Datasheet

MAGNETOM Terra

A Tim+Dot System Data sheet based
on syngo MR E12 System and Clinical Mode

siemens-healthineers.us/terra

SIEMENS Healthineers

MAGNETOM Terra

Translate 7T research power into clinical care

Secure Dual Mode functionality[1]

- Secure switch between research operation and clinical operation
- Operating with 2 separate databases for clear research and clinical distinction[1]

XR 80/200 gradients, up to 64 channels[4]

- More power for greater diffusion MRI and functional MRI with 80/200 gradients
- Stray field optimized for reduced eddy currents
- Higher acceleration factors with 64 receive channels[5]

50% lighter 7T magnet technology[2]

- First 7T scanner released for clinical use
- Lower weight and cold-shipment for easier integration in clinical environments[2]
- Reduced operating costs thanks to Zero Helium boil-off[3]

Double SNR for more precision[6]

- 0.2 mm in-plane resolution to visualize previously unseen structures[7]
- Submillimeter BOLD fMRI precision to visualize sub-cortical activations[8]
- Increased CNR in functional and structural MR

[1]Research mode as part of dual mode is available as an option and not intended for clinical use. Research operation may require observation of national regulations.
[2]Compared to previous 7T generation.
[3]Under normal operating conditions with standard Siemens sequences/protocols.
[4]Channels (coil elements) that can be connected simultaneously.
[5]Keil et al., Magnetic Resonance in Medicine 70:248–258 (2013) Wiesinger et al., Magnetic Resonance in Medicine 52:953–964 (2004) Pruessmann et al., Magnetic Resonance in Medicine 42:952–962 (1999) Griswold et al., Magnetic Resonance in Medicine 47:1202–1210 (2002) (4).
[6]Compared to 3T systems.
[7]Example Images in MAGNETOM Terra Brochure.
[8]Heidemann et al., Magnetic Resonance in Medicine 68:1506-1516 (2012), Yacoub et al., PNAS 105:10607-10612 (2008).

Physiology is at your fingertips[9]

- First 7T MRI scanner to unleash the full potential of the increased MR signal with multinuclear imaging and spectroscopy in clinical settings.
- Two dedicated coils – ^{23}Na head coil and ^{31}P loop coil
- Metabolic insights with ^{23}Na Head imaging and ^{31}P spectroscopy of the whole body excluding the head[9]

>75% global market share in 7T technology

- Over 75% of 7T and 100% of vendor-integrated > 7T MRI human scanners worldwide from Siemens
- 7 of 13 leading U.S. hospitals with a 7T, (2018–2019), trust Siemens when they decide for 7T investment[10]
- Over 73% of ISMRM UHF abstracts in 2018 were based on data from Siemens UHF systems[11]

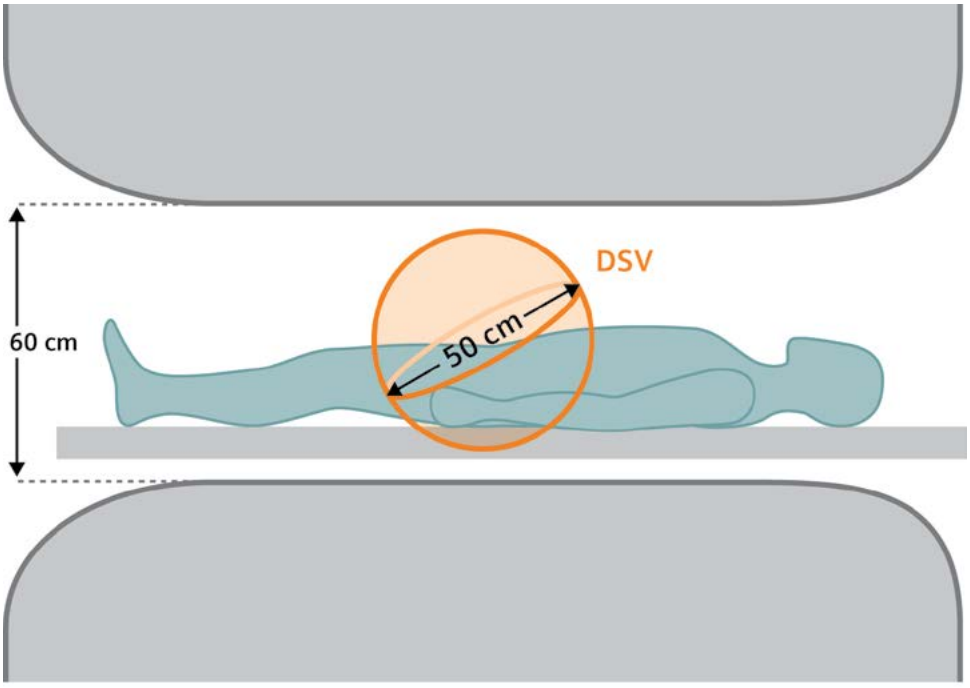
The world's largest UHF community

- Largest installed base for exchanging ideas in a strong collaborative network
- An opportunity to enhance your reputation and competitiveness
- Incentive for the brightest minds in the MRI community to work with you

[9]Madelin et al., J Magn Reson Imaging 38:511-529 (2013), Valkovic et al., Analytical Biochemistry 529:193-215 (2017).
[10]https://health.usnews.com/best-hospitals.
[11]https://www.ismrm.org/18m/.

Magnet System

General	
Superconducting Magnet	High homogeneity 7 Tesla with a 60 cm bore design.
	Easy siting due to AS (Active Shielding) and E.I.S. (External Interference Shielding) magnet technology



Magnet System

Magnet	
	MAGNETOM Terra
Operating field strength	7 Tesla
Magnet type	Superconductor
Field stability over time	<0.05 ppm/h
Weight	approx. 17000 kg
Magnet length	2.70 m
Patient bore diameter	60 cm

Homogeneity Based on highly accurate 24 plane			
		Vrms	**Peak to Peak**
10 cm DSV	Guaranteed	0.002 ppm	<0.015 ppm
20 cm DSV	Guaranteed	0.02 ppm	<0.15 ppm
30 cm DSV	Guaranteed	0.1 ppm	<0.5 ppm
40 cm DSV	Guaranteed	0.2 ppm	<2 ppm
45 cm DSV	Guaranteed	0.5 ppm	<5 ppm
50 cm DSV	Guaranteed	1.5 ppm	<20 ppm

In compliance with the German "Qualifikationsvereinbarung".
Standard deviation Vrms (volume root-mean square) measured with highly accurate 24 plane plot method (20 points per plane).
Standard active shim with 3 linear and 5 non-linear channels (2nd order).
DSV = Diameter spherical volume (x, y, and z direction).

