

WAREHOUSE/RM51-BU B30050

V.A. Medical Center

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Qty	Item Description
1	<p><b>MAGNETOM Aera - System</b></p> <p>MAGNETOM Aera - 1.5T Tim+Dot system - The integration of the next generation Tim - "Tim 4G" and the Siemens unique Dot Engines (Day optimizing throughput Engine). Short and open appearance (145 cm system length with 70 cm Open Bore Design). Tim 4G's redesigned RF system and all-new coil architecture. - Siemens unique DirectRF(tm) technology enable Tim's new all digital-in/ digital-out design - All-new coil architecture including Dual-Density Signal Transfer Technology - Whole-body superconductive Zero Helium Boil-Off 1.5T magnet - TrueForm Magnet and Gradient Design - Actively Shielded water-cooled Siemens gradient system - Head/Neck 20 DirectConnect, Spine 32 DirectConnect, Body 18, Flex Large/Small 4 Dot offers patient personalization, user guidance and process automation that result in consistent examination results. - Brain Dot Engine is designed to simplify general brain examinations through personalized, guided and automated workflows. - Dot Display and Dot Control Centers - efficient patient preparation. Additional features include: -Tim Application Suite including Neuro, Angio, Cardiac, Body, Onco, Breast, Ortho, Pediatric and Scientific Suite - syngo MR software including 1D/2D PACE, syngo BLADE, iPAT², Phoenix, Inline Technologies. - High performance host computer and measurement and reconstruction system The system (magnet, electronics and control room) can be installed in 30sqm space. For system cooling either the Eco Chiller options or the Separator is required.</p>
1	<p><b>Tim [204x48] XQ Gradients #Ae</b></p> <p>Tim [204x48] XQ-gradients performance level Tim 4G with it's newly designed RF system and innovative coil architecture enables high resolution imaging and increased throughput. Up to 204 simultaneously connected coil elements in combination with the standard 48 independent RF channels, allow for more flexible parallel imaging. Maximum SNR through the new Tim 4G matrix coil technology. This option includes also Advanced High Order Shim. XQ - gradients The XQ- gradients are designed combining high performance and linearity to support clinical whole body imaging at 1.5T. The force compensated gradient system minimizes vibration levels and accoustic noise. The XQ gradients combine 45 mT/m peak amplitude with a slew rate of 200 T/m/s.</p>
1	<p><b>PC Keyboard US english #Tim</b></p> <p>Standard PC keyboard with 101 keys.</p>
1	<p><b>Pure White Design #T+D</b></p> <p>The MAGNETOM Aera / MAGNETOM Skyra design is available in different light and appealing variants which perfectly integrates into the different environments. The color of the main face plate cover of the Pure White Design Variant with the integrated Dot Control Centers and the unique Dot Display is brilliant white surrounded by a brilliant silver trim. The asymmetrical deco area on the left side is colored white matte and also with a brilliant surrounding silver trim. The table cover is presented also in the same color and material selection.</p>

Qty	Item Description
1	<p><b>Tim Dockable Table #Ae</b></p> <p>The Tim Dockable Table is designed for maximum patient comfort and smooth patient preparation. Tim Dockable Table can support up to 250 kg (550 lbs) patients without restricting the vertical or horizontal movement. The one step docking mechanism and the innovative multi-directional navigation wheel ensure easy maneuvering and handling. Critically ill or immobile patients can now be prepared outside the examination room for maximum patient care, flexibility and speed.</p>
1	<p><b>Add. Tim Dockable Table #Ae</b></p> <p>Additional mobile table solution with integrated removeable Spine 32 for installations that already have a Tim Dockable Table and would like to increase their throughput even more.</p>
1	<p><b>Inline Composing syngo #Tim</b></p> <p>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 scan planning purposes.</p>
1	<p><b>Tim Planning Suite</b></p> <p>With the Tim Planning Suite, multiple regions in the entire body can be examined in a minimum of time through measurement planning on a single FoV of any desired size.</p>
1	<p><b>Native syngo #Tim</b></p> <p>Integrated software package with sequences and protocols for non-contrast enhanced 3D MRA with high spatial resolution. syngo NATIVE particularly enables imaging of abdominal and peripheral vessels and is an alternative to MR angiography techniques with contrast medium, especially for patients with severe renal insufficiency.</p>
1	<p><b>Tissue 4D syngo #Tim</b></p> <p>Tissue 4D is an application for visualizing and post-processing dynamic contrast-enhanced 3D datasets. This card provides two evaluation options: - Standard curve evaluation - Curve evaluation according to a pharmacokinetic model</p>
1	<p><b>Sentinel Endo-Rectal Coil #1.5T</b></p> <p>The Sentinel Endorectal Coil is a reusable MR coil for imaging and spectroscopy of the prostate. It delivers brilliant image quality for high-resolution 2D and 3D MR imaging, excellent coverage and image homogeneity. The coil consists of a 2-channel endo coil array and a patient support with a stabilization arm. For reuse it can be disinfected.</p>
1	<p><b>Flow Quantification #Tim</b></p> <p>Special sequences for quantitative assessment of flow.</p>
1	<p><b>Argus Flow</b></p>
1	<p><b>Advanced Cardiac Package #T+D</b></p> <p>This package contains special sequences and protocols for advanced cardiac imaging including 3D and 4D syngo BEAT functionalities. It supports advanced techniques for ventricular function imaging, dynamic imaging, tissue characterization, coronary imaging, and more.</p>
1	<p><b>Argus 4D Ventr.Function syngo #Tim</b></p> <p>syngo Argus 4D Ventricular Function software processes MR cine images of the heart and generates quantitative results for physicians in the diagnostic process.</p>
1	<p><b>Large Joint Dot Engine #T+D</b></p> <p>Large Joint Dot Engine optimizes image quality of knee, hip and shoulder scans by proposing the most appropriate protocols according to the examination strategy chosen for the specific patient. It ensures reproducible image quality and streamlines large joint examinations to a great extent. The Large Joint Dot Engine features AutoAlign and AutoCoverage for knee, hip and shoulder, syngo WARP with VAT (View Angle Tilting), and Inline MPR.</p>
1	<p><b>Inline Perfusion #Tim</b></p> <p>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.</p>

Qty	Item Description
1	<p><b>Neuro Perfusion Evaluation,USA #T+D</b></p> <p>Neuro Perfusion Evaluation syngo provides a task card for detailed post-processing of brain perfusion data sets. Color display of the relative Mean Transit Time (relMTT), relative Cerebral Blood Volume (relCBV), corrected rel CBV, and relative Cerebral Blood Flow (relCBF) is supported. Flexible selection of the Arterial Input Function (AIF). Furthermore a calculation of maps using the pre-selected local Arterial Input Functions (AIF) is provided. The detailed evaluation of brain perfusion data sets generates parameter maps for TTP and PBP and for the hemodynamic parameters relMTT, relCBV, rel CBVcor and relCBF.</p>
1	<p><b>Neuro fMRI/DTI Combi Package #T+D</b></p> <p>The Neuro fMRI/DTI Combi Package is a bundle of: - Inline BOLD Imaging - 3D PACE syngo - BOLD 3D Evaluation syngo - fMRI Trigger Converter - Diffusion Tensor Imaging - DTI Evaluation - DTI Tractography syngo The bundle comprehends all acquisition and postprocessing tools for comprehensive BOLD fMRI and DTI exams. BOLD fMRI experiments can be displayed fused with DTI data and anatomy. The package is particularly valuable for presurgical planning. The 3D display of anatomical images, functional brain mapping results and DTI allows a better understanding of the spatial relationship between eloquent cortices, cortical landmarks, brain lesions and tract shifts of white matter.</p>
1	<p><b>RESOLVE #T+D</b></p> <p>RESOLVE is a diffusion-weighted, readout segmented EPI sequence optimized towards high resolution imaging with reduced distortions. The sequence uses a very short echospacing compared to single-shot EPI, substantially reducing susceptibility effects. A 2D-navigator correction is applied to avoid artefacts due to motion-induced phase errors. This combination allows diffusion weighted imaging of the breast, prostate, brain and spine whole body with a high level of detail and spatial precision.</p>
1	<p><b>SWI #Tim</b></p> <p>Susceptibility Weighted Imaging is a high-resolution 3D imaging technique for the brain with ultra-high sensitivity for microscopic magnetic field inhomogeneities caused by deoxygenated blood, products of blood decomposition and microscopic iron deposits. Among other things, the method allows for the highly sensitive proof of cerebral hemorrhages and the high-resolution display of venous cerebral blood vessels.</p>
1	<p><b>Spectroscopy Package #T+D</b></p> <p>The Spectroscopy Package is a comprehensive software package which bundles Single Voxel Spectroscopy, 2D Chemical Shift Imaging, 3D Chemical Shift Imaging and syngo Spectroscopy Evaluation. Sequences and protocols for proton spectroscopy, 2D and 3D proton chemical shift imaging (2D CSI and 3D CSI) to examine metabolic changes in the brain (e.g. in tumors and degenerative diseases) and in the prostate are included. Furthermore included is the comprehensive syngo Spectroscopy Evaluation Software which enables fast evaluation of spectroscopy data on the syngo Acquisition Workplace.</p>
1	<p><b>TWIST syngo #Tim</b></p> <p>This package contains a Siemens unique sequence and protocols for time-resolved (4D) MR angiographic and dynamic imaging in general with high spatial and temporal resolution. syngo TWIST supports comprehensive dynamic MR angio exams in all body regions. It offers temporal information of vessel filling in addition to conventional static MR angiography, which can be beneficial in detecting or evaluating malformations such as shunts. In case of general dynamic imaging, for example an increase in spatial resolution by a factor of up to 2 at 60 seconds temporal resolution (compared to conventional dynamic imaging) is possible due to intelligent k-space sampling strategies. Alternatively, increased temporal resolution at constant spatial resolution is possible.</p>
1	<p><b>2/4/8-ch Sentinelle BreastCoil #Ae</b></p> <p>The 2-/4-/8-channel Sentinelle Breast Coil consists of a positioning frame with exchangeable coils with different numbers of channels as described in detail in the E text. The 2-/4-/8-channel Sentinelle Breast Coil can be used as 8-channel imaging coil, 4-channel biopsy coil for lateral biopsy access as well as 2-channel biopsy coil for medial biopsy access. This coil provides a large biopsy access. The preamplifiers are integrated into the coil. The coil is iPAT-compatible. A positioning guidance is provided.</p>

**Qty****Item Description**

1

**Peripheral Angio 36 #Ae**

The new Tim 4G coil technology with Dual Density Signal Transfer and SlideConnect Technology combines key imaging benefits: excellent image quality, high patient comfort, and unmatched flexibility: - 36 channels - Dual Density Signal Transfer - Ultra light-weight - SlideConnect Technology The 36-channel coil includes 36 integrated pre-amplifiers for excellent signal-to-noise ratio. The single SlideConnect Plug allows for fast and easy patient preparation. The Peripheral Angio 36 features: - 36-element design with 36 integrated preamplifiers, distributed over 6 planes with 6 elements each - Operates in an integrated fashion with Body 18 coils and with the Spine 32 . For Whole-Body examinations also with the Head/ Neck 20 - Automatic table feed and active coil switch - Can be utilized head and feet first - Both legs are independently covered with coil elements, maximizing the coil filling factor and the signal-to-noise ratio - No coil tuning - iPAT-compatible - Dual-Density Signal Transfer enables ultra-high density coil designs by integrating key RF components into the local coil - SlideConnect technology for easy coil set up - One cable only for easy handling - Includes special non-ferromagnetic coil cart for safe, user-friendly storage Applications: - High-resolution angiography of both legs incl. Pelvis (by additional use of the Body 18) with highest signal-to-noise ratio - Visualization of the iliac arteries and aorta in combination with Body 18 - Bilateral examinations of long bones of the legs Typically combined with: Head/ Neck 20, Body 18, Spine 32, and all flexible coils such as Flex Large 4 or Flex Small 4

1

**Shoulder 16 Coil Kit #Ae**

The new Tim 4G coil technology with Dual Density Signal Transfer and SlideConnect Technology combines key imaging benefits: excellent image quality, high patient comfort, and unmatched flexibility. The Shoulder 16 Coil Kit for examinations of the left or right shoulder consists of a base plate and two different sized iPAT compatible 16 channel coils (Shoulder Large 16 and Shoulder Small 16). These will be attached and can be relocated on the base plate. The 16-element coils with 16 integrated pre-amplifiers ensure maximum signal-to-noise ratio. Shoulder Large 16 and Shoulder Small 16 will be connected via a SlideConnect plug for fast and easy coil set-up and patient preparation.

