vessel filling in addition to conventional static MR angiography, which can be beneficial in detecting or evaluating malformations such as shunts. TWIST can be combined with water excitation.

Reconstruction algorithms for iPAT² enable highly efficient multi-directional parallel imaging.

NATIVE²⁾

Integrated software package with pulse sequences for non-contrast enhanced 3D MRA with high spatial resolution. NATIVE particularly enables imaging of abdominal and peripheral vessel

NATIVE offers:

- Non-contrast MRA
- Separate imaging of arteries and veins
- Visualization of – e.g. – renal arteries or peripheral vessels

The NATIVE package comprises:

- NATIVE TrueFISP
- NATIVE SPACE

¹⁾ Optional

²⁾ Part of DTI (optional)

QISS¹⁾

Software package for non-contrast enhanced peripheral MR angiography based on quiescent interval single-shot imaging.

- ECG triggered
- Robust, 2D non-subtractive technology
- Set-n-Go implementation (Dot AddIn) for workflow optimized application
- Allows export of all images in one series (Combined View, CT-like)

ASL (Arterial Spin Labeling) 2D¹⁾

Arterial Spin Labeling (ASL) uses the water in arterial blood as an endogenous contrast agent to evaluate perfusion noninvasively. It assists in the evaluation of human brain perfusion and function physiology by giving information on relative cerebral blood flow. ASL is capable of high spatial resolution perfusion imaging and may also be useful in basic neuroscience.

- iPAT compatible
- Includes 3D PACE motion correction for increased reliability
- Fully automated Inline calculation of relCBF color maps
- Supports the "Pulsed Arterial Spin Labeling" – technique (PASL)
- Supports the "Pseudo Continuous Arterial Spin Labeling" technique (PCASL)

ASL (Arterial Spin Labeling) 3D¹⁾

Arterial Spin Labeling (ASL) uses the water in arterial blood as an endogenous contrast agent to evaluate perfusion noninvasively. It assists in the evaluation of human brain perfusion and function physiology by giving information on relative cerebral blood flow. ASL is capable of high spatial resolution perfusion imaging and may also be useful in basic neuroscience.

ASL 3D is a tool to acquire high spatial resolution perfusion-weighted images covering the whole brain.

- Based on 3D TGSE pulse sequence for fast, high-resolution brain imaging with full coverage
- Higher SNR, optimized contrast uniformity and reduced motion sensitivity.
- Perfusion maps can be easily fused with anatomical images for detail evaluation in Neuro 3D¹⁾.
- Supports the "Pulsed Arterial Spin Labeling" technique (PASL)
- Supports the "Pseudo Continuous Arterial Spin Labeling" technique (PCASL)
- iPAT compatible

Flow Quantification²⁾

Special sequences for quantitative flow determination studies

- Non-invasive blood/CSF flow quantification
- ECG Triggered 2D phase contrast with iPAT support
- Retrospective reconstruction algorithms for full R-R interval coverage

¹⁾ Part of DTI (optional)

²⁾ Optional

Advanced Cardiac Package including PSIR HeartFreeze

This package contains special pulse sequences for advanced cardiac imaging including 3D and 4D BEAT functionalities. It supports advanced techniques for ventricular function imaging, 4D imaging, tissue characterization, coronary imaging, and more.

BEAT is a unique tool for fast and easy cardiovascular MR imaging. It provides 1-click switch from cine imaging to tagging for wall motion evaluation and 1-click switch from 2D to 3D imaging. BEAT automatically adjusts all parameters associated with the changes.

