



MAGNETOM ESSENZA

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SIEMENS

Tim

has changed MRI forever

Around the world, Tim (Total imaging matrix technology) has become the new standard in MRI. With more than 2500 installations, Tim is proving it every day, with unprecedented flexibility, accuracy and speed. Let Tim prove it to you, too.

Select exams not coils

[25×8] Up to 25 seamlessly integrated matrix coil elements and 8 independent RF-channels work combined to create one Total imaging matrix. A Matrix scalable to both the anatomy under examination and the individual patient size. This is how Tim redefines flexibility.

Local and total

Matrix coils unleash the high SNR only local coils provide. Extreme precision for single-organ exams up to whole CNS exams. From 5 mm to 140 cm FoV. Without coil or patient repositioning. For all applications. With up to 100% more SNR. This is how Tim redefines accuracy.

Parallel in all directions

Head to toe, front to back, and side to side for unlimited Parallel Imaging. Up to PAT 8. Even for double oblique slice orientation. Without restrictions in coverage. With the high SNR of standard Matrix coils. This is how Tim redefines speed.



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- Tim (Total imaging matrix) and IsoCenter Matrix
- New 1.5T magnet with zero helium boil-off
- Workflow automation

Tim – Total imaging matrix



Total imaging matrix technology. It's a unique way to think about MR. Tim goes beyond incremental enhancements in magnet technology and gradient power to something radically different. A transforming technology that shifts the spotlight to a new and tremendously innovative RF system and Matrix coil technology. A unique combination of features that enable a quantum leap forward. With 25 seamlessly integrated coil elements and 8 receiver channels MAGNETOM ESSENZA enables pristine image quality. Coverage from small field of views to 140 cm and accelerated imaging with parallel imaging in all directions. Tim opens up new worlds of opportunity.

Flexibility: 25 seamlessly integrated matrix elements combined with 8 receiver channels

This combination of up to 25 coil elements can be connected to 8 receiver channels allowing for outstanding flexibility in the choice of examinations covering all clinical questions, without the need for coil changes or patient repositioning.

Customer's advantage:
Revolutionary flexibility –
Select exams, not coils.

Accuracy: 140 cm FoV with imaging at pristine quality

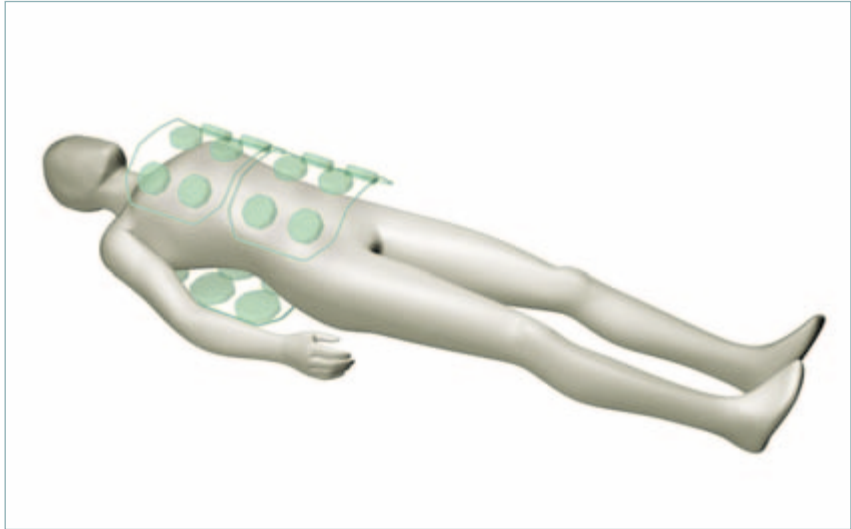
Tim puts it all together, for the very first time. It allows to exploit maximum SNR while enabling seamless imaging with a total FoV of up to 140 cm at full surface coil quality. And all that without the need to reposition the patient, or to change a single coil, not even once. Tim or Total imaging matrix resolves typical limitations of local anatomy MR imaging.

Customer's advantage:
Revolutionary accuracy –
Local and total.

Speed: PAT – Unlimited

Tim provides total iPAT (Integrated Parallel Acquisition Technique) functionality, in all directions, throughout the entire FoV of 140 cm. Siemens iPAT with Tim has highest signal-to-noise, provides GRAPPA for Parallel Imaging, and integrates the time-saving AutoCalibration into a single scan. The new iPAT² enables speed/acceleration factors up to 8.

Customer's advantage:
Revolutionary speed –
Parallel in all directions.



IsoCenter Matrix

The IsoCenter Matrix is a 9-element Matrix coil integrated at the center of the magnet underneath the patient table. It is always in position and ready to scan enabling pristine image quality as it is always in the optimal position, the isocenter of the magnet.

It speeds up patient setup and increases throughput thanks to this unique, integrated design. The IsoCenter Matrix can be used flexibly as a spine coil or in combination with other anterior coils. It effectively works as a 140 cm coil without patient repositioning in multi-step examinations.

Customer's advantage:
Clarity, comfort, and convenience

Matrix coils

The new multi-element Matrix coil technology is an essential part supplementing the most innovative Total imaging matrix.

Matrix coils have multiple receive coil elements that are grouped in clusters. Each receive coil element is equipped with a low noise preamplifier to maximize signal-to-noise ratio. The Matrix coil technology includes an intelligent logic combining signals into various permutations and combinations to yield best SNR from the numerous coil elements.

The Head Matrix, Neck Matrix, Body Matrix and IsoCenter Matrix are examples of the multi-element Matrix coils. The Head Matrix, for example, has 6 receive coil elements. The receive coil elements are grouped in 2 clusters with 3 coil elements per cluster. Since clusters are working in the left-right direction, they do not compromise image quality. The signals from the receive coil elements within a cluster can be chosen from three different Matrix Coil Modes. Depending on the Matrix Coil Mode selected, the Head Matrix coil can be operated as a 2, 4 or 6 channel array.

Matrix Coil Mode

The Matrix Coil Mode is a user-selectable parameter determining the mode extracted from a cluster of receive coil elements.

There are three Matrix Coil Modes available :

- CP (Circularly Polarized)
- Dual
- Triple

The CP Mode is optimized to obtain maximum signal-to-noise (SNR) at the center of the region of interest. The Dual and Triple modes contain additional information which can be used to improve SNR in the periphery of the image and/or enable higher PAT factors.

The Matrix Coil Modes, which are automatically pre-selected by the system, can be best compared with the mono, stereo and quattro-reception known from audio receiver systems : While the mono signal already contains the audio information, the stereo or quattro signal adds spatial information.

CP Mode

With the CP Mode selected, the Head Matrix is operated as a 2-element CP head array. There are 2 virtual CP elements. Each virtual CP element is generated from a cluster of 3 receive coil elements. This is the standard mode for non-parallel imaging. However, parallel imaging acceleration can be applied and is only limited by the number of virtual coil elements. As in conventional CP array coils, the CP Mode guarantees optimum SNR at the center of the image.

Dual Mode

With the Dual Mode selected, the Head Matrix is operated as an 4-element CP head array. There are 4 virtual coil elements. The Dual Mode improves SNR and CNR (contrast-to-noise ratio), particularly in the periphery of the image, as more coil elements receive signal. Higher PAT factors are available for speed, resolution, more slices or coverage, and image quality.

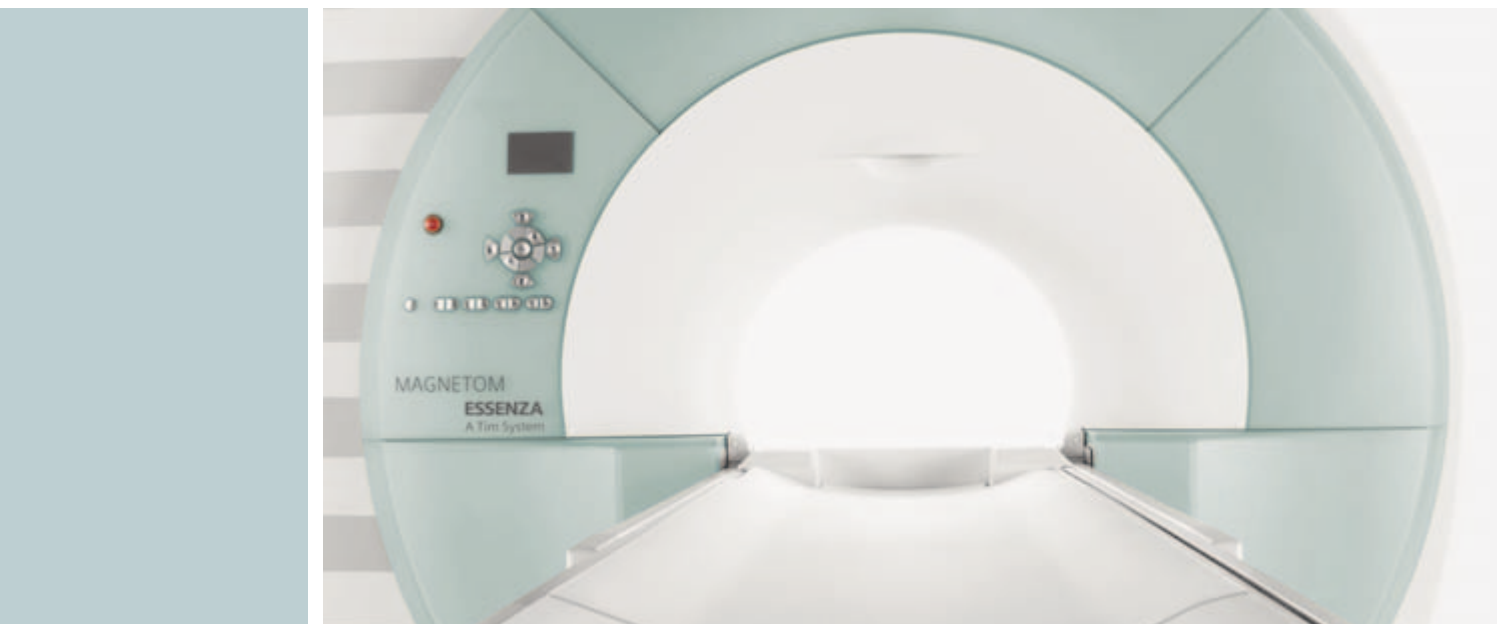
Triple Mode

With the Triple Mode selected, the Head Matrix is operated as a 6-element head array. The Triple Mode further improves SNR and CNR, particularly in the periphery of the image, as more coil elements receive signal and are available for post-processing. In addition, higher PAT factors are available for speed, resolution, more slices or coverage, and image quality. This is the standard mode for parallel imaging and provides maximum ultra-fast acquisition as well as high resolution iPAT imaging.



In the past, the signals from independent receiver coils within an array were directly connected to independent receiver channels. The Matrix coil technology allows an unprecedented flexible and efficient use of receiver channels. The higher the Matrix Coil Mode, the more independent receiver channels per Matrix coil are utilized, resulting in higher SNR and CNR, particularly in the periphery of the image. On one hand, it allows for a higher flexibility of iPAT as well as higher acceleration factors. On the other hand, even with the CP or Dual Mode selected, the SNR at the center of the region of interest is always optimal.

Superior Tim technology, revolutionary multi-element Matrix coils, excellent experience with iPAT and the intelligent logic available with the Coil Mode are collectively triggering a revolution in MR imaging.



Tim Application Suite

The Tim Application Suite has a complete range of clinically optimized examinations for all regions. Excellent head-to-toe imaging can be accomplished with the sequences and features included in this Application Suite. The Tim Application Suite – which exploits fully the benefits of Tim – is provided as standard on the MAGNETOM ESSENZA.

There are eight dedicated application packages – all of them have been included as standard applications. All of them are based on the revolutionary Tim technology:

- Neuro Suite
- Angio Suite
- Cardiac Suite
- Body Suite
- Onco Suite
- Breast Suite
- Ortho Suite and
- Pediatric Suite

Neuro Suite

The Neuro Suite is a part of the Tim Application Suite. Comprehensive head and spine examinations can be performed with dedicated programs that are optimized for clinical examinations. High resolution protocols and fast protocols for uncooperative patients are provided, as well as protocols optimized for pediatric applications. Neuro Suite also includes protocols for diffusion imaging, and perfusion imaging.

This package includes, for example:

- EPI sequences and protocols for diffusion imaging, and perfusion imaging, for advanced neuro applications. Diffusion-weighted imaging is possible with up to 16 b-values in the orthogonal directions
- 3D isotropic resolution volume imaging using T1 3D MPRAGE/3D FLASH and 3D TSE
- T2-weighted high resolution 3D Restore protocols optimized for inner ear examinations
- Whole-spine protocols in multiple steps with software-controlled table movement
- 2D and 3D MEDIC protocols for T2-weighted imaging, particularly for C-spine examinations in axial orientation where reproducibility is difficult due to CSF pulsations and blood flow artifacts
- 3D Myelo with 3D HASTE and 3D True-FISP for anatomical details
- Dynamic sacro-iliac joint imaging after contrast administration using a fast T1-weighted FLASH 2D sequence
- Spine diffusion protocols to differentiate osteoporosis versus tumor infiltration and post-radiotherapy changes versus residual tumor with PSIF sequence

Dedicated workflow and ease-of-use features

- IsoCenter Matrix conveniently integrated and always positioned at the isocenter of the system
- Examination of the whole spine or the whole central nervous system possible without patient or coil repositioning using the unique combination of Head and Neck Matrices and the IsoCenter Matrix
- Software-controlled table movement

Angio Suite

The Angio Suite¹⁾ is also a part of the Tim Application Suite. Excellent MR Angiography can be performed to visualize arteries and veins with or without contrast agent.

This package includes, for example:

Contrast-enhanced MRA

- 3D contrast-enhanced MRA protocols with or without iPAT for head, neck, thorax, abdomen, peripheral regions with the shortest TR and TE. It is possible to separate the arterial phase from the venous phase. No venous contamination is seen due to the fast ce-MRA protocols
- CareBolus functionality for excellent results. It supports accurate determination of the bolus arrival time and the “Stop and Continue” of the 3D ce-MRA protocol after the 2D bolus control scan
- Excellent peripheral ce-MRA can be acquired with Tim’s flexible coil combinations

Non-contrast MRA and venography

- 2D and 3D Time-of-Flight (ToF) protocols for MRA of the Circle of Willis, carotids, neck vessels, and breath-hold protocols for abdominal vessels
- Triggered 2D/3D ToF sequences for non-contrast MRA, particularly in the abdomen and the extremities
- 2D/3D Phase-Contrast
- MR venography with 2D/3D Time-of-Flight (ToF) and Phase-Contrast
- Tilted optimized non-saturating excitation (TONE) and MTC techniques for improved Contrast-to-Noise Ratio (CNR)

Image processing tools

- MIP, MinIP, and 3D SSD
- 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

Dedicated workflow and ease-of-use features

- Matrix coils provide flexibility to combine coil elements and have a large anatomical coverage
- IsoCenter Matrix conveniently integrated and always positioned at the isocenter of the magnet, e.g., as posterior coil for pMRA or renal MRA studies
- Software-controlled horizontal table movement
- Inline Technology for immediate results without the need of an extra post-processing step

1) For triggering the PMU Wireless Physio Control option is required

Cardiac Suite

The Cardiac Suite covers the complete application range from morphology, ventricular and valvular functions to tissue characterization. The utilization of triggering requires the optional PMU Bluetooth Physio Control.