Magnet System

Shimming		
Both: passive and active shimming. Passive shimming during installation		
Standard active shim with 3 linear channels (1st order) and 5 nonlinear channels (2nd order, 10 A per channel) Optional 3rd order shim with 4 additional nonlinear channels		
3D Shim	Patient-specific automated shim	
	Time to shim	Approx. 20 s
Shielding		
Active Shielding (AS)	5th generation active shielding (AS) technology with counter coils	
Fringe field (axial × radial)	0.5 mT*	<8.0 x <5.0 m
External Interference Shield (E.I.S.)	Patented shielding system integrated into the magnet	
	Continuous compensation and automatic suppression of external magnetic field interferences during measurement (caused by moving ferromagnetic objects or nearby power lines)	
Magnet Cooling System		
	MAGNETOM Terra	
Zero Helium boil-off technology	Standard	
Refill interval (typical)**	Not applicable	
Boil-off rate (typical)**	0.0 l/year	
Max. helium capacity	Approx. 4000 liters	

**Pacemaker safety limit*
***Under normal operating conditions with standard Siemens sequences/protocols.*

Gradient System

General

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

Gradient Performance For Each Axis

Max. amplitude	80 mT/m
Min. rise time	400 µs
Max. slew rate	200 T/m/s

Vector Gradient Performance (vector addition of all 3 gradient axes)

Max. eff. amplitude	139 mT/m
Max. eff. slew rate	346 T/m/s
Gradient duty cycle	100%

Table

Axis independent, water cooled, highly compact, modular design

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

Max. output voltage*	2250 V
Max. output current*	800 A

XR Gradients: Resolution Parameters

Min. FoV	5 mm
Max. FoV	500 mm
Slice thickness 2D	min. 0.1 mm max. 200 mm
Partition thickness 3D	min. 0.05 mm max. 20 mm
Slab thickness 3D	min. 5 mm max. 500 mm
Max. matrix	1024
Highest in-plane resolution	7 µm

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

** Values for each of the 3 gradient axes*

Gradient System

Sequences: XR Gradients					
		Matrix			
		64	**128**	**256**	**512**
Spin Echo	min. TR [ms]	4.2	4.3	4.7	5.6
	min. TE [ms]	1.5	1.5	1.8	2.4
Inversion Recovery	min. TR [ms]	26	26	27	27
	min. TE [ms]	1.5	1.5	1.8	2.4
	min. TI [ms]	21	21	21	21
2D GRE	min. TR [ms]	0.59	0.7	0.98	1.23
	min. TE [ms]	0.22	0.22	0.22	0.22
3D GRE	min. TR [ms]	0.59	0.7	0.98	1.21
	min. TE [ms]	0.23	0.24	0.29	0.32
TrueFISP	min. TR [ms]	2.03	2.22	2.7	3.54
	min. TE [ms]	0.94	0.98	1.21	1.53
TSE	min. Echo Spacing [ms]	1.50	1.54	1.78	2.16
	min. TR [ms]	5.7	5.8	6.5	7.5
	min. TE [ms]	1.5	1.5	1.8	2.2
	max. Turbo Factor = 512				
EPI (single-shot and multi-shot)	min. Echo Spacing [ms]	0.28	0.37	0.54	
	min. TR [ms]	10	10	10	
	min. TE [ms]	2	2.1	2.3	
	min. Measurement time	11	14	19	
	max. EPI Factor = 256				
Diffusion Imaging	Max. b-value = 10 000 s/mm^2	10 000	10 000	10 000	
	Min. TE [ms] with b = 1000 s/mm^2	29	30	34	

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

Tim Technology

General		
Receiver with high dynamic range without adjustments		
Direct Transmit Technology		
Frequency stability (5 min)	$\pm 2 \times 10^{-10}$	
Frequency control	32 bits (0.03 Hz)	
Phase control	16 bits (0.006 degrees)	
Transmitter path	Transmit amplitude	16 bit control 25 ns resolution
	Gain stability (after first minute)	<0.05 dB (1 s) <0.2 dB (5 min)
Transmit amplifier	Transmit amplifier bandwidth	800 kHz; 250 kHz usable BW
	Peak power	11 kW; 7 kW at coil plug
RF Receiver Technology		
Receive path	Maximum number of channels*	64
	Number of independent receiver channels that can be used simultaneously in one single scan and in one single FOV, each generating an independent partial image	32, 64**
	Quadrature demodulation and filtering	Digital
	Receiver bandwidth	500 kHz (for each channel)
	Receiver signal resolution	32 bit
	ADC sampling rate	10 MSamples pro channel
	Preamplifier noise figure	<0.9 dB

*Channels (coil elements) that can be connected simultaneously
**Optional Configuration for MAGNETOM Terra

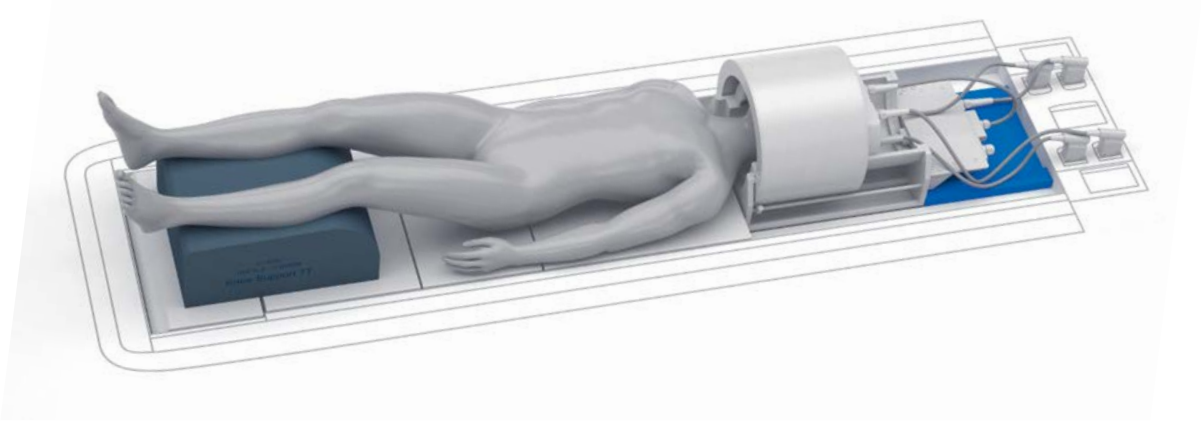
Coils

7T Coils		
Standard Coils		
1Tx32 Rx Head Coil 7T Clinic	Application area	Head
	Dimensions including look out mirror (L×W×H)	800 mm × 375 mm × 375 mm
	Weight	15 kg
1Tx28Rx Knee Coil 7T Clinic	Application area	Knee
	Dimensions (L×W×H)	420 mm × 530 mm × 310 mm
	Weight	7.4 kg
Standard MNO Coils*		
23Na 1Tx32Rx Head 7T	Application area	Head
	Dimensions including look out mirror (L×W×H)	660 mm × 360 mm × 440 mm
	Weight	10.5 kg
31P/1H TxRx Flex Loop 7T	Application area	Multi-purpose (all body parts excluding head)
	Dimensions (L×W×H)	260 mm × 140 mm × 25 mm
	Weight	0.98 kg