Cardiac and vessel morphology	<ul style="list-style-type: none"> • Multi echo technique assessment • 3D aortopathy imaging with free breathing (SPACE)
Morphology and global or regional ventricular wall motion analysis with BEAT	<ul style="list-style-type: none"> • 3D cine acquisition for full CT-like heart coverage • 2D segmented FLASH for visualization of the regional wall motion using various tagging techniques (grid or stripes)
Tissue characterization with BEAT	<ul style="list-style-type: none"> • Robust myocardial tissue characterization with 3D PSIR (phase-sensitive inversion recovery) • Fast and complete coverage of the myocardium with IR 3D FLASH and TrueFISP
PSIR HeartFreeze	Motion correction/averaging of multiple measurements with iPAT or tPAT accelerated single-shot TrueFISP or GRE images of the heart, for free-breathing acquisition
Coronary imaging with BEAT	<ul style="list-style-type: none"> • 3D whole heart non-contrast coronary MRA • 3D whole heart MRA with advanced free-breathing navigator compensating diaphragm shifts during the acquisition (motion-adaptive respiratory gating)

MyoMaps¹⁾

On the basis of fully system guided HeartFreeze Inline Motion Correction, MyoMaps provides pixel-based T1 and T2 myocardial tissue quantification maps. Results are presented in fully system-guided inline colored parametric maps of the heart.

T1 Map	– based on Modified Look-Locker Inversion Recovery T1 mapping
T2 Map	– based on T2-prepared single-shot TrueFISP T2 mapping
T2* Map	– based on a multi-echo segmented gradient echo acquisition with black blood preparation

¹⁾ Optional

Advanced Interactive Realtime¹⁾

Sequences for interactive real-time scanning

Uses ultra-fast Gradient Echo sequences for high image contrast

Real-time reconstruction of the acquired data

The user can navigate in all planes on-the-fly during data acquisition.

- Real-time cardiac examinations
- Real-time interactive slice positioning and slice angulation for scan planning
- Capability for multislice acquisition, definition of acquisition order, pausing, mosaic display, and skipping of the physiology trigger

Access-i¹⁾

Access-i provides an interface to enable the connection of a 3rd party workstation to the MR syngo Acquisition Workplace via a network router and secure local network connection.

Projection¹⁾

Projection provides functionality for acquisition of projection data in different orientations, which can be used to calculate the position of micro-coils within the scanner. The calculation of position information is not performed within the Siemens software and the projection data can be sent in real time (via Access-i interface) to a third party client that needs to calculate the location coordinates.

Tracking¹⁾²⁾

Adds software capability and interface for adjusting the real-time imaging slice position and orientation so as to follow interactive devices equipped with receive micro-coils.

Single Voxel Spectroscopy¹⁾

Integrated software package with pulse sequences for proton spectroscopy.

- Matrix Spectroscopy – phase-coherent signal combination from several coil elements for maximum SNR based on the Head/Neck 20
- Spectral suppression (user definable parameter) to avoid lipid superposition in order to reliably detect e.g. choline in the breast
- Spectroscopy can be combined with Free-Breath Prospective Acquisition Correction (2D-Phase navigator) when needed
- Up to 8 regional saturation (RSat) bands for outer volume suppression can be defined by the user
- Automatic reference scan to allow less evaluation time
- Physiological triggering (ECG, pulse, respiratory or external trigger) in order to avoid e.g. breathing artifacts.
- Spectroscopy relevant GRE-based shim pulse sequences provided
- Clinical applications: brain, breast, prostate

SVS Techniques SE and STEAM

- Short TEs available
- Fully automated adjustments including localized shimming and adjustment of water suppression pulses
- Also available: Interactive adjustments and control of adjustments
- Optimized pulse sequences for brain applications

Includes GRACE (GeneRALized breast speCtroscopy Exam), an SVS technique (spin echo sequence) optimized for breast spectroscopy.

The technique contains a special spectral lipid suppression pulse (user definable) for lipid signal reduction.

- Siemens unique water reference detection to visualize the normalized choline ratio.
- Online frequency shift correction for reduction of breathing related artifacts, Inline implementation – no additional user interaction is required.

