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Qty

Item Description

1

**MAGNETOM Sola - System**

MAGNETOM Sola - the first 1.5T BioMatrix system - leverages the intelligent combination of Tim 4G and the Siemens unique BioMatrix technology to be ready to embrace the unique set of challenges that each and every patient brings to the MRI exam.

System Design

- Short and open appearance (157 cm total system length cover-to-cover and 70 cm Open Bore Design) to reduce patient anxiety and claustrophobia
- Whole-body superconductive Zero Helium Boil-Off 1.5T magnet
- Weight-optimized magnet technology based on high performance 3T and 7T magnet design
- Actively Shielded water-cooled Siemens gradient system for maximum performance

Evolving from Total imaging matrix, MAGNETOM Sola comprises a new technology that addresses the intrinsic biovariability in humans - BioMatrix Technology.

BioMatrix Technology is designed to address different aspects of patient variability and is built on three key technological clusters:

BioMatrix Sensors: anticipate challenges before they happen with respiratory sensors integrated in the spine coil to measure the patient's respiratory signal as soon as the patient is on the table in either head-first or feet-first position.

BioMatrix Tuners: adapt and correct the field inhomogeneities induced by patient's individual anatomies with CoilShim and SliceAdjust technologies for robust and repeatable IQ.

BioMatrix Interfaces: easily manage any type of patient with intelligent interfaces such as Select&GO panels to accelerate workflow without compromising quality.

Tim 4G (Total imaging matrix in the 4th generation) for excellent image quality and speed

- Siemens unique DirectRX technology enabling all digital-in/digital-out design
- Dual-Density Signal Transfer Technology

Push-button exams with GO technologies

Select&GO

DotGO

Recon&GO

MR View&GO

Tim Application Suite allowing excellent

Qty	Item Description
	<p>head-to-toe imaging</p> <ul style="list-style-type: none"> <li>- Neuro Suite</li> <li>- Angio Suite</li> <li>- Cardiac Suite</li> <li>- Body Suite</li> <li>- Onco Suite</li> <li>- Breast Suite</li> <li>- Ortho Suite</li> <li>- Pediatric Suite</li> <li>- Scientific Suite</li> </ul>
1	<p><b>Silver &amp; White Design #So</b></p> <p>MAGNETOM Sola is available in two different light and appealing design variants which perfectly integrate into different environments. The Silver &amp;White Design Variant comprises a brilliant white front design ring with integrated unique Select&amp;GO panels. The smoothly embracing deco area on the left side and the outer rings in the front and the back of the system is colored in brilliant silver.</p> <p>The table cover is presented also in the same color and material selection.</p>
1	<p><b>BioMatrix Technology #Vi</b></p> <p>The new and unique BioMatrix technology addresses the different aspects of patient bio-variability. It is based on three technological clusters:</p> <ul style="list-style-type: none"> <li>- BioMatrix Sensors address patient physiology, in order to anticipate challenges</li> <li>- BioMatrix Tuners address patient anatomy, in order to adapt to all patients, especially critical ones.</li> <li>- BioMatrix Interfaces address user interaction with the patient, to accelerate the workflow in the face of patient variability.</li> </ul>
1	<p><b>SW syngo MR XA11B</b></p> <p>syngo MR XA11B software with new features and applications.</p> <p>Please be aware that certain or all positions of this quote have the software version syngo MR XA11B as prerequisite.</p>
1	<p><b>MR General Engine #Vi</b></p> <p>syngo.MR General Engine extends Numaris/X by adding dedicated workflows and tools for routine and advanced reading of MR examinations.</p> <p>A generic MR Basic workflow is provided, as well as specific MR Neurology, MR Prostate Reading, MR Breast Reading, and MR Cardio-Vascular workflows.</p>
1	<p><b>Turbo Suite Essential #BM</b></p> <p>Turbo Suite Essential comprises established acceleration techniques to maximize productivity for all contrasts, orientations and all routine imaging applications from head-to-toe.</p>
1	<p><b>Quiet Suite #T+D</b></p> <p>Quiet Suite enables complete, quiet examinations for neurology and orthopedics with at least 70% reduction in sound pressure levels.</p>
1	<p><b>DoD Facility IA Compliance (ATO-C)</b></p> <p>US government deals/orders/scanners, requiring the IA certification, shall not receive features marked by this license, since these features would not pass the security demands of IA (Information Assurance).</p>
1	<p><b>Brain Dot Engine #Se</b></p> <p>The Brain Dot Engine provides guided and automated workflows customizable to the site specific standards of care for general brain examinations. The Brain Dot Engine supports the user in achieving reproducible image quality with increased ease of use and time efficient exams.</p>

**Qty****Item Description**

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.

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**DotGO Routine Package #BM**

The DotGO Routine Package includes both:

- Spine Dot Engine and
- Large Joint Dot Engine.

As a package they offer a comprehensive set of workflows with guidance and automation, for standardized image quality in Spine and MSK MR imaging.

The Spine Dot Engine provides the functionality of Inline Composing and Tim Planning Suite for streamlining workflows in all spine imaging. Tools, such as auto-positioning and vertebral recognition with AutoAlign Spine, AutoCoverage and Spine Labelling support and optimize reproducibility for your cervical, thoracic and lumbar spine imaging for all clinical indications.

The Large Joint Dot Engine enhances standardization of the knee, hip and shoulder workflows and optimizes reproducible image quality by incorporating automation tools, such as anatomically based auto-positioning (AutoAlign). Dedicated imaging techniques, such as Advanced WARP, are included and can help to expand the access of diagnostic MRI to a broader range of patient types.

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**Tim Whole Body Suite #Vi**

Tim Whole Body Suite puts it all together. This suite enables table movement for imaging of up to 205 cm (6' 9") FoV without compromise. In combination with Tim's newly designed ultra-high density array higher spatial and temporal resolution can be achieved along with unmatched flexibility of any coverage up to Whole Body.

For faster exams and greater diagnostic confidence.

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**Tim Planning Suite #Vi**

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.

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**syngo TimCT FastView #Vi**

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

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

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**Advanced Diffusion #Vi**

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

QuietX DWI enables quieter diffusion-weighted imaging of the brain with up to 70% reduction in sound pressure relative to conventional diffusion-weighted imaging.

RESOLVE (Readout Segmentation Of Long Variable Echo-trains) is a multi-shot, readout segmented EPI sequence for high-resolution, low-distortion diffusion-weighted imaging (DWI). This technique is largely insensitive to susceptibility effects, providing anatomically accurate diffusion imaging for the brain, spine, breast and prostate. In combination with syngo.MR Tractography, RESOLVE enables excellent white-matter tract imaging even in regions of high susceptibility, such as the spine.

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**WARP & Advanced WARP #Vi**

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

Qty	Item Description
1	<p><b>Advanced Cardiac incl. PSIR #Vi</b></p> <p>This package contains special sequences and protocols for advanced cardiac imaging including 3D and 4D BEAT functionalities. It supports advanced techniques for ventricular function imaging, dynamic imaging, tissue characterization, coronary imaging, and more.</p>
1	<p><b>Inline Composing syngo #Se</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>System Start Timer #Vi</b></p> <p>Timer clock that can be installed together with the MAGNETOM MR system to start the system automatically at user-definable times, eliminating waiting times during system boot up.</p>
1	<p><b>PC Keyboard US English #Vi</b></p> <p>Standard PC keyboard with 105 keys.</p>
1	<p><b>Tim [204x48] XQ Gradient #So</b></p> <p>Tim [204x48] XQ-gradients performance level</p> <p>Tim 4G's RF system and innovative coil architecture enables high-resolution imaging and increased throughput.</p> <p>The system provides a maximum number of 204 channels (coil elements) that can be connected simultaneously. Flexible parallel imaging is achieved by the standard 48 independent RF channels that can be used simultaneously in one single scan and in one single FOV, each generating an independent partial image.</p> <p>This option includes also Advanced High Order Shim.</p> <p>XQ - gradients</p> <p>The XQ 45/200 gradients are designed for high performance and linearity to support clinical whole body imaging at 1.5T. The XQ gradients combine 45 mT/m peak amplitude with a slew rate of 200 T/m/s.</p> <p>The force compensated gradient system minimizes vibration levels and acoustic noise.</p> <p>High-performance measurement and reconstruction system.</p>
1	<p><b>Standard Coil Package, 48-ch #So</b></p> <p>This package includes:</p> <ul style="list-style-type: none"> <li>- BioMatrix Head/Neck 20 tiltable with CoilShim</li> <li>- BioMatrix Spine 32 with Respiratory Sensors</li> <li>- Body 18</li> <li>- Flex Large 4</li> <li>- Flex Small 4</li> <li>- Flex Coil Interface</li> </ul>
1	<p><b>BioMatrix Dock. Table w/ eDrive #So</b></p> <p>The BioMatrix Dockable Table with eDrive is designed for maximum patient comfort and smooth patient preparation. The BioMatrix Dockable Table with eDrive can support up to 250 kg (550 lbs) without restricting the vertical or horizontal movement. The BioMatrix eDrive provides motorized assistance for easy maneuverability of the table.</p>
1	<p><b>Tx/Rx Knee 18 #So</b></p> <p>New 18-channel transmit/receive coil optimized for knee imaging. The spacious design with a flared opening towards the thigh allows scanning even of large and swollen knees with exceptional image quality and signal to noise ratio.</p> <p>Main features :</p> <ul style="list-style-type: none"> <li>- 18-element design (3x6 coil elements) with 18 integrated preamplifiers</li> <li>- iPAT-compatible</li> <li>- SlideConnect Technology</li> </ul>

Qty	Item Description
1	<p><b>Shoulder Shape 16 #So</b></p> <p>The Shoulder Shape 16 combines the known benefits of Tim 4G coil technology with new highly flexible materials, resulting in unmatched image quality, high patient comfort and easy handling. The Shoulder Shape 16 for examinations of the left or right shoulder consists of an iPAT-compatible 16-channel shoulder coil in a flexible shoulder cup that can be shaped around small and large shoulders. An L-shaped cushion for easy positioning of the patient is included. The 16-element coil with 16 integrated pre-amplifiers ensures maximum signal-to-noise ratio. Shoulder Shape 16 will be connected via a SlideConnect plug for fast and easy coil set-up and patient preparation.</p>
1	<p><b>Hand/Wrist 16 #Ae</b></p> <p>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.</p> <p>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.</p>
1	<p><b>Foot/Ankle 16 #Ae</b></p> <p>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.</p> <p>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.</p>
1	<p><b>Body 18 -&gt; Body 18 long</b></p> <p>This option exchanges the Body 18 from the standard coil configuration for the Body 18 long.</p> <p>The long cable of the Body 18 enables flexible flexible combinations with additional Body 18, the Body 30 or Body 60 for extended anterior coverage.</p>
1	<p><b>BioMatrix Body 12 long #So</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:</p> <ul style="list-style-type: none"> <li>- 12 channels</li> <li>- Dual Density Signal Transfer</li> <li>- Ultra light-weight</li> <li>- SlideConnect Technology</li> <li>- Exchangeable cable design (165 cm / 90 cm cable length optionally available)</li> </ul> <p>The 12-channel coil with its 12 integrated pre-amplifiers ensures excellent signal-to-noise ratio and extensive coverage in all directions. The single SlideConnect plug allows for fast and easy patient preparation, aided by the light-weight design to ensure highest patient comfort.</p> <p>The coil's extended cable allows for more flexibility in connector selection which is especially helpful if multiple flexible coils need to be combined and challenging imaging set-ups need to be supported like in therapy imaging (e.g. for combined head-neck exams). The light-weight coil ensures highest patient comfort.</p> <p>The BioMatrix Body 12 long coil features:</p> <ul style="list-style-type: none"> <li>- 12-element design with 12 integrated preamplifiers (3 clusters of 4 elements each)</li> <li>- Operates in an integrated fashion with the BioMatrix Spine 24</li> <li>- Can be combined with further BioMatrix Body 12 coils for larger coverage</li> <li>- Can be positioned in different orientations (0°, 90°, 180°, 270°) for patient specific adaptations</li> </ul>

**Qty****Item Description**

- 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

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**Body 30 #1.5T**

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:

- 30 channels or up to 46 (in combination with the Spine 32)
- Dual Density Signal Transfer
- Ultra light-weight
- Highly flexible viscoelastic material
- SlideConnect Technology

The Body 30 features:

- 30-element design with 30 integrated preamplifiers (5 clusters of 6 elements each)
- Can be combined with further 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 allows the usage for:

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

Dedicated protocols are provided for abdominal imaging.