** Optional, MNO coils are not part of the default MAGNETOM Terra configuration.*

Coils

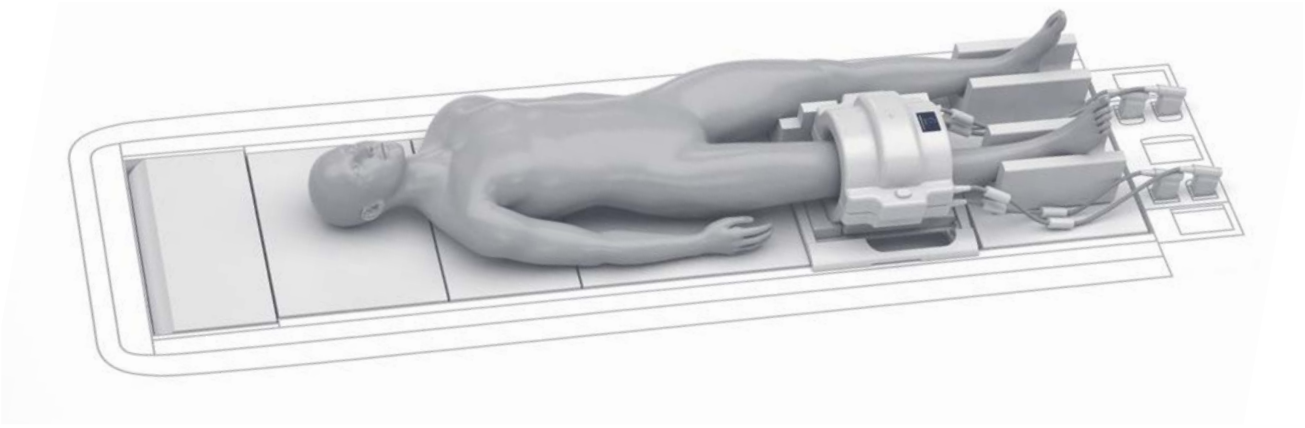
1Tx32Rx Head Coil 7T Clinic



General	• 1 CP transmit/CP receive/32-element receive design • Sliding transmit coil • Sliding upper receive coil part, designed with 16 elements • Lower receive coil part designed with 16 elements • Coil design with mirror for visual stimulation experiments and reduction of claustrophobic response • Cushions (removable) for head stabilization • No coil tuning • iPAT-compatible • Detachable mirror assembly
Applications	• High resolution head proton imaging • MR angiography of the head • Functional imaging of the brain
Weight	15 Kg
Dimensions (L×W×H)	800 mm × 375 mm × 375 mm
Legal Manufacturer	Nova Medical, Inc. 150 West Street, Suite 201 Wilmington, MA 01887, USA Phone: +1 978-988-5553

Coils

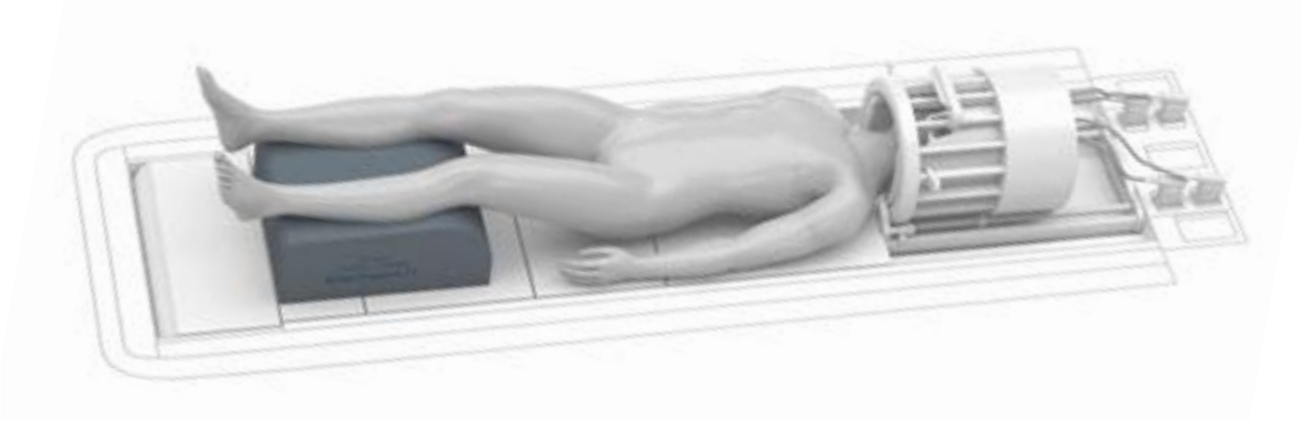
1Tx28Rx Knee Coil 7T Clinic



General	• 1 CP transmit/28-element receive design • 28-channel coil with 28 integrated preamplifiers, elements arranged in 3 rings comprising 10/8/10 elements • iPAT-compatible in all directions • Upper coil part removable • Holder allows off-center positioning to ensure a comfortable position for the patient • Cushions for patient comfort and stabilization of the anatomy • No coil tuning • Four coil plugs
Applications	• Examinations of the knee joint • High resolution knee imaging
Weight	7.4 Kg
Dimensions (L×W×H)	256 mm × 360 mm × 310 mm (420 mm x 530 mm x 310 mm incl. tray)
Minimum inner dimension	154 mm
Legal Manufacturer	Quality Electrodynamics LLC 700 Beta Drive, Suite 100 44143 Mayfield Village, OH USA Phone: +1 440-484-2228

Coils

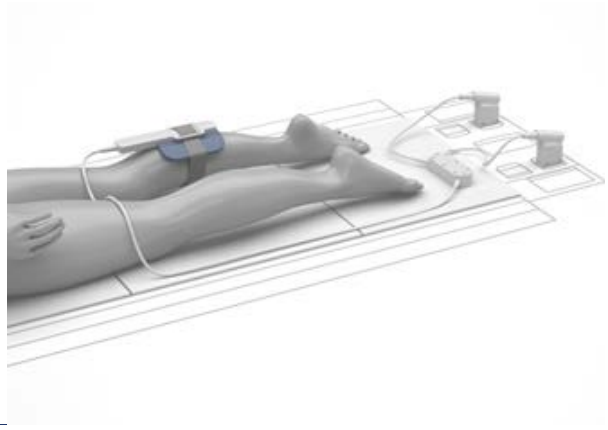
23Na 1Tx32Rx Head 7T (New coil)