¹⁾ Optional

²⁾ Prerequisite: Advanced Interactive Realtime

CSI 2D: Chemical Shift Imaging¹⁾

Integrated software package with pulse sequences for Chemical Shift Imaging (CSI)

Extension of the Single Voxel Spectroscopy (SVS) package, offering the same level of user-friendliness and automation

- Matrix Spectroscopy – phase-coherent signal combination from several coil elements for maximum SNR with configurable prescan-based normalization for optimal homogeneity
- 2D Chemical Shift Imaging
- Hybrid CSI with combined volume selection and Field of View (FoV) encoding
- Short TEs available (30 ms for SE, 20 ms for STEAM)
- Automated shimming of the higher order shimming channels for optimal homogeneity of the larger CSI volumes
- Weighted acquisition, leading to a reduced examination time compared to full k-space coverage while keeping SNR and spatial resolution
- Outer Volume Suppression
- Spectral Suppression
- Semi-LASER sequence available for CSI examination of the brain

CSI 3D: Chemical Shift Imaging¹⁾

Integrated software package with pulse sequences for Chemical Shift Imaging (CSI) Extension of the SVS package, offering the same level of user-friendliness and automation

- Matrix Spectroscopy – phase-coherent signal combination from several coil elements for maximum SNR with configurable prescan-based normalization for optimal homogeneity
- 3D Chemical Shift Imaging
- Hybrid CSI with combined volume selection and Field of View (FoV) encoding
- Short TEs available (30 ms for SE, 20 ms for STEAM)
- Automated shimming of the higher order shimming channels for optimal homogeneity of the larger CSI volumes
- Weighted acquisition, leading to a reduced examination time compared to full k-space coverage while keeping SNR and spatial resolution
- Outer Volume Suppression
- Spectral Suppression
- Pulse sequences for prostate spectroscopy

¹⁾ Optional

ZOOMit^{PRO1)2)}

ZOOMit^{PRO} provides EPI diffusion imaging of small, “zoomed” areas of interest while avoiding signal from surrounding tissue and minimizing artifacts from metal implants.

- Confines the excited FOV to a given region of interest
- Method uses spatially selective RF pulses to only excite the tissue in the target region
- Allows high resolution without infolding artifacts

Security Features

This *syngo* software version provides security settings to protect the scanner against known security threats.

- User management with authentication to prohibit unauthorized access
- Privileges to grant rights and define functionality based on user / role
- Hardened operating system and restricted network communication
- Whitelisting (Embedded Control) against manipulation of scanner software
- Security Delivery process to frequently distribute security updates
- Option to protect customer pulse sequence trees against unauthorized modifications
- Audit trail to log system and data access by the defined users and service
- Support of customers to implement their security policy including compliance with HIPAA (Health Insurance and Accountability Act)

MR Elastography¹⁾²⁾

MR Elastography can be used to non-invasively assess variations in relative tissue stiffness.

MR Elastography includes pulse sequence and processing software.³⁾

- Pulse sequences with 2D gradient-echo scheme with cyclic motion-encoding gradients (MEG)
- Pulse sequences with Spin Echo EPI with cyclic motion-encoding gradients (MEG)
- Advanced Siemens implementation
- iPAT enables shortened breath-hold time
- Fully integrated processing of the elastogram at the scanner
- Completely automated calculation of wave images and corresponding elastograms
- Confidence map for reliability

¹⁾ Optional

²⁾ Only available on non-pTX systems, pTX systems provide the same functionality in the Tim TX TrueShape package

³⁾ Please note that this functionality can only be used in combination with a dedicated hardware, which is not part of the MR Elastography package.

Breast Biopsy Software¹⁾

The Breast Biopsy Software guides breast interventions such as vacuum-assisted biopsy and wire localization.

Guidance for intervention planning and execution for both Grid method and Post&Pillar method.

- Workflow guides through the process of marker identification and target selection
- Workflow allows to handle the planning of multiple targets
- Automatic extraction of coordinates for the selected target and calculation of required point of entry, angulation (for Post&Pillar method) and penetration depth
- Projection of needle path on the planning images for control
- Support of coil-specific guidance with graphical instructions on both the console and the touch display at the scanner
- Typical, site-specific settings (e.g. grid method, biopsy device, marker position) can be set as default to minimize user interaction)
- Supported by Breast Dot Engine¹⁾
- Support of commonly used breast MR biopsy devices e.g. Bard EnCor, Bard Vacora, Hologic ATEC, Mammotome
- Support of following MR breast coils: Breast BI7, 2-/4-/8-Channel Sentinelle Breast Coil and 2-/10-/16-Channel Sentinelle Breast Coil