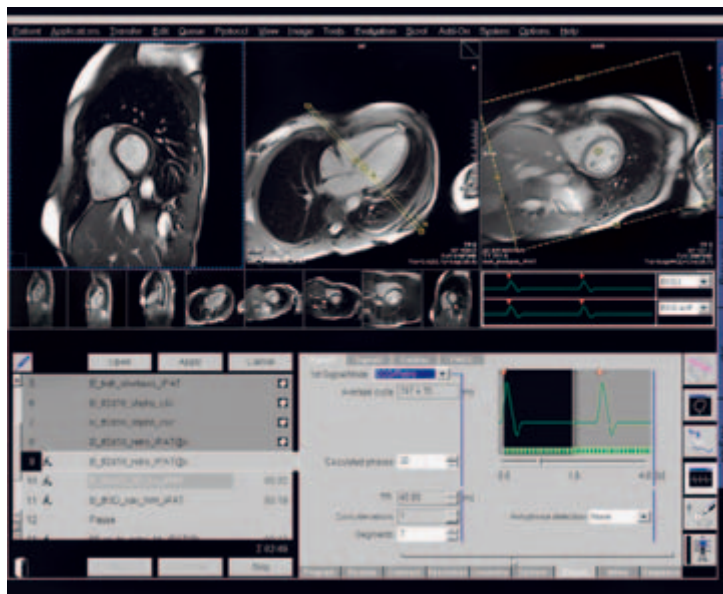
This package includes, for example:

Cardiac view creation

- Fast acquisition of the basic cardiac views 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

Morphology – heart and vessel structure and valve function

- Various breath-hold 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. Standard cine techniques (FLASH) can also be used to visualize functions of the heart valves



Ventricular function and wall motion

Tools for rapid evaluation of left or right ventricular function:

- Acquisition of a stack of short-axis slices (standard segmented FLASH, or 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)
- Protocols for coverage of the whole heart
- iPAT integration for higher temporal/spatial resolution

Tissue characterization

Protocols for high contrast and high resolution tissue characterization:

- Ultra-fast protocols for dynamic imaging, e.g., for 4 arbitrarily oriented slices per heart beat. These protocols provide multi-slice information for the assessment of coronary heart disease (TurboFLASH, TrueFISP)
- Segmented IR TrueFISP/FLASH
- T1 scout for optimization of contrast between tissues

Body Suite

The Body Suite is dedicated for clinical body applications. Ultra-fast high resolution 2D and 3D protocols are provided for abdomen, pelvis, MR Colonography, MRCP, dynamic kidney, and MR Urography applications.

This package includes, for example:

- 2D/3D HASTE (Restore) and 2D/3D TSE (Restore)
- Optimized fast single-shot HASTE protocols and high resolution 3D Restore protocols for MRCP and MR Urography examinations
- Excellent fat suppression protocols with Quick FatSat, STIR, HASTE, FLASH and 3D VIBE (in-phase/opposed-phase) protocols and multi-echo TSE
- Dynamic 3D VIBE protocols for best visualization of focal lesions with high spatial and temporal resolution
- Protocols for high resolution pelvic imaging for tumor visualization in cervix and prostate
- Colonography bright lumen with T2-weighted TrueFISP and dark lumen with T1-weighted VIBE
- Dynamic volume examinations with 3D VIBE with high spatial and temporal resolution
- REVEAL (diffusion-weighted imaging for liver and more), prerequisite: Inline Diffusion

Dedicated workflow and ease-of-use features

- Matrix coils provide flexibility to combine coil elements and have a large anatomical coverage for both tall or large patients. Up to 2 Body Matrix* coils can be connected
- Inline Technology reduce post-processing steps
- IsoCenter Matrix conveniently integrated and always positioned at the isocenter of the magnet as posterior coil to work in combination with the Body Matrices

* Separate option

Onco Suite

MR imaging has the advantage of excellent soft tissue contrast, multi-planar capabilities and the possibility of selectively suppressing specific tissue, e.g., fat or water. This helps in the detection of pathologies, particularly metastases. The Onco Suite features a collection of sequences as well as protocols and evaluation tools that guide through a detailed screening of clinical questions.

This package includes, for example:

- 3D VIBE, FLASH and STIR-TSE in-phase/opposed-phase protocols with a high sensitivity to metastases detection
- Dynamic imaging protocols for assessment of the kinetic behavior for lesion visualization and characterization
- 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 or for offline calculation
- Display and analysis of the temporal behavior in selected regions of interest with the included MeanCurve post-processing application. This includes the capability of using additional datasets as a guide for defining regions of interest even faster and easier than before
- REVEAL (diffusion-weighted imaging for liver and more), prerequisite: Inline Diffusion

Dedicated workflow and ease-of-use features

- Matrix coils provide flexibility to combine coil elements and have a large anatomical coverage for both tall or large patients. Up to 2 Body Matrix* coils can be connected
- Inline Technology reduce post-processing steps

* Separate option

Breast Suite

MRI has shown to be extremely sensitive for the visualization of breast lesions and MR can be a definitive exam for implant assessment.

High spatial and temporal resolution can be obtained in extremely short acquisition times (e.g., 1 minute) supported by iPAT.

Excellent soft tissue characterization, multi-planar viewing capabilities and tailored techniques (e.g., fat suppression and water excitation) allow fast, easy and reproducible evaluation of breast MR examinations.

This package includes, for example:

- High resolution 2D protocols for morphology
- High resolution 3D protocols for contiguous coverage of both breasts simultaneously
- REVEAL (diffusion-weighted imaging for the breast), prerequisite: Inline Diffusion
- Implant assessment protocols
- Silicone detection used to suppress the silicone signal if the tissue is examined, or used to enhance it if leakage of implants shall be detected
- Automated and manual frequency adjustment
- iPAT for increased speed and resolution

Siemens Technique: VIEWS (Volume Imaging with Enhanced Water Signal)

- Bilateral – both breasts are scanned simultaneously
- Axial – ductal paths can be directly visualized
- Fat-saturated or water stimulated – fat impedes clinical analysis and requires suppression
- 3D – utilizing the full potential of MRI
- Near isotropic – same dimensions in all directions
- Sub-millimeter voxels – high resolution for great morphological analysis
- Excellent reconstruction in any plane including RADIANT (ultra-sound like reconstruction around the nipple)

Dedicated workflow and ease-of-use features

- Tim's flexible coil combination enables combining a breast coil* with flexible coil – for specialized visualization of the axilla region
- Inline Technology reduces post-processing steps
- Offline Subtraction, MPR, MIP and SSD capabilities
- Inline Subtraction and MIP capabilities

* Separate option

Ortho Suite

The Ortho Suite is a comprehensive collection of protocols for joint imaging including the spine. Avascular necrosis and internal derangements may benefit from MR. Also in case of tumors and infections, a large amount of additional information can be acquired using the protocols provided as standard in this suite.

This package includes, for example :

- 2D TSE protocols for PD, T1, and T2-weighted contrast with high in-plane resolution and thin slices
- 3D MEDIC, 3D TrueFISP protocols with water excitation for T2-weighted imaging with high in-plane resolution and thin slices
- High resolution 3D VIBE protocols for MR Arthrography (knee, shoulder and hip)
- 3D MEDIC, 3D TrueFISP, 3D VIBE protocols with Water Excitation having high isotropic resolution optimized for 3D post-processing
- 3D imaging with high isotropic resolution optimized for post-processing
- Whole-spine, single-step and multi-step protocols

- Excellent fat suppression in off-center positions, e.g., the Focus Shoulder Array with an attached shim device focuses the homogeneity volume of the system to the region of interest
- Dynamic TMJ protocol (different joint positions)
- Dynamic ilio-sacral joint protocol for contrast dynamics
- Susceptibility-insensitive protocols

Dedicated workflow and ease-of-use features

- IsoCenter Matrix conveniently integrated and always positioned at the isocenter of the magnet
- Software-controlled table movement for easy spine or long-bone examinations

Pediatric Suite

Tissue relaxation times in pediatrics¹⁾ are very different compared to those of adults. The reasons for these differences are: developing tissues, body size, faster heart rates and compliance with breath-hold commands. The Pediatric Suite provides dedicated protocols with optimized contrasts for pediatric imaging.

This package includes, for example :

Neuro

- Head protocols divided according to age groups and providing best contrast-to-noise ratio with optimized parameters
- Excellent T1-weighted contrast with optimized TR, TE and flip angles
- Protocols with MTC pulse for postcontrast T1-weighted imaging that provides excellent contrast-to-noise ratio resulting in improved conspicuity of lesions/pathologies

1) The safety of imaging infants has not been established

Sequences

Spin Echo family of sequences

- 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; Echo Sharing for dual-contrast TSE
- 2D/3D HASTE (Half-Fourier Acquisition with Single Shot Turbo Spin Echo) – Inversion Recovery for STIR and DarkFluid contrast

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; 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)
- 2D/3D TrueFISP – Shared Phases Real-time TrueFISP (w/o ECG gating)
- ce-MRA sequence with Inline subtraction and Inline MIP
- 2D/3D Time-of-Flight (ToF) Angiography – single slab and multi slab; triggered and segmented¹⁾
- 2D/3D Phase Contrast Angiography – multiple velocity encoding; triggered¹⁾

1) For triggering the PMU wireless Physio Control option is required



Tim Application Suite: Acquisition and Reconstruction Techniques

- 2D PACE (Prospective Acquisition CorrEction)
- LOTA (Long Term Data Averaging) technique for motion and flow artifact reduction without increasing scan time
- Elliptical scanning reduces scan time for 3D imaging
- Selectable centric elliptical phase reordering via the user interface
- Inversion Recovery to nullify the signal of fat, fluid or any other tissue
- 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., MPRAGE)
- Presaturation Technique. RF saturation pulses to suppress flow and motion artifacts. Up to six saturation bands may be positioned in any orientation
- Tracking SAT Bands maintain constant saturation of venous and/or arterial blood flow, e.g., for 2D/3D sequential MRA
- Fat Saturation. Additional frequency selective RF pulses, used to suppress bright signal from fatty tissue. Two selectable modes: weak, strong
- Water Saturation. All sequences used for fat saturation can also be used to suppress the water signal
- Quick FatSat
- SPAIR: robust fat suppression for body imaging using a frequency selective inversion pulse
- Fat Excitation. Spectral selective RF pulses for exclusive fat excitation
- Water Excitation. Spectral selective RF pulses for exclusive water excitation
- Silicone detection for breast examinations
- MTC (Magnetization Transfer Contrast). Off-resonance RF pulses to suppress signal from certain tissues, thus enhancing the contrast. Used e.g., in 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
- 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
- PAT averaging for motion artifact suppression using Self-Calibration

Highlights

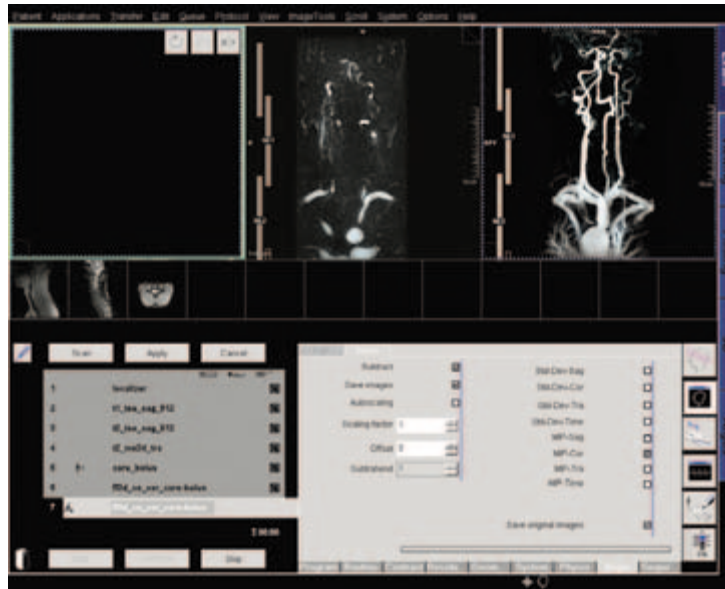
- syngo MR – the cross-modality intuitive user interface
- syngo Scan Assistant
- Inline Technology
- Advanced workflow features such as image stamps, Inline display, Inline movie functionality
- iPAT – high-performance and flexible Parallel Imaging. Tim and its Matrix coils are combined with the most innovative implementation of PAT for highest speed and resolution
- The Tim Assistant and the Intelligent Coil Control help maximize PAT factors according to the selected coils to achieve exemplary image quality in the shortest time
- Phoenix functionality for reproducible image quality and for benefiting from other MAGNETOM users sharing their protocols
- scan@center enables maximum image quality by automatically moving the table into the magnet isocenter with every scan
- Argus viewer for reviewing cine studies
- Report Viewer for DICOM structured reports including report editing
- Dynamic Analysis for addition, subtraction, division, standard deviation, calculations of ADC maps, T1 and T2 values, TTP etc.
- Image Filter
- 3D post-processing MPR, MIP, MinIP, SSD
- Software-controlled patient table movement for a total coverage of 140 cm (standard)
- Flexible film formats and paper print
- Data storage of images and cine avi files on CD/DVD with DICOM viewer as the viewing tool

Inline Technology – Processing Instead of Post-processing

Inline Technology helps to streamline the clinical workflow by automating mundane post-processing steps before image viewing. See the clinical results immediately.