General	• 1H and 23Na dual tuned volume type coils and single tuned 23Na phased array 32-element receive coil • The 1H volume type coil is used for localization of the region of interest, to adjust the frequency and for shimming • The 23Na volume type coil is used for excitation, while the 32 channel phased array is used for Sodium signal reception. • Sliding transmit coil • Sliding receive 23Na coil, designed with 32 elements • Coil design with mirror for reduction of claustrophobic response • Cushions (removable) for head stabilization • No coil tuning • iPAT-compatible
Applications	• Head Sodium imaging
Weight	10.5 Kg
Dimensions (L×W×H)	660 mm × 360 mm × 440 mm (including look out mirror)
Legal Manufacturer	RAPID Biomedical GmbH Kettelerstrasse 3-11 97222 Rimpar, Germany Tel.: +49 (0)9365-8826-0 Fax: +49 (0)9365-8826-99

Coils

31P/1H TxRx Flex Loop 7T



General	• Light weight 1H and 31P dual tuned surface type coil • Transmit/receive linear polarization for both nuclei • Flexible housing for maximum patient comfort and better adaption to the anatomical region of interest • Comes with a set of hook-and-loop straps for fixation on patient • No coil tuning
Applications	• Multi-purpose (all body parts excluding head)
Weight	0.98 Kg
Dimensions (L×W×H)	260 mm × 140 mm × 25 mm
Minimum inner dimension	154 mm
Legal Manufacturer	RAPID Biomedical GmbH Kettelerstrasse 3-11 97222 Rimpar, Germany Tel.: +49 (0)9365-8826-0 Fax: +49 (0)9365-8826-99

Parts & Accessories

Patient Video Monitoring

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

- Up to two in-room cameras for optimized patient observation from front end and rear-end
- Color 800×600 pixel LCD monitor may be positioned at the *syngo* Acquisition Workplace or at a convenient wall location
- Possibility to switch between 4 camera layout and single camera layout

Remote Viewing Monitor

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

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

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 and LCD Monitor technical data: refer to "Computer System" section of this data sheet.

Workplace Table

Ergonomically designed table for:

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

Patient Handling

Patient Video Monitoring

Increased patient comfort and improve workflow efficiency.

- Set up the patient once, no repositioning, no changing of coils needed
- Imaging with optimized high element surface coil
- Remote table move
- In-room Dot Display: Patient preparation is smooth with all patient data displayed right at the scanner. Dot gives the user advice during the positioning process – very helpful in the case of ECG, for example

Patient Positioning Aids

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

Tim Table

Comfortable patient table solution which fits the needs for patients from 30 kg up to 200 kg.

Max. patient weight for horizontal table movement		200 kg (440 lbs)
Max. scan range		115 cm
Horizontal table movement	Max. range	2710 mm
	Max. speed	35 mm/s
	Position accuracy*	±1.0 mm

** Accuracy for repositioning from one direction*

Patient Handling

Dot Control Centers

Two ergonomically designed control units integrated into the front cover on each side of the patient tunnel.

- Continuous table movement or two speed predefined levels
- Automatic transfer to isocenter
- Automatic transfer from any horizontal position to home position
- In bore ventilation (6-step regulation)
- In bore lighting (6-step regulation)
- Headphone volume adjustment (6-step regulation)
- In room loudspeaker adjustment (6-step regulation)
- Laser light localization
- Start scan
- Alarm off
- Horizontal table movement, lighting adjustments, and ventilation are also possible from the console

Dot Display

Dot Display with user guidance for fast and efficient exam preparation and start of measurement at the scanner. Display of physiological curves and guidance for patient set up of triggering device.

Color LCD Monitor	13.3"; 16 : 10
Horizontal frequency	15.0–80.0 kHz
Vertical frequency	50.0–85.1 kHz
Screen Matrix	1280×800 pixels

Patient Handling

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). The physiological curves are visualized at the Dot Display.

Wireless Sensors	Wireless Vector ECG/respiration and pulse sensors for physiologically synchronized imaging, rechargeable battery-powered – for optimized patient handling
Physiological Signals	• ECG (3 channels) • Pulse • Respiration
	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 cardiac motion (due to the magnetohydrodynamic effect, the recorded potentials can be distorted)
	Peripheral PulseTriggering: • 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. Patient Monitoring System) inside the examination room • Interface for trigger input from external sources (e.g. pulse generator, trigger sources for fMRI) outside the examination room • Optical trigger output for fMRI
	Retrospective gating for ECG, peripheral pulse and external trigger input

Patient Communication

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

- Intercom system for patient communication
- Assistance call via squeeze-bulb for the patient
- Response to the patient's activation of the squeeze-bulb via communication unit
- Table stop
- Sequence stop
- Volume of speaker in control room
- Volume of speaker and headphones in examination room for voice commands
- Connection to external audio system
- Independent volume control of voice and music
- Pneumatic system of ergonomically designed headphones
- Loudspeaker
- Microphone
- Automatic and freely programmable voice commands for breath-hold examinations

Noise Reduction Features

General Features

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

Gradient

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

Magnet

- Encapsulation of the entire magnet
- Efficient floor decoupling for reduction of noise transferred to the building
- Noise-optimized cold head

Sequence Design

Optimized sequence timing.

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

"Whisper Mode"

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

Acquisition Parameters

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

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

Standard Acquisition and Reconstruction Techniques

Standard techniques

- True Inversion Recovery to obtain strong T1-weighted contrast
- Dark Blood inversion recovery technique that nulls fluid blood signal
- Saturation Recovery for 2D TurboFLASH, gradient echo, and T1-weighted 3D TurboFLASH with short scan time (e.g. MPRAGE)
- Freely adjustable receiver bandwidth, permitting studies with increased signal-to-noise ratio
- Freely adjustable flip angle. Optimized RF pulses for image contrast enhancement and increased signal-to-noise ratio
- MTC (Magnetization Transfer Contrast). Off-resonance RF pulses to suppress signal from certain tissues, thus enhancing the contrast. Used e.g. in MRA
- 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, t-Test, etc.
- Image Filter
- 3D post-processing MPR, MIP, MinIP, SSD
- Flexible film formats and paper print
- Data storage of images and cine AVI files on CD/DVD with DICOM viewer as the viewing tool
- Selectable centric elliptical phase reordering via the user interface
- Inversion Recovery to nullify the signal of fat, fluid or any other tissue
- Multiple Direction Diffusion Weighting (MDDW) – diffusion tensor imaging measurements can be done with multiple diffusion-weightings and up to 256 directions for generating data sets for diffusion tensor imaging