MR Protocol Manager

- | | |
|---------------------------|--|
| Basic package | <ul style="list-style-type: none"> • For first installation by SHS service the Basic License of MR Protocol Manager is required once and includes the first MR scanner connected. It includes one installations and a connection to the first MR scanner. |
| Additional scanner option | <ul style="list-style-type: none"> • For every additional MR scanner to be managed by the MR Protocol Manager a Connect License is required. |

¹⁾ Optional

Expert-i

Interactive real-time access to imaging data and exam information from any PC within the hospital network¹⁾ during the MR exam.

Until now, radiologists or other experts had to stop what they were doing and go to the MR scanner to see the acquired images, help with the scan set-up, or answer an open question.

Now, questions can be addressed quickly and efficiently via remote PC.

Benefits of Expert-i

- Excellent results right from the first examination
- Streamlined workflow and faster patient throughput
- Reduced repeat rates with a check on images while the patient is still in the examination room
- Reduced training effort by enabling expert assistance for specialized procedure

Remote Assist²⁾

Direct computer link to the local Siemens service department or the Siemens service centers (via router with telephone connection)

Image transfer for further evaluation

- Image and file transfer in batch mode
 - Reading of entries in the error logbook
 - Remote trouble shooting
 - Remote access to service manuals written in easy-to-use HTML format
 - Remote access to Service Site Database
 - Start of preventive maintenance and quality assurance routines.
 - Remote access granted only with permission of the institution.
- Data security is ensured by secure access

¹⁾ minimum bandwidth 30Mbit/s, recommended 100Mbits

²⁾ In conjunction with a Siemens service contract

IDEA (Integrated Development Environment for Applications)^{1),2)}

Extensive programming environment used to create and modify pulse sequence and reconstruction algorithms, offering a maximum of flexibility

Based on C++ for Windows 10. Sequences and RF pulses are displayed in a visual interface

Features	<ul style="list-style-type: none"> • Allows direct access to the Image Calculation Environment (ICE), and to pulse sequences • Testing the generated code is extensively supported by the debugger and the simulation program • IDEA is also usable on any standard PC with operating system Windows 10 making developments independent of the MR system
Processing plug-ins	<p>For development or modification of user-defined image processing steps which may be integrated into the measurement pulse sequences</p> <ul style="list-style-type: none"> • Individual processing is secured by a number of functions (e.g. TTP and MTT), useful for neuro or perfusion imaging
Prerequisite	IDEA training course

¹⁾ Optional

²⁾ Within hospital enterprise

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MAGNETOM Lumina – A BioMatrix System

Post-processing Applications & Features

siemens-healthineers.com/lumina



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Post-processing Applications & Features

MR relevant post-processing functionalities from *syngo.via* are available in *syngo* MR XA20 as well. They are optional and medical devices (or parts of them) in their own rights.

If an MR Workplace (secondary console) is available an application can be flexibly used on one of the workplaces (Acquisition vs. MR Workplace). In case a dual user package is available the application can be used in parallel (for different patients) on the two workplaces.

Integrated reporting and Findings Assistant, as known from *syngo.via* are not available in *syngo* MR XA20.

Post-processing results will be available as result images at remote DICOM nodes.¹⁾

Applications & Features²⁾

- *syngo*.MR Onco
 - *syngo*.MR 3D Lesion Segmentation
 - *syngo*.MR OncoCare
 - *syngo*.MR Tissue 4D
 - *syngo*.MR BreVis
-
- *syngo*.MR Neuro Perfusion
 - *syngo*.MR Neuro Perfusion Mismatch
 - *syngo*.MR Brain Morphometry
-
- *syngo*.MR Neuro fMRI
 - *syngo*.MR Tractography
-
- *syngo*.MR Spectro SVS
 - *syngo*.MR Spectro CSI
 - *syngo*.MR Spectro Extension
 - *syngo*.MR Spectro Research

¹⁾ Special post-processing DICOM objects like segmentations or structured reports won't be sent out

²⁾ Optional

Applications & Features *(Continued)*

- *syngo*.MR Vascular Analysis
- *syngo*.MR Cardiac 4D Ventricular Function
- *syngo*.MR Cardiac Flow
- *syngo*.MR Cardiac Perfusion

-
- *syngo*.MR Composing
 - *syngo*.MR Cinematic VRT
 - *syngo*.MR Anatomic Intelligence
-

For a more detailed application and feature description please refer to the *syngo.via* VB40A data sheet.