1

**Hand/Wrist 16 #Ae**

The new Tim 4G coil technology with Dual Density Signal Transfer and SlideConnect Technology combines key imaging benefits: excellent image quality, high patient comfort, and unmatched flexibility. Hand/Wrist 16 for examinations of the left or right hand and wrist region consists of a base plate and an iPAT compatible 16-channel coil and allows high resolution imaging of the wrist and the hand within one examination. Hand/Wrist 16 will be connected via a SlideConnect plug for fast and easy patient preparation.

1

**Foot/Ankle 16 #Ae**

The new Tim 4G coil technology with Dual Density Signal Transfer and DirectConnect Technology combines key imaging benefits: excellent image quality, high patient comfort, and unmatched flexibility. Foot/Ankle 16 for examinations of the left or right foot and ankle region consists of a base plate and an iPAT compatible 16-channel coil and allows high resolution imaging of the foot and ankle within one examination. Foot/Ankle 16 is a cable-less coil and will be connected via DirectConnect for fast and easy patient preparation.

1

**Tx/Rx 15-channel Knee Coil DDST #Ae**

New 15-channel transmitter/receiver coil for joint examinations in the area of the lower extremities. Main features : - 15-element design (3x5 coil elements) with 15 integrated preamplifiers, - iPAT-compatible - SlideConnect Technology

Qty	Item Description
1	<p><b>Body 18 #Ae</b></p> <p>The Tim 4G coil technology with Dual Density Signal Transfer and SlideConnect Technology combines key imaging benefits: excellent image quality, high patient comfort, and unmatched flexibility: - 18 channels (inherent) or up to 30 (in combination with the Spine 32) - Dual Density Signal Transfer - Ultra light-weight - SlideConnect Technology The Body 18 is part of the standard configuration. The 18-channel coil with its 18 integrated pre-amplifiers ensures excellent signal-to-noise ratio. The 18 coil elements provide extensive coverage in all directions. The single SlideConnect plug allows for fast and easy patient preparation. The light-weight coil ensures highest patient comfort. The Body 18 Coil features: - 18-element design with 18 integrated preamplifiers (3 clusters of 6 elements each) - Operates in an integrated fashion with the Spine 32 as an 30 channel body coil - Can be combined with further Body 18 coils for larger coverage - Can be positioned in different orientations (0°, 90°, 180°, 270°) for patient specific adaptations - No coil tuning - iPAT compatible in all directions The highly flexible design enables a wide variety of applications including: - Thorax (incl. heart) - Abdomen - Pelvis - Hip Typically combined with: - Head / Neck 20 - Spine 32 - Additional Body 18 coil(s) (optional) - Peripheral Angio 36 (optional) - Flex Large 4 - Flex Small 4 - Loop coils (optional) - Endorectal coil (optional)</p>
1	<p><b>MR Workplace Table 1.2m</b></p> <p>Table suited for syngo Acquisition Workplace and syngo MR Workplace based on syngo Hardware.</p>
1	<p><b>MR Workplace Container, 50cm</b></p> <p>50 cm wide extra case for the syngo host computer with sliding front door to allow change of storage media (CD/DVD/USB).</p>
1	<p><b>Patient Supervision TV #T+D</b></p> <p>The supervision solution is customizable and designed to address different site specific requirements. Up to 4 cameras can be connected for patient supervision in the examination or waiting room. This package contains a special video camera for monitoring the patient during an MR examination, conveniently mounted on the wall of the examination room. The information is displayed at an LCD monitor in the control room. Note: For Spectra, up to 2 cameras can be connected for patient supervision in the examination room.</p>
1	<p><b>UPS Cable #Tim</b></p> <p>Power cable for connecting the UPS Powerware PW 9130-3000i (14413662) to the ACC of MAGNETOM Tim and MAGNETOM Tim+Dot systems for backing up the computer. Standard cable length: 9 m.</p>
1	<p><b>UPS Powerware PW9130G-3000T-XLEU</b></p> <p>UPS system Eaton PW9130G-3000T-XLEU for MAGNETOM Tim, MAGNETOM Tim+Dot and MAGNETOM Symphony systems for safeguarding computers. Power output: 3.0 kVA / 2.7 kW Bridge time: 5 min full load / 14 min half load Input voltage: 230 VAC</p>
1	<p><b>Additional Set of Manuals</b></p> <p>Additional set of manuals for the above selected MR system.</p>
1	<p><b>MR_GOV_RIG_INSTL</b></p>
1	<p><b>T+D Preinstall kit for dockable table</b></p>
1	<p><b>Standard Cryogens</b></p>
1	<p><b>MR Project Management</b></p> <p>A Siemens Project Manager (PM) will be the single point of contact for the implementation of your Siemens equipment. The assigned PM will work with the customer's facilities management, architect or building contractor to assist you in ensuring that your site is ready for installation. Your PM will provide initial and final drawings and will coordinate the scheduling of the equipment, installation, and rigging, as well as the initiation of on-site clinical education.</p>

Qty	Part No.	Item Description
1	MR_INITAL_32	<b>Initial onsite training 32 hrs</b> Up to (32) hours of on-site clinical education training, scheduled consecutively (Monday - Friday) during standard business hours for a maximum of (4) imaging professionals. Training will cover agenda items on the ASRT approved checklist. Uptime Clinical Education phone support is provided during the warranty period for specified posted hours. This educational offering must be completed (12) months from install end date. If training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund.
1	MR_FOLLOWU P_32	<b>Follow-up training 32 hrs</b> Up to (32) hours of follow-up on-site clinical education training, scheduled consecutively (Monday - Friday) during standard business hours for a maximum of (4) imaging professionals. Uptime Clinical Education phone support is provided during the warranty period for specified posted hours. This educational offering must be completed (12) months from install end date. If training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund.
1	MR_INT_D_GO V_CLS	<b>MR Dot Govt. Training Class (No T&amp;L)</b> Tuition for (1) government attendee to attend a Classroom Course of choice at one of the Siemens training centers. This educational offering must be completed (12) months from install end date. If training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund.
2	MR_ADD_16	<b>Additional onsite training 16 hours</b> Up to (16) hours of on-site clinical education training, scheduled consecutively (Monday - Friday) during standard business hours for a maximum of (4) imaging professionals. Training will cover agenda items on the ASRT approved checklist if applicable. This educational offering must be completed (12) months from install end date. If training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund.
1	MR_ADD_32	<b>Additional onsite training 32 hours</b> Up to (32) hours of on-site clinical education training, scheduled consecutively (Monday - Friday) during standard business hours for a maximum of (4) imaging professionals. Training will cover agenda items on the ASRT approved checklist if applicable. This educational offering must be completed (12) months from install end date. If training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund.
4	MR_GOV_CLS	<b>GOV'T ONLY - MR Training Class</b> Tuition for (1) government attendee to attend a classroom course of choice at one of the Siemens training centers. This educational offering must be completed (12) months from install end date. If training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund.
1	KKTECOMR_6 0	<b>KKT ECOCHILLER 133L</b> The KKT ECO 133 -L chiller is a dedicated 20°C cooling system for MAGNETOM Aera and MAGNETOM Skyra which automatically adapts to the different cooling requirements (e.g. system in operation, standby, ...) to reduce the energy consumption for cooling. The cooling system must be used in combination with the IFP (Interface Panel), if there is no on-site chilled water supply at all. The IFP is included in the scope of supply.
1	CHILINST_AVT	<b>Chiller Start-up and Warranty for TIM</b>

Qty	Item Description
1	<p><b>Spectris Solaris EP Injector iCBC</b></p> <p>Includes Spectris Solaris EP injector and Integrated Continuous Battery Charger (ICBC). - Optimized color touch screen with few keystrokes. - Six user-programmable phases for added flexibility. - Independent Keep Vein Open (KVO) allows more time to focus on patient. - Large 115 mL saline syringe allows for longer KVO and multiple flushes. - Design of low pressure tubing eliminates dead space in the "T" connection that can waste contrast. - The clear barrel design with molded FluidDots help detect the presence of air in a syringe. - Pressure Limit Setting control software enables user to select from one to six preset maximum pressure limits, ranging from 100-300 psi, and to view current pressure during injection next to the pre-selected maximum value on the Solaris display. Installation, applications and one year warranty provided by Medrad. Not for mobile use, refer to Siemens part number M3SSMR300EPM for the Solaris injector used in a mobile environment. This product has been tested and verified for compatibility with the following Siemens' products: MAGNETOM Trio, Espree, Essenza, Verio, Avanto, Symphony, Aera, Skyra and Biograph mMR. Compatibility with other products cannot be guaranteed and use with any other products may void service contracts and/or system warranties.</p>
1	<p><b>Advanced Invivo Expression</b></p> <p>ECG, SpO2, EtCO2, NIBP, Agents, Body Temperature with printer and 1 wireless display (can be used in both rooms) o Accessories to perform all the above parameters on 20-30 (each) Adult, Pediatric and Neonatal patients o Gating connector included Includes installation and one year warranty through Invivo. This product has been tested and verified for compatibility with the following Siemens' products: MAGNETOM Symphony, Avanto, Espree, Trio, Skyra, Verio, Aera, Essenza, and Biograph mMR. Compatibility with other products cannot be assured and may void service contracts and/or system warranties.</p>
1	<p><b>MR Wall sign -English</b></p>
1	<p><b>FERRALERT HALO II</b></p> <p>Ferromagnetic Portal Detector Model H22 - Adjustable width 42 - 52 inches Model H21 - Adjustable width 31 - 41 inches Model H20 - Adjustable width 25 - 35 inches (Consult Factory for Application) * Allowing technologist to quickly identify the ferromagnetic threat * No invasive pat-down required * Limits alarm fatigue - Patented technology suppresses false positive alarms * Has Intelligent Visual Advanced Warning Installation &amp; Training by Kopp Development Inc. - Are Mandatory One year warranty through Kopp Development.</p>
1	<p><b>Offset for Initial onsite train 32 hrs</b></p>

## **Appendix A**

### **Incidental Services Associated with this Quotation:**

One complimentary biomedical tuition is included with the purchase of this system. This training must be completed before the end of the warranty period.