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 • 2D TSE with multiple averages – it is possible to acquire T2-weighted TSE images during shallow breathing in a time efficient manner • SPACE for 3D imaging with high isotropic resolution with T1, T2, PD, and DarkFluid Contrast

Standard Acquisition and Reconstruction Techniques

Sequences

Gradient Echo family of sequences

- 2D/3D FLASH (spoiled GRE) – dual echo for in-/opposed phase imaging – quick fat saturation; double echo for in-phase/opposed phase 3D imaging
- 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
- 3D GRE for field mapping
- 2D/3D FISP (Fast Imaging with Steady State Precession)
- Echo Planar Imaging (EPI) – diffusion-weighted; single shot SE and FID e.g. for BOLD imaging; 2D/3D Segmented EPI (SE and FID)
- 2D/3D Time-of-Flight (ToF) Angiography – single slab and multi slab; triggered and segmented
- 2D/3D Phase Contrast Angiography

Standard Fat/Water Imaging

- Fat and Water Saturation. Additional frequency selective RF pulses used to suppress bright signal from fatty tissue. Two selectable modes: weak, strong
- Quick FatSat
- Fat/Water Excitation. Spectral selective RF pulses for exclusive fat/water excitation

Standard Flow Artifact Reduction

- LOTA (Long Term Data Averaging) technique to reduce motion and flow artifact
- Pre-saturation technique. RF saturation pulses to suppress flow and motion artifacts
- Tracking SAT bands maintain constant saturation of venous and/or arterial blood flow, e.g. for 2D/3D sequential MRA
- GMR (Gradient Motion Rephasing). Sequences with additional bipolar gradient pulses, permitting effective reduction of flow artifacts

Standard Acquisition and Reconstruction Techniques

Standard Scan Time Reduction	
Elliptical scanning reduces scan time for 3D imaging	
iPAT – integrated Parallel Acquisition Technique high-performance and flexible Parallel Imaging with integrated AutoCalibration	Two algorithms – mSENSE and GRAPPA – for maximum quality for all applications
	iPAT is compatible with all relevant sequence techniques (e.g. SE, TSE, SPACE, MEDIC, DarkFluid, EPI, MPRAGE, FLASH, TrueFISP, TurboFLASH, FLASH Phase Contrast, etc.)
	iPAT is compatible with all multi-element 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
	3 different calibration techniques can be used: • AutoCalibration with an integrated 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. • T-PAT and PAT averaging for motion artifact suppression using Self-Calibration
iPAT²	More slices and coverage in the same breath hold by applying PAT in 2 directions simultaneously (phase-encoding direction and 3D direction for 3D sequences)
	The effective PAT factor can be maximized, and PAT applications are extended. Typical clinical applications are MR Angiography or ultrafast isotropic T1-weighted 3D imaging of the head
	The iPAT2 sequence technique named CAIPIRINHA (Controlled Aliasing In Parallel Imaging Results IN Higher Acceleration) is available. It can be applied to volumetric 3D imaging.

Standard Acquisition and Reconstruction Techniques

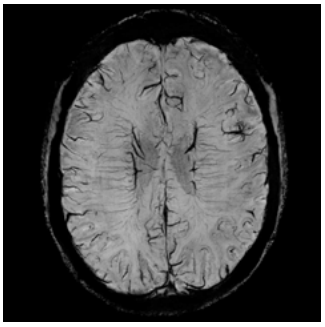
Standard Motion Correction	
BLADE	• Improves image quality by minimizing and correcting for the effects of motion during an MR sequence acquisition • Motion insensitive Turbo Spin Echo sequence • Can be used with all coils and in all planes • Supports T2-weighted, T1-weighted, STIR, and DarkFluid protocols • Simultaneous in-plane motion correction for arbitrary slice orientations • Versatile sequence e.g. supporting iPAT with GRAPPA
Standard Workflow Enhancements	
AutoVoiceCommands	These multi-language automatic voice commands during the scan assist the user in providing optimal timing of breathing and scanning.
Phoenix and PhoenixZIP	Exchange of protocol data (e.g. via Internet) by drag & drop clinical images. PhoenixZIP allows transfer of whole measurement programs.
Online Help Functions	Context sensitive and quick resource for questions about software operation or MR physics.
Inline Technology – Processing Instead of Post-processing	Inline Technology helps to streamline the clinical workflow by automating common post-processing steps before image viewing. See the clinical results immediately. Inline functionality is user-configurable. Examples: • Automatic subtraction of images • MIP on-the-fly, automatic image subtraction and following MIP in three orthogonal planes • Prospective motion correction (1D and 2D PACE) on-the-fly • Automatic diffusion maps • Automatic composing of multi-step images • Automatic on-the-fly calculation of standard deviation, for better differentiation of arterial and venous phases • Inline Display automatically shows reconstructed images. It offers immediate access to the results and opens automatically for e.g. interactive real-time scanning • Inline Movie automatically starts the cine image display

Tim Application Suite

The Tim Application Suite offers a complete range of clinically optimized examinations. The Tim Application Suite – allowing excellent imaging – is provided standard on MAGNETOM Terra.

- Neuro Suite
- Ortho Suite

Neuro Suite



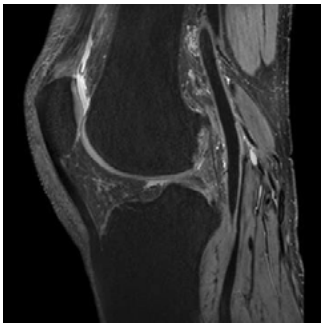
Comprehensive head examinations can be performed. For 7T optimized measurement protocols with customizable sequence parameters are provided. The Neuro Suite also includes measurement protocols for diffusion imaging and fMRI

General features

- Fast 2D imaging with SE, TSE, GRE protocols for high-resolution imaging
- in all orientations and all contrasts
- BLADE motion correction for TSE imaging in all orientations and contrasts
- EPI sequences and protocols for diffusion imaging, and fMRI for advanced neuro applications. Diffusion-weighted imaging is possible with up to 16 b-values in the orthogonal directions
- 3D TOF for non-contrast-enhanced angiography
- 3D isotropic resolution volume imaging using T1 3D MPRAGE /3D FLASH, SPACE DarkFluid, T2 SPACE, and 3D TSE T2-weighted high resolution protocols
- Double Inversion Recovery 3D protocols (DIR SPACE) with two user-selectable inversion pulses for the simultaneous suppression of e.g. cerebrospinal fluid and white matter
- MP2RAGE (Magnetization Prepared 2 Rapid Acquisition Gradient Echoes) provides homogeneous tissue contrast for segmentation and applications such as voxel-based morphometry.
- 2D and 3D MEDIC protocols for T2-weighted imaging
- AutoAlign Head LS providing a fast, easy, standardized, and reproducible patient scanning supporting reading by delivering a higher and more standardized image quality

Tim Application Suite

Ortho Suite



The Ortho Suite is a comprehensive collection of measurement protocols for knee imaging. For 7T optimized measurement protocols with customizable sequence parameters are provided.