Typically combined with:

- Spine 32
- Body 18
- Body 18 long (optional)
- Peripheral Angio 36 (optional)
- Body 30 (optional)

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**UltraFlex Large 18 #So**

Light-weight, iPAT compatible, 18-element no-tune receive coil made of highly flexible and soft viscoelastic material. It is used for examinations of larger extremities (e.g. medium to large shoulder, hip, knee ankle and hand) and for abdominal examinations. A dedicated positioning aid for larger extremities, like knee is delivered with the coil.

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**Positioning Aids Shoulder&Ankle #Vi**

This package contains additional positioning aids that can be used for the UltraFlex Large 18 and UltraFlex Small 18.

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**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

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## Item Description

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

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## Simultaneous Multi-Slice Package #BM

This license includes:

- Simultaneous Multi-Slice EPI
- Simultaneous Multi-Slice TSE (from SW MR XA11 and higher)

Simultaneous Multi-Slice (SMS) EPI enables accelerated imaging for diffusion-weighted (DWI/DTI) and BOLD functional MR imaging. With SMS EPI, scan times for DWI can be reduced by up to 68% and/or images with higher spatial/diffusion resolution can be acquired. For BOLD imaging, SMS EPI can enable increased temporal sampling of BOLD data acquisitions and/or improved slice coverage/resolution.

TSE is the most frequently utilized clinical pulse sequence. Simultaneous Multi-Slice TSE is available for reducing scan time and/or to increase slice coverage/resolution in routine MSK examinations.

1

## SWI #Tim

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.

Qty	Item Description
1	<p><b>Neuro Perfusion Package #T+D</b></p> <p>The Neuro Perfusions Package helps to streamline the clinical workflow by inline post-processing in dynamic susceptibility contrast (DSC) based perfusion imaging. This makes it possible to see perfusion maps immediately.</p> <p>Perfusion parameter maps are based on a Local Arterial Input function. A corrected relCBV map calculation and motion correction is provided.</p>
1	<p><b>Flow Quantification #Tim</b></p> <p>Special sequences for quantitative assessment of flow.</p>
1	<p><b>syngo.MR Cardiac Flow #1</b></p> <p>syngo.MR Cardiac Flow processes velocity-encoded MR images to evaluate blood flow dynamics e.g. in the heart and the great vessels. The application generates quantitative results for physicians in the diagnostic process. The MR cardiac interactive reporting template is included.</p>
1	<p><b>Cardiac Dot Engine, USA #T+D</b></p> <p>Cardiac examinations: Dot Cardiac - Customized workflows that are easier to repeat. Using anatomical landmarks, standard views of the heart (such as dedicated long axis and short-axis views), are easily generated and can easily be reproduced using different scanning techniques. Scan parameters are adjusted to the patient's heart rate and automatic voice commands are given.</p>
1	<p><b>MyoMaps #T+D</b></p> <p>This package contains special sequences and protocols for inline T1,T2 and T2* calculation at the heart. The generation of T1 and T2 parametric maps is enhanced by the use of motion correction. T1,T2 and T2* parametric maps could be used to support assessment of cardiovascular disease.</p>
1	<p><b>Dual Monitor Package #BM</b></p> <p>The Dual Monitor Package provides a second 24 LCD monitor for the acquisition workplace, identical to the system main host monitor.</p> <p>The two monitors provide space for protocol planning and exam progress on the left monitor, as well as viewing and post-processing functionalities on the right monitor. The Dot Cockpit can be used on both monitors as a floating window. This improves the MR examination workflow by a smoother and more comfortable work space that avoids interruptions between planning, scanning, viewing and post-processing. It allows to keep running patient examinations always in sight to allow for fast interactions.</p>
1	<p><b>Peripheral Pulse Unit #Vi</b></p> <p>Peripheral Pulse Unit for Pulse Triggering</p>
1	<p><b>Abdomen Dot Engine #T+D</b></p> <p>The Abdomen Dot Engine: Personalized Exam Strategies - Guidance - Automatic sequence scaling - Auto Navigator - Auto-FoV - Timeline setup and monitoring - Automatic Voice Commands - Auto Bolus Detection - Inline radial range calculation for MRCP - Inline Subtraction - Inline Registration</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>FREEZEit+ #Vi</b></p> <p>The FREEZEit+ Body Package contains three robust sequences for advanced imaging: TWIST, TWIST-VIBE and StarVIBE.</p> <p>- TWIST is a Siemens unique sequence for time-resolved (4D) MR angiographic and dynamic imaging in general with high spatial and temporal resolution.</p>

Qty	Item Description
	<ul style="list-style-type: none"> <li>- TWIST-VIBE is a fast, high-resolution 4D imaging sequence, e.g. for multi-arterial liver imaging.</li> <li>- StarVIBE is a motion-insensitive VIBE sequence using a stack-of-stars trajectory.</li> </ul>
1	<b>LiverLab #T+D</b> LiverLab is a system guided workflow to examine the hepatic fat and iron status, as part of the Abdomen Dot Engine.
1	<b>MR Elastography #T+D</b> MR Elastography offers a new diagnostic tool for all Tim+Dot systems that allows identifying variations in liver tissue stiffness. The MR Elastography package consists of new protocols and sequences, new reconstruction algorithms and inline reconstruction.
1	<b>fMRI Trigger Converter</b> An optical trigger signal is available to trigger external stimulation devices in fMRI experiments. 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).
1	<b>QISS #T+D</b> Software package with QISS sequence, protocols and Dot AddIn for non-contrast enhanced peripheral MRA. QISS particularly enables higher reproducibility than existing methods and is an alternative to MR angiography techniques with contrast medium, especially for patients with severe renal insufficiency.
1	<b>Patient Supervision TV #T+D</b> 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 on an LCD monitor in the control room, included in this kit.  The supervision solution is customizable and designed to address different site specific requirements. Up to 4 cameras can be optionally connected for patient supervision in the examination or waiting room.  This feature provides a connection from the radiographer to the patient. It improves the patient experience by reducing anxiety through virtual hand-holding.
1	<b>Coil Storage Cart #T+D</b> Specially designed non-ferromagnetic cart for easy storage of the most commonly used coils and accessories.
1	<b>MR Workplace Container, 50cm</b> 50 cm wide extra case for the syngo host computer with sliding front door to allow change of storage media (CD/DVD/USB).
1	<b>Additional Set of Manuals</b> Additional set of manuals for the above selected MR system.
1	<b>Separator 60kW/75kW #Vi</b> The SEP (Separation cabinet) has to be used if a central hospital chilled water supply is available or if a chiller of any brand/type is already available. The SEP is the interface between the on-site water chiller (of any brand or type) or the interface to the central hospital cooling water supply. For the above-mentioned cases the SEP is mandatory!  In these cases, the primary water specifications must fulfill the requirements (i.e. 60 kW (for XK/XQ gradient) / 75kW (for XT gradient) heat dissipation; 100+-10l/min flow; 6 to 14°C (for XQ gradient)/6 to 12°C (for XT gradient) water temperature; pH value 6 to 8, max. working pressure 6 bar).

**Qty****Item Description**

Dimensions: 1950mm x 650mm x 650mm (height x width x depth)

Weight: approx. 350kg

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**Dimplex chiller - 60 kW/Low Ambient**

The Dimplex Thermal Solutions outdoor, air-cooled, water/glycol chiller has been specially designed for medical applications to provide stable, fully dedicated cooling.

Low ambient design includes upgrade for use in -40 to +122 F ambient temperature range.

60 kW water/glycol air-cooled heat exchanger/chiller package for outside installation. Features dual tandem refrigerator circuits and dual redundant pumps. Unit also includes fluid reservoir and controls as well as remote control display to monitor the heat exchanger package operation from indoors at the operator's work station. This design also includes the features to meet the specification of OSHPD requirements. For use with Siemens SEP cabinet.

Features:

Dual 10 hp compressor, dual refrigerant circuits to smoothly transition through the 25 to 100% heat load capacity cycles of patient scanning and idling

Energy savings and quiet operation when minimal cooling is required between patient use, and overnight for facilities located amongst residential areas

Full capacity cooling enabling optimized utilization

Dual, redundant fluid pumps, with automatic switch-over ensures no loss of flow

Pricing also includes:

Filter & flow meter kit

Service package including two start-up visits (one upon cold head start-up, one at commissioning), one PM visit during 12 month P&L warranty period.

One year warranty through Dimplex Thermal Solutions.

Customer is responsible for rigging and installation. Customer is responsible for providing glycol as specified by the manufacturer.

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**Start-up of DTS chiller**

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**Eaton 93PM-180 kW UPS**

Complete system backup without interruption. One UPS per MR. Approved for the following systems: Prisma/Prisma Fit (including chiller), Skyra/Skyra Fit (including chiller), Vida XQ (including chiller), Vida XT (excluding chiller), Trio (including chiller), Verio (including chiller), Aera XQ (including chiller), Espree (including chiller), Avanto (including chiller), Sola XQ (including chiller), Lumina (including chiller).

Includes the following:

Eaton 93PM UPS Electronics Cabinet w/integrated maintenance bypass sidecar

Eaton 93PM Single Battery Cabinet System (Full load back-up time @ 180kW of 5.1 minutes.)

Network Card

Eaton 24x7 start-up

One year (24x7) warranty through Eaton Corp.

Shipping to the customer's dock.

Not approved for sites that require OSHPD.

Optional Remote Monitoring Panel

Shipment is to customer's dock. Customer is responsible for logistics from the dock to inside location.

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**Elastography hardware**

RESOUNDANT Hardware starter set for Elastography

**Qty****Item Description**

The hardware components of the MR Elastography option create, conduct and introduce mechanical waves into the human body. They are designed to be used in conjunction with imaging systems.