Offset Part 14407354 Additional Set of Manuals Page 7

Offset Part MR\_FOLLOWUP\_32 Follow-up training 32 hrs Page

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# Detailed Technical Specifications

## MAGNETOM Aera - USA

### Description

#### Aera ex Erlangen ENS\_14416900

MAGNETOM Aera - the first 1.5T Tim+Dot system - integrates the next generation Tim - Tim 4G and the Siemens unique Dot Engines (Day Optimizing Throughput Engines) enabling workflow efficiency combined with higher diagnostic confidence due to consistent results.

The system includes:

#### Tim 4G+Dot

Tim 4G provides increased patient comfort and optimized workflow efficiency. Only one patient setup, no repositioning, and no changing of coils. Ultra-light-weighted coils with high density of coil elements for maximized patient comfort and increased SNR. Feet-first positioning for almost all examinations possible reduces claustrophobia.

Tim 4G is 4G flexibility, accuracy and speed and brings image quality and acquisition speed to a new level.

Dot helps to take away the complexity in MRI scanning through patient personalization, user guidance and process automation. Optimized scan strategies are provided and can be selected based on patient condition, which allows for high quality exams even when conditions change. Integrated decision points allow the user to easily add or remove one or a group of protocols with one click. Step by step real-time on board guidance guides novice users even through the most complicated exams. Process automation allows optimal timing for breathing, scanning, and planning. Dot can be easily customized to follow the individual standards of care.

Dot is personalized, guided and automated and designed to improve workflow efficiency and image consistency.

MAGNETOM Aera with its 70 cm Open Bore design and a system length of only 145 cm gives a patient friendly appearance that can significantly help patients with anxiety or claustrophobia.

#### Magnet:

- Ultra-short 137 cm long (145 cm with covers), whole-body superconductive 1.5T magnet with active shielding (AS) technology with counter coils
- External Interference Shielding (E.I.S.)
- Excellent homogeneity enabled by TrueForm magnet design which allows for a cylindrically optimized homogeneity volume resulting in higher image quality (50 × 50 × 45 cm<sup>3</sup> DEV, typ. 3.6 ppm based on the 24-plane plot method)
- The magnet has a helium capacity of approximately 1,280 liters and a typical Helium boil-off rate of 0 l/yr during typical, undisturbed clinical operation depending on the sequences used and examination time, and provided the system is serviced in regular intervals.
- It has an integrated magnet cooling system.

#### Gradient system:

- Actively shielded water-cooled world-class gradient system
- True Form Gradient Design
- All axes force compensated

#### DirectRF - RF Transmit/Receive System:

- Fully integrated Transmit and Receive path in the magnet housing including extremely compact water-cooled solid state amplifier with 26.1 kW peak power
- High dynamic range
- Immediate feedback loop for real-time sequence adaptation
- Integrated no tune transmit/receive Body Coil
- The revolutionary Tim 4G technology allows connecting up to 204 coil elements simultaneously enabling higher SNR and iPAT in all directions. No repositioning of patients is needed even for large Field of View

## Description

examinations.

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

### **Tim 4G Coils:**

The new Tim 4G coil technology with Dual-Density Signal Transfer, DirectConnect and SlideConnect Technology combines key imaging benefits:

Excellent image quality, high patient comfort, and unmatched flexibility.

The Tim 4G coils are designed for highest image quality combined with easy handling. The high element density of the coils increases SNR and reduces examination times. DirectConnect and SlideConnect™ technology reduce patient set up time significantly. The coils are designed with the patient in mind. Light weighted coils and open design ensure highest patient comfort which results in better patient cooperation and image quality. No coil changing with multi-exam studies saves patient setup- and table time.

AutoCoilSelect enables dynamic, automatic, or interactive selection of the coil elements within the Field of View and speeding the exam preparation at the host.

All coils are time-saving "no-tune" coils.

A comprehensive set of pads for comfortable and stable patient positioning together with safety straps are included.

- Head/Neck 20

The 20-channel coil with its 20 integrated pre-amplifiers ensures excellent signal-to-noise ratio. The unique DirectConnect technology allows users connecting the 20 coil elements of the Head/Neck20 without cables. The patient friendly open design allows for maximum patient comfort which is supported in addition by a look-out mirror for claustrophobic patients. The high channel coil is iPAT compatible in all directions.

The open and light design of the upper coil part increases patient comfort and is removable for easy patient handling. The lower coil part may remain on the table for most of the examinations can be used without the upper part. The Head/Neck 20 and Spine 32 are smoothly integrated into the patient table, thus enabling high flexibility in imaging and fewer coil changes and easy handling when switching patients. The Head /Neck 20 coil is equipped with two removable cushioned head stabilizers for stable and comfortable patient positioning.

The Head/ Neck 20 can be used for applications like head examinations, neck examinations, MR Angiography, combined head/neck examinations or for imaging of the TMJ (temporomandibular joints).

Typically combined with the Spine 32 and Body 18 or Peripheral Angio 36 but also other combinations eg with flexible coils like the Flex Large 4 are possible.

- Body 18

The 18-channel coil with its 18 integrated pre-amplifiers ensures maximum signal-to-noise ratio. The 18 coil elements of the Body 18 with only one SlideConnect Plug allows for fast and easy patient preparation resulting in less table time. Fast acquisition times enabled by iPAT in all directions. The light-weighted coil ensures highest patient comfort.

Body 18 operates in an integrated fashion with the Spine 32 as a 30 channel body coil

Body 18 can be combined with further Body 18 coils for larger coverage and positioned in different orientations (0°, 90°, 180°, 270°) for patient specific adaptations

The Body 18 is typically used in combination with the Spine 32 for examinations of the thorax, abdomen, pelvis or hip and operates as a 30 channel body coil (3 rings 10 elements). The Body 18 can also be used for cardiac or vascular applications. Through its perfect combinability with the Spine 32, further Body 18 (optional), the Peripheral Angio 36 (optional), but also the Head/Neck20 and all flexible coils (e.g. Flex Large 4, Flex Small 4) it contributes for a broad range of indications up to whole-body imaging.

- Spine 32

The 32-channel coil with its 32 integrated pre-amplifiers ensures maximum signal-to-noise ratio. The unique DirectConnect technology allows connecting the 32 coil elements of the Spine 32 without the need to plug in any cable. The patient friendly ergonomic design allows for maximum patient comfort. The high element coil is iPAT compatible in all directions.

Smoothly integrated into the patient table the Spine 32 may remain on the patient table for nearly all exams.

The Spine 32 is typically combined with Body 18, Head/Neck 20, Peripheral Angio 36 or Flex Large 4, Flex

## Description

Small 4.

- Flex Large 4/ Flex Small 4

Light-weighted, very flexible, iPAT compatible, 4-element no-tune receiver coils which are made of soft and smooth material. The coils can be wrapped around or used flat.

Both coils can be connected via Flex Coil interface. One Flex Coil interface is already delivered as standard.

The coils can be used for different examinations ranging from examinations of the extremities to abdominal examinations.

### TimTable

- The maximum scan range of the Tim Table is 140 cm. A scan range of 205 cm can be achieved with the Tim Whole Body suite (optional)
- The maximum patient weight of 250 kg (550 lbs) is valid for horizontal and vertical movements, which ensures maximized patient comfort for obese patients.
- The patient table can be lowered to a minimum height of 52 cm from the floor, for easier patient positioning and better accessibility for geriatric, pediatric or immobile patients. An infusion stand is integrated to ensure fast patient set up also for critical patients.
- Multiple Tim4G coils can be connected at once for efficient and patient friendly examinations.
- The Tim Table can be moved with two clicks into the isocenter - one click to the upmost position and one click into the isocenter.

### Dot (Day Optimizing Throughput) Engine

Dot multiplies the power of Tim resulting in greater image consistency and diagnostic confidence

### Dot Control Centers and Dot Display

- The ergonomically designed Dot Control Centers are integrated left and right into the front covers for controlling table movement and interaction with the Dot Display. The Dot Control Centers are well illuminated for easy visual recognition.
- Automated table move up to upmost position, to center position or Home position facilitate smooth patient preparation and will reduce table time
- Variable (6 levels) ventilation and lighting inside the magnet bore or volume adjustments are possible for increased patient comfort
- The Dot Display provides on board guidance for patient set up where it's needed - directly at the scanner. Information such as Patient name or exam type or required patient position, guidance for ECG set up and immediate visualization of physiological curves will be provided for convenient operation.
- Almost all table control functions, including ventilation and illumination of the magnet bore, can be also controlled from the operator console for convenient operation.

### Dot Technology

Dot makes it easy to get the best possible results for virtually any type of patient. Dot gives uniquely tailored, optimized scans configurable to patient condition or clinical question.

Dot provides patient personalization, user guidance and process automation and is of course configurable by the user to adapt to the different clinical needs and standards of care.

### Brain Dot Engine

The Brain Dot Engine simplifies general brain examinations with guided and automated workflows customized to the site specific standards of care. The Brain Dot Engine supports the user in achieving reproducible image quality with increased ease of use and time efficient exams.

The brain workflow can be personalized to the individual patient condition and clinical need. Several predefined strategies are included, which can be easily selected with one click. They can be changed at any time during the brain workflow.

Protocols tailored for use of contrast media are integrated.

- Standard: Standard examination with 2D protocols
- Resolution focus: Examination with 3D protocols (with e.g. SPACE) for detailed views
- Speed focus: Examination with fast 2D protocols (with e.g. HASTE) for further speeding up the exam
- Limited patient capabilities: Examination with *syngo* BLADE protocols
- to minimize and correct for the effects of motion automatically

## Description

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

Easy positioning of the patient with AutoPosition. The patient is automatically placed at the isocenter without any laser marking required.

AutoAlign Head allows automatic slice positioning and aligns on the anatomically derived sagittal, coronal, and axial slices of the localizer. The operator-free alignment and anatomical marking are consistent, independently of patient age, head position, or disease.

Automatic real-time calculation of trace-weighted images and ADC maps with Inline DiffusionTechnology.

Easy rerun or repeat with functionality allows for reduced table time even in case of patients with pain or claustrophobia. An image inside the examination UI can be selected and a rerun of the corresponding series can be triggered with identical sequences or parameters. Alternatively an exam can be repeated with a changed strategy.

The Brain Dot Engine as all Dot Engines can be modified by the user to their individual standard of care.

### Tim Application Suite

The Tim Application Suite offers a complete range of clinically optimized sequences, protocols and workflow functionalities for all body regions. Excellent head-to-toe imaging can be accomplished with the sequences and features included in this application suite. To enable this comprehensive application range, nine dedicated application packages have been included.