Examples are:

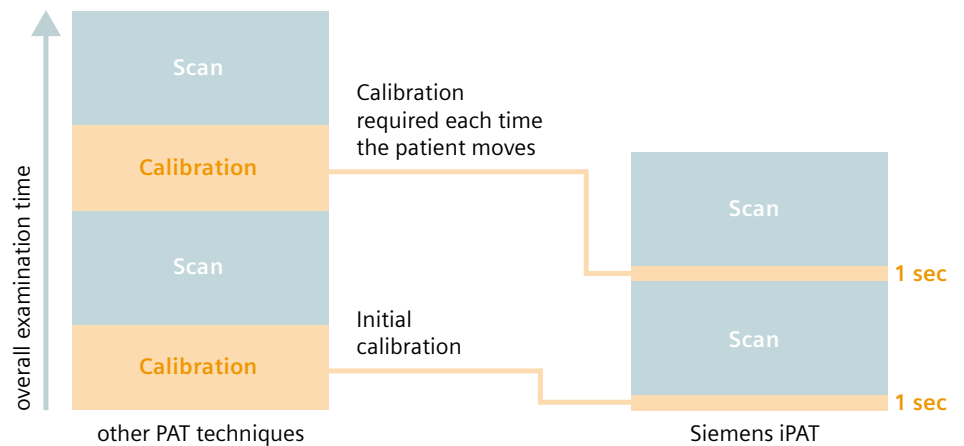
- Automatic subtraction of images, e.g., pre- and postcontrast enhancements
- Automatic on-the-fly calculation of standard deviation, for better differentiation of arterial and venous phases



- MIP on-the-fly, i.e., MR Angiography with automatic image subtraction and following MIP in three orthogonal planes, stored as a separate study
- Automatic diffusion and perfusion imaging
- Automatic soft tissue evaluation

iPAT (Integrated Parallel Acquisition Technique)

- iPAT is the Siemens Parallel Imaging solution. It is fully integrated. PAT factors up to 4 are implemented in the Tim Application Suite
- GRAPPA included for maximum quality for all applications
- Integrated AutoCalibration includes an immediate reference (calibration) scan to additionally save on total scan time
- TurboCalibration uses a separate measurement directly before the actual measurement. Images measured using TurboCalibration are characterized by reduced PAT artifacts. TurboCalibration is only used in conjunction with GRAPPA
- PAT averaging for motion artifact suppression using Self-Calibration
- iPAT is compatible with all relevant sequence techniques (e.g., SE, TSE, Restore, MEDIC, TIRM DarkFluid, HASTE, EPI, MPRAGE, 3D VIBE, FLASH, TrueFISP, TurboFLASH, FLASH Phase Contrast, etc)
- iPAT is compatible with all Matrix coils, all array coils, as well as coil combinations
- Tim Assistant facilitates optimized iPAT settings



Higher speed and temporal resolution can be used for:

- Improved image resolution
- Improved image quality due to reduced artifacts
- More slices and coverage in the same breath-hold

Tim – Matrix Coils and RF Technology

One of the major benefits of the revolutionary Total imaging matrix is that it optimizes coil positioning and virtually eliminates coil changing times.

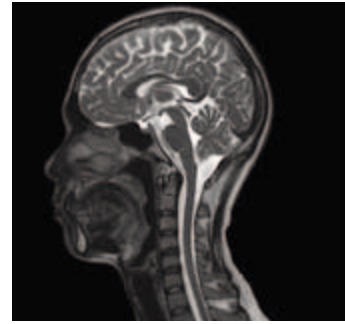
RF Receiver Technology

The MAGNETOM ESSENZA equipped with Tim facilitates the integration of up to 25 coil elements within one examination.

Two coil connectors integrated in the patient table enable the simultaneous use of a large number of coils. All coil elements of all connected coils can be flexibly selected for each scan.

Intelligent Coil Control

- Automatic detection of the exact coil position on the patient table
- What you see is what you get: graphical visualization of coils at their current position within the user interface
- Choice of coil setting via software buttons at the *syngo* Acquisition Workplace
- Storage of coil settings within the protocols and adaptation when the protocol is recalled
- AutoCoil Select for dynamic, automatic or interactive selection of the coil elements within the Field of View



Additional benefits

- No coil changing with multi-exam studies
- For fast start of the examinations and pristine image quality all coils are “no-tune” coils with low noise preamplifiers

Matrix coils

The multi-element Matrix coil technology is an essential part supplementing the Total imaging matrix.

It is the next generation IPA (Integrated Panoramic Array) technology from Siemens. With new advances in MR imaging, the IPA coil technology evolved into the Matrix coil technology. The Matrix coil design has an intelligent logic that combines signals in various permutations and combinations to yield best SNR from the numerous coil elements.

The following Matrix coils are standard:

- Head Matrix coil 2-channel CP Mode, 4-channel Dual Mode, 6-channel Triple Mode
- Neck Matrix coil 2-channel CP Mode, 4-channel Dual Mode
- IsoCenter Matrix 9 elements
- 4-Channel Flex coil large and 4-Channel Flex coil small

The following coils are optional:

- Body Matrix coil 2-channel CP Mode (a maximum of 2 Body Matrix coils can be plugged in simultaneously), 4-channel Dual Mode, 6-channel Triple Mode
- PA Matrix coil (Peripheral Angio Matrix) 8-channel CP Mode
- Breast Matrix 2-channel CP Mode, 4-channel Dual Mode
- Focus Shoulder Array coil
- Extremity Matrix coil
- Endorectal coil

> For further information refer to the coil appendices.

Additional RF Coils

In addition to the Matrix coils, a large variety of Siemens coils as well as 3rd party coils are compatible with Tim's Open Architecture of MAGNETOM ESSENZA.

> For further information refer to the coil appendices.

Integrated CP Body Coil

Integrated whole-body coil system

- No-tune transmit/receive coil
- Circularly polarized (CP)

Optimized RF efficiency and signal-to-noise ratio (SNR)



Digital Signal Processing System

- Solid-state amplifier, maintenance-free
- Digital filtering
- Digital quadrature demodulation
- Receiver with high dynamic range without adjustments

	Frequency stability (5 min)	$\pm 2 \times 10^{-10}$
	Frequency control	32 bits (0.015 Hz)
	Phase control	16 bits (0.006 degrees)
Transmitter path		
	Transmit amplitude	16 bit control 50 ns resolution
	Gain stability (5 min)	<0.15 dB (low signal path) <0.40 dB (power amplifier)
Transmit amplifier		
	Extremely compact water-cooled	
	Transmit amplifier bandwidth	500 kHz
	Peak power	15 kW
Receive path		
	Receiver bandwidth	500 – 1 MHz (for each channel)
	Receiver signal resolution	32 bits
	Number of independent receiver channels	8
	Sampling rate (Sampling resolution)	10 MHz (100 ns)
	Preamplifier noise figure	<0.55 dB
	Total gain	35 dB/50 dB with automatic control
	Dynamic range	142 dB with automatic control 135 dB instantaneous at receiver

Tim – Workflow and Patient Handling



Tim ensures increased patient comfort and optimized workflow efficiency.

- Only one patient setup, no repositioning, no changing of coils
- Ultra-light weight coils
- Imaging with optimized surface coil quality
- Remote table move
- Feet-first examinations for many applications

The majority of applications can be performed in the feet first position, e.g., cardiac, liver, upper abdomen, pelvis, colonography, body angio, reducing the level of anxiety experienced by highly claustrophobic patients.

The scan range of 140 cm allows examinations such as whole CNS, whole Abdomen, and peripheral MRA with full usage of SNR of Matrix surface coils without patient or coil repositioning. This saves time without compromising image quality.

Patient Table

Free-floating table: Free foot room for the attending staff and better access to the patient (cantilevered table design).

Optional: vertical table drive to lower patient table to 55 cm for easy access.

Patient Positioning Aids

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

Patient Comfort Facilities

Facilities at the tableside control unit and at the syngo Acquisition Workplace

- In-bore lighting (3 levels)
- In-bore ventilation (3 levels)
- In-bore intercom via loudspeaker, microphone and earphones
- Look-out mirror 90°

Patient Table

Max. patient weight (including vertical movement)	200 kg
Max. scan range	140 cm
Vertical table movement¹	
Range	55–89 cm
Max. vertical movement time	13 s
Longitudinal table movement	
Max. range	205.5 cm
Max. speed	20 cm/s
Positioning accuracy	± 0.8 mm

1) Optional

Tableside Control Unit

One ergonomically designed unit integrated into the front covers.

Controls

- Table in/out in 2 speed levels
- Table stop
- Laser light localizer



- Automatic transfer to isocenter
- Home position (auto transfer)
- Ventilation within the patient tunnel (adjustable in 3 levels)
- Lighting within the patient tunnel (adjustable in 3 levels)
- Scan start, scan stop
- Volume of speaker and headphones in examination room for external audio system

Table functions can also be controlled via software from the *syngo* Acquisition Workplace.

Patient Communication

Assistance call via squeeze-bulb for the patient.

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

- Intercom communication with the patient
- Response to the patient's activation of the squeeze-bulb
- Table 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 headphones
- Loudspeaker
- Microphone

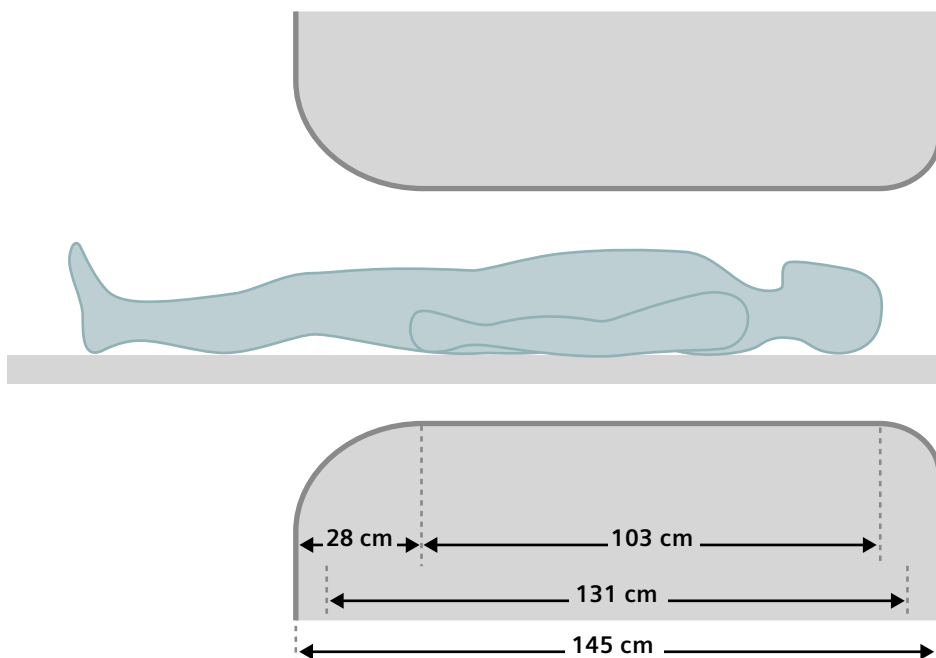
Automatic and freely programmable voice commands for breath-hold examinations.

Magnet System

Superconducting Magnet

Short bore, patient-friendly design with flared opening.

Easy siting due to AS (Active Shielding) and E.I.S. (External Interference Shielding) magnet technology.



Magnet Parameters

Operating field strength	1.5 Tesla
Superconductor	Niobium-Titanium
Field stability over time	<0.1 ppm/h

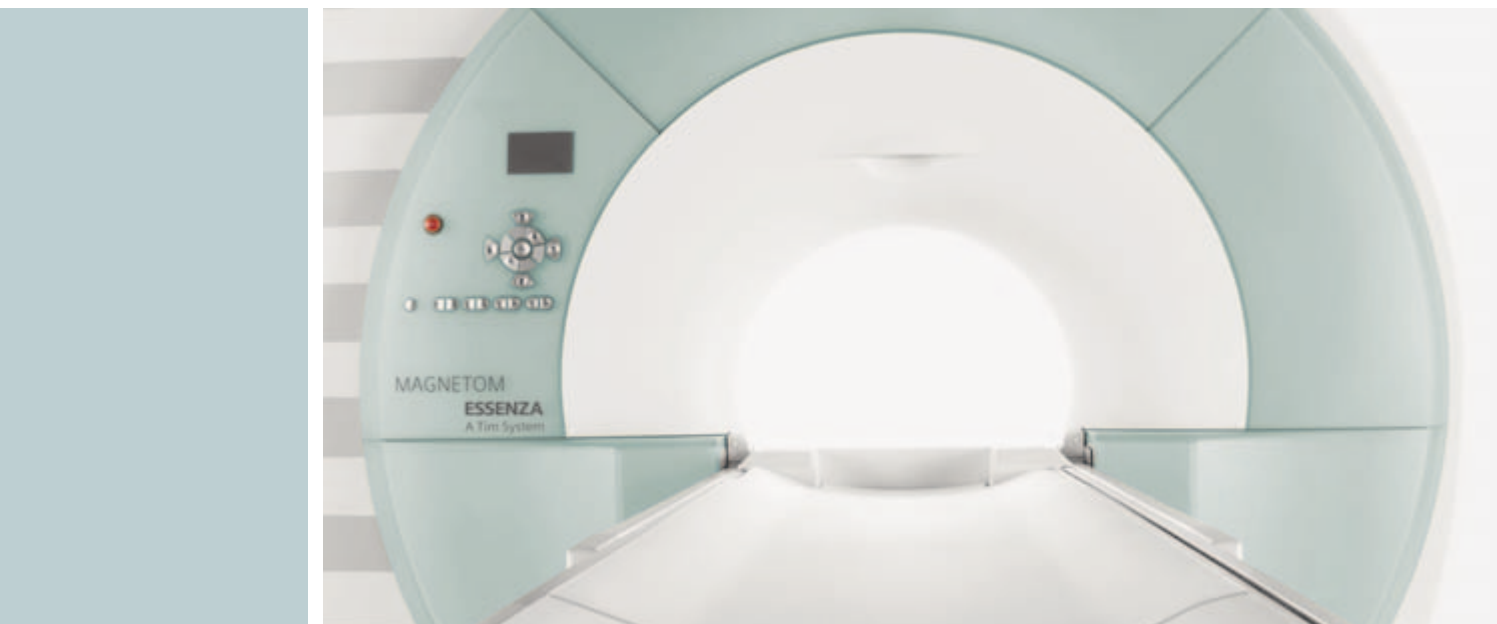
Magnet Bore

Magnet length	131 cm
Magnet bore diameter ¹	82 cm
Inner tunnel length	103 cm
Length of flared opening	28 cm
Inner diameter ²	60 cm
System length	145 cm

1) W/o shim coils, gradient coil, RF body coil

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

Homogeneity	DSV	Guaranteed	Typical
	10 cm DSV	≤0.2 ppm	0.04 ppm
	20 cm DSV	≤0.22 ppm	0.16 ppm
	30 cm DSV	≤1.2 ppm	1.1 ppm
	40 x 40 x 30 cm ³	≤2.2 ppm	1.9 ppm
	45 x 45 x 30 cm ³	≤7.5 ppm	6.0 ppm
	Standard deviation Vrms (volume root-mean square) measured with highly accurate 24 plane plot method (20 points per plane)		
	40 x 40 x 40 cm ³	≤5 ppm*	
	DSV=Diameter spherical volume (x, y, and z direction) * In compliance with the German “Qualifikationsvereinbarung”		
3D Shim			
	Patient-specific automated shim		
	For optimization of the magnetic field homogeneity		
	Time to shim	12–15 s	
Active Shielding (AS)			
	Fringe field (axial x radial)	0.5 mT*	4.0 m × 2.5 m
		0.1 mT	5.8 m × 3.4 m
		* Pacemaker safety limit	
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)		
Magnet Cooling System			
	Refill interval (typical)	10 years*	
	Boil-off rate (typical)	0.0 l/year*	
	Helium capacity	approx. 1400 liters	
	Cryostat	Stainless steel	
		* For typical clinical use, depending on sequences and operating time	



Gradient System

The combination of our worldclass gradients together with Tim (Total imaging matrix) enables the most demanding applications.