The set includes these major specific components of the MR Elastography option:

The active driver, which creates the mechanical waves

Two (2) passive drivers, which applies the mechanical waves to the patient's body

Long and short plastic tubing for mechanical wave transfer from active to passive driver - one 30 foot tube and an additional 9 foot section. For maximum performance use only the 30 foot hose or both the 30 foot and 9 foot hoses. Additional 9 foot hoses can be ordered if site restrictions make it necessary, but doing so may require power setting adjustments.

Applicator belt for securing the passive driver to the patient's body

Cords and cables for connecting the trigger box with the active driver and the components with the scanner electronics. Cable connecting active driver to fMRI trigger box is 50 feet.

DO NOT TAKE THE ACTIVE DRIVER OR TRIGGER BOX INTO THE MAGNET ROOM.

Customer is responsible for hardware installation.

Requires minimum software version syngo MR D13A or syngo MR B19.

The active driver includes a two years parts warranty. The passive driver, tubes and belts includes a 6 month warranty.

**1 T+D Preinstall kit for dockable table****1 Armrest #MR****1 Deluxe Foam Positioning Kit**

Set of 2, 18.75° Wedges. 3 H x 4 W x 7L 45° Wedge. 6.6 H x 6.75 W x 7.25L Circular Disc. 1.5H x 7 Diameter Set of 2, 12° Wedges. 2.25 H x 9.5 W x 7.25L Rectangle .5 x 4 x 6 Rectangle 4H x 18W x 24H 2 Cylinders, 4.25D x 12L Set of 2 Thin Mats, .25H x 18W x 24L Standard vinyl table pad 1 x 24 x 72

**1 GOKnee3D**

GOKnee3D is a 10-minute, push-button examination for diagnostic imaging of the knee developed and clinically validated by the US board certified MSK radiologists at John Hopkins University Hospital. GOKnee3D exam consists of AutoAlign localizer in the knee, PD weighted contrast and T2 weighted contrast with fat suppression. The AutoAlign technology provides a push-button functionality and ensures consistency in imaging. The 3D protocols are high resolution and isotropic, enabled by SPACE sequence with CAIPIRINHA technique. SW syngo MR E11C AP04 is required for GOKnee3D. Examination time for 3T system is 10 minutes, for a 1.5T system is up to 11 minutes. All given examination times are examination only, adjustments have been excluded. Applies to measurements only with 15channel knee coil.

**1 teamplay Welcome & Registration Package**

teamplay is a cloud-based network that brings together your imaging modality users, the systems' dose and utilization data, and the users' expertise to help you improve the delivery of care to your patients. Basic features are provided free of charge. Premium features (benchmarking, non-Siemens devices) are provided on a trial basis for three months at no charge, and may be used thereafter on a subscription fee basis.

To register: <http://teamplay.siemens.com/#/institutionRegistration/1>

**1 MRXperion injector**

The MRXperion injector has the following features:

Streamlined Injection Workflow

Enhanced Point of Care - On-board eGFR and Weight Based Dosing Calculators, an Injection Pressure Graph, and independent Test Inject and KVO functions.

Informatics-ready - Connect with the Radmetrics Enterprise Platform for automated

Qty	Item Description
	<p>documentation, advanced analytics and viewable patient histories to facilitate standardized injection protocols and enhanced operational consistency.</p> <p>Maximized Uptime Support - Connect to VirtualCare Remote Support for advanced injector system diagnostics, seamless software updates, and fast repairs.</p> <p>Price includes installation, training and one year warranty through Bayer Healthcare.</p>
1	<p><b>MRXperion penetration panel</b></p> <p>Includes penetration panel and installation by Bayer.</p> <p>To be selected only if the customer has no wall outlets in the MR suite and requires the power to be sourced from outside the room.</p>
1	<p><b>MRI Patient Audio System</b></p> <p>The MRI Patient Audio System is to be installed in the technologist room and is connected to the Siemens intercom system. The package provides the following benefits:</p> <ul style="list-style-type: none"> <li>Create custom, commercial-free radio stations based on artist, song or genre preferences</li> <li>Avoid any AM/FM tuning issues that may occur in RF-shielded rooms</li> <li>Compatible with all popular audio apps</li> </ul> <p>Includes all cables and adapters; Bose Companion 2 technologist speakers; 3.5 mm to RCA cable; and customized iPad Mini with all original accessories and iPad stand.</p> <p>The MR Stereo can play internet radio (depending on quality of and access to Wi-Fi signals) and device (iPad) stored audio content. Optimal performance requires access to Wi-Fi signal for Internet radio through the facility's wireless network.</p> <p>The audio system is not MR safe and is only intended for use outside the MRI suite.</p> <p>Installation is not included unless purchased with the Siemens system.</p> <p>Includes 3 year limited liability warranty on all system components through MRI Med.</p>
1	<p><b>Initial onsite training 32 hrs</b></p> <p>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.</p>
1	<p><b>Additional onsite training 32 hours</b></p> <p>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.</p>
1	<p><b>Follow-up training 24 hrs</b></p> <p>Up to (24) 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.</p>

Qty	Item Description
1	<b>Additional onsite training 24 hours</b> Up to (24) 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	<b>Local Offset - Abdomen Dot Engine</b>
1	<b>Dot Engine 1 pricing offset</b> To be eligible for this promotion, a binding purchase order including the purchase of any DOT Engine must be received by Siemens by September 31, 2019.
1	<b>Local Offset - Cardiac Dot Engine, USA</b>
1	<b>Dot Engine 2 pricing offset</b> To be eligible for this promotion, a binding purchase order of the application(s) must be received by Siemens Medical on or before September 30, 2019.
1	<b>MR Project Management</b> 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.
1	<b>Standard Cryogenics</b>
1	<b>MR_GOV_RIG_INSTL</b>
1	<b>MAGNETOM Sola Complimentary Biomed Training</b> This educational offering includes system training tuition for 1 clinical engineering professional on the MAGNETOM VIDA system and the syngo multimodality workstation as applicable. The training curriculum depends on and is limited to the system purchased and may include multiple courses including classroom training in USA or an international site, and/or virtual and web-based training. Additional modality basics training may be required as a prerequisite to these courses and must be purchased separately. This system training includes a 15% discount. Travel and lodging are not included. This educational offering must be completed by the later of (12) months from purchase or install end date; if training is not completed within the applicable time period, Siemens obligation to provide the training will expire without refund. This forfeiture does not apply to Federal government agencies.

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## OPTIONS

Qty	Item Description
1	<p><b>syngo.MR Cardio Engine #1</b></p> <p>The syngo.MR Cardio Engine bundles the following features for Cardiac evaluation:</p> <ul style="list-style-type: none"> <li>- syngo.MR Cardiac 4D Ventricular Function</li> <li>- syngo.MR Cardiac Flow</li> </ul>
1	<p><b>syngo.MR Neuro Perfusion Engine #1</b></p> <p>syngo.MR Neuro Perfusion Engine extends the MR Neurology workflow with a complete package for advanced processing and evaluation of brain perfusion datasets</p>
1	<p><b>Diffusion Tensor Imaging #T+D</b></p> <p>Diffusion Tensor Imaging provides a Single Shot EPI sequence for measuring diffusion-weighted data sets with up to 256 directions of diffusion weighting. Based on these data sets, the diffusion tensor itself and parametric maps derived from it (e.g. fractional anisotropy) are calculated automatically and in real-time. The package supports both clinical applications regarding diseases of the white matter (e.g. multiple sclerosis, brain maturation disorders, or displacement of nerve fiber tracts through masses) and advanced research applications.</p> <p>Diffusion spectrum imaging (DSI), an extension of diffusion tensor imaging, is included in this package. DSI expands on the DTI acquisition capabilities by providing the ability to resolve white matter fiber crossings.</p>
1	<p><b>syngo.MR Tractography #1</b></p> <p>syngo.MR Tractography enables the representation of diffusion paths of the human brain based on diffusion tensor imaging. syngo.MR Tractography supports surgery planning and is suitable for neurophysiological research in relation to cortical networking and pathologies of the white matter.</p>
1	<p><b>Spectroscopy Package #Vi</b></p> <p>This package combines the following functionalities:</p> <ul style="list-style-type: none"> <li>- Single-Voxel Spectroscopy,</li> <li>- 2D Chemical Shift Imaging,</li> <li>- 3D Chemical Shift Imaging,</li> <li>- syngo.MR Spectro Engine</li> </ul>
1	<p><b>UltraFlex Small 18 #So</b></p> <p>Light-weight, iPAT compatible, 18-element no-tune receive coil made of highly flexible and soft viscoelastic material. It is used for examinations of smaller extremities (e.g. small to medium shoulder, smaller ankle, elbow and hand) and for abdominal examinations. A dedicated positioning aid for smaller extremities, like ankle or elbow is delivered with the coil.</p>
1	<p><b>Tx/Rx CP Head Coil #Ae</b></p> <p>Circularly polarized no-tune transmit/receive coil with an open patient-friendly design. The integrated transmit mode allows volume selective excitation. Integrated, extremely low-noise pre-amplifiers permit very high signal-to-noise ratio. Furthermore, the coil is outfit with SlideConnect Technology, allowing for easier patient preparation and less table time for the patient.</p>
1	<p><b>MR Workplace Table, height adjust.</b></p> <p>The table is suitable for the syngo Acquisition Workplace and the syngo MR Workplace based on syngo hardware.</p>

**Qty****Item Description**

This 110V version has motorized table height adjustment.

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**GOV'T ONLY - MR Training Class**

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.

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**Additional onsite training 16 hours**

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.

# Detailed Technical Specifications

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## Description

MAGNETOM Sola - the first 1.5T BioMatrix system - leverages the intelligent combination of Tim 4G and the Siemens unique BioMatrix technology to be ready to embrace the unique set of challenges that each and every patient brings to the MRI exam.

The system includes:

### BioMatrix Technology

In order to meet the requirements of the changing healthcare market, Tim® is now further enhanced with the ability to address patient biovariability: Evolving from Total imaging matrix, BioMatrix® technology addresses the intrinsic biovariability in humans.

BioMatrix can anticipate challenges in MR examinations, for example, the limited ability to hold one's breath, to manage growing patient populations and increasing exam complexity in MRI.

BioMatrix can adapt to all patients and their anatomic individuality, even the critical ones, to make MRI more predictable and consistent for all patients, even critical ones. BioMatrix can accelerate the workflow, without compromising quality of care by assisting interactions between the patient and the user, to improve MRI cost-effectiveness and patient outcomes.

BioMatrix anticipates, adapts and accelerates to embrace human nature.

### Tim 4G

Tim 4G provides excellent image quality and speed in MRI combined with increased patient comfort and optimized workflow efficiency. Only one patient setup, no repositioning, no changing of coils. Ultra-light-weighted coils with high density of coil elements for maximized patient comfort and increased SNR. Feet-first positioning reduces claustrophobia.

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

### Magnet:

- Short 145 cm long (157 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 magnet design which allows for a cylindrically optimized homogeneity volume resulting in higher image quality (50 x 50 x 45 cm<sup>3</sup> DEV, typ. 2,8 ppm based on the 24-plane plot method)
- Temperature sensors with real time correction algorithm for unmatched long-term stability at 70 cm
- The magnet has 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.
- The combination of standard active shim with 3 linear channels (1<sup>st</sup> order) and 5 nonlinear channels (2<sup>nd</sup> order) and passive shim allows for maximized magnetic field homogeneity and consistent high image quality for a wide range of applications
- Integrated Eco-Power technology to save around 30% of energy during standby of the system.