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

### Neuro Suite

Comprehensive head and spine examinations can be performed with dedicated programs. High resolution protocols and fast protocols for uncooperative patients are provided. The Neuro Suite also includes protocols for diffusion imaging, perfusion imaging, and fMRI. It includes for example:

- EPI sequences and protocols for diffusion, perfusion and fMRI for advanced neurological applications. Diffusion weighted imaging is possible with up to 16 b-values in the orthogonal directions. Dynamic Analysis software (included in standard configuration) enables calculation of:
  - ADC maps
  - t-test maps from the EPI images for fMRI
  - Time-to-Peak maps for perfusion analysis.
- Whole spine protocols acquire in multiple steps via software controlled table movement in a single click.
- 3D isotropic resolution volume imaging using T1 3D MPRAGE / 3D FLASH, SPACE DarkFluid, T2 SPACE 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 Myelograms 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

## Description

- Precision filter for high spatial accuracy e.g. for neuro intra-operative imaging and stereotactic planning
- 3D CISS (Constructive Interference in Steady State) for excellent visualization of fine structures such as cranial nerves. High resolution imaging of inner ear and spine
- AutoAlign Head LS providing a fast, easy, standardized, and reproducible patient scanning supporting reading by delivering a higher and more standardized image quality

### Angio Suite

Excellent MR Angiography can be performed to visualize arteries and veins with or without contrast agent.

#### *Contrast-enhanced MRA*

- 3D contrast-enhanced MRA protocols for e.g. single step, dynamic, peripheral, whole body MRA with the shortest TR and TE. The strong gradients make it possible to separate the arterial phase from the venous phase.
- TestBolus workflow for optimized bolus timing and superb image quality.
- CareBolus functionality for accurate determination of the bolus arrival time and the "Stop and Continue" of the 3D ce-MRA protocol after the 2D bolus control scan.
- Dynamic ce-MRA for 3D imaging over time.

#### *Non-contrast-MRA and venography*

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

#### *Image processing tools*

- MPR, 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

### Cardiac Suite

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

#### *Cardiac views*

- Fast acquisition of the basic cardiac orientations for further examination planning
- Cardiac scouting provides users with a step-by-step procedure for the visualization and planning of typical cardiac views, e.g. based on TrueFISP or Dark Blood TurboFLASH: short axis, 4-chamber and 2-chamber views.

#### *syngo BEAT*

- Unique tool for fast and easy cardiovascular MR imaging
- E.g. 1 click change from FLASH to TrueFISP for easy contrast optimization
- 1-click to switch arrhythmia rejection on / off
- 1-click change from Cartesian to radial sampling to increase effective image resolution (e.g. in pediatric patients) and avoid folding artifacts in large patients

#### *Visualization of structural cardiovascular pathologies with CMR - syngo BEAT*

- Breath-hold and free breathing techniques for strong contrast between the blood and vascular structures. Dark Blood TSE and HASTE imaging are available for the structural evaluation of the cardiothoracic anatomy, including vessels or heart valves. Cine techniques (FLASH & TrueFISP) for high-resolution valve evaluation
- Multiple contrasts such as T1- and T2-weighted imaging for use in diseases such as myocarditis (inflammation / hyperaemia), ARVD (fibrous-fatty degeneration) or acute myocardial infarction (edema)
- Dark-blood TSE with motion compensation for high-quality vessel wall imaging in small or large vessels

#### *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)

## Description

- Protocols for whole-heart coverage
  - iPAT integration for highest temporal and spatial resolution
  - Real-time imaging in case the patient is not able to hold his breath
- Dynamic imaging and tissue characterization with syngo BEAT*
- Protocols for high-contrast and high-resolution tissue characterization
  - Protocols for stress and rest imaging with TrueFISP or TurboFLASH contrast support the acquisition of multiple slices with high resolution and arbitrarily adjustable slice orientation for each slice
  - T-PAT with mSENSE and GRAPPA for advanced parallel imaging provides fast high-resolution dynamic imaging
  - Segmented IR TrueFISP / FLASH with TI scout for optimization of tissue contrast
  - Advanced tissue characterization with 2D phase-sensitive IR (PSIR) sequences TrueFISP and FLASH contrast. Magnitude and phase-sensitive images with one acquisition
  - Simple: no adjustment of inversion time (TI) necessary with PSIR technique
  - Ungated single-shot PSIR imaging for tissue characterization under difficult conditions: free-breathing technique that can be applied even in case of arrhythmia

### 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
- Physiological Signals Display
- ECG (3 channels)
- 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 cardiac 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. 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

### Breast Suite

MR imaging has proven a very high sensitivity for breast lesions and is the gold standard for the examination of silicone implants. Extremely high spatial and temporal resolution can be achieved in very short measuring times by using iPAT with GRAPPA.

Excellent soft tissue differentiation, customized protocols (e.g. with fat saturation or water excitation or silicone excitation), as well as flexible multiplanar visualization allow for fast, simple and reproducible evaluation of MR breast examinations.

This package includes:

- Quantitative evaluation and fast analysis of the data with colorized Wash-in, Wash-out, Time-To-Peak, Positive-Enhancement-Integral, MIPTIME and combination maps with Inline technology or for offline calculation

## Description

- High-resolution 2D protocols for morphology evaluation
- High-resolution 3D protocols covering both breasts simultaneously
- Protocols to support interventions (fine needle and vacuum biopsies, wire localization)
- Protocols for evaluating breasts with silicone implants
- Automatic and manual frequency adjustment, taking into account the silicone signal
- Detection of the silicone signal either to suppress the silicone signal, if the surrounding tissue is to be evaluated, or to suppress the tissue signal in order to detect an implant leakage
- SPAIR - robust fat sat (robust fat suppression using an adiabatic frequency selective inversion pulse)
- DIXON - 2-point Dixon with 3D VIBE, the following contrasts can be obtained: in-phase, opposed phase, fat and water image.
- iPAT with GRAPPA for maximum resolution in short time
- Inline subtraction and MIP display
- Offline subtraction, MPR and MIP display
- *syngo* REVEAL: diffusion imaging for breast exams
- iPAT Extension allows bilateral 3D sagittal breast imaging with Fat Sat or Water excitation

The Breast Suite also includes:

### ***syngo* VIEWS (Volume Imaging with Enhanced Water Signal)**

- bilateral - both breasts are examined simultaneously
- axial - the milk ducts are directly displayed
- fat-saturated or water-excited - fat complicates clinical evaluation and is suppressed
- near-isotropic 3D measurement - the same voxel size in all three directions for reconstruction in any slice direction
- submillimeter voxel - highest resolution for precise evaluation

### **Body Suite**

Body Suite covers your needs for clinical body applications. Ultrafast high resolution 2D and 3D protocols are provided for abdomen, pelvis, MR Colonography, MRCP, dynamic kidney, and MR Urography applications. Siemens unique 2D PACE technique makes body imaging easy allowing for multi-breath hold examinations as well as free breathing during the scans. Motion artifacts are greatly reduced with 2D PACE Inline technology.

This package includes:

- Free breathing 2D PACE applications with 2D/3D HASTE (RESTORE) and 2D/3D TSE (RESTORE)
- Optimized fast single shot HASTE protocols and high-resolution 3D RESTORE protocols based on SPACE and TSE for MRCP and MR Urography examinations

### **ABDOMEN:**

2D:

- T1w (FLASH) breath-hold scans +/- Fat Sat (SPAIR, Q-FatSat, in-/opp-phase)
- T2w (HASTE, TSE/BLADE, EPI ) breath-hold scans +/- Fat Sat (SPAIR, FatSat, STIR)
- T1w (TFL) triggered scans (2D PACE free breathing) in-/opp-phase
- T2w (HASTE, TSE/BLADE, EPI) triggered scans (2D PACE free breathing) +/- Fat Sat (SPAIR, FatSat, STIR) as well as HASTE- and TSE-multi-echo
- Optimized fast single shot HASTE protocols and high-resolution 3D RESTORE protocols based on SPACE and TSE for MRCP and MR urography examinations

3D:

- Dixon (VIBE 2pt-Dixon) breath-hold scans, following contrasts can be obtained: in-phase, opposed phase, fat and water image.
- Dynamic (VIBE + Q-FatSat) protocols for best visualization of focal lesions with high spatial and temporal resolution
- Colonography bright lumen with T2-weighted TrueFISP and dark lumen with T1-weighted VIBE

### **PELVIS:**

- High-resolution T1w, T2w pelvic imaging (prostate, cervix)
- Isotropic T2w SPACE 3D protocols for tumor search in the pelvis
- Dynamic volume examinations with 3D VIBE
- *syngo* REVEAL: diffusion imaging for liver and whole body exams

## Description

### Onco Suite

MR imaging has an excellent advantage of soft tissue contrast, multi-planar capabilities and the possibility of selectively suppressing specific tissue e.g. fat or water. This helps visualize 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 indications, such as in hepatic neoplasms.

This package includes:

- STIR TSE and HASTE, FLASH in-phase and opposed-phase protocols with a high sensitivity to metastases visualization
- 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, MIPtime 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.
- *syngo* REVEAL: diffusion imaging for liver and whole body exams

Dedicated prostate protocols for detection, localization, and staging of tumors and recurrences

- *syngo* REVEAL (diffusion-weighted imaging)
- Protocols with high temporal resolution allow time course evaluation based on pharmacokinetic modeling

### OrthoSuite

Ortho Suite is a comprehensive collection of protocols for joint and spine imaging. MR imaging is especially suitable for avascular necrosis and internal derangements. The protocols included in this Suite can also be applied for imaging of tumors and infections.

This package includes:

- 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 protocol 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
- PD SPACE with fat saturation and T2 SPACE with high isotropic resolution optimized for 3D post-processing
- Whole spine single-step or multi-step protocols
- Excellent fat suppression in off-center positions, e.g. in the shoulder due to high magnet homogeneity
- Dynamic TMJ and ilio-sacral joint protocol
- Susceptibility-insensitive protocols for imaging in the presence of a prosthesis
- Multi-Echo SE sequence with up to 32 echoes for the calculation of T2 time maps (calculation included in the Scientific Suite)
- High resolution 3D DESS (Double Echo Steady State): T2 / T1-weighted imaging for excellent fluid-cartilage differentiation

### Pediatric Suite

The parameters for pediatric imaging vary significantly in comparison to the parameters for adults. The reasons are developing tissues, body size, faster heart rates and restricted compliance with breath-hold commands. Protocols can be adapted for imaging infants.

### Scientific Suite

Scientific Suite supports the scientifically oriented user with an easy access to application-specific data for further processing and advanced image computation methods.

- Support of USB memory sticks
- Access to the file system by means of a secure and convenient browser
- Anonymization of patient data
- Easy generation of AVIs and screenshots for integration into presentations and training videos
- Export function for tables, statistics and signal-time-courses in a communal format (MeanCurve, Spectroscopy, DTI evaluation)



## Description

- Advanced image computation methods such as T2 and T1 time calculation, addition, subtraction, multiplication, division, and integration of images

The sequences, features and techniques for acquisition and reconstruction included in the Tim Application Suite are described in detail below.