General Features

- Actively shielded (AS), super-compact whole-body gradient coil system
- Extremely low eddy currents
- Water-cooled coil and amplifier for maximum performance

Excellent spatial and temporal resolution

Shortest TE and TR for high image contrast and best signal-to-noise ratio

Patient-specific shimming

Active shim via 3 linear channels.

Includes advanced, non linear 2nd order shim.

Features and Technical Data

> Refer to appendix:
"Tim [25x8] with V-engine"



Acquisition Parameters*

2D Slices		
	Number of slices	
	per single slice stack	1 – 128 (steps of 1)
	per series (total number of slices in one dynamic measurement)	Up to 262, 144 (depending on matrix size)
	Slice order	Ascending, descending or interleaved
3D Slabs/Partitions		
	Number of 3D partitions per single slab	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 64)
	Phase encoding	32 – 1024 (in steps of 1)
Partial Fourier Imaging		
	Phase partial Fourier (1/2 = Half Fourier)	4/8 – 1 (steps of 1/8)
	Read partial Fourier (asymmetric echo)	Selectable
	Slice partial Fourier (3D volumes)	6/8 – 1 (steps of 1/8)
Rectangular Field of View		
	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)

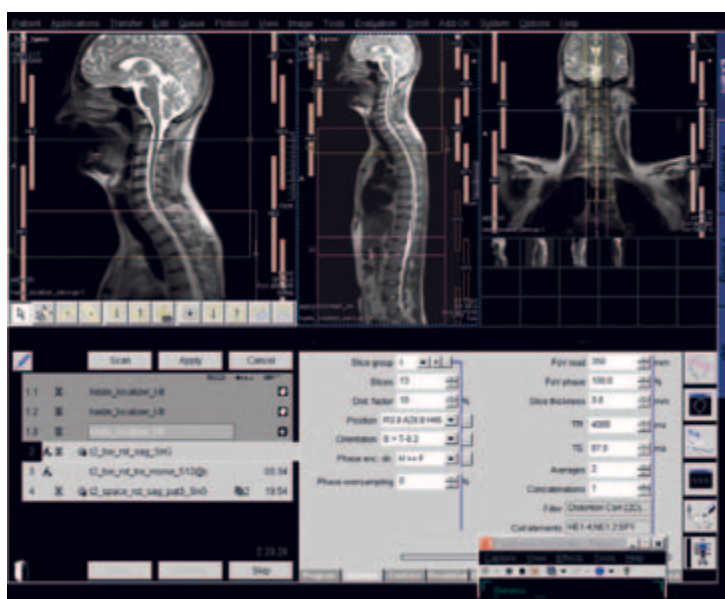
* Combinations of the parameters stated are not always possible;
some parameters may depend on optional application packages

Oversampling			
	Read oversampling	100% standard	
	Phase oversampling	0 – 100% (steps of 1%)	
	Slice oversampling (3D volumes)	0 – 100% (steps depend on slice per slab)	
Interpolation			
	In-plane interpolation in frequency-encoding and phase-encoding direction	Selectable (factor of 2)	
	3D interpolation (3D volumes)	Selectable (up to factor of 2)	
Slice Orientation			
	Slice orientations for 2D scans and 3D scans	Transverse, sagittal, coronal, oblique, double oblique (steps of 0.1°)	
	Multi-slice multi-angle (simultaneously)	Yes	
Off-center Shift			
	Longitudinal direction (head-feet)	– 150 mm to + 150 mm	
	Horizontal direction (left-right)	– 200 mm to + 200 mm	
	Vertical direction (anterior-posterior)	– 200 mm to + 200 mm	
Serial Acquisitions			
	Number of repeat scans	with constant delay times	1 – 4096
		with different delay times	1 – 65
Swap			
	Exchange of read-out and phase-encoding direction	Yes	

syngo MR Software

syngo®, the unique software platform for medical applications and systems, integrates all patient related information, physiological and imaging data across your entire clinical workflow. In every workplace *syngo*'s innovative user interface allows you to know intuitively what to do.

Its intelligent automation features accelerate your examination, enabling smooth efficient workflow, across modalities, departments and people. With *syngo*, your workplace is uniquely customized to the way you work. The "program" concept in *syngo* MR enables scanning patients with a minimum of mouse clicks. This speeds up the total examination time.



Intelligent Features

The *syngo* MR user interface is the cockpit for dynamic MRI.

The ergonomic and easy-to-use interface supports the clinical workflow.

Tim Assistant

Helps to make Parallel Imaging easy by automatically recommending the appropriate PAT factor for the selected application. Tim Assistant always knows the selected coil elements and the MR protocol, ensuring the optimal iPAT configuration for each application.

scan@center

Easy planning – best position scanning. scan@center automatically moves the table so that the scan is performed in the magnet isocenter. This enables best image quality especially for fat saturation techniques. Extended Field of View examinations benefit from this functionality as well as multi-stage examinations.

Intelligent Coil Control

Detects the position and orientation of coils automatically. Shows coils in the user interface right within the graphical slice positioning.

AutoCoil Select

Dynamic, automatic and interactively selects the coil elements within the Field of View.

Image Filter

The Image Filter Software uses adaptive filtering and adjusts to the local image content automatically. The Image Filter is available “inline” and “offline” on the syngo Acquisition Workplace and “offline” on the syngo MR Workplace. Default and freely definable image filter values are provided.

Inline Applications Card

Programming of Inline processes for the current protocol

- Subtraction
- Standard deviation
- MIP
- Soft tissue evaluation

syngo Scan Assistant

Shows parameter constraints and offers possible solutions.

Inline Display

Automatically shows reconstructed images. It offers real-time control of the results and opens automatically for e.g., real-time interactive scanning or CareBolus examinations.

Inline Movie

Inline technology automatically starts the cine image display.

Scan Open Protocol

Allows faster workflow for breath-hold exam.

Table Positioning Interface

Remote software control of table move and patient comfort facilities, such as in-bore ventilation and lighting.

Physiological Display

Displays the pulse, ECG or respiration signal, combined with a graphical indication of the acquisition window (requires PMU option).

Automatic Voice Command

Records and plays freely programmable language-independent voice commands, e.g., for breath-hold instructions to the patient.

Online Help

Functions as a context-sensitive and quick resource for questions about software operation or MR physics.



Phoenix – What you see is what you get

The unique Phoenix technique from Siemens is the easiest way to exchange protocol data. It supports intelligent extraction of sequence parameters from images acquired worldwide with MAGNETOM systems via network, CD exchange, or the Internet.

By simply dragging the desired image into the measurement queue, Phoenix extracts the protocol from the DICOM header in the images, and instantly duplicates the protocol – TR, TE, bandwidth, number of slices, echo spacing, etc. The same parameters can be applied for subsequent scans.

Phoenix is standard on all MAGNETOM systems

- Supports multi-center protocol standardization
- Improves reproducibility of studies, e.g., in case of follow-up or research
- Helps to establish new applications quickly. Expertise from other sites is available in seconds
- Shares optimized protocols on the different MAGNETOM systems
- Is an effective tool for monitoring and assessing quality and can help to maintain the highest possible performance level
- Is a tool for the visual selection of applications that are either new to a facility or for facilities that are in the start-up phase
- Enables MAGNETOM users around the world to exchange protocols and benefit from the experience of other experts, e.g., by downloading images from the internet

PhoenixZIP

PhoenixZIP allows the transfer of whole measurement programs in an easy and simple way. Once measured examinations can be restored from the PACS, data sets can be exchanged between MAGNETOM systems via Internet or storage media like CD or DVD. The data sets for PhoenixZIP contain the protocol data of all protocols of the measurement as well as the order and conjunctions of these. Therefore PhoenixZIP offers an effective and time – efficient way to exactly reproduce once measured examinations.



syngo MR Examination

Integrated Exam Programs

- Executable with just one mouse click
- Selects automated examinations with less interaction
- Enables automated scanning
- Allows queuing of multiple protocols as program steps during an examination
- Pending program steps can be rearranged or removed from the queue, as required
- Allows for predefined pauses between program steps, e.g., for the administration of contrast agent
- Allows for the appending and deleting of program steps
- Parameters can be copied either manually or automatically
- Programs can be saved to the exam explorer
- Enables easy exchange of program steps between queue area and exam explorer
- Both program steps and the whole queue can be repeated, as required

Exam Explorer

- Allows free and flexible programming of customized integrated exam programs
- Simple change of exam programs via drag & drop

Scan Preparation

- Automatic adjustment of frequency, transmitter power and 3D Shim
- Eliminates the need for receive adjustments through dynamic receiver gain control, significantly reducing scan time
- Allows for individual interactive adjustments
- No coil tuning necessary, also saving examination time

Autoscout

- Allows for automatic start of localizer scan with very short acquisition time
- Allows for 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, i.e., simultaneous measurement of multiple images (stacks with different orientations)
- 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
- Loads images immediately when they are available, i.e., during image reconstruction
- Allows quick overview via image stamps. Loads entire series of planning images with drag & drop
- Slice positioning (GSP) on 3D reconstructed images
- Slice positioning (GSP) on 2D distortion corrected images
- Slice positioning (GSP) on composed images



syngo MR Image Viewing and Filming

Image Recall

Images are stored in DICOM format, allowing fast image access and recall.

- Combines images in a new series, e.g., post-processed images
- Loads images automatically
- Inline Display

Image Display

- Various display layouts selectable
- Up to 3 patients can be simultaneously active in the viewer
- Image annotation and labeling
- Non-interpolated display
- Fast paging through up to 500 images with 15 images/s for full screen display

Windowing

- Freely selectable window width and center
- Windowing on succeeding images
- Auto-windowing for optimized contrast
- Saves and sends window values

Automatic Movie for cine display

Interactive movie paging by dragging the mouse or Automatic Movie mode by clicking the icon

Evaluation

Parallel evaluation of up to 40 regions of interest

- Circle
- Rectangle
- Freehand ROI
- Pixel lens with position marker
- Statistical evaluation
- Area
- Standard deviation
- Mean value
- Min/max values
- Image scrolling
- Magnification
- Distance
- Angle

2D Post-processing

Image manipulations

- Reversal of gray-scale values
- Image rotation by 90° or by user-defined angle
- Flip horizontally/vertically
- Image zoom and pan
- Shutter
- Annotation

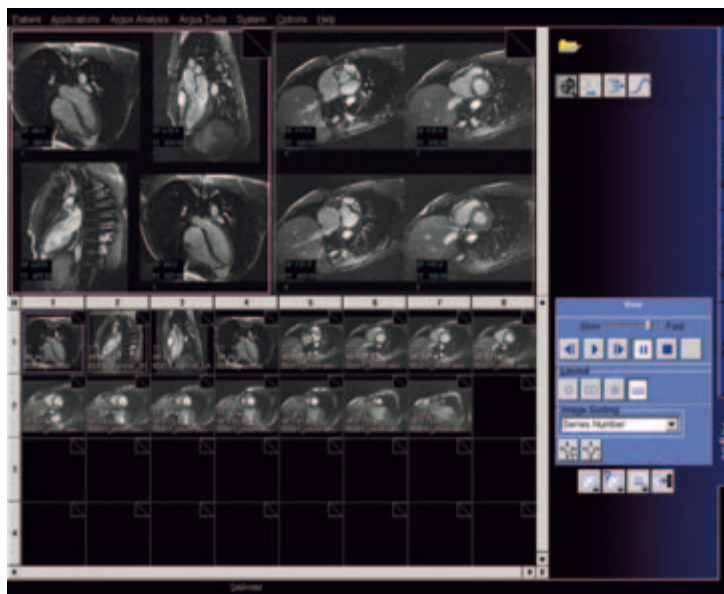
Position display

Displays measured slice positions on localizer image and selected series.

Argus Viewer

Viewing software for cardiac MR studies and large data sets

- Efficient cine review of cardiac and other dynamic data sets
- Multiple sorting options
- Single movie as well as 2, 4, or 8 simultaneous slices together in movie mode
- Rapid avi creation of 1 to 8 slices simultaneously
- Creates and edits DICOM structured reports



Mean Curve

Time-intensity analysis for contrast-enhanced examinations

- Creates and edits DICOM structured reports

Filming

- Connection via DICOM Basic Print
- Interactive filming
- Filming parallel to other activities
- Independent scanning and documentation – no wait time due to camera delays
- Freely selectable positioning of images onto virtual film sheet
- Selectable various film layouts
- Mother-in-Child display
- Windowing, image zoom and pan on film sheet
- Configurable image text
- Simultaneous handling of multiple film jobs
- Up to 100 virtual film sheets

Dynamic Analysis

Arithmetic operations on images and series (e.g., for evaluation of contrast media studies)

- Addition, subtraction, multiplication, division of single images and whole series
- Arithmetic mean and standard deviation across a range of selected images
- Calculation of T1 and T2, and logarithmic images
- Differentiation/integration of selected images
- Calculation of a mean slope image from a range of selected images
- Time-to-peak evaluation (TTP)
- ADC maps

Several evaluation functions may be started consecutively in the background.

Printing on Paper

Interface and software for printing images on paper (laser printer not included)

Grey levels and color printing supported

Data format Postscript Level 2



syngo MR 3D Post-processing

MPR – Multiplanar Reconstruction

Real-time multiplanar reformatting of secondary views

- Viewing perspectives: sagittal; coronal; axial; oblique; double oblique; curved (freehand)
- Reconstruction along polygon and/or curved (freehand) cut lines
- Reconstruction based on reconstructed planes possible
- Reconstruction of user-defined ranges of parallel, radial or freehand cuts
- Selectable slice thickness and slice increment of reconstructed images
- Storing of post-processing protocols
- Annotations and 2D evaluations such as distance and ROI

MIP – Maximum Intensity Projection

3D reconstructions of vessels from a 3D data set, or a 2D sequential slice data set (acquired with dedicated MR Angiography sequences)

- Volume of Interest (Vol) defined to increase reconstruction speed and to improve image quality
- Freehand MIP: virtually eliminating interfering overlays by manually drawn, irregular contours in all dimensions
- Arbitrary views along any direction can be defined interactively with mouse-driven virtual trackball
- Multiple view angles around any orthogonal axis
- Projections displayed as single images, as interactive movie or by fast paging
- MIP thin/MIP thick

MinIP – Minimum Intensity Projection

Similar to MIP but reconstructs the minimum intensity (e.g., for Dark Blood techniques)

- Volume of Interest (Vol) defined to increase reconstruction speed and to improve image quality
- Freehand minMIP: virtually eliminating interfering overlays by manually drawn, irregular contours in all dimensions
- Arbitrary views along any direction can be defined interactively with mouse-driven virtual trackball
- Multiple view angles around any orthogonal axis
- Projections displayed as single images, as interactive movie or by fast paging
- MinIP thin/MinIP thick

SSD – Shaded Surface Display

Three-dimensional display of surfaces, such as contrast-enhanced vessels

- Selectable variable threshold values
- Multiple view angles around any orthogonal axis

Rectangular and irregular Volumes of Interest (Vol) can be defined to improve image quality

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; communication back to information system
- DICOM Structured Reports

DICOM Conformance Statements can be found on the Internet:

www.siemens.com/healthcare

> **Services**
> **DICOM**
> **Magnetic Resonance**

DICOM Study Split

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.