General features

- 2D TSE protocols for PD, T1, and T2-weighted contrast with high in-plane resolution and thin slices
- T1, T2, and PD SPACE, 3D imaging with high isotropic resolution optimized for post-processing
- Excellent fat suppression in off-center positions
- High resolution 3D DESS (Double Echo Steady State): T2/T1-weighted imaging for excellent fluid-cartilage differentiation
- AutoAlign providing a fast, easy, standardized, and reproducible patient scanning supporting reading by delivering a higher and more standardized image quality

Dot Cockpit

Intuitive protocol management ...

by providing unprecedented flexibility in MRI configuration.

At the heart of this new flexibility is the Dot Cockpit. It is the central protocol management platform enabling highly flexible and intuitive configuration, manipulation, organisation and updating of all protocols.

MRI flexibility from the start:

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

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

Dot Cockpit

Designed to realize the full potential of the Dot Engines. The new Dot Cockpit is your central interface for all protocol management tasks. In the following, we introduce the most important features of the new Dot Cockpit.*

*Optimized 7T Dot Engines are not provided

Dot Cockpit

Dot Cockpit	
Configure all protocols from one central interface	The Dot Cockpit enables you to configure and save all of your MRI protocols.
Dot Explorer and Program Editor on one page	The Dot Cockpit offers two tasks: Dot Explorer and Program Editor. In the Dot Explorer, you browse through and organize your protocols. In the Program Editor, you modify them.
A new program overview	With the Dot Cockpit, you can see the whole exam workflow, the different User Trees, Protocols, Strategies, Decisions, Sequences and AddIns are visualized together on one page.
Dynamic search delivers highlighted results	In the Dot Explorer, searching for protocols is very quick. Just type in your search query, and results are highlighted instantly.
Editing protocols instantly	In order to modify a protocol opened in the Dot Explorer, you can immediately switch to the Program Editor with one click.
Adding a new Strategy	In the Program Editor, just drag & drop or click on the Strategy button in the sidebar, and a new Strategy is added to your exam workflow. This step automatically creates a new Dot engine.
Drag & drop from the sidebar	In the Program Editor, you can add protocols to a Strategy by drag & drop from the sidebar.
User-friendly toolbar	Use the toolbar for opening and saving of programs, for Copy, Paste, Undo, Redo – in the same way as you are used to in Office programs.

syngo MR Software

syngo MR Examination	
AutoScout	• 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 measure- ments for graphically positioning slices and sat regions. Interactive modification of measurement parameters (slice thickness, distance factor, oversampling etc.): • Off-center positioning (shift of FoV within the selected slice position) • True multi-slice multi-angle, e.g. simultaneous measurement of multiple images (stacks with different orientation) • Recall of previous slice and/or sat region positioning • Paging through all images during graphical positioning • Inline Movie, allowing positioning of slices • Loads images immediately when they are available, e.g. during image reconstruction • Allows quick overview via image stamps. Loads entire series of planning images with drag-and-drop • Slice positioning (GSP) on 3D reconstructed images • Slice positioning (GSP) on 2D and 3D distortion corrected images • Slice positioning (GSP) on composed images

syngo MR Software

***syngo* MR Image Viewing and Filming**	
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.

syngo MR Software

***syngo* MR Image Viewing and Filming**		
Mean Curve	Time-intensity analysis • 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 • 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 • Calculation of z-score (t-test) images for evaluation of BOLD imaging data (Blood Oxygenation Level Dependent) • 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)	
	Supported printing	Grey levels and color
	Data format	PostScript Level 2

syngo MR Software

syngo MR 3D Post-processing	
MPR – Multi-Planar Reconstruction	Real-time multi-planar 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 • Volume of Interest (VoI) defined to increase reconstruction speed and to improve image quality • Freehand MIP • 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)
SSD – Shaded Surface Display	Three-dimensional display of surfaces • Selectable variable threshold values • Multiple view angles around any orthogonal axis
Volumes of Interest (VoI)	Rectangular and irregular VoI can be defined to improve image quality

syngo MR Software

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 Study Split
DICOM Study Split	DICOM Study Split provides the mapping of one study acquired based on multiple requests to multiple studies directly at the scanner.
	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

syngo MR Software

***syngo* MR Network Communication**		
***syngo* MR Network Communication**	Exchange Media Storage of images and additional data (e.g. avi files) on CD/DVD	
DICOM Viewer	A viewing tool which can be stored together with images on a DICOM CD/DVD to be handed out to the patient	
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)	
Image Transfer	Local network	Ethernet
	Data transfer rate	Max. 1 Gbit/s
	Transfer rate (256×256 image)	Approx. 60 images/s

Application Packages

RESOLVE

RESOLVE (Readout Segmentation Of Long Variable Echo-trains) delivers high resolution diffusion-weighted imaging (DWI) for visualizing the diffusion properties of fine anatomical structures. Additionally, this technique is largely insensitive to susceptibility effects, providing detailed anatomy-true diffusion imaging for the brain. In combination with the DTI Tractography package, RESOLVE enables excellent white-matter tract imaging even in the most challenging areas.

- Diffusion-weighted, readout-segmented (multi shot) EPI sequence for high-resolution susceptibility-insensitive DWI
- Variable number of readout segments for greater flexibility
- 2D navigator-based phase correction for pulsation artifact reduction and automatic reacquisition of corrupted data
- Inline calculation of diffusion tensor (DTI) and diffusion parameter maps
- Simultaneous Multi-Slice RESOLVE: Enable ultra-high resolution diffusion imaging within clinically acceptable scan times.

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

Inline BOLD Imaging (Blood Oxygen Level Dependent)

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

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

Simultaneous Multi-Slice (SMS)

SMS is a revolutionary method to significantly reduce imaging times for diffusion and BOLD imaging through excitation and readout of multiple slices simultaneously. It is the only acceleration technique that does not result in SNR-related losses due to sub-sampling. Implementation includes a multi-band pulse coupled with the blipped CAIPIRINHA technique to minimize g-factor related SNR penalties.