### 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
- SPACE for 3D imaging with high isotropic resolution with T1, T2, PD, and DarkFluid Contrast

Gradient Echo family of sequences:

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

Standard Fat/Water Imaging

- Fat and Water Saturation. Additional frequency selective RF pulses used to suppress bright signal from fatty tissue. Two selectable modes: weak, strong
- Quick FatSat
- SPAIR: robust fat suppression for body imaging using a frequency selective inversion pulse
- Fat / Water Excitation. Spectral selective RF pulses for exclusive fat / water excitation
- Dixon technique for fat and water separation - based on VIBE (2 point Dixon)

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
- Argus viewer for reviewing cine studies•
- Report Viewer for DICOM structured reports including report editing

## Description

- 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 for hand out to the patients or referrals
- Selectable centric elliptical phase reordering via the user interface
- Multiple Direction Diffusion Weighting (MDDW) - perform diffusion tensor imaging with multiple diffusion weightings and up to 12 directions for generating data sets.
- Inversion Recovery to nullify the signal of fat, fluid or any other tissue

### Standard techniques for Flow Artifact reductions

- LOTA (LongTerm Data Averaging) technique to reduce motion and flow artifacts
- Pre-saturation techniques using RF saturation pulses to suppress flow and motion artifacts
- Tracking SAT bands maintain constant saturation of venous and/or arterial blood flow e.g. for 2D/3D sequential MRA
- TONE (Tilted Optimized Non-saturating Excitation - variable excitation flip angle to compensate inflow saturation effects in 3D MRA - selectable on desired flow direction and speed
- Gradient Motion rephasing permitting effective reduction of flow artifacts

### Standard Motion Correction

- *syngo* Blade - improves image quality by minimizing and correcting for the effects of motion during an MR sequence acquisition. e.g. head, spine, orthopedic imaging and the abdomen
- 1D PACE (Prospective Acquisition Correction) allows examination of patients with free breathing
- 2D PACE (Precise Motion Correction) detects and corrects respiratory motion eg of the heart or liver

MAGNETOM Aera runs *syngo* MR software. *syngo*® is the unique software platform for medical applications. Parallel working and one-click exams are efficiently supported and increase productivity. Parallel scanning and reconstruction are standard.

The unique Phoenix technique is the easiest way to exchange protocol data. It supports intelligent extraction of sequence parameters from images acquired on a MAGNETOM Aera system.

Inline technologies, scan@center or AutoVoiceCommands speed up the workflow further.

The context-sensitive "Online Help" function and *syngo* Scan Assistant offer support and propose solutions to MR-specific questions and parameter conflicts.

Studies can be easily networked and managed using the standard DICOM 3.0 protocol for efficient support of workflow. The following standard functions are supported: Send/Receive, Query/Retrieve, and Basic Print for DICOM-compatible laser cameras (camera is not included in the basic unit), DICOM Worklist, DICOM Storage Commitment (SC) DICOM Modality Perform Procedure Step (MPPS), DICOM Structured Report (SR), DICOM Study Split.

### Patient Communication

- The intercom system includes an ergonomically designed patient communication unit for desktop positioning on the *syngo* Acquisition Workplace and pneumatic headphones for the patient.
- Active Noise Cancellation allows for increased user comfort in the control room combined with comprehensive patient supervision.
- It controls emergency table stop, volume control of speaker and headphones in the examination room, volume control of speaker in the control room, response to the patient's activation of the assistance-call button and provides a connection to an external audio system (external audio system is not included in the basic unit) for music playback.

### Computer system

The high performance host computer and the new high performance measurement and reconstruction system are ideally suited for even the most demanding applications. The PC-based computer system uses the intuitive *syngo* MR user interface. The computer system includes the following components:

High-performance measurement and reconstruction system

## Description

- Two Intel Quadcore Processor  $\geq$  E 5540
- clock rate of  $\geq 2 \times 2.53$  GHz
- Main memory (RAM) of 48 GB,
- Hard disk for raw data  $\geq 300$  GB
- Hard disk for system software  $\geq 100$  GB
- Parallel Scanning and Reconstruction of up to 8 data sets
- Reconstruction speed
  - 12.195 recons per second (256 x 256 FFT, full FoV)
  - 37.914 recons per second (256 x 256 FFT, 25 % recFoV)

### High-performance host computer

- Intel Xeon processor  $\geq$  W3520 QuadCore
- clock rate  $\geq 2.66$  GHz
- Main Memory (RAM)  $\geq 4$  GB
- three hard disks
  - system SW  $\geq 146$  GB SAS
  - data base  $\geq 146$  GB SAS
  - images  $\geq 146$  GB SAS
- DVD-R writer for CD-R (approx. 4000 images 256<sup>2</sup> DICOM Standard, ISO 9660 ) and DVD-R (approx. 25 000 images 256<sup>2</sup> DICOM Standard, ISO 9660) storage of DICOM data or other data like AVI files
  - DVD-ROM drive
  - Electronic mouse.
- The combination of host computer and the measurement and reconstruction system offers a truly powerful imaging system designed for large image matrix sizes of up to 1024 x 1024. The unrestricted multitasking capability allows time-saving parallel scanning and reconstruction.
- High-resolution 19" color LCD flat screen monitor with 1280 x 1024 pixel display, integrated gamma correction for optimum display of radiographic grayscale images and automatic backlight control for long term brightness stability.

### Installation:

- The relatively lightweight design of the MAGNETOM Aera in most cases eliminates the need for structural building reinforcements and thus facilitates installation in upper floors.
- The compact integrated design allows for short installation times and reduces the required space to less than 30 sqm (323 sq. ft.) for the entire installation. The minimum room height clearance is only 2.40 m (7' 10").
- MAGNETOM Aera allows siting of the system without a dedicated computer room - no additional cooling or floor requirements.
- MAGNETOM Aera combines state-of-the-art performance with peace of mind. High system availability is ensured by the expert, highly trained Siemens MR service engineers;
- Your Siemens service contract (not included in the basic unit) offers a comprehensive range of benefits such as Uptime Remote Diagnostics for improved productivity and maximum uptime.

### Tim [204x48] performance level

Tim 4G offers DirectRF a completely redesigned RF architecture. This new all digital-in/ digital-out design integrates all RF transmit and receive components at the magnet, eliminating analog cables for true signal purity. This compact and efficient design enables a dynamic feedback control for temporal stability and power linearity. The all-new innovative coil architecture packs more coil elements in a smaller space. Therefore up to 204 coil elements can be simultaneously connected. The newly designed ultra high density array is an essential part supplementing Tim4G. Combined with the 48 independent RF channels advanced iPAT capabilities and SNR are enabled.

An additional benefit of multiple coil elements and receiver channels is improved performance in multi-directional, i.e. three dimensional, high-speed, high-resolution iPAT in the head-feet, anterior-posterior or left-right directions.

This option includes also Advanced High Order Shim.

### XQ gradients

## Description

Siemens XQ gradients provide actively shielded, water cooled world-class gradients. All axes are force-compensated.

The XQ gradients have:

- Maximum gradient amplitude of 45 mT/m, per axis, i.e. 78 mT/m vector summation gradient performance,
- max. slew rate 200 T/m/s per axis, i.e. 346 T/m/s vector summation,
- minimal rise time 225  $\mu$ s, from 0 to 45 mT/m amplitude
- Max. output voltage for each of the gradient axes 2250 V
- Max. output current for each of the gradient axes 900 A
- Separate cooling channels that simultaneously cool primary and secondary coils allow the application of extremely gradient intensive techniques in a new class of performance.
- 100% duty cycle for fast and demanding techniques such as ultra-short TE MRA in continuous operation, thin slice single breath-hold liver studies and EPI imaging techniques (all optional in appropriate clinical packages).
- Variable Field-of-View selection from 0.5 cm to 50 cm (up to 45 cm in z direction) for optimal coverage and highest spatial resolution in diagnostic. The minimum slice thickness in 2D and 3D is 0.1 mm and 0.05 mm, respectively.
- Acquisition of sagittal, transverse, coronal, single oblique and double oblique slices with highest resolution.
- The extremely compact water-cooled gradient amplifier features a modular expandable design with excellent linearity and pulse reproducibility. It is digitally controlled and has very low switching losses due to ultrafast solid state technology.

The keys of the numerical key panel are assigned to syngo-specific functions and labeled with the corresponding syngo icons. The keyboard supports the country specific special characters.

The unique color and material selection enhances the visual appeal of the new system design, thereby creating an enticing, patient-friendly impression.

The Dot Control Centers and the unique Dot Display are neatly integrated into this main face plate. The aesthetically pleasing and ergonomically designed control elements of the Dot Control Centers are well illuminated for easy visual recognition.

In particular, the table cover and the asymmetric left deco area cover have also been designed to promote a modern visual appearance. This combination of ingenuity and practical design as presented with "Pure White" design with its brilliant white and the silver trim simply makes the MAGNETOM an overall visually appealing system and creates a patient-friendly environment.

The Tim Dockable Table with its light appealing design allows for a fast patient preparation and maximized patient comfort.

It provides unobstructed foot space for attending staff and direct access to the patient. The patient table can be lowered to a minimum height of 56 cm (18.5") from the floor, for easier moving of immobile patients and better access for geriatric, pediatric patients or immobile patients. The Tim Dockable Table can be moved with two clicks into the isocenter - one click to the upmost position and one click into the isocenter. The tabletop travels beyond the rear end of the system, enabling additional patient access.

Multiple Tim4G coils can be connected at once for efficient patient set up and patient friendly examinations. The seamless integration of multiple Tim 4G coils is possible via 4 SlideConnect and 4 DirectConnect connector slots, which are embedded in the table. This allows for comprehensive examinations without the need of repositioning.

The Tim Dockable Table is easily adjustable for height even in the undocked state. A minimum height of 61 cm allows for easy wheelchair access or easy patient movement to the hospital bed.

The integrated infusion stand and arm rests allow for fast patient set up anywhere and also for critical patients

This option enables the preparation of the next patient on the Tim Dockable Table outside the examination room, while the current patient is being scanned. A Spine 32 coil is included with the additional Tim Dockable Table option.