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.

This package allows:

- 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

Exchange Media

Storage of images and additional data (e.g., avi files) on CD/DVD.

A viewing tool (DICOM Viewer) 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 (256 x 256 image)	Approx. 20 images/s

Remote Diagnostics

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

Provided in conjunction with a service contract with Siemens (UPTIME Services)

- Remote access granted only with permission of the institution. Data security is ensured by secure access

Virus Protection

Permanent scanning for malicious software in the background to provide maximum security

Via Remote Access over secure network connection the latest virus scanner updates and operating system hotfixes are installed automatically

Provided in conjunction with a service contract with Siemens (UPTIME Services)

MPPS

DICOM Modality Performed Procedure Steps (MPPS) allows communication of information about the examinations from the MR system to an information system (such as RIS systems). MPPS enables provision of data for billing, documentation and planning purposes to an information system.



Computer System

syngo Acquisition Workplace

Full multi-tasking for simultaneous functionality, e.g.:

- Patient registration and pre-registration
- Scanning
- Reconstruction
- Viewing
- Post-processing
- Filming
- Data storage

Color LCD Monitor

High resolution flicker-free flat-screen monitor

Horizontally tiltable, forward and backward

Automatic backlight control for long-term brightness stability

Integrated Measurement and Reconstruction system: Technical Data

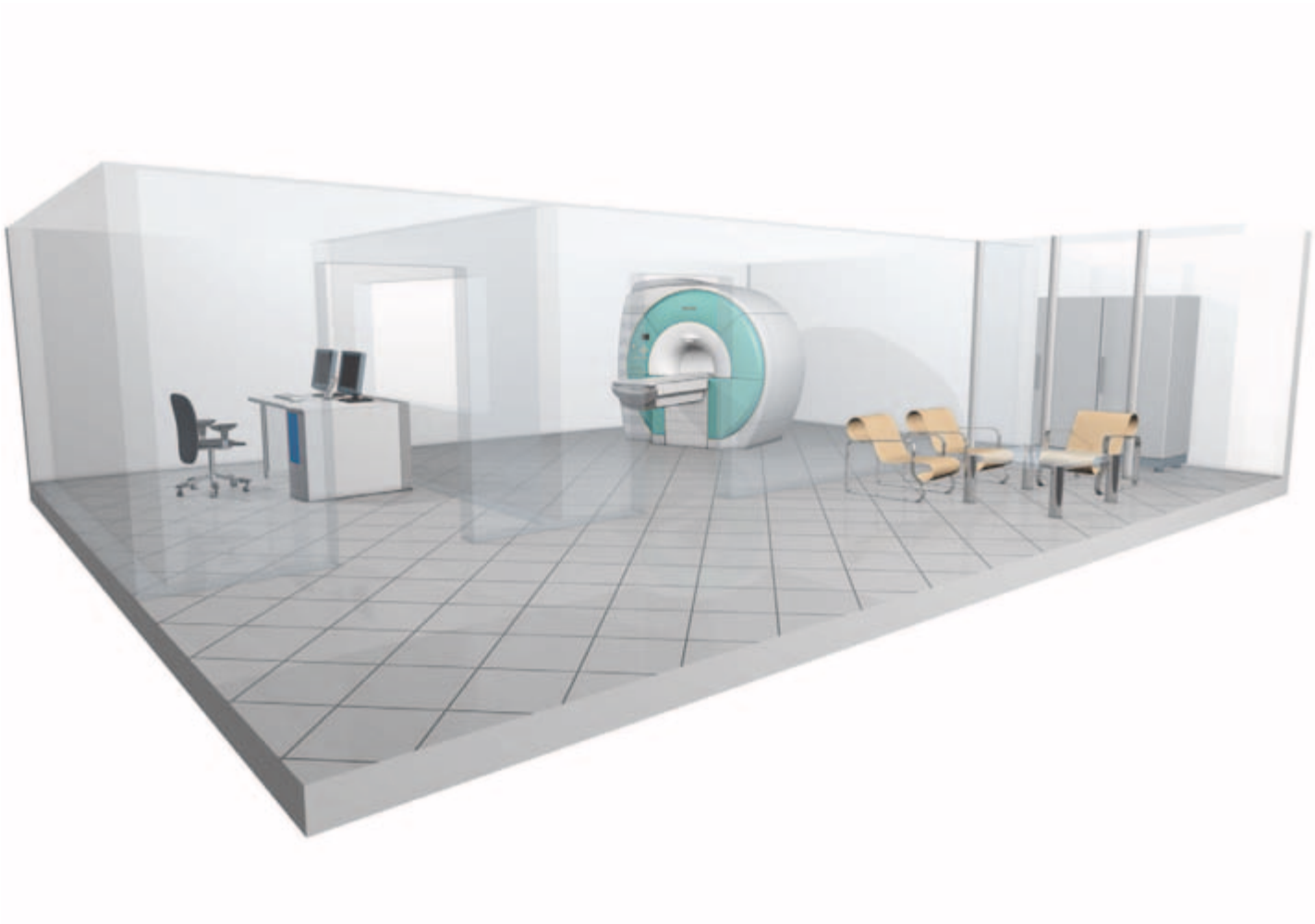
> Refer to appendix "Computer System"

Color LCD Monitor

Screen size (diagonal)	19"
Horizontal frequency	30 – 90 kHz
Vertical frequency	50 – 120 Hz
Screen matrix	1280 × 1024

Installation

Radio Frequency Shielding		
For shielding the examination room from external RF sources		
RF attenuation factor		> 90 dB
Frequency range		15 – 65 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 MAGNETOM ESSENZA, even in case of very low room heights



System Electronics Cabinets																																				
2 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 eliminates the need for a dedicated computer room																																				
Power Requirements																																				
Line voltage	380, 400, 420, 440, 460, 480 V																																			
Stability tolerances	± 10 %																																			
Line frequency	50/60 Hz, ± 1 Hz																																			
Connection value	45 kVA *																																			
* Long-term average in full operation																																				
Cooling Water Requirement																																				
Water consumption	> 30 l/min ¹																																			
Heat dissipation to water	≤ 21 kW																																			
1) Water temperature: 6 °C – 12 °C (43 °F – 54 °F)																																				
Power Consumption (in kW)	<table><tr><td></td><td colspan="2">PCS¹</td><td colspan="2">ACS¹</td></tr><tr><td></td><td>50 Hz</td><td>60 Hz</td><td>50 Hz</td><td>60 Hz</td></tr><tr><td>System off²</td><td>6.5</td><td>8.5</td><td>15.0</td><td>20.0</td></tr><tr><td>Stand-by</td><td>6.8</td><td>8.8</td><td>15.3</td><td>20.3</td></tr><tr><td>Ready for measurement</td><td>9.0</td><td>11.0</td><td>18.8</td><td>23.8</td></tr><tr><td>Typical measurement</td><td>9.4</td><td>11.4</td><td>19.6</td><td>24.6</td></tr><tr><td>Highest average power</td><td>21.7</td><td>23.7</td><td>30.5</td><td>35.5</td></tr></table>		PCS ¹		ACS ¹			50 Hz	60 Hz	50 Hz	60 Hz	System off ²	6.5	8.5	15.0	20.0	Stand-by	6.8	8.8	15.3	20.3	Ready for measurement	9.0	11.0	18.8	23.8	Typical measurement	9.4	11.4	19.6	24.6	Highest average power	21.7	23.7	30.5	35.5
	PCS ¹		ACS ¹																																	
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1) PCS : Passive Cooling System, ACS : Active Cooling System																																				
2) Refrigerator only, 24 h/d																																				
Space Requirements																																				
Min. total space requirement	30 m ²																																			

Dimensions	Component	Width [cm]	Depth [cm]	Height [cm]	Weight [kg]	Heat Dissipa- tion [kW]
Examination Room						
	Magnet 1.5 Tesla AS (incl. Helium)	211.4	131	214	3150	
	Magnet in operation, incl. gradient coil, body coil, patient table, and covers	226	410	216	4350	3
	Patient table	55.5 (top)	210.5	55–89	270	
	Required min. room height clearance			240		
	Min. transport dimensions	226 *	183 *	216 *		
Control Room						
	<i>syngo</i> Acquisition Workplace (table + monitor)	120	80	117 (72+45)		2
	Host computer	22	69	44		
	<i>syngo</i> MR Workplace (optional) (table + monitor)	120	80	117 (72+45)		
Equipment Room						
	Electronics cabinet, incl. system control, RF system, gradient power system, image processor	95	65	189 **	700	3
	Active Cooling System	100	65	189 **	400	
	Passive Cooling System	80	65	189 **	264	
* Without electronics, table and table bracket						
** Without attachments						

System Cover

The system design follows the award winning design of the other members of the MAGNETOM family.



Zebra

On account of certain regional limitations of sales rights and service availability, we cannot guarantee that all products included in this brochure are available through the Siemens sales organization worldwide. Availability and packaging may vary by country and is subject to change without prior notice.

The information in this document contains general technical descriptions of specifications and options as well as standard and optional features which do not always have to be present in individual cases.

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Note: Any technical data contained in this document may vary within defined tolerances. Original images always lose a certain amount of detail when reproduced.

Please find fitting accessories:

www.siemens.com/healthcare-accessories

Contact

Germany

Siemens AG, Medical Solutions
Magnetic Resonance
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0

USA

Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

Japan

Siemens-Asahi
Medical Technologies Ltd.
Takanawa Park Tower 14F
20-14, Higashi-Gotanda 3-chome
Shinagawa-ku
Tokyo 141-8644
Telephone: +81 3 5423 8411

Asia

Siemens Medical Solutions
Asia Pacific Headquarters
The Siemens Center
60 MacPherson Road
Singapore 348615
Telephone: +65 6490 6000
Telefax: +65 6490 6001

China

Siemens Medical Park, Shanghai
278, Zhouzhu Road
SIMZ, Nanhui District
Shanghai, 201318, P.R.China
Telephone: +86-21-38895000
Telefax: +86-10-28895001

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MC.MR-00410 PA 0508 POD

Legal manufacturer

Siemens Mindit Magnetic
Resonance Ltd. (SMMR)
Siemens MRI Center, Gaixin C. Ave.,
2nd, Hi-Tech Industrial Park
Shenzhen 518057
P.R. China
Telephone: +86 755-26525421
Telefax: +86 755-26549253

Headquarter

Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare



MAGNETOM ESSENZA

Tim [25x8]
V-engine

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Tim – Total imaging matrix

[25x8]. 25 seamlessly integrated coil elements.
8 RF channels.

- Up to 25 simultaneously connected coil elements which can be seamlessly integrated into one examination
- 8 independent receiver channels (Analog/Digital Converters, ADCs)

Almost all receiving coils with up to 25 coil elements in total can be connected simultaneously. They can be seamlessly integrated into the examination without repositioning the patient or even changing a single coil.

iPAT – Advanced iPAT capabilities

- Full iPAT throughout the whole body – without patient repositioning or changing the coil setup
- Multi-directional, i.e., three dimensional, high-speed, high-resolution iPAT
- Flexible iPAT through use of multiple coils and Matrix Coil Mode
- iPAT with acceleration factors up to 4 (one direction) or 8 (with iPAT², optional)¹⁾
- Tim Assistant ensures ease-of-use and optimized iPAT settings

1) With iPAT Extension Option

Gradients

General

Gradient duty cycle	100%
Gradient performance	
Max. amplitude	30 mT/m
Min. rise time	300 µs
Max. slew rate	100 T/m/s
Vector gradient performance (vector summation of all 3 gradient axes)	
Max. eff. amplitude	52 mT/m
Max. eff. slew rate	173 T/m/s

Gradient Amplifier

Water-cooled, highly compact, modular design
Ultra-fast solid-state technology with very low switching losses

Max. output voltage²⁾	1200 V
Max. output current²⁾	150 A

2) Values for each of the 3 gradient axes

Resolution Parameters			
	Min. FoV	5 mm	
	Max. FoV ¹	45 cm	
	Min. slice thickness 2D	0.1 mm	
	Max. slice thickness 2D	200 mm	
	Min. partition thickness 3D	0.05 mm	
	Max. partition thickness 3D	20 mm	
	Min. slab thickness 3D	5.12 mm	
	Max. slab thickness 3D	450 mm	
	Max. matrix	1024	
	Highest in-plane resolution	16 µm	
1) Depending on the application, the maximum FoV may be smaller (e.g., up to 35 cm in the z-direction)			
Spin Echo	Matrix	128	256
	Min. TR	9.7 ms	11 ms
	Min. TE	3.6 ms	4.4 ms
2D GRE (TurboFLASH)	Matrix	128	256
	Min. TR	1.46 ms	2 ms
	Min. TE	0.62 ms	0.89 ms
	Min. measurement time	34 ms	43 ms
3D GRE (ceMRA)	Matrix	128	256
	Min. TR	1.46 ms	1.99 ms
	Min. TE	0.62 ms	0.9 ms
TrueFISP	Matrix	128	256
	Min. TR	2.24 ms	2.96 ms
	Min. TE	0.94 ms	1.25 ms
	Min. measurement time	72 ms	100 ms
TSE (HASTE)	Matrix	128	256
	Min. echo spacing	2.66 ms	3.0 ms
	Min. TR	13 ms	16 ms
	Min. TE	3.7 ms	4.4 ms
	Min. measurement time	71 ms	77 ms
	Max. Turbo factor	512	

EPI (single-shot and multi-shot)	Matrix	64	128	256
	Min. echo spacing	0.4 ms	0.6 ms	0.97 ms
	Min. TR	10 ms	10 ms	10 ms
	Min. TE	2.4 ms	2.6 ms	3.2 ms
	Min. measurement time	10 ms	13 ms	16 ms
	Max. EPI factor	256		
Diffusion Imaging	Matrix	64	128	256
	Max. b-value [s/mm ²]	10 000	10 000	10 000
	Min. TE with b=1 000 [s/mm ²]	66 ms	70 ms	76 ms

All matrices without interpolation

Combinations of the stated parameters are not always possible; some parameters may require optional application packages

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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

IsoCenter Matrix Coil

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IsoCenter Matrix Coil

General

- 9-element design integrated at isocenter into the bore of the magnet
- Operates as spine coil, in single and multi-step examinations and as posterior coil together with Body Matrix or PA Matrix coils
- Workflow optimized setup with a coil that never needs to be positioned on the table
- No coil tuning
- iPAT-compatible

Applications

Imaging of multiple body parts in single and multi-step examinations in matrix coil image quality including:

- T- and L-spine examinations
- Whole spine and whole CNS
- Bilateral peripheral MRA
- Bilateral examination of long bone and legs
- Pelvic and abdominal imaging
- Thorax and cardiac imaging

Can be combined with

- Body Matrix coil
- Head Matrix coil
- Neck Matrix coil
- PA Matrix coil
- 4-Channel Flex coil large
- 4-Channel Flex coil small
- Endorectal coils

Matrix Coil Mode

- 3-channel CP Mode
- 6-channel Dual Mode



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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Head Matrix Coil

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SIEMENS

Head Matrix Coil

General

The Head Matrix coil is part of the standard system configuration.