### Gradient system:

- Actively shielded water-cooled world-class gradient system
- All axes force compensated for lowest vibrations and acoustic performance

### DirectRF - RF Transmit/Receive System:

- Fully integrated Transmit- and Receive path in the magnet housing including extremely compact water-cooled solid state amplifier with 37.5 kW peak power

## Description

- 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 204 channels (coil elements) simultaneously enabling higher SNR and iPAT in all directions. No repositioning of patients is needed even for large Field of View examinations. Dual-Density Signal Transfer enables ultra-high density coil design by integrating key RF components into the local coil.

### GO technologies

#### Select&GO

The Select&GO interface enables fast and easy single-touch patient positioning. Correct positioning saves unnecessary wasted time for repositioning and additional adjustments, therefore shortening the total room time.

- The ergonomically designed Select&GO touch panels are integrated into the front cover on each side of the patient tunnel for controlling table movement, guidance for patient setup and comfort features. They are well illuminated for easy visual recognition.
- Automated table move 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 Select&GO touch panels provide 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.

#### DotGO

Go for consistent results, efficiently with Dot Engines.

Dot offers a customizable framework for patient personalization, user guidance and exam automation. Optimized scan strategies are provided and can be selected based on patient condition, which allow 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 image and text guidance guides novice users even through the most complicated exams. Exam automation allows optimal timing for breathing, scanning, planning or contrast arrival. 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.

#### Dot Cockpit

The central tool to continuously build knowledge into standardized exams strategies and to make those available for every user in the MRI department. Dot Cockpit is the new starting point for every exam.

#### Recon&GO

The Recon&GO technology encompasses a wide range of in-line functionalities automizing reconstruction and post-processing steps to provide ready-to-read results for the radiologist. Examples are Inline ADC calculation, inline subtraction of dynamic contrastenhanced series, up to Inline Launch of advanced post-processing applications.

#### MR View&GO

MR View&GO is MAGNETOM Sola's all-in-one viewing and reading solution for fast and intuitive quality check and result distribution. It receives the images directly as they come on the scanner, giving the user a clear overview of the quality of images scanned, without being distracted by constant context switches. Once the images have been checked for acceptable quality, they can easily be sent to the PACS with minimal user interaction.

Beyond that, MR View&GO offers the additional advantage to perform extended post-processing, directly at the scanner. In-line launching of post-processing applications makes it possible to fully automate the evaluation of, for example, perfusion maps, permeability or cardiac function, all without additional user interaction. This makes it possible to save radiologist time by delivering quantitative, ready-to-read results, directly to the PACS.

#### Tim Application Suite

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

## Description

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

\* MR scanning has not been established as safe for imaging fetuses and infants less than two years of age. The responsible physician must evaluate the benefits of the MR examination compared to those of other imaging procedures.

### Neuro Suite

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

It includes for example:

- Fast 2D imaging with SE, TSE, GRE pulse sequences for high-resolution imaging
- BLADE for motion-insensitive TSE imaging EPI pulse sequences and protocols for diffusion imaging, perfusion imaging, and fMRI for advanced neuro applications. Diffusionweighted imaging is possible with up to 16 b-values in the orthogonal directions. For reduced distortions and homogeneous signal intensity even in the presence of challenging susceptibility interfaces and at station boundaries, SliceAdjust (slice-by-slice adjustments) can be selected.
- 3D TOF for non-contrast enhanced angiography
- 3D isotropic resolution volume imaging using T1 3D MPRAGE / 3D
- FLASH, SPACE DarkFluid, T1 SPACE and T2 SPACE pulse sequences
- High-resolution T2 SPACE pulse sequence optimized for inner ear examinations
- Double Inversion Recovery 3D pulse sequences (DIR SPACE) with two user-selectable inversion pulses for the simultaneous suppression of e.g. cerebro-spinal fluid and white matter
- MP2RAGE (Magnetization Prepared 2 Rapid Acquisition Gradient Echoes) provides homogeneous tissue contrast for segmentation and applications such as voxel-based morphometry. In combination with MapIt\*, it also provides T1 mapping functionality.
- Whole-spine pulse sequences in multiple steps with software controlled table movement
- 2D and 3D MEDIC pulse sequences for T2-weighted imaging, particularly for C-spine examinations in axial orientation where reproducibility is difficult due to CSF pulsations and blood flow artifacts
- RESOLVE (Readout Segmentation Of Long Variable Echo-trains) delivers high-resolution, low-distortion diffusion-weighted imaging (DWI) for accurate depiction of lesions.
- BioMatrix's CoilShim helps to reduce patient induced strongly localized B0 inhomogeneities as may arise, e.g., in the neck region.
- 3D Myelo with 3D HASTE for anatomical details
- 3D CISS (Constructive Interference in Steady State) for excellent
- visualization of fine structures such as cranial nerves. High-resolution imaging of inner ear
- TGSE sequence used primarily for T2-weighted imaging for shorter measurement time, decreased RF power deposition, and high-resolution imaging of the brain
- AutoAlign Head LS providing a fast, easy, standardized, and reproducible patient scanning supporting reading by delivering a higher and more standardized image quality.

### Angio Suite

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

- 3D MRA pulse sequences for carotid arteries, abdominal arteries, and peripheral arteries, with short TR and TE. The strong gradients make it possible to separate the arterial phase from the venous phase.

## Description

- Dynamic MRA for 3D imaging over time Signal from Respiratory Sensor can be selected to actively trigger MR image acquisition, e.g. with NATIVE\*.

### *Contrast-enhanced MRA*

3D contrast-enhanced MRA pulse sequences for dynamic carotid, abdominal, and peripheral arteries, shortest TR and TE. The strong gradients make it possible to separate the arterial phase from the venous phase

- TestBolus workflow for optimal bolus timing and excellent image quality
- CareBolus functionality for accurate determination of the bolus arrival time and the "Stop and Continue" of the 3D ce-MRA pulse sequence after the 2D bolus control scan
- Dynamic ce-MRA for 3D imaging over time

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

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

### *Image processing tools*

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

## **Cardiac Suite**

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

### *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 CMRBEAT*

- 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: advanced segmented TrueFISP)
- Automatic adjustment of the acquisition window to the current heart rate
- Use of the Inline ECG for graphical ECG triggering setup
- Retrospective gating with cine sequences (TrueFISP, FLASH)
- Pulse sequences for whole-heart coverage
- Integration of Compressed Sensing Cardiac Cine (optional) for highest temporal and spatial resolution

## Description

(segmented and realtime pulse sequences)

- Real-time imaging in case the patient is not able to hold his breath

*4D imaging and tissue characterization with BEAT; pulse sequences for high-contrast and high-resolution tissue characterization*

- Pulse sequences for stress and rest imaging with TurboFLASH contrast support the acquisition of multiple slices with high resolution and arbitrarily adjustable slice orientation for each slice T-PAT and e-PAT with mSENSE and GRAPPA for advanced parallel imaging provides fast high-resolution dynamic imaging
- Segmented IR TrueFISP / FLASH with T1 scout for optimization of tissue contrast
- Advanced tissue characterization with 2D phase-sensitive IR (PSIR) pulse sequences with TrueFISP and FLASH contrast. Magnitude and phase-sensitive images with one acquisition.
- Simple: no adjustment of inversion time (TI) necessary with PSIR technique
- Motion correction/averaging of multiple measurements with iPAT or tPAT accelerated single-shot TrueFISP or GRE images of the heart, for free-breathing acquisition.

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 for physiologically synchronized imaging, rechargeable battery-powered - for optimized patient handling
- Physiological Signals Display
- ECG (3 channels)
- 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
- 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 provides excellent tissue contrast that may be useful in the evaluation of the breasts. Extremely high spatial and temporal resolution can be achieved in very short acquisition times by using iPAT with GRAPPA and CAIPIRINHA.

Customized pulse sequences (e.g. with fat saturation or water excitation or silicone excitation), as well as flexible multiplanar visualization allow a fast, simple and reproducible evaluation of MR breast examinations.

This package includes:

- High-resolution 2D pulse sequences for morphology evaluation
- High-resolution 3D pulse sequences covering both breasts simultaneously
- Pulse sequences to support interventions (fine needle and vacuum biopsies, wire localization)
- Pulse sequences for evaluating breasts with silicone implants
- Automatic and manual frequency adjustment, taking into account the silicone signal
- Detection of the silicone signal either to suppress the silicone signal, if the surrounding tissue is to be evaluated, or to suppress the tissue signal in order to detect an implant leakage
- SPAIR - robust fat sat (robust fat suppression using an adiabatic frequency selective inversion pulse)
- DIXON - 2-point Dixon with 3D VIBE, the following contrasts can be obtained: in-phase, opposed phase, fat and water image iPAT with GRAPPA for maximum resolution in short time
- iPAT<sup>2</sup> with CAIPIRINHA that allows state-of-the-art sagittal breast imaging and further improvement of the

## Description

temporal resolution in dynamic scans while maintaining spatial resolution

- Inline subtraction and MIP display
- Offline subtraction, MPR and MIP display
- REVEAL: diffusion imaging for breast exams. In pulse sequences with multiple b-values individual numbers of averages may be specified per b-value.
- RESOLVE: Diffusion-weighted, readout-segmented (multi shot) EPI sequence for high-resolution susceptibility-insensitive DWI of the breast
- RADIANT: Ultrasound-like reconstruction around the nipple

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**

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

Motion artifacts are greatly reduced with 2D PACE Inline technology.

This package includes:

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

### **ABDOMEN:**

2D:

- T1 (FLASH) breath-hold scans with and without FatSat (SPAIR, Quick FatSat, in- / opp-phase)
- T2 (HASTE, TSE / BLADE, EPI) breath-hold scans with and without FatSat (SPAIR, FatSat, STIR)
- T1 (TFL) triggered scans (2D PACE free breathing) in- / opp-phase T2 (HASTE, TSE / BLADE, EPI) triggered scans (2D PACE free breathing) with and without FatSat (SPAIR, FatSat, STIR) as well as HASTE- and TSE-multi-echo
- Optimized fast single-shot HASTE pulse sequences and high-resolution pulse sequences based on SPACE and TSE for MRCP and MR urography examinations

3D:

- Dixon (VIBE 2pt-Dixon) breathhold scans, following contrasts can be obtained: in-phase, opposed phase, fat and water image
- Dynamic (VIBE and Quick-FatSat) pulse sequences with Inline motion correction for visualization of focal lesions with high spatial and temporal resolution
- Colonography dark lumen with T1-weighted VIBE
- REVEAL: Diffusion-weighted imaging of the prostate, cervix, rectum and other organs with multiple b-values.

## Description

Inline calculation of

- ADC maps, exponential ADC maps and inverted b-value images can be selected. Inline calculation (extrapolation) of high b-values (up to  $b=5000 \text{ s/mm}^2$ ) is possible.