- For diffusion-weighted imaging, slice acceleration can be used to reduce scan time and/or achieve higher spatial/diffusion resolution
- For BOLD, slice acceleration can be used to increase temporal sampling of BOLD data, for higher sensitivity to BOLD signal changes, and/or to increase slice coverage/resolution.
- SMS accelerated BOLD and diffusion-weighted protocols for the brain are provided

Application Packages

3D PACE

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

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

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

DTI (Diffusion Tensor Imaging)

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

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

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

syngo System Security Enhanced*

The Security Enhanced option additionally allows the assignment of different user roles to users and the allocation of patients to different patient groups.

- It supports customers to implement their security policy including compliance with HIPAA (Health Insurance Portability and Accountability Act).

Expert-i**

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

Until now, radiologists or other experts had to stop what they were doing and go to the MR scanner to see the acquired images, help with the scan set up, or answer an open question.
Now, questions can be addressed quickly and efficiently via remote PC.

Benefits of Expert-i

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

**Option*
***Within hospital enterprise*

Application Packages

Multinuclear Spectroscopy*)**)

FID and 3D CSI spectroscopy pulse sequences for multinuclear MRS

- The FID and CSI sequences support measurements with all frequencies supported by the hardware
- Basic pulse sequences and protocols Phosphorous spectroscopy
- The sequences supports NOE (Nuclear Overhauser Effect)
- ECG triggering available
- Weighted acquisition available

Multinuclear Support*)**)

Integrated hardware and system software package to prepare the MAGNETOM Terra system for Sodium imaging (23Na) of the head and Phosphorus (31P) spectroscopic images and/or spectra of the whole body, excluding the head. MR pulse sequences and optimized protocols for ^{23}Na imaging and ^{31}P spectroscopy are available. RF coils for ^{23}Na imaging and ^{31}P spectroscopy are available.

- Supports spectroscopic and imaging experiments using the ^{1}H Nuclear Overhauser Effect (NOE)
- Two sequences for spectroscopy FID (basic sequence) and 3D CSI are available.
- Two sequences for imaging GRE (basic sequence) and UTE are available.

Remote Assist

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

** Option*
*** Prerequisite: Additional hardware*

Post-processing Packages

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

BOLD 3D Evaluation

Comprehensive processing and visualization package for BOLD fMRI. It provides a full set of features for clinical fMRI, as well as advanced features for more research oriented applications.

This package provides statistical map calculations from BOLD datasets and enables the visualization of task-related areas of activation with 2D or 3D anatomical data.

On the *syngo* Acquisition Workplace the unique Inline function of BOLD 3D Evaluation merges, in real time, the results of ongoing BOLD imaging measurements with 3D anatomical data. Additionally, evolving signal time courses in task-related areas of activation can be displayed and monitored.

Functional and anatomical image data can be exported for surgical planning as DICOM datasets, additionally all color fused images and results can be stored or printed.

- Statistical map generation: paradigm definition, calculation of t-value map with General Linear Model or t-test
- 3D Visualization: fused display of fMRI results, color t-value maps on anatomical datasets
- Inline 3D real time monitoring of the fMRI acquisition
- On-the-Fly Adjustment for t-value thresholding, 3D clustering, and opacity control
- Data export to neurosurgical planning software
- Fly Through the Volume: Zoom, pan, rotate, cut planes
- Analysis of Signal Time Curves
- Data Quality Monitoring: B0 field map, cine display of the BOLD time series
- Archiving & Distribution of results and views as colored DICOM images and bit maps
- If the respective options are available, results from Diffusion Tensor Imaging and DTI Tractography can be displayed together with fMRI results and anatomy

Post-processing Packages

DTI Evaluation

Offline post-processing to generate and visualize parametric maps derived from the diffusion tensor in order to assess anisotropic diffusion properties of brain tissue

- Generation of diffusion maps based on tensor including: Fractional Anisotropy (FA), Volume Ratio (VR), trace-weighted, ADC, E1–E3, E1, linear, planar, tensor maps
- Display of maps in scalar mode (grey scale), vectorized mode (directions color coded) and tensorized mode (using tensor graphics like ellipsoid or cuboids); overlay of maps onto anatomical images
- Side by side display of several maps (e.g. ADC, FA, and trace-weighted) and anatomy for simultaneous ROI based evaluation; generation of a results table in order to support the assessment of diseases of the white matter
- Integrated into Neuro 3D taskcard: display of DTI maps in the context of an anatomical
- 3D data set; arbitrary oriented clip planes allow to explore the 3D volume
- Fused display with white matter tracts if the "DTI Tractography" option is present.
- Export of reformatted images for neuro navigation
- Together with the "BOLD 3D Evaluation" option: simultaneous display of anatomical, fMRI, and DTI data

DTI Tractography

DTI Tractography allows the visualization of multiple white matter tracts based on diffusion tensor imaging data. DTI Tractography is optimized to support the presurgical planning and to allow for neuro physiological research with respect to connectivity and white matter pathology.

- Advanced 3D visualization of white matter tracts in the context of 2D or 3D anatomical and DTI datasets
- Texture Diffusion, a highly versatile in-plane visualization of white matter tracts, allows to display and read DTI Tractography results on PACS reading stations and in the OR
- Seed points for tracking with single ROI and with multiple ROIs to assess connectivity
- Tract and seeding ROI statistics (mean / max FA value, min / mean / max ADC value, and more)
- DICOM export of views, HTML export of Tract, and seeding ROI statistics
- Interactive QuickTracking displays the tract originating from the mouse pointer position while moving over the DTI data set

Computer System

***syngo* Acquisition Workplace**		
General	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 tilt able, forward and backward Automatic backlight control for long-term brightness stability Optional second monitor	
	Screen size (diagonal)	19”
	Horizontal frequency	30–100 kHz
	Vertical frequency	50–75 Hz
	Screen matrix	1280×1024
Host computer	Processor	Intel Xeon ≥ E5-1620 Quad-Core
	Clock rate	3.5 GHz
	RAM	32 GB
	1st hard disk (system SW)	≥300 GB SAS
	2nd hard disk (data base)	≥300 GB SAS
	3rd hard disk (images)	≥300 GB SAS
	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 drive

Computer System

***syngo* Acquisition Workplace**		
Measurement and reconstruction system[2)]	Processor	Intel ≥ E5-2698 2×16-Core
	Clock rate	2×2.3 GHz
	Main memory (RAM)	256 GB
	Hard disk for raw data	> 2.5 TB
	Hard disk for system software	≥ 200 GB Solid State Drive
	Reconstruction speed	62 256 recons per second (256^2 FFT, full FoV)
	Parallel Scan & Recon	Simultaneous scan and reconstruction of up to 12 data sets
	GPGPU	
	Type	Tesla M60
	Single Precision Performance	9.6 TFLOPS
	Memory size	2x 8 GB
	CUDA Cores	2×2048
***syngo* MR Workplace**		
Color LCD Monitor and host computer as for *syngo* Acquistion Workplace		