- 6-element design with 6 integrated preamplifiers
- Upper coil part 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 Neck Matrix coil and IsoCenter Matrix Coil
- Open patient-friendly design
- Cushioned head stabilizers (removable)
- No coil tuning
- iPAT-compatible
- Detachable double mirror

Applications

- Head examination
- MR Angiography
- Combined head/neck examination
- TMJ (temporo mandibular joints)

Can be combined with

- Neck Matrix coil
- IsoCenter Matrix coil
- Body Matrix coil
- All flexible coils (e.g., 4-Channel Flex coil, small, 4-Channel Flex coil, large)

Matrix Coil Mode

- 2-channel CP Mode
- 4-channel Dual Mode
- 6-channel Triple Mode

Technical Data

- Weight: 4.6 kg
- Dimensions:
359 mm × 385 mm × 307 mm
(L×W×H)



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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Neck Matrix Coil

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Neck Matrix Coil

General

The Neck Matrix coil is part of the standard system configuration.

- 4-element design with 4 integrated preamplifiers, 2 clusters of 2 elements each
- Upper coil part removable
- Lower coil part may stay on the patient table for most of the examinations
- Operates in an integrated fashion with the Head Matrix coil and IsoCenter Matrix coil, for coverage of the posterior and anterior neck region
- No coil tuning
- iPAT-compatible

Applications

- Cervical Spine
- Neck
- Larynx/Esophagus
- MR Angiography
- Mediastinum
- Combined head/neck examination

Can be combined with

- Head Matrix coil
- IsoCenter Matrix Coil
- Body Matrix coil

Matrix Coil Mode

- 2-channel CP Mode
- 4-channel Dual Mode

Technical Data

- Weight: 2.4 kg
- Dimensions:
230 mm × 398 mm × 306 mm
(L×W×H)



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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

4-Channel Flex Coil

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4-Channel Flex Coil

4-Channel Flex Coil Interface

- Four integrated low-noise preamplifiers
- Allows flexible coil positioning
- Only one interface necessary for all flexible coils
- Several Flex Coil Interfaces can be used simultaneously

4-Channel Flex Coil, large

- Wrap-around coil made from soft and flexible material
- 4 linear polarized elements
- iPAT-compatible
- No coil tuning

Applications:

- Imaging of large regions such as hip and knee

Can be combined with:

- Matrix coils
- All flexible coils (second Flex Coil Interface required)
- Endorectal coil

Technical Data:

- Weight: 550 g
- Dimensions: 516 mm × 224 mm

4-Channel Flex Coil, small

- Wrap-around coil made from soft and flexible material
- 4 linear polarized elements
- iPAT-compatible
- No coil tuning

Applications:

- Imaging of small regions such as wrist, elbow and ankle

Can be combined with:

- Matrix coils
- All flexible coils (second Flex Coil Interface required)
- Endorectal Coil

Technical Data:

- Weight: 450 g
- Dimensions: 366 mm × 174 mm





MAGNETOM ESSENZA

Body Matrix Coil

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Body Matrix Coil

General

- 6-element design with 6 integrated preamplifiers, with 2 clusters of 3 elements each
- Operates in an integrated fashion with the IsoCenter Matrix coil (2 rings of 6 elements each = 12-element design)
- Can be combined with further Body Matrix coils for larger coverage
- No coil tuning
- iPAT-compatible

Applications

- Thorax (incl. heart)
- Abdomen
- Pelvis
- Hip

Can be combined with

- Head Matrix coil
- Neck Matrix coil
- IsoCenter Matrix coil
- Additional Body Matrix coil
- PA Matrix coil (optional)
- All flexible coils (e.g., 4-Channel Flex coil, small, 4-Channel Flex coil, large)
- Endorectal coils



Matrix Coil Mode

- 2-channel CP Mode
- 4-channel Dual Mode

which results in 4- or 8-channel body imaging in combination with the IsoCenter Matrix coil.

- 6-channel Triple Mode

Technical Data

- Weight: 1.5 kg; "patient-felt" weight of coil only 950 g
- Dimensions: 322 mm × 520 mm × 40 mm (L×W×H)

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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

PA Matrix Coil

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PA Matrix Coil

General

- 16-element design with 16 integrated preamplifiers, in 8 CP pairs, i.e., 4 levels with 2 CP elements each
- Operates in an integrated fashion with the Body Matrix coils and IsoCenter Matrix coil
- Automatic table feed and active coil switch
- Both legs are independently covered with coil elements, maximizing the coil filling factor and the signal-to-noise ratio
- No coil tuning
- iPAT-compatible

Applications

- High resolution angiography of both legs incl. pelvis with highest signal-to-noise ratio
- Visualization of the iliac arteries and aorta
- Bilateral examinations of long bones of the legs



Can be combined with

- IsoCenter Matrix coil
- Body Matrix coils
- All flexible coils (e.g., CP Flex coil, small, CP Flex coil, large)

Matrix Coil Mode

- 8-channel CP Mode

Technical Data

- Weight: 5.75 kg
- Dimensions:
970 mm × 300–600 mm × 270 mm
(L×W×H)

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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Focus Shoulder Array Coil

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Focus Shoulder Array Coil

General

- 6-element design with 6 integrated preamplifiers
- For narrow or wide shoulders the coil can be attached at different positions on the base plate
- Includes one base plate pad and one head rest for high patient comfort
- No coil tuning
- iPAT-compatible
- Focus Wing with integrated shim device focuses the homogeneity volume of the magnet to the off-center anatomy



Applications

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

Technical Data

Focus Shoulder Array Coil

- Opening: 200 mm
- Weight: 1.6 kg

Base plate

- Dimensions:
445 mm × 490 mm (L×W)
- Weight: approx. 5 kg

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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Extremity Matrix Coil

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Extremity Matrix Coil

General

- 8-channel receive coil only
- CP coil with 12 integrated preamplifiers
- Upper coil part removable
- Two different-sized cushions to comfortably position different-sized knees
- No coil tuning

Applications

- Knee
- Ankle
- Peripheral MR Angiography

Matrix Coil Mode

- 8-channel Dual Mode

Technical Data

- Weight: 6.5 kg
- Dimensions:
536 mm × 240 mm × 298 mm
(L×W×H)



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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Endorectal Coil

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Endorectal Coil

Flex Coil Interface

- Integrated dual ultra low-noise preamplifiers
- Allows flexible coil positioning
- Only one interface necessary for all flexible coils
- Several Flex Coil Interfaces can be used simultaneously to connect several flexible coils

General

- Interface device for connecting either the prostate, colon, or cervix receive coil
- The endo coil is plugged into the endo interface which is then plugged into the Flex Coil Interface
- No coil tuning
- Disposable

Applications

- Excellent visualization of the prostate, colon, rectum and cervix without the risk of invasive procedures
- Non-invasive preoperative diagnostic evaluation and treatment planning

Can be combined with

- IsoCenter Matrix coil
- Body Matrix coil
- All additional flexible coils (second Flex Coil Interface required)

Technical Data

- Weight: 200 g



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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Breast Matrix Coil

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Breast Matrix Coil

General

- 4-element design with 4 integrated preamplifiers, 2 clusters with 2 elements each
- Padded for imaging in prone position
- Stabilizing pads for wide anatomical variations
- Mediolateral compression capability
- No coil tuning
- iPAT-compatible

Applications

- Simultaneous high resolution imaging of both breasts in all directions
- Uni- or bi-lateral imaging of the breasts in sagittal direction
- Visualization of axilla region

Can be combined with

- Body Matrix coils (optional)
- All flexible coils for even more axillary coverage (e.g., CP Flex coil, small, CP Flex coil, large)



Matrix Coil Mode

- 2-channel CP Mode
- 4-channel Dual Mode

Technical Data

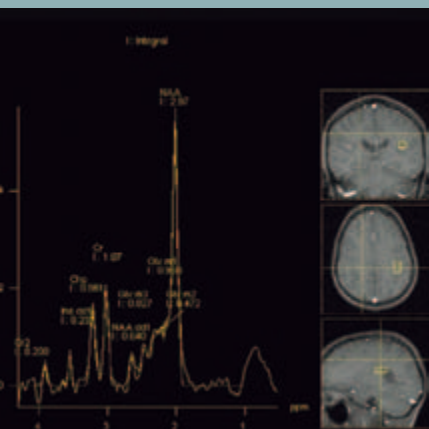
- Weight: 7.5 kg
- Dimensions:
500 mm × 520 mm × 135 mm
(L×W×H)

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Headquarter
Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare

Contact in the USA
Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

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MAGNETOM ESSENZA

Application Packages

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CISS & DESS

Unique Siemens sequences and protocols

3D DESS (Double Echo Steady State):

- T2/T1-weighted
- Excellent fluid-cartilage differentiation in orthopedic imaging

3D CISS (Constructive Interference in Steady State):

- Excellent visualization of fine structures such as cranial nerves
- High resolution imaging of inner ear and spine

syngo SWI (Susceptibility Weighted Imaging)

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 to increase sensitivity to intracerebral hemorrhage

syngo BLADE

Motion and flow insensitive Turbo Spin Echo sequence

- Supports T2-weighted, T1-weighted, STIR and DarkFluid protocols
- Optional in-plane motion correction for head applications
- Versatile sequence, e.g., supporting iPAT with GRAPPA and Restore pulses
- Improves image quality for uncooperative patients, e.g., children in head, spine and orthopedic imaging

syngo Security

Security package for general regulatory security rules

The option supports customers to achieve compliance with HIPAA (Health Insurance and Accountability Act).

- User authentication
- Restricts access to functions and data through privileges and permissions
- Logs relevant data security information in audit trail

Flow Quantification

Special sequences for quantitative flow determination studies

Measuring blood/CSF flow non-invasively

Requires Physiological Measurement Unit (PMU) option

RetroGated Flow

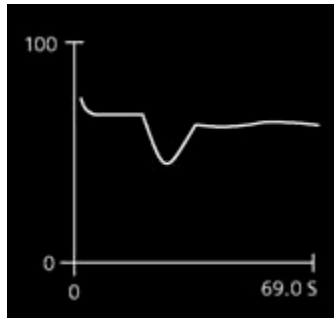
- Retrogated flow measurement for dynamic representation of temporally changing flow

Inline Diffusion

Automatic real-time calculation of trace-weighted images and ADC maps with Inline Technology. Compatible with single-shot diffusion-weighted EPI. Inline Diffusion enables *syngo* REVEAL body diffusion applications.

Inline Perfusion

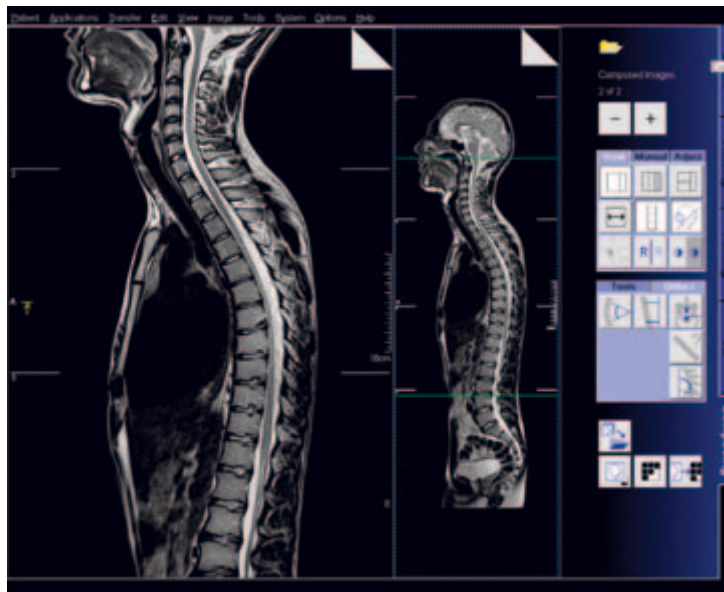
Automatic real-time calculation of Global Bolus Plot (GBP), Percentage of Baseline at Peak map (PBP) and Time-to-Peak map (TTP) with Inline technology.



Inline Composing

Automatic anatomical or angiographic composing of multiple adjacent coronal or sagittal images for presentation and further evaluation.

Composed images can be automatically loaded into Graphical Slice Positioning for planning purposes. Composing is a prerequisite.



iPAT Extensions (integrated Parallel Acquisition Technique)

iPAT² allows iPAT in 2 directions simultaneously (phase-encoding direction and 3D direction for 3D sequences).

By applying PAT in 2 directions simultaneously, the effective PAT factor can be maximized, and PAT applications are extended.

Typical clinical applications are MR Angiography or ultra-fast isotropic T1-weighted 3D imaging of the head.



Tim Planning Suite

Easy planning of extended Field of View examinations in an efficient way using Set-n-Go protocols.

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.

- Tim Planning UI with optimized layout for slice positioning
- Ready to use Set-n-Go protocols for different clinical questions
- Integrated toolbar for fast advanced slice planning: FoV-Plus, FoV-Minus, AlignParallel, AlignFieldOfViews

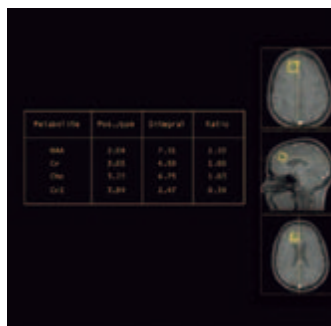
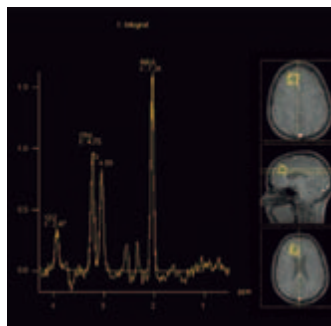
Single Voxel Spectroscopy

Integrated software package with sequences and protocols for proton spectroscopy. Streamlined for easy push-button operation

- Matrix Spectroscopy – phase-coherent signal combination from several coil elements for maximum SNR

Clinical application:

- Brain



SVS technique Spin Echo (SE)

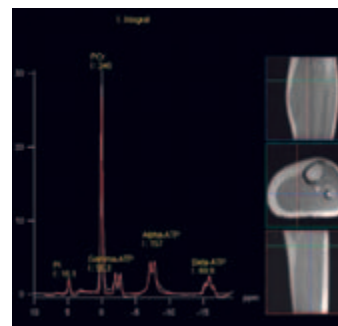
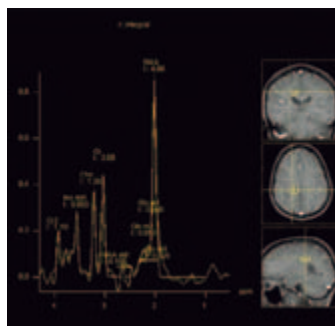
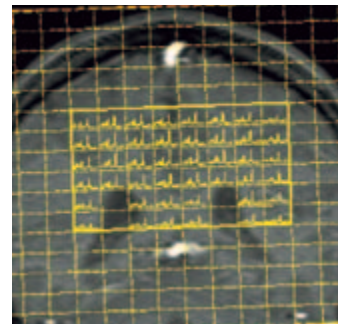
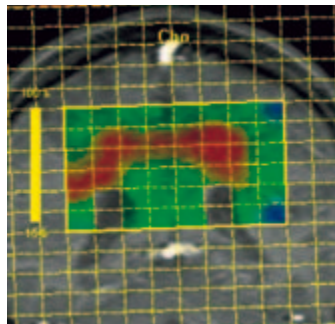
- Short TEs available
- Fully automated adjustments including localized shimming and adjustment of water suppression pulses
- Also available: Interactive adjustments and control of adjustments
- Optimized protocols for brain applications

Chemical Shift Imaging

Integrated software package with sequences and protocols 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
- Chemical Shift Imaging
- Hybrid CSI with combined Volume selection and Field of View (FoV) encoding
- Short TEs available
- Automated shimming of the higher order shim 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



syngo Expert-i

Interactive remote assistance during the MR exam. Get real-time access to imaging data and exam information from any networked PC within the hospital network.