<p><b>Description</b></p> <p>The Inline Composing option includes the following functions:</p> <ul style="list-style-type: none"> <li>- Inline calculation of full-format images of the spine, the central nervous system or the vessel tree, for example, combined from multiple overlapping steps.</li> <li>- Dedicated composing algorithms, optimized for the generation of anatomical or angiographic full-format images.</li> <li>- Data sets with different FoV, resolution, matrix and slice thickness can be combined.</li> <li>- Generation of full-format images from inline-computed MIPs.</li> <li>- Different inline functions can be combined; e.g. in case of multiple-step angios, Inline subtraction, Inline MIP and Inline Composing can be performed fully automatically.</li> <li>- Full-format acquisitions from Inline Composing are ideal for further measurement planning on large FoV, e.g. with the Tim Planning Suite (optional, urgently recommended).</li> </ul> <p><i>Prerequisite: Software syngo MR B13.</i></p>
<ul style="list-style-type: none"> <li>- Easy planning on a FoV of any desired size (up to 205 cm).</li> <li>- Planning of multiple steps simultaneously, e.g. on a whole-body image, with only one Set-n-Go protocol - which includes several steps.</li> <li>- Tim Planning Suite UI: Dedicated user interface and exclusive tools for effective and smooth working on a large FoV.</li> <li>- Multiple slice groups with their overlap are displayed together and can be easily arranged.</li> <li>- All steps can have independent sets of parameters.</li> <li>- All steps are displayed together with a single mouse click.</li> <li>- Easy positioning of all steps, for example, through Align FoV.</li> <li>- Full support of .</li> <li>- Full support of Phoenix, thus maximum reproducibility, for example, for follow-up studies, multi-centric studies or exchange of experiences across different institutions.</li> <li>- Dedicated protocols are provided for the Tim Planning Suite, for example, for orthopedic, oncological or angiographic indications.</li> <li>- Inline Composing for optimized workflow for the generation of full-format images of anatomic or angiographic data sets is a prerequisite. Efficient measurement planning on these full-format images with Tim Planning Suite.</li> <li>- It is highly recommendable to order application training!</li> </ul> <p><i>Prerequisite: Software syngo MR B13</i></p>
<p>syngo NATIVE offers:</p> <ul style="list-style-type: none"> <li>- Non-contrast enhanced MRA</li> <li>- Separate imaging of arteries and veins</li> <li>- Visualization of - e.g. - renal arteries or peripheral vessels</li> </ul> <p>The syngo NATIVE package comprises:</p> <ul style="list-style-type: none"> <li>- syngo NATIVE TrueFISP</li> <li>- syngo NATIVE SPACE</li> <li>-</li> </ul>
<p><b>Visualization features:</b></p> <ul style="list-style-type: none"> <li>- 4D visualization (3D and over time)</li> <li>- Color display of parametric cards (Ktrans, Kep, Ve, Vp, iAUC)</li> <li>- Additional visualization of 2D or 3D morphological dataset</li> </ul> <p><b>Post-processing features:</b></p> <ul style="list-style-type: none"> <li>- Elastic 3D motion correction</li> <li>- Fully automatic calculation of subtracted images</li> </ul> <p><b>Standard curve evaluation:</b></p> <ul style="list-style-type: none"> <li>- Calculation and display of enrichment curves</li> </ul> <p><b>Pharmacokinetic model:</b></p> <ul style="list-style-type: none"> <li>- Pharmacokinetic calculation on a pixel-by-pixel basis using a 2-compartment model</li> <li>- Calculation is based on the Toft model. Various model functions are available.</li> <li>- Manual segmentation and calculation on the result images.</li> </ul>

Description
<p>The following result images can be saved as DICOM images:</p> <ol style="list-style-type: none"> <li>1. 3D motion-corrected, dynamic images</li> <li>2. Colored images</li> <li>3. Possibility for exporting results in the relevant layout format.</li> </ol>
<p>The 2-channel Sentinelle Endo-Rectal Coil is well suited for performing imaging and spectroscopy of the prostate. The reusable coil consists of a 2-channel array design and ensures brilliant image quality for high-resolution 2D and 3D MR imaging, excellent coverage and image homogeneity. For reducing scan time parallel imaging (iPAT) is supported. The coil can be used for either head-first or feet-first scanning and can be disinfected. For optimal imaging results the Sentinelle Endo-Rectal Coil should be operated in conjunction with a Body Matrix Coil or a 4-channel Flex Coil, large.</p> <p>As part of the imaging procedure for using the Endo-Rectal Coil, you will need products from other third-party companies: covers for the transducer and stabilization arm (supplier recommendations may be provided upon request).</p> <p>The patient support is optimized to provide maximum access for medical personnel to the patient perineal area and medial line while maintaining patient comfort.</p> <p>The stabilization arm on the patient support holds the Endo-Rectal Coil in place and prevents it from moving during scanning.</p> <p>The Sentinelle Endo-Rectal Coil is available for MAGNETOM Avanto.</p>
<p>Flow Quantification enables the acquisition of flow encoded images and the evaluation of blood as well as of cerebro-spinal fluid (CSF).</p> <p>Sequences include:</p> <ul style="list-style-type: none"> <li>- ECG triggered 2D phase contrast with iPAT support</li> <li>- Retrospective reconstruction algorithms for full R-R interval coverage</li> <li>- Maxwell Term Compensation</li> </ul>
<p>The combination of automated contouring and easy-to-use editing tools, provides users with a rapid way to quantify flow parameters.</p> <p>Argus Flow includes:</p> <ul style="list-style-type: none"> <li>- Calculation of flow and velocity parameters( e.g. mean and max velocity, mean, cumulative, prograde, retrograde flow) for large and small vessels.</li> <li>- Semi-automatic detection of regions of interest over time</li> <li>- Color-coded display of velocity values</li> <li>- Calculation of flow and velocity parameters (e.g. peak velocity, average velocity, flow, integral flow)</li> <li>- Graphical and tabular display of the results (e.g. flow-time curves)</li> <li>- Integration of the results in Argus structured report and storage in DICOM format for documentation.</li> </ul>
<p>Combining the unique advantages of Tim and <i>syngo</i> BEAT with iPAT and powerful gradients, it allows performing cardiac MR examinations without compromise in image resolution or acquisition speed.</p> <p><i>syngo</i> BEAT is a unique tool for fast and easy cardiovascular MR imaging. It provides 1-click switch from cine imaging to tagging for wall motion evaluation and 1-click switch from 2D to 3D imaging. <i>syngo</i> BEAT automatically adjusts all parameters associated with the changes.</p> <p><b>Cardiac and Vessel Morphology</b></p> <ul style="list-style-type: none"> <li>- Multi echo technique for e.g. thalassemia assessment</li> </ul>

<p><b>Description</b></p> <ul style="list-style-type: none"> <li>- 3D aortopathy imaging with free breathing (SPACE)</li> </ul> <p><b>Global or Regional Wall Motion Analysis with syngo BEAT</b></p> <ul style="list-style-type: none"> <li>- 3D cine acquisition for full CT-like heart coverage</li> <li>- 2D segmented FLASH for visualization of the regional wall motion using various tagging techniques (grid or stripes)</li> </ul> <p><b>Dynamic myocardial imaging with syngo BEAT</b></p> <ul style="list-style-type: none"> <li>- Ultra-fast, high-SNR sequence for dynamic imaging with GRE EPI contrast for stress and rest exams</li> </ul> <p><b>Tissue characterization with syngo BEAT</b></p> <ul style="list-style-type: none"> <li>- Robust myocardial tissue characterization with 3D PSIR (phase-sensitive inversion recovery), e.g. after myocardial infarction or for differentiation of cardiomyopathies</li> <li>- Fast and complete coverage of the myocardium with IR 3D FLASH and TrueFISP</li> </ul> <p><b>Coronary imaging with syngo BEAT</b></p> <ul style="list-style-type: none"> <li>- 3D Whole-Heart non-contrast Coronary MRA</li> <li>- 3D Whole-Heart MRA with advanced free-breathing navigator compensating diaphragm shifts during the acquisition (motion-adaptive respiratory gating)</li> </ul>
<p>This package includes Argus Function as well as Argus 4D Ventricular Function.</p> <p>Argus Function:</p> <ul style="list-style-type: none"> <li>- Automatic, semi-automatic, or manual segmentation of the left and semi-automatic or manual segmentation of the right ventricle.</li> <li>- Volumetric analysis and wall thickness analysis.</li> <li>- Output of parametric results, volume-time curves and bull's-eye plots.</li> <li>- DICOM Structured Reporting.</li> </ul> <p>Argus 4D Ventricular Function:</p> <ul style="list-style-type: none"> <li>- Calculation of volumetric cardiac data of a given patient very quickly and easily.</li> <li>- Parametric results and volume-time curves are calculated upon automatic creation and adaptation of a 4D model of the left ventricle.</li> <li>- The resulting 4D model of the patient's heart can be visualized superimposed to anatomical images as a reference.</li> </ul>
<p><i>Dot Exam Strategies</i></p> <p>The workflow can be personalized to the individual patient condition and clinical need. The Large Joint Dot Engine comes with the following predefined strategies, which the user can select according to patient conditions or change at any time during the workflow, when conditions change:</p> <ul style="list-style-type: none"> <li>- Image quality: Achieve high image quality in a reasonable scan time with 2D and 3D protocols.</li> <li>- Speed focus: Examine patients in a short time frame with protocols being accelerated to the maximal extent.</li> <li>- Motion artifact reduction: Compensate for the effects of motion, e.g. with motion insensitive <i>syngo</i> BLADE protocols.</li> <li>- Artifacts reduction: Reduce susceptibility artifacts, using <i>syngo</i> WARP.</li> </ul> <p><i>AutoAlign</i></p> <ul style="list-style-type: none"> <li>- Automated, localizer based positioning and alignment of slice groups to the anatomy, relying on anatomical landmarks. Providing fast, easy, and reproducible patient scanning and supporting the reading by consistently delivering high image quality with a standardized slice orientation.</li> </ul> <p><i>Inline MPRs - Automatic multiplanar reconstruction for 3D datasets</i></p> <ul style="list-style-type: none"> <li>- The Multi Planar Reconstruction (MPR) tool uses the position information from the AutoAlign algorithm and can be easily configured to automatically generate required 2D images from high resolution 3D acquisitions.</li> </ul> <p><i>syngo WARP Susceptibility Artifact Reduction</i></p> <ul style="list-style-type: none"> <li>- 2D TSE sequences with high bandwidth protocols tailored to reduce susceptibility artifacts. Available</li> </ul>

## Description

protocols include T1-weighted, T2-weighted, proton density and STIR contrast.

### *Guidance View*

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

### *Customization*

The Large Joint Dot Engine can be modified by the user to their individual standard of care.

- Add/remove protocol steps
- Change guidance content (images and text)
- Change or add Dot exam strategies
- Add clinical decision points
- Add/remove parameters in the parameter viewing card

### **Inline Technology – Processing Instead of Post-processing.**

Inline Technology helps to streamline the clinical workflow by automating post-processing steps before image viewing. This facilitates getting clinical results immediately. This package integrates Inline technology with perfusion imaging. Automatic real-time calculation of Global Bolus Plot (GBP), Percentage of Baseline at map (PBP) and Time-to-Peak map (TTP) with Inline technology is possible.

An optimized EPI sequence for perfusion-diagnostics is included in the standard Tim Application Suite. With this package real-time calculations are done of anatomical images and, in addition, of a global bolus plot and a Time-to-Peak map for visualizing the time dependence of tissue perfusion.

### **Post-processing features:**

- Flexible selection of the Arterial Input Function (AIF) by the user.
- Pixelwise calculation of the hemodynamic parameters relative Mean Transit Time (relMTT), relative Cerebral Blood Volume (relCBV), relative Cerebral Blood Flow (relCBF), corrected relative Cerebral and Blood Flow (relCBF) for compensation of blood brain barrier leakage.
- Pixelwise calculation of maximum signal loss due to contrast agent enhancement (Percentage of Baseline at Peak, PBP) and of the time to the maximum signal loss (Time-To-Peak, TTP).
- Display of the global signal time course (averaged over all slices) to assess the quality of the exam.
- Predefined post-processing protocols available, user definable post-processing protocol are possible.

### **Visualization features:**

- Colored display of relMTT-, relCBV-, relCBF-, relCBFcor, PBP- and TTP-maps.
- Zoom, pan, annotate.
- Colored images can be saved as DICOM images.