### **PELVIS:**

- High-resolution T1, T2 pelvic imaging
- Isotropic T2 SPACE 3D pulse sequences
- Dynamic volume examinations with 3D VIBE

### **THORAX:**

- High-resolution T1, T2 thorax imaging
- Motion-insensitive pulse sequences (BLADE, HASTE)
- TrueFISP pulse sequences for imaging of respiratory mechanics
- Dynamic imaging with TWIST (optional), TWIST-VIBE (optional)
- Non-contrast-enhanced vessel visualization with SPACE pulse sequences
- STIR pulse sequences for the evaluation of lymph nodes
- Diffusion-weighted imaging with REVEAL

### **Onco Suite**

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

General features:

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

Prostate:

- Dedicated prostate pulse sequences for a variety of clinical scenarios
- T1-weighted 3D VIBE pulse sequences with high temporal resolution (VIBE, TWIST (optional) and TWIST-VIBE (optional)) allow time course evaluation
- Prostate spectroscopy (3D CSI (optional) volume scan) with up to 8 sat bands (suppression of water and fat signal)

Whole-body imaging:

- TSE STIR pulse sequences for head-to-toe and head-to-pelvis imaging
- Dedicated pulse sequences for focus regions head, neck, thorax, abdomen and pelvis

## Description

- Diffusion-weighted imaging with REVEAL including SliceAdjust

### OrthoSuite

Ortho Suite is a comprehensive collection of pulse sequences for joint and spine imaging.

This package includes:

- 2D TSE pulse sequences for PD, T1, and T2-weighted contrast with high in-plane resolution and thin slices
- 3D MEDIC, 3D TrueFISP pulse sequences with water excitation for T2-weighted imaging with high in-plane resolution and thin slices
- High-resolution 3D VIBE pulse sequences for MR Arthrography (knee, shoulder, and hip)
- 3D MEDIC, 3D TrueFISP, 3D VIBE pulse sequences with Water Excitation having high isotropic resolution optimized for 3D postprocessing
- T1 and PD SPACE 3D imaging with high isotropic resolution, optimized for post-processing Single-step, and multi-step pulse sequences
- Excellent fat suppression in off-center positions, e.g. in the shoulder due to high magnet homogeneity
- Dynamic TMJ pulse sequence (different joint positions)
- Multi Echo SE sequence with up to 32 echoes for T2 mapping
- High-resolution 3D DESS (Double Echo Steady State): T2 / T1- weighted imaging for excellent fluid-cartilage differentiation
- 2-point Dixon technique for fat and water separation - Turbo Spin Echo sequence
- WARP - 2D TSE sequence combining optimized high-bandwidth pulse sequences and View Angle Tilting (VAT), tailored to reduce susceptibility artifacts caused by orthopedic MRConditional implants. This helps in evaluation of soft tissue in proximity of the implants. Available pulse sequences include T1- weighted, T2-weighted, proton density and STIR contrast.
- Advanced WARP enables the reduction of gross artifacts (i.e. through-plane artifacts) caused by large MR-Conditional\* implants. It contains the 2D TSE based SEMAC technique and is especially useful in the case of hip and knee joint replacements.
- Available pulse sequences include T1-weighted, proton density and T2 TSE STIR contrast.

### \*Pediatric Suite

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

\* MR scanning has not been established as safe for imaging fetuses and infants less than two years of age. The responsible physician must evaluate the benefits of the MR examination compared to those of other imaging procedures.

### Scientific Suite

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

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

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

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

## Description

- Support of customers to implement their security policy including compliance with HIPAA (Health Insurance and Accountability Act)

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
- 2D TSE with multiple average - it is possible to acquire T2-weighted TSE images during shallow breathing, in a time efficient manner
- 2D / 3D HASTE (Half-Fourier Acquisition with Single-Shot Turbo
- Spin Echo) - Inversion Recovery for STIR and DarkFluid contrast
- SPACE for 3D imaging with high isotropic resolution with T1, T2, PD, and DarkFluid Contrast
- 2D Optimized high bandwidth TSE (T1, T2, and PD weighted and STIR) with WARP for the reduction of susceptibility artifacts caused by MR Conditional metal\* implants.

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)
- RESOLVE (Readout Segmentation Of Long Variable Echo-trains) delivers high-resolution, low-distortion diffusion-weighted imaging (DWI) for accurate depiction of lesions.
- ce-MRA sequence with Inline subtraction and Inline MIP
- 2D / 3D Time-of-Flight (ToF) Angiography - single slab and multi slab; triggered and segmented
- 2D / 3D Phase Contrast Angiography
- BEAT Tool - TrueFISP segmented; 2D FLASH segmented; Magnetization-prepared TrueFISP (IR, SR, FS); IR TI scout; Retrogating

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 - available both 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)

## Description

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

### 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 eg. 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 GMR (Gradient Motion Rephasing). Sequences with additional bipolar gradient pulses, permitting effective reduction of flow artifacts

### Standard Motion Correction

- 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
- PSIR HeartFreeze (Phase-Sensitive Inversion Recovery) - Motion correction/averaging of multiple measurements with iPAT or tPAT accelerated single-shot TrueFISP or GRE images of the heart, for free-breathing acquisition

MAGNETOM Sola runs on *syngo* MR XA11 software that offers an acquisition workplace with a large 16:10 24" monitors, one keyboard and one mouse.

The MR acquisition workplace provides environments for scheduling, scanning and basic quality assurance as well as viewing, basic and advanced post-processing, and data handling (Export, Import, Transfer, Record to media). The acquisition workplace can host one MR View&GO for viewing, basic postprocessing, and data distribution and up to three post-processing applications in parallel.

For faster data transfer and reduced storage demand *syngo* MR XA11 uses the DICOM Enhanced MR Image format for its scanning result.

Features like Online Help, DICOM MPPS autocomplete, inline technologies, and scan@center additionally support the workflow.

### 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.
- It controls emergency table stop, volume control of speaker and headphones in the examination room,

## Description

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 PC-based computer system uses the intuitive *syngo* MR user interface and allows the usage of up to 3 advanced *syngo*.via applications at the scanner workplace.

High-performance host computer:

- Intel Xeon processor  $\geq$  E5-1650 (6 core)
- Clock rate  $\geq$  3.5 GHz
- Main Memory (RAM)  $\geq$  64 GB
- SSD  $\geq$  480GB
- DVD-R writer for CD-R (approx. 4000 images 2562 DICOM Standard, ISO 9660 ) and DVD-R (approx. 25 000 images 2562
- DICOM Standard, ISO 9660) storage of DICOM data or other data like AVI files
- DVD-ROM drive
- Electronic mouse
- One high-resolution 24" color LCD flatscreen monitors with 1920 x 1200 pixel display, integrated gamma correction for optimum display of radiographic grayscale images and automatic backlight control for longterm brightness stability.

### Installation

- The relatively light-weight design of MAGNETOM Sola eliminates in most cases the need for structural building reinforcements and also facilitates installation in upper floors.
- The compact integrated design allows for short installation times and reduces the required space to less than 28 sqm (302 sq. ft.) for the entire installation. The minimum room height clearance is only 2.40 m (7' 10").
- MAGNETOM Sola allows siting of the system without a dedicated computer room - no additional cooling or floor requirements.
- MAGNETOM Sola 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.

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

The unique Select&GO panels are neatly integrated into the front design ring. The aesthetically pleasing and ergonomically designed control elements are well illuminated for easy visual recognition.

In particular, the table cover and the smoothly embracing colored system cover parts have been designed to promote a modern visual appearance.

This combination of ingenuity and practical design as presented with the "Silver & White" design with its brilliant white and silver makes MAGNETOM Sola an overall visually appealing system and creates a patient-friendly environment.

### BioMatrix Sensors anticipate challenges before they happen.

Respiratory sensors are integrated in the BioMatrix Spine coils and measure the patient's respiratory signal in head-first and feet-first position. The sensor loops measure the change in impedance resulting from the shift of the tissue and organs during the inhaled and exhaled phase of the patient's respiration as soon as the patient is lying on the table.

### BioMatrix Tuners – adapt to all patients, even critical ones.

The BioMatrix Tuners are CoilShim and SliceAdjust.

BioMatrix's CoilShim helps to reduce patient induced strongly localized B0 inhomogeneities by generating the respective anatomy-specific B0 field with 4 independent shim channels built into the system. Calculation and fine-tuning of local CoilShim currents integrated into global shim algorithm.

BioMatrix Head/Neck 20 tilttable with CoilShim and the Head/Neck 64 with CoilShim have local shim elements integrated into the posterior part, addressing patient induced B0 distortions in the neck region.

BioMatrix SliceAdjust enables precise slice-by-slice tuning of resonance frequency, transmitter voltage, and first order B0-shim and B1-shim. For whole-body diffusion, the SliceAdjust technology helps to avoid station boundaries

## Description

and apparent broken spine artifacts as well as to preserve the SNR for whole-body diffusion.

### **BioMatrix Interfaces – accelerate workflow without compromising quality of care**

The BioMatrix body model, leveraged by the Select&GO panel on the front of the system, is able to derive the precise location of the organs based on the patient's individual characteristics. With a single touch, the technologist can quickly position the body part of interest at the isocenter and start the examination.

To simplify and speed up patient transportation, the BioMatrix table with eDrive (optional) and AutoDocking (optional) functionalities is motorized, making patient management easy in all situations: no matter their size or strength, all technologists can handle all patients.

By facilitating patient transport and accelerating patient positioning using individual characteristics, the BioMatrix Interfaces accelerate the complete workflow without compromising image quality.

Main functionalities of *syngo*.MR General Engine:

- MR Basic workflow with Easy Reading mode for easy, fast, and intuitive MR reading, based on single-click and drag&drop interactions:
  - single-click interaction to navigate through the series
  - intelligent layout adaptation to compare series together
  - single-click fusion between different contrasts
- MR Cardio-Vascular Workflows: Cardiac Reading, Angio Single Station, Angio Multi Station, Angio TimCT and Angio TWIST
- MR Evaluation tools: Subtraction, MeanCurve, Image Filter, 2D/3D Distortion Correction. ADC and b-value tool (for extrapolated b-values), Multiplication, Division, Addition, Elastic Motion Correction. Workflow optimized report templates.

Scope of delivery:

*syngo*.MR General Engine software package with MR Radiology workflows, MR Cardio-Vascular workflows and MR Evaluation for a workstation-based server.

Turbo Suite Essential contains:

- iPAT and iPAT<sup>2</sup> parallel imaging capabilities for all contrasts, orientations and body regions
- T-PAT (temporal iPAT) for advanced parallel imaging provides fast high-resolution dynamic imaging in cardiac exams by distributing reference scans over time
- CAIPIRINHA for advanced iPAT<sup>2</sup> is a unique k-space reordering scheme that improves the g-factor significantly and therefore improves the SNR, which can be translated into higher imaging speed.
- CAIPIRINHA SPACE – high-resolution, fast 3D imaging with isotropic, sub-millimeter resolution, all contrasts. Protocols optimized for joints are provided.
- CAIPIRINHA VIBE – T1 weighted 3D imaging for high-resolution imaging throughout the body and significantly shortened breath-hold scans.