Until now, radiologists or other experts had to stop what they were doing and go to the MR scanner when complex clinical questions arose.

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

Some of the benefits of syngo Expert-i are:

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



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Contact

Germany

Siemens AG, Medical Solutions
Magnetic Resonance
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0

USA

Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

Japan

Siemens-Asahi
Medical Technologies Ltd.
Takanawa Park Tower 14F
20-14, Higashi-Gotanda 3-chome
Shinagawa-ku
Tokyo 141-8644
Telephone: +81 3 5423 8411

Asia

Siemens Medical Solutions
Asia Pacific Headquarters
The Siemens Center
60 MacPherson Road
Singapore 348615
Telephone: +65 6490 6000
Telefax: +65 6490 6001

China

Siemens Medical Park, Shanghai
278, Zhouzhu Road
SIMZ, Nanhui District
Shanghai, 201318, P.R.China
Telephone: +86-21-38895000
Telefax: +86-10-28895001

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Siemens Mindit Magnetic
Resonance Ltd. (SMMR)
Siemens MRI Center, Gaoxin C. Ave.,
2nd, Hi-Tech Industrial Park
Shenzhen 518057
P.R. China
Telephone: +86 755-26525421
Telefax: +86 755-26549253

Headquarter

Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0
www.siemens.com/healthcare



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Post-processing Packages

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All post-processing packages are separately available for the *syngo* Acquisition Workplace or the *syngo* MR Workplace

syngo Argus 4D Ventricular Function

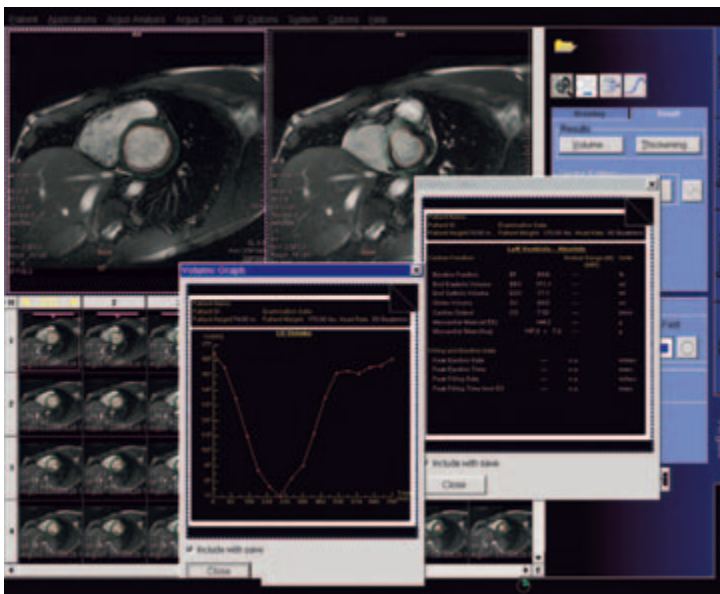
syngo Argus 4D VF software processes MR cine images of the heart and generates quantitative results for physicians in the diagnostic process. This new Argus protocol provides volumetric cardiac data of a given patient very quickly and easily. Parametric results and volume-time curves are being calculated upon automatic creation and adaptation of a 4D model of the left ventricle. The resulting 4D model of the patient's heart can be visualized superimposed to anatomical images as reference.



Argus Function

Automated tool for cardiac function evaluation

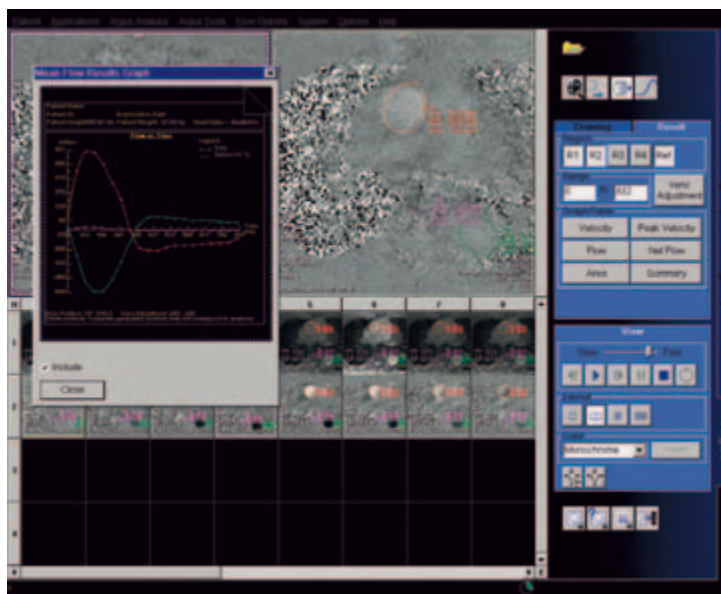
- Fully automatic left ventricle segmentation
- Easy user guidance with graphical selection of ED, ES, basal and apical slices
- Volumetric and regional wall motion analysis (e.g., stroke volume and bull's-eye plots)



Argus Flow

Automated tool for analysis of blood and CSF flow

- Semi-automatic detection of regions of interest over time
- Color-coded display of velocity values
- Calculation of flow and velocity parameters with color results (e.g., peak velocity, average velocity)

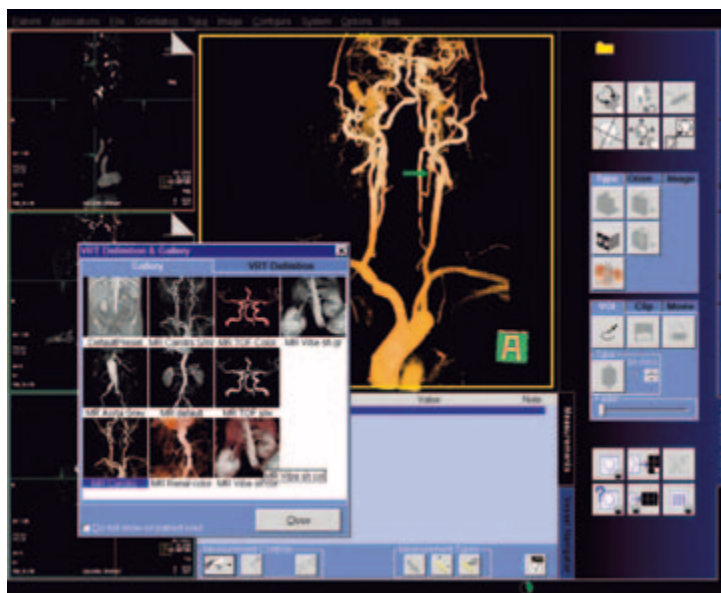


Vessel View

Interactive analysis of vessel disease using MR or CT angiography data

Viewing with VRT, MPR or MIP mode

- Semi-automatic detection of vessel segments
- Quantification of changes in vessel size (e.g., stenosis graduation, aneurysm volume measurement)
- Protocol-based software for workflow support
- Creates and edits DICOM structured reports

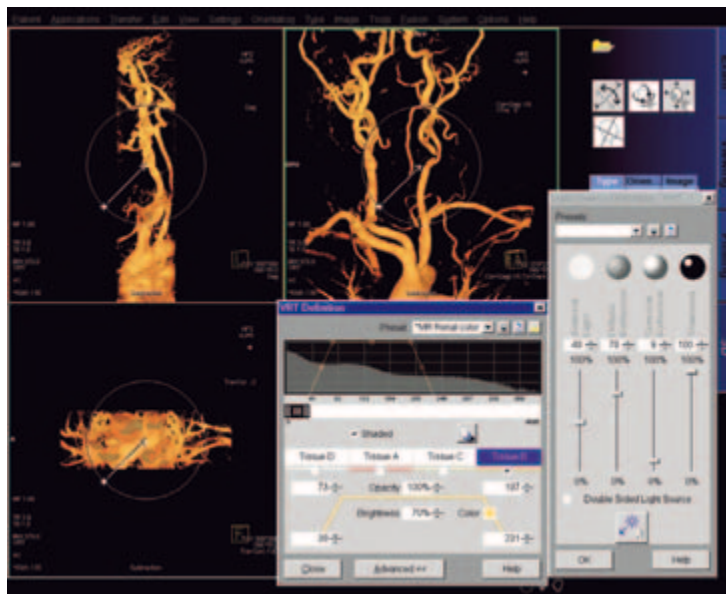


3D VRT Volume Rendering Technique

3D visualization for clearer depiction of complex anatomy and relationship of anatomy in 3D for contrast MR Angiography and VIBE imaging

More productive surgical planning and discussion with referring physicians

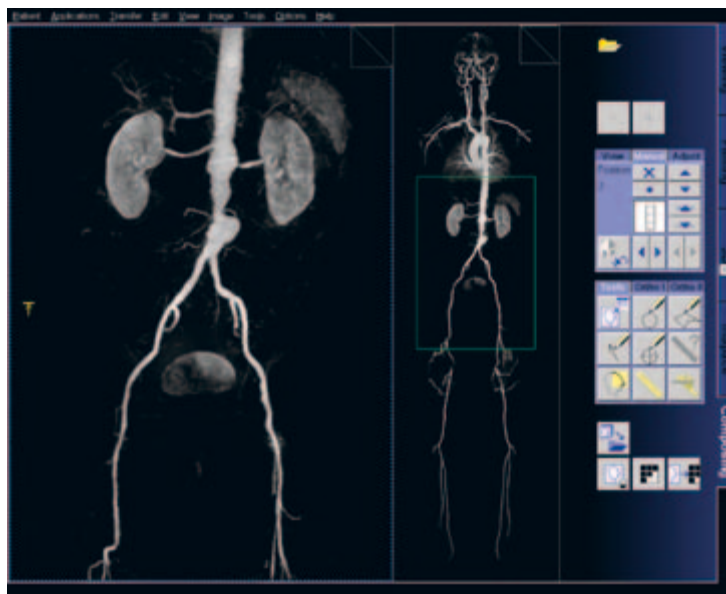
- Integrated with other 3D functionality
- Color image creation
- Color gallery of icon presets
- Additional threshold-based segmentation of 3D objects
- Volume measurements



Composing

Composing of images from different table positions

- Automatic and manual composing of sagittal and coronal images
- Dedicated algorithms for spine and angio examinations
- Measurement on composed images (angle, distance)



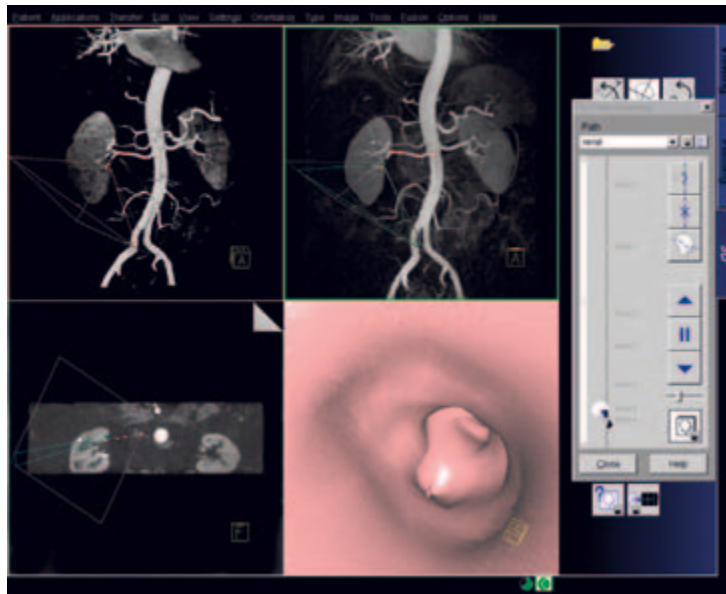
Fly Through

Simulated endoscopic views of the inside of bronchi, vessels, colon and any other hollow structures

Multi-modality application for CT, MR and 3D AX data

Fully integrated into the familiar 3D workflow and user interface

- Ready-to-use from day one
- One click to action



Neuro Perfusion Evaluation

Dedicated task card for quantitative processing of neuro perfusion data

- Color display of relative Mean Transit Time (relMTT), relative Cerebral Blood Volume (relCBV), and relative Cerebral Blood Flow (relCBF)
- Flexible selection of Arterial Input Function (AIF) for reliable analysis. This function takes into account the dynamics over time of the contrast agent enhancement