Engines¹⁾

The following Engines are available:

-
- *syngo*.MR General Engine
 - *syngo*.MR Onco Engine
 - *syngo*.MR Onco Engine Pro
 - *syngo*.MR Neuro Perfusion Engine
 - *syngo*.MR Neuro 3D Engine
 - *syngo*.MR Spectro Engine
 - *syngo*.MR Cardio Engine
-

For a more detailed description of the engines please refer to the *syngo.via* VB40A data sheet.

¹⁾ Optional

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MAGNETOM Lumina – A BioMatrix System

Parts & Accessories

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Parts & Accessories

Patient Video Monitoring

Dedicated MAGNETOM Lumina video camera for comprehensive patient observation in the examination room and waiting room observation.

- Up to two in-room cameras for optimized patient observation from front end and rear-end
- Up to two waiting room cameras for observing the situation in the waiting room
- Color 640×480 pixel LCD monitor may be positioned at the *syngo* Acquisition Workplace or at a convenient wall location
- Possibility to switch between 4 camera layout and single camera layout

Remote Viewing Monitor

Color LCD monitor (1920×1200) to be connected in parallel to the Workplace monitor.

Data transfer via ethernet for high signal quality over a long distance allows the computer and user to be located anywhere on the 100 or 1000 Mbps network with full routing of data across routers, switches and subnets (1 Gbit/s recommended).

The system supports SSL (Secure Sockets Layer) via a TCP/IP connection. All media streams transferred in the network are encrypted.

Additional Select&GO Control Center Rear

Additional Dot Display and Dot Control Center Rear, e.g. for interventional procedures. Located at the rear end of the system.

Foot Switch

In-room foot switch with two pneumatic buttons for start and stop of a preset MR sequence. The foot switch is MR compatible and is positioned near the patient table on the examination room floor.

syngo MR Workplace

Additional integrated Workplace connected to the host computer of the *syngo* Acquisition Workplace for post-processing and image evaluation.

Same user interface as the *syngo* Acquisition Workplace, except for scan control.

Shared database with *syngo* Acquisition Workplace, therefore eliminating image copy time.

Host Computer and LCD Monitor technical data: refer to "Computer System" section of the main data sheet.

Workplace Table

Ergonomically designed table for:

- Color monitor
- Keyboard
- Mouse
- Patient communication unit
- Patient supervision display

System Start Timer

Timer clock that can be installed together with the MAGNETOM Lumina to start the system automatically at user-definable times, eliminating waiting times during system boot up. It allows the definition of three different startup times for different days.

Comfort Kit

Vacuum cushions for stable and comfortable positioning of the patient during the examination

Vacuum pump connection at the Tim Table

3 anatomically shaped cushions of different size for patient stabilization and comfort (spine, head, multi-purpose)

May significantly reduce patient set-up times and improve image quality by minimizing the occurrence of motion artifacts

Coil Storage Cart

Specially designed non-ferromagnetic cart for easy storage of some of the most commonly used coils and accessories

May be rolled to convenient locations in the examination room

Additional storage space on the inside of the doors when doors are opened

Coil storage	Width	cart closed	140 cm (4'7")
		cart opened	280 cm (9'2")
	Depth		54 cm (1'9")
	Height		121 cm (3'12")
Upper drawer	Height		13.3 cm
Tray	Height		9.0 cm
Lower drawer	Height		24.0 cm

> Additional optional accessories and consumables for MR: [siemens.com/healthcare-accessories](https://www.siemens.com/healthcare-accessories)



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