Effective noise reduction is achieved through Quiet Suite by targeting the main source of MRI noise - rapid switching in the gradient coils. Quiet Suite consists of QuietX, an intelligent algorithm which effectively reduces noise through summation of gradients and reduction of slew rates while keeping timing parameters within the same range. QuietX has been enabled for TSE, SE and GRE sequences for T1, T2 and DarkFluid contrasts. Within the TSE-sequence, the parameter "Echo-spacing" allows the user to further lower the gradient slew-rates. QuietX has also been enabled for susceptibility and diffusion-weighted imaging and these sequences are available with the SWI and Advanced Diffusion licenses (not available for MAGNETOM ESSENZA), respectively. The automated algorithm runs in parallel to normal protocol handling. All features and contrasts of the TSE, SE, and GRE sequences remain available.

In addition, Quiet Suite contains PETRA, a 3D T1 UTE sequence. The PETRA sequence allows for even lower gradient switching. With its unique gradient trajectories, no acoustic noise associated with gradient switching is generated during a PETRA scan. Residual noise may arise due to radio frequency switching.

With Quiet Suite, optimized quiet protocols for imaging the brain and large joints are also provided.

Protocols tailored for use of contrast media are integrated.

- Standard: Standard examination with 2D protocols

## Description

- 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
- Motion insensitive: Examination with *syngo* BLADE protocols
- to minimize and correct for the effects of motion automatically

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 provides automated, positioning and alignment of slice groups to the anatomy, relying on multiple anatomical landmarks. Besides basic brain positioning, AutoAlign Head computes reference position for several other brain structures such as the inner ear, the orbits and the optic nerve.

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

Easy rerun or repeat with functionality allows for reduced table time. 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.

### Spine Dot Engine:

The Spine Dot Engine provides optimized cervical, thoracic and lumbar spine imaging for patients of all conditions. Spine Dot Engine provides the functionality to simplify your spine workflow by providing tools to reduce examination times, achieve optimal image quality, and assist you during reading.

- User guidance step-by-step
- AutoPosition
- AutoAlign Spine with intervertebral disc detection
- AutoCoverage
- AutoSatPosition
- Initial and interactive snapping
- AutoLabeling of vertebrae
- Automatic curved multiplanar reconstructions of 3D datasets

The Spine Dot Engine includes:

- Tim Planning Suite
- Inline Composing
- *syngo* WARP Susceptibility Artifact Reduction  
*syngo* WARP integrates different techniques tailored to reduce susceptibility artifacts caused by orthopedic MR-conditional metal implants. 2D TSE sequence combining optimized high-bandwidth protocols and View Angle Tilting (VAT) technique, tailored to reduce susceptibility artifacts caused by orthopedic MR-conditional metal implants. This helps in evaluation of soft tissue in proximity of the implant. Available protocols include T1- weighted, T2-weighted, proton density and STIR contrast.

### Large Joint Dot Engine:

Large Joint Dot Engine optimizes image quality of knee, hip and shoulder scans by proposing the most appropriate protocols according to the examination strategy chosen for the specific patient. It ensures reproducible image quality and streamlines large joint examinations to the greatest extent.

### Dot Exam Strategies

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:

- Image quality: Achieve highest image quality in a reasonable scan time with 2D and 3D protocols.
- Speed focus: Examine patients in the shortest possible time with protocols being accelerated to the maximal

## Description

extent.

- Motion artifact reduction: Compensate for the effects of motion, e.g. with motion insensitive *syngo* BLADE protocols.
- Artifacts reduction: Reduce susceptibility artifacts, using *syngo* WARP.

### *AutoAlign*

- Automated, localizer based positioning and alignment of slice groups to the anatomy, relying on anatomical landmarks. Providing fast, easy, and reproducible patient scanning and supporting the reading by consistently delivering high image quality with a standardized slice orientation.

### *Inline MPRs - Automatic multiplanar reconstruction for 3D datasets*

- The Multi Planar Reconstruction (MPR) tool uses the position information from the AutoAlign algorithm and can be easily configured to automatically generate any required 2D images from high-resolution 3D acquisitions.

### *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

### *syngo WARP - Susceptibility Artifact Reduction*

- *syngo* WARP integrates different techniques tailored to reduce susceptibility artifacts caused by orthopedic MR-conditional metal implants. 2D TSE sequence combining optimized high-bandwidth protocols and View Angle Tilting (VAT) techniques. This helps in evaluation of soft tissue in proximity of the implant. Available protocols include T1- weighted, T2-weighted, proton density and STIR contrast.

### *Advanced WARP:*

- Advanced WARP application consists of SEMAC, a technique to reduce gross metal artifacts (i.e. through-plane artifacts) caused by big orthopedic implants. The main clinical applications are in hip and knee joint replacements. Available protocols include T1-weighted, T2-weighted, proton density and STIR contrast.

### *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
- dd/remove parameters in the parameter viewing card

### *New with SW syngo XA11A:*

GOKnee3D - push-button 10-minute knee exam

GOKnee3D is a 10-minute, push-button examination for diagnostic imaging of the knee developed and clinically validated by the US board certified MSK radiologists at John Hopkins University Hospital. GOKnee3D exam consists of AutoAlign localizer in the knee, PD weighted contrast and T2 weighted contrast with fat suppression. The AutoAlign technology provides a push-button functionality and ensures consistency in imaging. The 3D protocols are high-resolution and isotropic, enabled by SPACE sequence with CAIPIRINHA technique.

Tim and the Tim Whole Body Suite enable for true whole body MR scanning for head-to-toe imaging. Whole body imaging with highest image quality without patient repositioning and without the need to change a single coil, not even once, this means whole body imaging without compromise.

The Tim Whole Body Suite features:

- The all-new Tim Table or Tim Dockable Table enable a full Field-of-View with coverage up to 205 cm (6' 9"). The table top has the same length as the standard system without whole body capabilities. Additional free space is required at the rear part of the magnet to ensure, that the table movement is not limited by the rear wall.
- Table movement to its full extent can be remotely controlled from the operator console either by the operator

## Description

or by sequence protocols.

- Protocols and programs for whole body MR angiography and morphology e.g. for metastasis visualization and preventive care examinations.
- Whole body MR Angiography is possible with high speed, high resolution and high image contrast on the entire volume combining high speed gradients and iPAT.
- The large FoV of 205 cm supports the assessment of metastases distribution in the body with sequences such as TIRM (Turbo Inversion Recovery).

The dedicated Tim Planning Suite user interface has been optimized for these comprehensive measurement requirements. Set-n-Go protocols for entirely automated examinations in each body region in one work step are available. For example, for orthopedic, oncological or angiographic imaging.

- Easy planning on a FoV of any desired size (up to 205 cm).
- Planning of multiple steps simultaneously, e.g. on a whole-body image, with only one Set-n-Go protocol - which includes several steps.
- Tim Planning Suite UI: Dedicated user interface and exclusive tools for effective and smooth working on a large FoV.
- Multiple slice groups with their overlap are displayed together and can be easily arranged.
- All steps can have independent sets of parameters.
- All steps are displayed together with a single mouse click.
- Easy positioning of all steps, for example, through Align FoV.
- Full support of Phoenix, thus maximum reproducibility, for example, for follow-up studies, multi-centric studies or exchange of experiences across different institutions.
- Dedicated protocols are provided for the Tim Planning Suite, for example, for orthopedic, oncological or angiographic indications.
- It is highly recommendable to order application training!

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 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 (SEEit sequence for prostate DWI), brain and spine 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.

QuietX DWI protocols for the brain utilize QuietX, an intelligent algorithm which effectively reduces noise through summation of gradients and reduction of slew rates while keeping timing parameters within the same range. All features and contrasts of DWI remain available, delivering image quality comparable to a conventional single shot diffusion sequence, while providing at least 70% sound pressure reduction for increased patient comfort.

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

WARP and Advanced WARP help in evaluation of soft tissue in proximity of the implant. Available protocols include T1-weighted, T2-weighted, proton density and STIR contrast.

Main Features:

- Can be switched on in the standard TSE sequences
- For each slice, additional phase encoding is performed to better characterize the distortion
- Distorted signals are corrected by dedicated inline processing

## Description

Combining the unique advantages of Tim and BEAT with iPAT and powerful gradients, it allows performing cardiac MR examinations without compromise in image resolution or acquisition speed. BEAT is a unique tool for fast and easy cardiovascular MR imaging. It provides 1-click switch from cine imaging to tagging for wall motion evaluation and 1-click switch from 2D to 3D imaging. BEAT automatically adjusts all parameters associated with the changes.

### Cardiac and Vessel Morphology

- 3D aortopathy imaging with free breathing (SPACE)

### Global or Regional Wall Motion Analysis with BEAT

- 3D cine acquisition for full CT-like heart coverage
- 2D segmented FLASH for visualization of the regional wall motion using various tagging techniques (grid or stripes)

### Dynamic myocardial imaging with BEAT

- Ultra-fast, high-SNR sequence for dynamic imaging with GRE EPI contrast for stress and rest exams

### Tissue characterization with BEAT

- Robust myocardial tissue characterization with 3D PSIR (phase-sensitive inversion recovery)
- Fast and complete coverage of the myocardium with IR 3D FLASH and TrueFISP
- Including PSIR HeartFreeze (motion correction) for free-breathing measurements

### Coronary imaging with BEAT

- 3D Whole-Heart non-contrast Coronary MRA
- 3D Whole-Heart MRA with advanced free-breathing navigator compensating diaphragm shifts during the acquisition (motion-adaptive respiratory gating)

The Inline Composing option includes the following functions:

- Inline calculation of full-format images of the spine, the central nervous system or the vessel tree, for example, combined from multiple overlapping steps.
- Dedicated composing algorithms, optimized for the generation of anatomical or angiographic full-format images.
- Data sets with different FoV, resolution, matrix and slice thickness can be combined.
- Generation of full-format images from inline-computed MIPs.
- 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.
- Full-format acquisitions from Inline Composing are ideal for further measurement planning on large FoV, e.g. with the Tim Planning Suite.

The System Start Timer allows the user to define three different startup times for different days. The time switch can be programmed one year in advance. A programmed weekly schedule is repeated unless it is modified or suspended.

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.

### Tim [204x48] performance level

BioMatrix builds on DirectRF - The 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 innovative architecture packs more coil elements in a smaller space and the system provides a maximum number of 204 channels (coil elements) that can be connected simultaneously. Advanced iPAT capabilities and SNR are enabled by the 32 independent RF channels that can be used simultaneously in one single scan and in one single FOV, each generating an independent partial image.

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.

### XQ gradients

Siemens XQ gradients provide actively shielded, water cooled worldclass gradients. All axes are force-

## Description

compensated.

The XQ gradients have:

- Maximum gradient amplitude of 45 mT/m, per axis, i.e. 78 mT/m vector summation gradient performance,
- Maximum 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
- Maximum output voltage for each of the gradient axes 2250 V
- Maximum 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 ultrashort 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 50 cm in z direction) for optimal coverage and highest spatial resolution in diagnostic imaging. 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.

### Computer system

High-performance measurement and reconstruction system

- Intel Xeon Processor  $\geq 2 \times$  E5-2609v4 (8 core)
- Clock rate of  $\geq 2.1$  GHz
- Main memory (RAM) of 96 GB
- SSD for raw data  $\geq 480$  GB
- SSD for system software  $\geq 240$  GB
- Parallel Scanning and Reconstruction of up to 12 data sets
- Reconstruction speed
  - 40404 recons per second (256 x 256 FFT, full FoV)
  - 149532 recons per second (256 x 256 FFT, 25 % recFoV)

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.