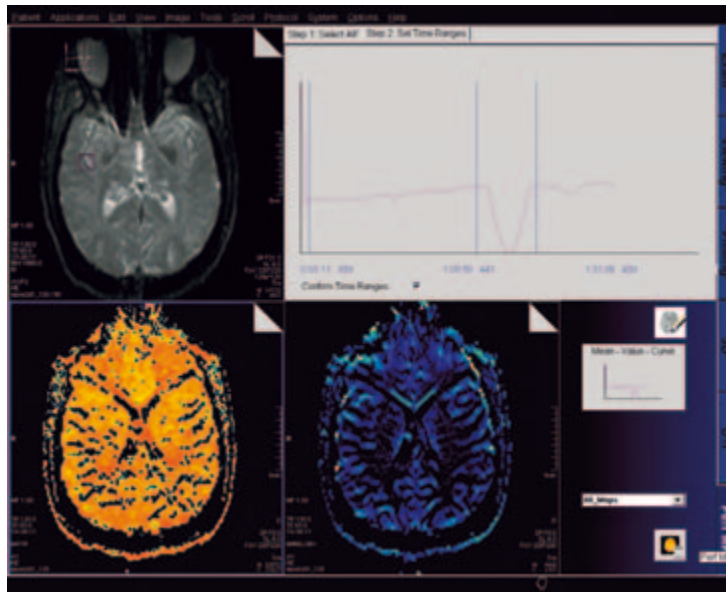
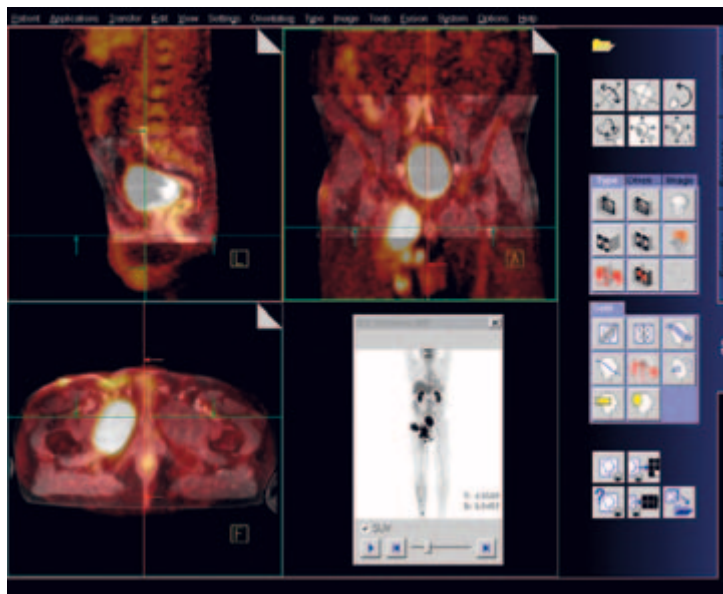


Image Fusion

Image fusion of multiple 3D data sets with alpha blending, i.e., overlay of two images with manual setting of the opacity

- Multiple 3D data sets from different modalities (MR, CT, Nuclear Medicine, PET)
- Visual alignment, automatic registration, or landmark based registration



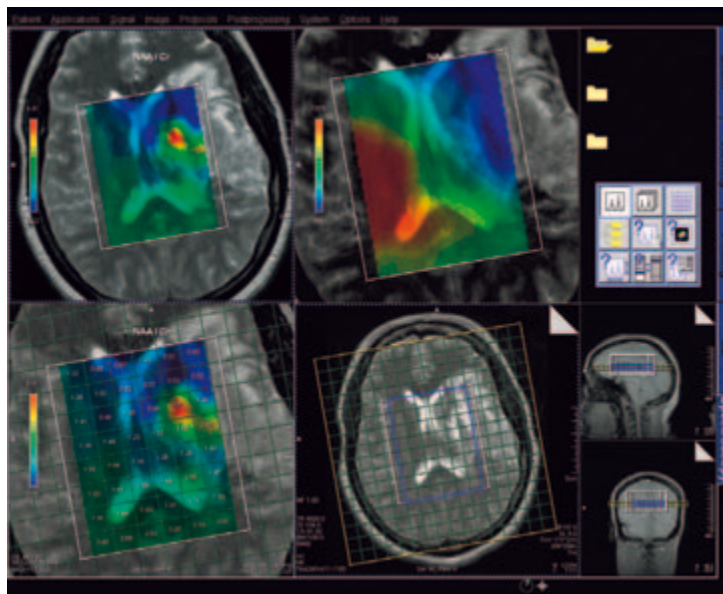
Spectroscopy Evaluation

Integrated software package with extensive graphical display functionality.

Comprehensive and user-friendly evaluation of spectroscopy data.

Display of CSI data as colored metabolite images or spectral overview maps, overlaid on anatomical images

- Export of spectroscopy data to a user-accessible file format
- Relative quantification of spectra, compilation of the data to result table



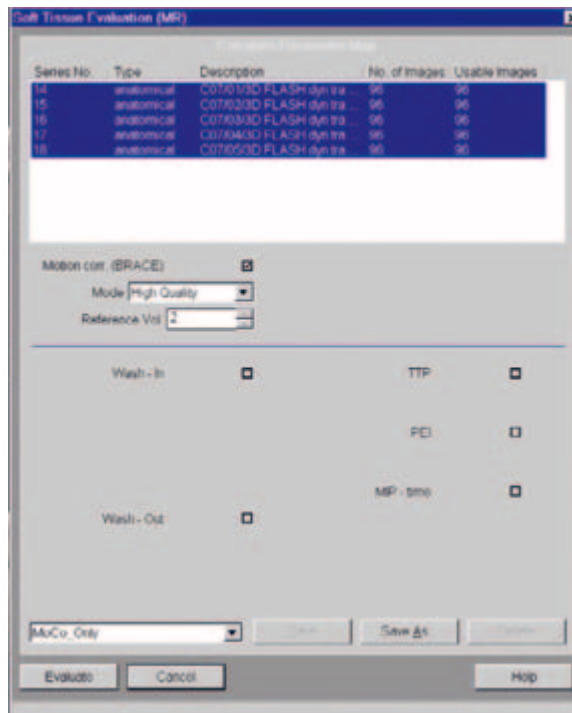
Soft Tissue Motion Correction

3D elastic motion correction, for offline 3D correction in all directions over entire 2D and 3D data sets suitable for breast MR exams.

Allows higher conspicuity and accuracy especially for multi-focal lesion detection in the breast.

Two different registration algorithms (fast and high quality) are now available to compensate for patient motion of the breast. Both correction possibilities can be applied offline for 2D and 3D MR data sets.

New image data is reconstructed and saved in a separate series within the patient browser. It can be combined with the original non-corrected image data.



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Contact

Germany

Siemens AG, Medical Solutions
Magnetic Resonance
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0

USA

Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

Japan

Siemens-Asahi
Medical Technologies Ltd.
Takanawa Park Tower 14F
20-14, Higashi-Gotanda 3-chome
Shinagawa-ku
Tokyo 141-8644
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Asia

Siemens Medical Solutions
Asia Pacific Headquarters
The Siemens Center
60 MacPherson Road
Singapore 348615
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SIMZ, Nanhui District
Shanghai, 201318, P.R.China
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Shenzhen 518057
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Headquarter

Siemens AG, Medical Solutions
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Germany
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Parts & Accessories

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Physiological Measurement Unit (PMU) – Wireless Physio Control

Synchronizes the measurement with the physiological cycles (triggering to minimize motion artifacts caused by cardiac and respiratory movements)

Wireless Sensors

Wireless Vector ECG/respiration and pulse sensors for physiologically synchronized imaging, rechargeable battery-powered – for optimized patient handling

- VCG acquires ECG signal from two projection directions, for easy identification of the R-wave
- ECG – disposable electrodes
- Pneumatic cushion to be placed on the chest or abdomen
- The signals can be transmitted to an external MRI-compatible Patient Monitoring System (option) via a respective receiver interface in the Patient Monitoring System

Physiological Signals Display

- ECG (2 channels I and/or aVF)
- Pulse
- Respiration

External Trigger Input Display

ECG Triggering

Acquisition of multiple slices, e.g., of the heart, at different phases of the cardiac cycle

Excellent image quality by synchronizing data acquisition with the heart motion

Peripheral Pulse Triggering

Reduces flow artifacts caused by pulsatile blood flow

Excellent image quality by synchronizing data acquisition to the pulsatile blood flow

Respiratory Triggering

Excellent image quality by synchronizing data acquisition with the respiratory motion

External Triggering

Interface for trigger input from external sources (e.g., pulse generator)

Retrospective gating for ECG, peripheral pulse and external trigger input



PMU Examination Room Display

LCD monitor mounted on the magnet cover for display of physiological signals in the examination room

- Provides for the display of the 2 ECG-channels I and aVF, for optimal signal quality, pulse signal, respiratory signal and external trigger input

Patient Video Monitoring

Special video camera integrated in the back magnet cover for observing the patient

Color 640×480 pixel LCD monitor may be positioned at the *syngo* Acquisition Workplace or at a convenient wall location

Remote Viewing Monitor

Color LCD monitor (1280×1024) to be connected in parallel to the Workplace monitor

Data transfer via fiber optic cables for high signal quality over a long distance

Max. distance from Workplace – 150 m (492 feet)

syngo MR Workplace

Additional integrated Workplace with host computer 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
(*syngo* MR Workplace)
Technical Data:

> Refer to appendix
"Computer System"

Workplace Table

Ergonomically designed table for:

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

Vertical Table Move

Enables lowering of the patient table down to 55 cm for easy set-up of elderly or very sick patients.

Additional optional accessories and consumables for MR

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Contact

Germany

Siemens AG, Medical Solutions
Magnetic Resonance
Henkestr. 127, D-91052 Erlangen
Germany
Telephone: +49 9131 84-0

USA

Siemens Medical Solutions USA, Inc.
51 Valley Stream Parkway
Malvern, PA 19355
Telephone: +1 888-826-9702
Telephone: +1 610-448-4500
Telefax: +1 610-448-2254

Japan

Siemens-Asahi
Medical Technologies Ltd.
Takanawa Park Tower 14F
20-14, Higashi-Gotanda 3-chome
Shinagawa-ku
Tokyo 141-8644
Telephone: +81 3 5423 8411

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Siemens Medical Solutions
Asia Pacific Headquarters
The Siemens Center
60 MacPherson Road
Singapore 348615
Telephone: +65 6490 6000
Telefax: +65 6490 6001

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SIMZ, Nanhui District
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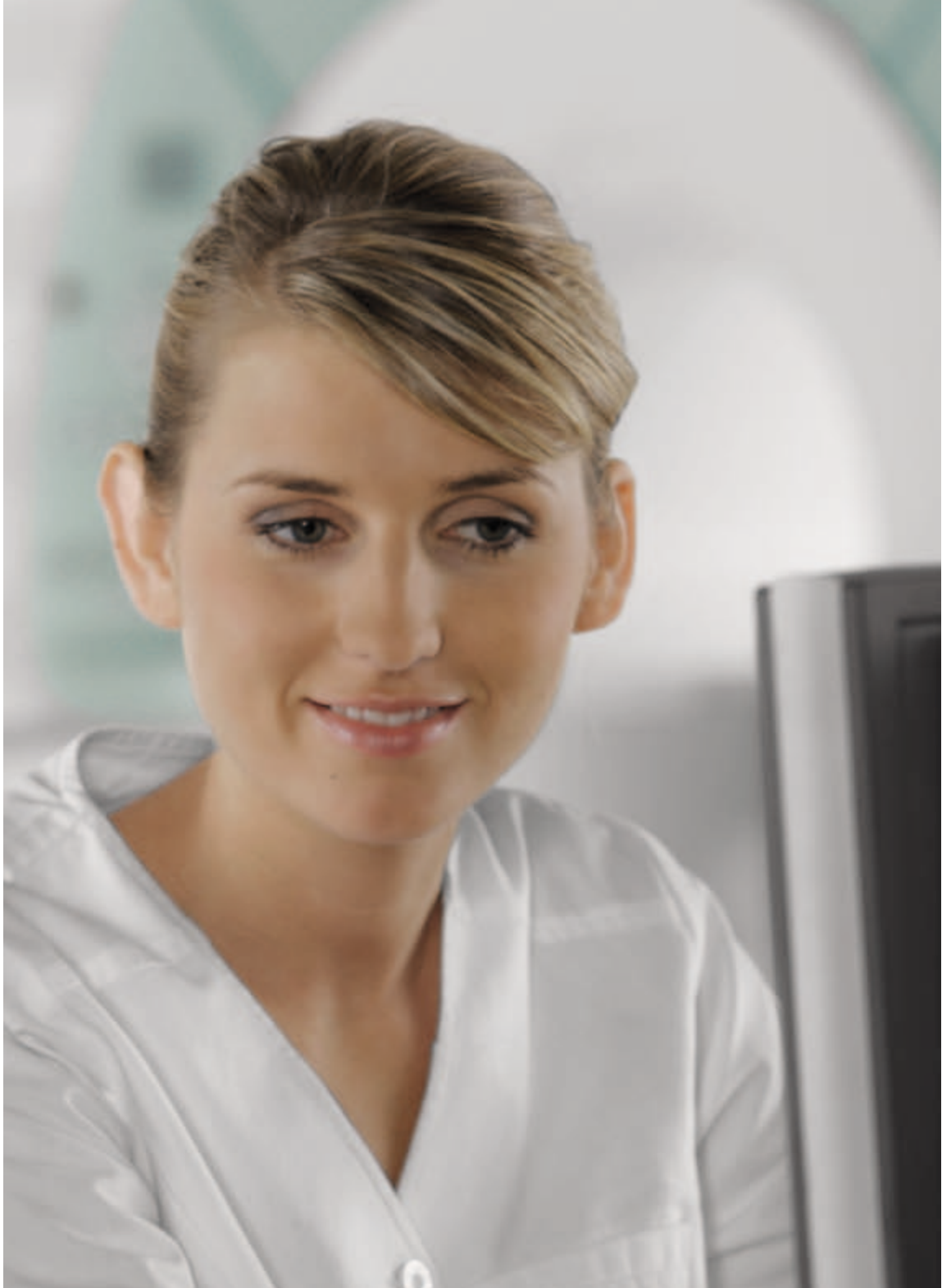
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2nd, Hi-Tech Industrial Park
Shenzhen 518057
P.R. China
Telephone: +86 755-26525421
Telefax: +86 755-26549253

Headquarter

Siemens AG, Medical Solutions
Henkestr. 127, D-91052 Erlangen
Germany
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Computer System

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Host Computer

(syngo Acquisition Workplace)

Double processor	2 × Dual Core Xeon™
Clock rate	≥ 2.6 GHz
Main memory (RAM)	4 GB
1st hard disk (system SW)	73 GB
2nd hard disk (data base)	73 GB
3rd hard disk (images)	73 GB (approx. 110 000 images, square matrix 256^2 and 512^2 uncompressed)
CD-R writer	approx. 4000 images 256^2 ; DICOM Standard, ISO 9660
DVD-R writer	approx. 25 000 images 256^2 ; DICOM Standard, ISO 9660
Media drives	CD/DVD-ROM drive

Measurement and Reconstruction System (MARS)	
CPU	2 × Dual Core AMD Opteron™
Clock rate	≥ 2.0 GHz
Main memory (RAM)	≥ 8 GB
1 hard disk	73 GB
Reconstruction speed	≥ 983 recons per second (256 ² FFT, full FoV)
	≥ 2773 recons per second (256 ² FFT, 25% recFoV)
Parallel Scan & Recon	Simultaneous scan and reconstruction of up to 8 data sets
syngo MR Workplace	
(optional)	
Double processor	2 × Dual Core Xeon™
Clock rate	≥ 2.6 GHz
Main memory (RAM)	4 GB
1 st hard disk (system SW)	73 GB
2 nd hard disk (images)	73 GB
CD-R writer	approx. 4000 images 256 ² ; DICOM Standard, ISO 9660
DVD-R writer	approx. 25 000 images 256 ² ; DICOM Standard, ISO 9660
Media drives	CD/DVD-ROM drive



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Germany
Telephone: +49 9131 84-0

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