Installation

Siting and Installation	
Typical installation time	Less than 60 working days
Radio Frequency Shielding	
For shielding the examination room from external RF sources	
RF attenuation factor	>65 dB
Frequency range	14–300 MHz
Magnetic Shielding	
Room shielding	For additional reduction of the magnetic fringe field, suitable iron shielding can be installed in the walls of the examination room. The room shielding can be used to create a magnetic shielding enclosure
One-Floor Installation	A combination of active shielding and a special shielding (installed on the ceiling of the magnet room or below it) will keep the 0.5 mT line within the same floor as the MRI scanner installation, even in case of very low room heights
System Electronics Cabinets	
Two cabinets which may be placed directly against the wall or even in a corner, additional two cabinets available as options	
Require service access only from the front, saving considerable space	
Integrated water cooling cabinet may eliminate the need for a dedicated computer room	

Installation

Power Requirements		
Line voltage	380, 400, 420, 440, 460, 480 V	
Stability tolerances	±10%	
Line frequency	50/60 Hz, ±1 Hz	
Connection value	110 kVA	
Cooling		
Separators for connection to available cooling system	Water consumption	100 l/min ±10 l/min*
	Heat dissipation to water	90 kW
Power Consumption		
System off	14 kW	
System ready to measure**	21 kW	
Scan**	30 kW	

All values are typical values, applicable for 400V/50Hz
Consumption for optional separator pump and other options not includedPower Consumption

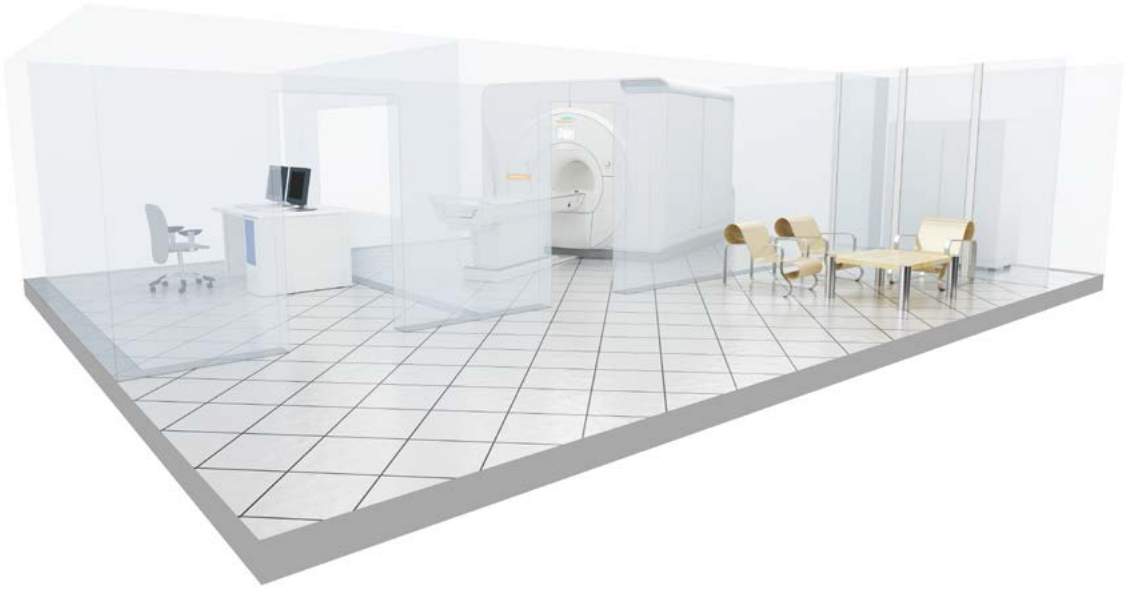
** Water temperature 12 °C/54 °F*

*** The power consumption described herein is based on results that were achieved in a setting according to the COCIR methodology MRI - Measurement of the energy consumption (http://www.cocir.org/site/index.php?id=46). Since many variables impact power consumption (e.g. sequences used for scanning and sequence parameters, scan time), there can be no guarantee that each customer will achieve the same values.*

Installation

Space Requirements

< 85 m²	
< 65 m²	Min. total space requirement (for magnet, electronics, and console room)



Installation

Dimensions

		Width [cm]	Depth [cm]	Height [cm]	Weight [kg]
Examination Room	Magnet 7 Tesla AS (incl. Helium)	280	270	270	approx. 17 000
	Magnet in operation, incl. gradient coil, Tim Table, covers and energy chain	290	760	280	<20 000
	Tim Table	76	247	105	
	Required min. room height clearance			340*	
	Min. transport dimensions	300	300	350	
Control Room	*syngo* Acquisition Workplace (table + monitor)	120	80	117 (72+45)	
	Host computer	22	46	47	
	syngo MR Workplace (optional)	120	80	117 (72+45)	
Equipment Room	Electronics cabinet, incl. system control, RF system, gradient power system, image processor	160	65	198**	1500
	Heat dissipation	≤10 kW, only ventilation might be required			
	Cooling system	65	65	189	500

System Cover

** Finished floor to finished ceiling*
*** Without attachments*

Notes

At Siemens Healthineers, our purpose is to enable healthcare providers to increase value by empowering them on their journey toward expanding precision medicine, transforming care delivery, and improving patient experience, all enabled by digitalizing healthcare.

An estimated 5 million patients globally benefit every day from our innovative technologies and services in the areas of diagnostic and therapeutic imaging, laboratory diagnostics, and molecular medicine, as well as digital health and enterprise services.

We're a leading medical technology company with over 120 years of experience and 18,500 patents globally. With about 50,000 dedicated colleagues in over 70 countries, we'll continue to innovate and shape the future of healthcare.

The outcomes and statements provided by customers of Siemens Healthineers are unique to each customer's setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, and level of service/technology adoption), there can be no guarantee that others will achieve the same results.

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 Healthineers sales organization worldwide. Availability and packaging may vary by country and is subject to change without prior notice. Some/All of the features and products described herein may not be available in the United States.

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.

Siemens Healthineers reserves the right to modify the design, packaging, specifications, and options described herein without prior notice. For the most current information, please contact your local sales representative from Siemens Healthineers.

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

Medical images courtesy of: FAU, Erlangen, Germany

Siemens Healthineers Headquarters
Siemens Healthcare GmbH
Henkestr. 127
91052 Erlangen, Germany
Phone: +49 9131 84-0
siemens-healthineers.com

USA
Siemens Medical Solutions USA, Inc.
Healthcare
40 Liberty Boulevard
Malvern, PA 19355-9998, USA
Phone: +1-888-826-9702
siemens-healthineers.us

Published by Siemens Medical Solutions USA, Inc. · Order No. MR-20-NAM-1353 · Online · 08-2020 ·