### Tim 4G & BioMatrix Coils

The coils in the standard coil package combine the new BioMatrix functionalities CoilShim and Respiratory Sensor with the Tim 4G coil technology with Dual-Density Signal Transfer, DirectConnect and SlideConnect technology. The results are key imaging benefits: Excellent image quality, high patient comfort, and unmatched flexibility.

The Tim 4G & BioMatrix coils are designed for highest image quality combined with easy handling. BioMatrix's CoilShim helps to reduce patient induced localized B0 inhomogeneities.

Respiratory sensors, embedded in the BioMatrix Spine 32, detect the breathing pattern of the patient as soon as he/she is on the table. The high coil element density 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 weight coils with an open design ensure highest patient comfort resulting in better patient cooperation and image quality. No coil changing with multi-exam studies saves patient setup- and table time.

AutoCoilSelect for dynamic, automatic, or interactive selection of the coil elements within the Field of View fastens 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.

### BioMatrix Head/Neck 20 tiltable with CoilShim

The 20-channel coil with its 20 integrated pre-amplifiers ensures excellent signal-to-noise ratio. The unique

## Description

DirectConnect technology allows users connecting the 20 coil elements of the Head/Neck 20 without cables. The possibility to tilt the coil in 3 different positions together with 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 integrated CoilShim is located in the lower coil part which may remain on the table for most of the examinations and can be used without the upper part. The BioMatrix Head/Neck 20 and BioMatrix 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 BioMatrix Head/Neck 20 coil is equipped with two removable cushioned head stabilizers for stable and comfortable patient positioning.

The BioMatrix 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 BioMatrix Spine 32 and Body 18 but also other combinations e.g. with flexible coils like the Flex Large 4 are possible.

Whole-body set ups from Head to Toe are possible with the combination of BioMatrix Head/Neck 20, BioMatrix Spine 32, Body 18 coils, and Peripheral Angio 36 in one MR examination.

### **BioMatrix Spine 32 with Respiratory Sensors**

The 32-channel coil with its 32 integrated pre-amplifiers ensures maximum signal-to-noise ratio. The unique integrated BioMatrix Respiratory Sensors measure the patient's respiratory signal in head-first and feet-first position. The DirectConnect technology allows connecting the 32 coil elements of the BioMatrix Spine 32 without the need to plug in any cable. The patient friendly ergonomical design allows for maximum patient comfort. The high element coil is iPAT compatible in all directions.

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

The BioMatrix Spine 32 is typically combined with Body 18, BioMatrix Head/Neck 20, Peripheral Angio 36 (optional) or Flex Large 4, Flex Small 4.

### **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 BioMatrix Spine 32 resulting in a 30 channel body imaging setup.

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

The Body 18 is typically used in combination with the BioMatrix 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 the perfect combinability of the BioMatrix Spine 32, further Body 18 Coils (optional), the Peripheral Angio 36 (optional), but also the BioMatrix Head/Neck 20 and all flexible coils (e.g. Flex Large 4, Flex Small 4, UltraFlex Large 18 (optional) or UltraFlex Small 18 (optional) a broad range of indications up to whole-body imaging are covered.

### **Flex Large 4/ Flex Small 4**

Light-weight, 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.

The new BioMatrix Dockable Table with eDrive with its light appealing design allows for a fast patient preparation and maximized patient comfort. The BioMatrix eDrive provides motorized assistance for easy maneuverability of the table making patient transportation easy in all situations.

The user only needs to apply slight pressure to the table grip in order to start propulsion support. The table can adjust its speed based on the pressure applied by the user. With its newly designed AutoDocking functionality the table can be smoothly docked and undocked with just one click on the BioMatrix table interface.

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 BioMatrix Dockable Table with eDrive can be moved with two clicks into the isocenter - one click to the upmost position and one click into the isocenter. The

## Description

tabletop travels beyond the rear end of the system, enabling additional patient access. Multiple Tim 4G and BioMatrix coils can be connected at once for efficient patient set up and patient friendly examinations. The seamless integration of multiple Tim 4G and BioMatrix 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 BioMatrix Dockable Table with eDrive is easily adjustable for height even in the undocked state. A minimum height of 56 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.

Thanks to its 18-channel design this coil is perfectly suited for high-resolution images with excellent SNR. With the arrangement of the antennas in three rings of 6 elements each, the coil is specially designed for parallel imaging with high acceleration factors. 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. 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). The housing of this coil has a flaired opening towards the patient's thigh, as well as an easy coil sliding and opening mechanism.

The iPAT compatible Shoulder Shape 16 is ergonomically designed and adapted to the shape of the shoulder. The flexibility in size obtains maximum image quality for different body sizes. The opening of the coil can be adjusted between 16 cm - 27 cm to cover small, medium and large shoulders. The coil can be used either for left or right shoulders. It features an L-shaped cushion than can easily be placed for comfortable positioning. The coil excels in highest resolution imaging with exceptional signal-to-noise ratio.

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.

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.

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.

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.

The BioMatrix Body 12 long has a 12-element design with 12 integrated preamplifiers that are arranged in 3 clusters of 4 coil elements each.

The BioMatrix Body 12 long will be typically used together with the Spine 24 with which it operates in an integrated fashion as a 21-element coil, resulting in 3 rings of 7 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.

The coil's extended cable allows for more flexibility in connector selection which is especially helpful if multiple flexible coils need to be combined and challenging imaging set-ups need to be supported like in therapy imaging (e.g. for combined head-neck exams). No tuning of the fully iPAT-compatible BioMatrix Body 12 is necessary allowing for efficient and patient friendly set-up.

In case of Radiation Therapy imaging, the BioMatrix Body 12 long will be typically combined with :

- Flex 4 coil(s)
- BioMatrix Body 12 coil(s)
- BioMatrix Spine 24 with Respiratory Sensors

The dimensions of the BioMatrix Body 12 are 385 mm x 590 mm x 68 mm (L x W x H). Its weight is about 1.6 kg

## Description

(3.5 lbs), whereas the patient feels as little weight as 1kg (2,25 lbs).

The Body 30 has a 30-element design with 30 integrated preamplifiers that are arranged in 5 clusters of 6 coil elements each. The Body 30 will typically be 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 30 can be combined with the Spine 32, the Body 18, further Body 30 (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. It can be positioned in different orientations and addresses the requirement range for the examinations of obese patient to small patients. The light weight coil with its new viscoelastic material improves patient comfort and can be easily connected via SlideConnect technology. No tuning of the fully iPAT-compatible Body 30 is necessary allowing for efficient and patient friendly set-up.

The dimensions of the Body 30 are 460 mm x 600 mm x 55 mm (L x W x H). Its weight is about 3 kg whereas the patient feels as little weight as only 1.6 kg.

The UltraFlex Large 18 can be wrapped around or placed flat on top of the area of interest. This rectangular coil measures approx. 29 cm x 59 cm and connects with only one SlideConnect Plug which allows for fast and easy patient preparation. The positioning aids that come with the coil enhance positioning flexibility and help minimize involuntary patient motion artifacts.

This package contains a wedge shaped cushion that can be used together with the UltraFlex Large 18 or UltraFlex Small 18, e.g. for shoulder imaging and an L-shaped holder that can be used together with the coil holder of the UltraFlex Small 18 or UltraFlex Large 18 for ankle imaging to achieve a 90° angle of the patient's ankle.

The Peripheral Angio 36 has a 36-element design with 36 integrated preamplifiers distributed over 6 planes with 6 elements each.

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.

No tuning of the fully iPAT-compatible Peripheral Angio 36 is required.

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. 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).

The dimensions of the Peripheral Angio 36 are:  
860 mm x 300 - 640 mm x 280 mm

Simultaneous Multi-Slice (SMS) EPI provides slice accelerated BOLD and Diffusion protocols for the brain. The slice acceleration factor can be selected on the protocol parameter card and can be utilized by the user in various ways:

- For diffusion weighted imaging, the user can choose to invest the benefits into scan time reductions or into more spatial or diffusion resolution.
- For BOLD, the user can utilize the slice acceleration to increase temporal sampling of BOLD data, for higher sensitivity to BOLD signal changes, and/or to increase the slice coverage and resolution (Inline BOLD Imaging required).

From SW MR XA11 and higher:

Simultaneous Multi-Slice (SMS) TSE provides accelerated TSE protocols for MSK joints

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

## Description

(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*

Neuro Perfusion Package provides a modified sequence and image reconstruction for motion correction and post-processing in dynamic susceptibility contrast (DSC) based perfusion imaging.

Depending on whether motion correction is switched on, the following uncorrected or motion corrected perfusion maps can be calculated: time-to-peak (TTP), relative cerebral blood volume (relCBV), relative cerebral blood flow (relCBF), relative mean transit time (MTT), relative corrected cerebral blood volume (relCCBV) and bolus plots.

Perfusion parameter maps are calculated based on a Local Arterial Input Function. The algorithm selects many AIFs per slice and volume based on a number of built-in criteria. This removes the need for manual selection of AIF voxels to calculate the cerebral perfusion parameters and allows the calculation to be performed in-line at the end of the measurement. It also minimizes deconvolution errors due to the effects of delay and dispersion of the contrast agent bolus. Additionally, in cases of contrast extravasations due to a disrupted blood-brain barrier, the postprocessing allows a correction to be applied during calculation of the relCBV maps.

Flow Quantification enables the acquisition of flow encoded images and the evaluation of blood as well as of cerebro-spinal fluid (CSF).

Sequences include:

- ECG triggered 2D phase contrast with iPAT support
- Retrospective reconstruction algorithms for full R-R interval coverage
- Maxwell Term Compensation

This application provides velocity- and flow-related data of an examined patient quickly and easily.

### Image Display

- Two large screen segments for viewing magnitude and phase Images
- Synchronized movie display
- Application of color look-up tables similar to Doppler-ultrasound

### Automated Segmentation Tools

- Semi-automatic edge detection for vessel lumen from initial user input
- Automatic compensation of in-plane motion as well as vessel size or shape changes

### Quantitative Analysis

- Through-plane and in-plane flow analysis
- Background phase correction
- Display of value and location of peak velocity on each image

## Description

- Calculation of: Mean and peak velocity; mean, cumulative, forward and retrograde flow; regurgitation fraction
- Changes in vessel size

### Digital and Paper Reports

- Various graphs: Velocity vs. time, flow rate vs. time, integral flow vs. time, area vs. time
- Summary tables
- Export of result images including segmented contours
- Dedicated reporting of flow evaluation results.