### **Inline BOLD Imaging**

The BOLD imaging package allows the user to define protocols which, apart from the measurement, configure automatic evaluation of the measured data during the scan. With Inline Technology it is thus possible to generate statistical images (t-value) based on 3D motion corrected and spatially filtered data automatically in real time without any further user interaction. The Inline display of activation cards allows the user to decide during the scan whether enough statistical power has built up for his brain mapping task or if the examination is corrupted by motion. As a result examinations will be shorter with a higher success rate. Functional brain mapping can be easily integrated into the clinical routine e.g. prior to neurosurgical interventions.

### **Additional Features:**

- Inline retrospective 3D motion detection and correction in 3 rotational and 3 translational directions
- Inline t-statistics calculation for variable paradigms and display of t-value images
- Statistical evaluation by means of "General Linear Model (GLM)":
- Paradigms can be configured
- Transitions between passive and active states can be modelled by the hemodynamic response function



## Description

- Correction of low-frequency trends
- Allows for time delays due to the BOLD-EPI slice order during a measurement
- Display of GLM design matrix
- Display of a continuously updated t-value card during measurement
- Display of colored activation cards continuously updated during measurement, overlaid over the respective BOLD images using Inline technology
- MOSAIC image mode for accelerating display, processing and storage of images

### 3D PACE *syngo*

By tracking the patients head 3D PACE reduces motion resulting in increased data quality beyond what can be achieved with a retrospective motion correction. As a result the sensitivity and specificity of BOLD experiments are increased.

Features:

- Real time prospective motion correction: Highest accuracy real time motion detection algorithm feeding a real time feed back loop to the acquisition system with updated positioning information
- 3D motion correction for 6 degrees of freedom (3 translation and 3 rotation)
- Motion related artifacts are avoided in first place instead of correcting for them retrospectively
- Significant reduction of motion-related artifacts in statistical evaluations
- Increased sensitivity and specificity of BOLD experiments

### BOLD 3D Evaluation *syngo*

All tasks from statistical evaluation of the fMRI datasets to reading and exporting results are supported by BOLD 3D Evaluation *syngo*:

Generation of statistical maps:

- In cases an inline calculated statistical map is not available a statistical map can be generated easily using processing protocols. An intuitive editor UI allows the paradigm definition and offers the selection of head motion correction, image filters and statistical evaluation.
- Predefined processing protocols and paradigms are available, which can be edited if required.

Statistical evaluation using General Linear Model (GLM)

- Transitions between passive and active states modeled by the hemodynamic response function.
- Correction of low-frequency trends.
- Corrects for time delays due to the BOLD-EPI slice order during a measurement.
- Output of a t-value map and the GLM design matrix

Inline monitoring of the fMRI exam

- During an ongoing BOLD imaging exam results are calculated (by Inline BOLD imaging) and displayed in real time.
- The results are displayed and continuously updated as an overlay on online adjustable, free angulated cut planes through the anatomical 3D data set.
- The evolving signal time courses in task-related areas of activation can be displayed and monitored.

Visualization of fMRI Results

- Visualization with 3D volume rendering.
- Superimposing on cut planes through the volume.
- Interactive Navigation: Zoom, pan and rotate in 3D without noticeable delay. Free double oblique angulation of up to 6 cut planes.
- Cine display of the BOLD time series and of EPI volumes in 3 orthogonal cuts for evaluation of non-corrected head motion.

Data Quality Monitoring

- Based on the B0 field map, loaded automatically with the fMRI data, areas with less reliable results are indicated.

### fMRI Trigger Converter

An optical trigger signal is available to trigger external stimulation devices in fMRI experiments.

## Description

With the "fMRI Trigger Converter" this signal can be converted to an electrical signal (TTL/BNC and RS 232 interface for PC; modes: toggle or impulse).

### Diffusion Tensor Imaging

Diffusion Tensor Imaging allows for a complete description of the diffusion properties of the brain within the scope of the tensor diffusion model, both for anisotropic and isotropic diffusion. Efficient diffusion direction schemes are pre-defined to allow for optimal diffusion directional resolution. Schemes with up to 256 directions can be selected. Inline technology enables automatic and immediate calculation of the diffusion tensor, including grey-scale and colored "fractional anisotropy" (FA) map derived from it.

Details:

- Measurements with up to 256 different directions and with up to 16 different b-values
- Inline calculation of tensor, grey-scale and colored FA map, ADC map and trace-weighted image
- Support of parallel imaging (iPAT)
- Clinical protocols with full head coverage, incl. inline calculation of tensor, FA, ADC and trace-weighted images in 4 minutes.

### DTI Tractography *syngo*

*syngo* DTI Tractography is optimized for the clinical use by providing advanced 3D visualization of white matter tracts in the context of 2D or 3D anatomical datasets and DTI datasets. DTI data sets can be explored fast and intuitively using the interactive QuickTracking. QuickTracking instantaneously displays the tract originating from the mouse pointer position while moving over the DTI data set. This also allows identifying qualified regions to place seeding ROIs. Seed points can be set to assess connectivity by tracking with single ROI and with multiple ROIs. Furthermore they can be placed in fused views displaying the anatomical reference and e.g. the colored FA map simultaneously.

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.

At the same time the package provides the scientific user with the flexibility to configure the tracking algorithm and to change display settings for the tracts. Tract and seeding ROI statistics are included to support publications (e.g. mean/max FA value, min/mean/max ADC value).

All views can be exported as DICOM images or bitmaps. Tract and seeding ROI statistics can be exported as html files.

### DTI Evaluation

Clinical applications are supported by a dedicated DTI evaluation mode to support diagnostics of white matter diseases (e.g. multiple sclerosis and brain maturation disorders). Based on the tensor, in addition to the already inline-calculated parameter maps, further maps characterizing the anisotropy of diffusion properties can be calculated and stored. Multiple diffusion parameter maps (e.g. Fractional Anisotropy, ADC,  $b=0$ ) and an anatomical image are displayed next to each other in the same slice position for comparison. The images can be evaluated together based on ROIs and the results can be documented in a table. The display options include 2D and 3D tensor graphics, colour-coded images and overlay images on the anatomical images.

In addition, the package offers the scientific user full flexibility of 2- and 3-dimensional visualization of the diffusion tensor with measures of isotropic and anisotropic (fractional and relative) diffusion, Eigen vectors (E1, E2, E3) of the diffusion tensor and shape-descriptive measures of the diffusion tensor (linear, planar, spherical).

RESOLVE is a diffusion-weighted, readout-segmented EPI sequence optimized towards high resolution imaging with reduced distortions.

The sequence uses a very short echo-spacing compared to singleshot EPI, substantially reducing susceptibility effects. A 2Dnavigator correction is applied to avoid artefacts artifacts due to motioninduced phase errors. This combination allows diffusion weighted imaging of the breast, prostate, brain and spinewhole body with a high level of detail and spatial precision.

Additionally, an automatic reacquisition of data with large phase errors can be used to ensure that diffusion-weighted images of the brain are not affected by CSF pulsation.

*S-Text o For neuro applications where high-resolution diffusion is required. Is the basis of distortion insensitive high-resolution DTI, e.g. in spine. Especially beneficial for 3T systems.*

## Description

Despite a strong sensitivity for local magnetic field inhomogeneities Susceptibility Weighted Imaging (SWI) as a 3D technology keeps up the signal near large susceptibility leaps due to very thin slices and high resolution in the slice (high image quality e.g. in the area of the forebrain near the frontal sinus).

Moreover, the phase information of the MR signal is integrated in the image display. In order to further increase sensitivity for localized microscopic magnetic field inhomogeneities, large-area magnetic field inhomogeneities (e.g. caused by susceptibility leaps near the sinus) are specifically suppressed in the phase images.

This allows even small amounts of deoxygenated hemoglobin (e.g. in cerebral veins) or from products of hemoglobin decomposition (e.g. from hemorrhages) to be displayed.

Interesting measuring times for the ultra-high-resolution 3D protocols are achieved through parallel imaging with iPAT (GRAPPA).

The Susceptibility Weighted Imaging package includes:

- SWI measuring sequence, iPAT compatible
- optimized measuring protocols for the head
- inline-postprocessing for automatic calculation of relevant images within the scope of image reconstruction:
  - calculation of susceptibility-weighted images
  - venous angiography: MIP of a thin slice block

SWI has been optimized for clinical use to support diagnostics with cerebrovascular diseases (e.g. cerebral insult), venous malformation, brain trauma and tumors.

*Prerequisite: Software syngo MR B13*

The Single Voxel Spectroscopy option is used to measure proton spectra from single voxels. The spectra may show alterations in brain metabolism e.g. in brain tumors, in degenerative changes of the brain and in metabolic diseases. The possibility of automatic adjustment, measurement and evaluation permits near automatic spectroscopy measurements. The whole procedure, including the evaluation of the spectra using the mandatory spectroscopy evaluation option, takes approx. 6 minutes and can be done by doctors or technologists.

The 2D Chemical Shift Imaging option is used to measure 2D proton spectroscopic data to generate metabolite images e.g. in brain tumors, metabolic diseases of the brain and degenerative changes in brain metabolism. The whole procedure, including the generation of metabolite images using the spectroscopy evaluation takes approximately 8 minutes.

The 3D Chemical Shift Imaging option is used to measure 3D proton spectroscopic data and allows for the evaluation of the spectra in measured volumes and the generation of metabolite images and spectral maps, e.g. in cases of brain tumors, metabolic diseases of the brain and degenerative changes in brain metabolism. The whole procedure, including the generation of metabolite images using the spectroscopy evaluation takes approximately 10-16 minutes

Optimized protocols for 3D CSI in the prostate are also included.

The evaluation software is fully integrated in *syngo MR*.

Evaluation protocols adapted to the scan protocols carry out a complete and automatic evaluation of the measured data.

The following functions are included:

- Subsequent water suppression with optional phase correction
- Apodization
- Zero filling
- Fourier transformation
- Base line correction
- Automatic or manual phase correction
- Curve fitting and peak labeling
- Summaries in tabular form of the essential results specifying the metabolites, their position, integrals and signal ratios in relation to a selectable reference.
- Capability of exporting spectroscopy header information and data into a documented external format.
- Automated peak normalization to tissue, water or reference.

For CSI the following functions are included:

- Spectra of selected voxels are automatically calculated, corrected for possible B0 deviations and displayed.

Description
<ul style="list-style-type: none"> <li>- Spectral fit is automatically optimized for each voxel.</li> <li>- CSI data can be represented as spectral maps and colored metabolite images that can be superposed onto anatomical images.</li> </ul>
<p><i>syngo</i> TWIST provides:</p> <ul style="list-style-type: none"> <li>- Visualization of contrast agent dynamics in the vessel system of interest with maximum flexibility.</li> <li>- Needs only a low amount of contrast agent.</li> <li>- Imaging in all body regions, e.g. carotids, pulmonary and peripheral vessels with brilliant spatial and temporal resolution.</li> <li>- Clear separation of the arterial and venous phase.</li> <li>- High speed acquisition by intelligent k-space strategies and use of iPAT, powered by Tim.</li> <li>- <i>syngo</i> TWIST provides fat suppression using water selective excitation.</li> <li>- Inline technologies, such as subtraction and MIP are provided for optimal workflow.</li> <li>- In case of very high spatial resolution <i>syngo</i> TWIST may even replace conventional static MR angio. Moreover, <i>syngo</i> TWIST does not require any bolus timing - just inject and go.</li> </ul>
<p>The 8-channel Sentinelle Breast Coil consists of 2 lateral 3-channel coil elements and a 2-channel coil middle element.</p> <p>The 4-channel Sentinelle Breast Coil consists of 2 lateral 1-channel coil elements and a 2-channel coil middle element.</p> <p>The 2-channel Sentinelle Breast Coil consists of a lateral 1-channel coil element and another lateral 1-channel coil element.</p> <p>The Sentinelle Breast Coil supports the GRID biopsy method.</p> <p>The 2-/4-/8-channel Sentinelle Breast Coil delivers brilliant image quality for high-resolution 2D and 3D MR breast imaging. Techniques for reducing scan times, such as parallel imaging, can be used very well.</p> <p>Together with the Tim Whole Body Suite, the coil can also be operated in “feet first” mode. This function substantially improves the examination flow with claustrophobic patients.</p> <p>For optimal patient positioning, a set of comfortable positioning cushions and aids, such as a height-adjustable head rest, is included in the scope of delivery.</p> <p>A set of GRID plates and a Biopsy Training Starter Kit are further included in delivery. (Not for use on humans)</p> <p>The 2-/4-/8-channel Sentinelle Breast Coil measures approx. 1097 x 582 x 279mm (L x W x H) and weights approx. 22kg with base plate and 16kg without base plate.</p>
<p>The Peripheral Angio 36 has a 36-element design with 36 integrated preamplifiers distributed over 6 planes with 6 elements each.</p> <p>A uniquely designed non-ferromagnetic coil cart for safe coil storage is included. The PA Matrix Coil is also shipped with a set of positioning cushions for proper handling.</p> <p>No tuning of the fully iPAT-compatible Peripheral Angio 36 is required.</p> <p>With a length of about 1m both legs are covered from the iliac artery level down to the foot arch vessels using multiple, flexible wings. For the visualization of the abdominal aorta and the iliac bifurcation it can be combined with the Body 18 and Spine 32. For larger body coverage eg whole body with up to 205 cm possible coverage, it can be combined with Head/Neck20 or a further Body18 to allow for large Field of View examinations with high patient comfort. Patient set up is done once and no repositioning is necessary</p> <p>For peripheral Angiography the PA Matrix coil will be typically used in feet-first position, but also head-first positioning for whole-body examinations is possible (optional Tim Whole Body Suite required).</p> <p>The dimensions of the Peripheral Angio 36 are: 860 mm x 300 - 640 mm x 280 mm</p>

Description
<p>The iPAT compatible Shoulder 16 Large and Shoulder 16 Small are ergonomically designed and adapted to the shape of the shoulder.</p> <p>The different sizes obtain maximum image quality for different body sizes:</p> <ul style="list-style-type: none"> <li>- 165 mm (6.5 in) diameter for small and medium sized shoulders</li> <li>- 200 mm (7.9 in) diameter for large shoulders</li> </ul> <p>The coils can be used either for left or right shoulders. It features sliding attachments to the base plate and can easily be adjusted for comfortable positioning. The coils excels in highest resolution imaging with exceptional signal/noise ratio.</p>
<p>The 16-element coil with 16 integrated pre-amplifiers excels in highest resolution imaging with exceptional signal/noise ratio, while taking full advantage of iPAT in all directions.</p> <p>Hand/Wrist 16 is ergonomically designed and adapted to the shape of the hand/wrist region. The coil features a hinged design of the upper part and slidable attachment to the base plate. Together with the included stabilization pads the coil allows easy, fast and comfortable patient positioning.</p>
<p>The 16-element coil with 16 integrated pre-amplifiers excels in highest resolution imaging with exceptional signal/noise ratio, while taking full advantage of iPAT in all directions.</p> <p>Foot/Ankle 16 is ergonomically designed and features a boot-like coil design. Together with the included stabilization pads the coil allows easy, fast and comfortable patient positioning.</p>
<p>Thanks to its 15-channel design this coil is perfectly suited for high-resolution images with excellent SNR. With the arrangement of the antennas in three rings of 5 elements each, the coil is specially designed for parallel imaging with high acceleration factors.</p> <p>The coil is positioned on a laterally movable support and therefore allows for comfortable patient positioning of both legs for off-center examinations. SlideConnect Technology allows for fast and easy patient preparation, resulting in less table time. Furthermore, the upper part can be removed for easier patient positioning. Additional cushions allow for optimum patient immobilization.</p> <p>The integrated transmission function makes volume-sensitive excitation with greatly reduced RF power possible on the one hand and, on the other, prevents aliasing artifacts (e.g. due to the other knee).</p>
<p>The Body 18 has a 18-element design with 18 integrated preamplifiers that are arranged in 3 clusters of 6 coil elements each. The Body 18 will be typically used together with the Spine 32 with which it operates in an integrated fashion as a 30-element coil, resulting in 3 rings of 10 elements each for highest SNR and fast imaging. It can be positioned in different orientations and addresses the requirement range for the examinations of obese patient to pediatric patients. The light weight coil improves patient comfort and can be easily connected via SlideConnect technology. No tuning of the fully iPAT-compatible Body 18 is necessary allowing for efficient and patient friendly set-up.</p> <p>For examinations where larger anatomical coverage is required, several Body 18 coils can be used simultaneously. Up to four Body 18 can be used simultaneously, but typically two Body 18 will be used for coverage of the entire abdomen or in the case of large patients.</p> <p>The Body 18 is typically used in combination with the Spine 32 for examinations of the thorax, abdomen, pelvis or hip and is also well suited for cardiac or vascular applications. In addition, the Body 18 can be combined with the Spine 32, further Body 18 (optional), the Peripheral Angio 36 (optional), but also the Head/Neck20 and the 4-channel flex coils (e.g. Flex Large 4, Flex Small 4) it contributes for all large-Field-of-View applications up to whole-body imaging.</p> <p>The dimensions of the Body 18 are 385 mm x 590 mm x 65 mm (L x W x H). Its weight is about 2 kg (4.5 lbs), whereas the patient feels as little weight as 1kg (2,25 lbs).</p>
<p>The table design matches the MED-wide uniform design with silver-finished rim, use of friendly colors matching the Siemens color pattern for MAGNETOM and SOMATOM.</p> <ul style="list-style-type: none"> <li>- Width 120 cm</li> <li>- Depth 80 cm</li> </ul>

Description
<ul style="list-style-type: none"> <li>- Height 72 cm</li> </ul>
<p>The table design matches the MED-wide uniform design with silver-finished rim, use of friendly colors matching the Siemens color pattern for MAGNETOM and SOMATOM.</p> <p>Table height 72 cm, matching the <i>syngo</i> Acquisition Workplace and <i>syngo</i> MR Workplace console table, for installation in the operator room either directly to the left or right of the <i>syngo</i> Acquisition Workplace or <i>syngo</i> MR Workplace console table or separately.</p> <ul style="list-style-type: none"> <li>- Width 50 cm</li> <li>- Depth 80 cm</li> <li>- Height 72 cm</li> </ul> <p>Alternatively this casing is also suited for the Recon image processor (except for the MR systems with the Tim generation: there the Recon image processor is always placed inside the electronics cabinet).</p>
<p>Special video camera for monitoring the patient during an MR examination.</p> <p>Color 640 x 480 pixel LCD monitor may be positioned at the <i>syngo</i> Acquisition Workplace or at a convenient wall location (wall support not included in scope of delivery) in the control room.</p>
<p>Power cable to connect the 3 KVA Powerware 9125 small UPS system (pn PWR9125H3000) to the ACC cabinet of the MAGNETOM Avanto/ Espree/ Tim Trio for backing up the host computer and imager.</p> <p>Configuration includes connection box.</p> <p>The standard cable length is 9 m.</p>
<p>Voltage range: 180 - 276 V  Input frequency: 50 / 60 Hz  Output voltage: 230 VAC  Dimensions (H x W x D): UPS 346 x 214 x 412 mm  incl. UPS bracket set  Weight: approx. 36 kg</p>
<p><b>Chiller KKT ECO 133 - L</b>  Function:  Supplies dedicated primary chilled water in cases where no chilled water supply is available on site. Air-cooled version, for outdoor installation up to a maximum distance of 25 m for connection to the IFP, incl. 50 m FOC for control.  The cooling capacity of the chiller is 60 kW, the chilled water temperature is 20°C, the water flow is 130 l/min.  Ambient temperature: -20 to +48°C  Connection rating: 28 kW  Voltage: 3/PE 400 V to 480 V / 50/60 Hz  Fuse rate: 80 A  Power consumption: 66 A  Dimensions: 2000 mm x 1100 mm x 2100 mm (height x width x depth).  Weight: 760 kg  Noise level at a distance of 10 m at outside temperatures of:  21°C 47 dB(A)  32°C 52 dB(A)  48°C 58 dB(A)</p> <p><b>IFP (Interface Panel)</b>  Main functions of the IFP:  - Interface function between the KKT chiller and the MR cabinet.  - Water supply for MREF, MBB, CBB and TX box.  Additional devices such as integrated differential pressure control, a pressure gage, and a filter are used in order to guarantee the precise functioning of the cooling circuit, especially for the cold head compressor (MREF).</p>

## Description

The connection must be made locally with 2" lines up to a maximum distance of 25 m.  
Dimensions: 800 mm x 1150 mm x 210 mm (height x width x depth).  
Weight: 67 kg

Start up and initial set up service performed by the chiller manufacturer or designated service representative. This service does not include the piping and other prerequisite siting, of the waterchiller, which are the responsibility of the customer.  
12 months warranty and performed by the chiller manufacturer.

Includes Spectris Solaris EP injector and Integrated Continuous Battery Charger (ICBC).

- Optimized color touch screen with few keystrokes.
- Six user-programmable phases for added flexibility.
- Independent Keep Vein Open (KVO) allows more time to focus on patient.
- Large 115 mL saline syringe allows for longer KVO and multiple flushes.
- Design of low pressure tubing eliminates dead space in the "T" connection that can waste contrast.
- The clear barrel design with molded FluidDots help detect the presence of air in a syringe.
- Pressure Limit Setting control software enables user to select from one to six preset maximum pressure limits, ranging from 100-300 psi, and to view current pressure during injection next to the pre-selected maximum value on the Solaris display.

Installation, applications and one year warranty provided by Medrad.

**Not for mobile use, refer to Siemens part number M3SSMR300EPM for the Solaris injector used in a mobile environment.**

**This product has been tested and verified for compatibility with the following Siemens' products: MAGNETOM Trio, Espree, Essenza, Verio, Avanto, Symphony, Aera, Skyra and Biograph mMR.**

**Compatibility with other products cannot be guaranteed and use with any other products may void service contracts and/or system warranties.**

Highly durable 1mm PVC wall signs with high-tack, double-back tape. Sticks to most any surface. English. 12" x 18".