Scope of delivery:

- 1 x syngo.MR Cardiac Flow software

### Cardiac Dot Engine

#### **Guidance View**

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

#### **Patient View**

- Within the Patient View the user can easily tailor the exam to each individual patient (e.g. patient with arrhythmia, breath hold capability).
- Pre-defined Dot Exam Strategies are integrated. The user just selects the appropriate strategy with one click and the queue and the complete scan set-up are automatically updated

#### **AutoFoV (automatic Field of View calculation)**

- Based on the localizer images the optimal FoV is automatically estimated.
- If the patient moves during the examination, this step can be repeated at any time

#### **Automated parameter adaptation**

- Scan parameters are automatically adapted to the patient's condition (e.g. heart rate)

#### **Novel heart localization method**

- On-board guidance visually facilitates anatomic landmark settings which are used for calculation
- Automated localization
- Automated localization of short-axis views

#### **Cardiac Views**

- Easy selection of cardiac views (e.g. 3 chamber view) during scan planning

#### **Inline Ventricular Function Evaluation**

- syngo Inline VF performs volumetric evaluation of cardiac cine data fully automatically right after image reconstruction.
- If desired, inline calculated segmentation results can be loaded to 4D Ventricular Function Analysis for further review or processing

#### **Cardiac specific layout for the Exam task**

- layouts show the new physio display and are configured for every step of the exam

#### **Automated Naming**

- Automated naming of series depending on cardiac views and sequence type

#### **Auto Voice Commands**

- Seamlessly integrated into scanning workflow.
- Played automatically
- The user controls breath-hold or pauses are actually played

## Description

- Ability to add pauses between automatic breath-holds

### ***Dot Exam Strategies***

The workflow can be personalized to the individual patient condition and clinical need. The following predefined strategies are included. They can be changed at any time during the workflow:

- **Standard:** Segmented acquisition techniques
- **Limited patient capabilities:** switch to real-time and single shot imaging if breath-hold is not possible or arrhythmias occur

### ***Customization***

Existing Dot Engines 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 and Decision Points
- Modify the Parameter View

The MyoMaps package enables the calculation of quantitative T1, T2 and T2\* parametric maps at the heart. The calculation is available shortly after the measurement is finished without the need of post-processing.

### **T1 Parametric Map**

- Acquisition based on ECG triggered modified look-locker inversion recovery (MOLLI)
- T1 parametric maps could be used to enhance the characterization of both ischemic and non-ischemic heart disease.

### **T2 Parametric Map**

- Acquisition based on T2-prepared TrueFISP sequence
- T2 parametric maps could be used to enhance the evaluation of myocarditis and heart transplant rejection.

### **T2\* Parametric Map**

- Acquisition based on multi-echo GRE sequence
- T2\* parametric maps could be used in the evaluation of iron overload for hemochromatosis patients.

Peripheral Pulse Unit for Pulse Triggering:

- Reduces flow artifacts caused by pulsatile blood flow.
- Excellent image quality by synchronizing data acquisition to the pulsatile blood flow.

## **Abdomen Dot Engine**

### ***Guidance view***

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

### ***Patient View***

- Easily tailored to the individual patient.
- Several pre-defined, integrated Dot Exam Strategies are included
- Single click update of queue and the complete scan set-up.
- Integrated contrast media protocols (Vibe Dynamic)

### ***Parameter View***

- A new view that displays the essential parameters
- Can be opened at any time during an examination

### **Automatic sequence scaling**

## Description

- Auto FoV: optimal FoV is proposed, based on the localizer images.
- AutoNavigator: based on automatic breathing pattern detection and scaling of triggered scans.
- Breath-hold adaptations

### **Dot Exam Strategies**

Personalize to the individual patient condition and clinical need.

- Predefined strategies:
  - Standard with breath-hold
  - Standard with PACE triggering
  - Limited patient capabilities using *syngo* BLADE and PACE triggering.

### **Dot Decisions**

Seamlessly integrated into scanning workflow:

- Select the queue and the appropriate protocol or set of protocols are automatically added.
- Abdomen Dot Engine integrates MRCP and Diffusion decision points.

### **Timeline setup and monitoring**

Convenient visual overview of multi-phase breath-hold examinations and CM enhancement curve visualization.

### **Auto Voice Commands**

- Played automatically
- Facilitate timing of scanning, breathing and contrast media.
- The user controls breath-hold or pauses are actually played
- Ability to add pauses between automatic breath-holds.

### **Auto Bolus Detection**

- Automatically initiates the dynamic upper abdomen examination based on bolus detection.
- The user can override this function.

### **Inline radial range calculation for MRCP**

- MRCP is measured
- Inline Radial Ranges are automatically generated.

### **Inline Subtraction**

Automatically subtracts the native (non-contrast) measurement from the arterial, portal-venous and late phase.

### **Inline Registration**

The system automatically performs a registration / alignment of the anatomy for the different dynamic phases, of interest when examining nodular enhancing pathologies.

### **Customization**

Existing Dot Engines 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 and Decision Points
- Modify the Parameter View

*syngo* NATIVE offers:

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

The *syngo* NATIVE package comprises:

- *syngo* NATIVE TrueFISP
- *syngo* NATIVE SPACE

## Description

### Main Features:

TWIST is a sequence for time-resolved (4D) angiographic imaging with high spatial and temporal resolution, in particular for angiography. For fat suppression, water-selective excitation is used.  
TWIST-VIBE is a VIBE sequence with CAIPIRINHA capability providing high spatial resolution. The view-sharing mode provides temporal information to ensure the right contrast timing for different lesions. Dixon is used for fat-water separation.  
StarVIBE allows body imaging in free breathing mode, providing a solution for patients without breath-hold capabilities.

### Main Features:

- The inline screening Dixon sequence gives the user a first overview of possible fat and/or iron overload in the whole liver.
- Based on the result images, liver segmentation runs without user interaction.
- If further evaluation is needed, the user can choose from two methods:
  1. HISTO is a pushbutton single breath-hold single voxel spectroscopy method to calculate fat fraction as well as water R2.
  2. Multi-echo Dixon is an image based method to calculate maps such as water, fat, fat signal percentage, and R2\*.

### QISS offers:

- Non-contrast enhanced peripheral MRA
- Higher robustness when compared to other non-contrast enhanced peripheral MRA methods
- Improved usability provided by the Dot AddIn which enables easier multi-stage planning

### The QISS package comprises:

- QISS sequence
- QISS Dot AddIn
- Non contrast-enhanced peripheral vessels protocols

Special video camera for monitoring the patient during an MR examination.

Color 640 x 480 pixel LCD monitor may be positioned at the *syngo* Acquisition Workplace or at a convenient wall location (wall support not included in scope of delivery) in the control room.

The cart may be rolled to convenient locations in the examination room and can be opened up to work like a shelf. The coil storage cart has multiple drawers and trays as well as many other storage spaces for coils, cushions and miscellaneous items.

Its dimensions are: Width 140 cm (4' 7") when closed and 280 cm (9' 12") when opened, depth 54 cm (1'9") and height 121 cm (3'12").

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.

Table height 72 cm, matching the *syngo* Acquisition Workplace and *syngo* MR Workplace console table, for installation in the operator room either directly to the left or right of the *syngo* Acquisition Workplace or *syngo* MR Workplace console table or separately.

- Width 50 cm
- Depth 80 cm
- Height 72 cm

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).

### Function:

- Interface between the on-site water chiller (of any brand/type) or

## Description

- Interface to the central hospital chilled water supply.

Delivery volume:

- Separator
- Two 3.0 m hoses (forward and return) for connecting the SEP to the local cooling water supply system
- Separation cabinet
- With the SEP configuration, the helium compressor is built into the SEP cabinet and connected internally
- Regional specific adapter for connection to the hospital installation

Eaton 93PM-200/180 3-Wire UPS Electronics Cabinet: 200kW Frame cabinet with four (4) Power Modules (UPM) configured as a 180kW capacity system specifically for a medical imaging application. 480 volts input / 480 volts output, 3-Wire + Gnd. Double Conversion Topology, Unit efficiency up to 97% (up to 99% with ESS), Unit output rating @ Unity Power Factor, Input current distortion < 3% @ 100% load, Patented ABM Technology, Patented HotSync parallel firmware control, Scalable Architecture, Parallel Redundancy and Capacity capable. Onboard monitoring of UPS status via front panel display is standard. Includes Four (4) internal min-xslot communication card bays and single feed input with three (3) circuit breaker (BIB, MBP, MIS) integrated maintenance bypass in a 14.7" wide right-mounted sidecar. This sidecar will ship separately on its own pallet. Included Services: Start-up (7x24): PLUS One (1) year on-site labor coverage (7x24).

UPS Cabinet Dimensions: 46.7"W x 42.0"D x 74.0"H  
UPS Cabinet Weight: 1,751 Lbs.

Eaton 93PM 480Vdc Battery System: One (1) IBC-LWH Integrated Battery Cabinet consisting of one (1) string of 240 cells (@480Vdc), 40 Batteries, and 500A Circuit Breaker in cabinet. Full load back-up time @ 180kW of 5.1 minutes.

Battery Cabinet Dimensions: 34.2"W x 42.0"D x 74.0"H  
Battery Cabinet Weight: 4,913 Lbs.

Eaton Power Xpert Gateway UPS Mini-Slot Card (PXGMS): This card can provide Web/SNMP and Modbus TCP/IP connectivity and functionality for the 93PM UPS system for the purpose of remotely monitoring the status of the UPS via an Ethernet network connection.

An MR-compatible arm rest that supports the patient's arm on the magnet patient table when starting intravenous lines. The board is removed after the IV is inserted.

This product has been tested and verified for compatibility with the following Siemens' products: MAGNETOM Trio, Verio, Espree, Essenza, Avanto, Symphony, Area Skyra and Biograph mMR. Compatibility with other products cannot be assured and may void service contracts and/or system warranties.

- Set of 2, 18.75° Wedges. 3" H x 4" W x 7"L
- 45° Wedge. 6.6" H x 6.75" W x 7.25"L
- Circular Disc. 1.5"H x 7" Diameter
- Set of 2, 12° Wedges. 2.25" H x 9.5" W x 7.25"L
- Rectangle .5" x 4" x 6"
- Rectangle 4"H x 18"W x 24"H
- 2 Cylinders, 4.25"D x 12"L
- Set of 2 Thin Mats, .25"H x 18"W x 24"L
- Standard vinyl table pad 1" x 24" x 72"

To be eligible for this promotion, a binding purchase order of the application(s) must be received by Siemens Medical on or before September 30, 2018

Features of syngo.MR Cardio Engine:

syngo.MR Cardiac 4D Ventricular Function processes MR cine images of the heart and generates quantitative results for physicians in the diagnostic process.

## Description

syngo.MR Cardiac Flow processes velocity-encoded MR images to evaluate blood flow dynamics e.g. in the heart and the great vessels. The application generates quantitative results for physicians in the diagnostic process.

The MR cardiac interactive reporting template is included.

Scope of delivery:

- 1 x syngo.MR Cardio Engine software package with
- Cardiac 4D Ventricular Function and
- Cardiac Flow evaluation

Main functionalities of syngo.MR Neuro Perfusion Engine:

- Rigid Motion Correction and spatial filter
- Computation of relative Mean Transit Time (relMTT), relative Cerebral Blood Volume (relCBV), relative Cerebral Blood Flow (relCBF), Time to Peak (TTP) and Percentage of Baseline at Peak (PBP)
- Global AIF, Global AIF with delay correction, local AIF, and local AIF with T1 correction for perfusion maps generation.
- Preprocessing functionality for map generation using local AIF methods
- Dedicated stripes layout for perfusion map reading
- Mean curve evaluation with up to 10 ROIs
- One-click mirror ROIs on the contralateral side with ratio computation
- Summary table displaying the results with .CSV export functionality
- Mismatch evaluation between any series with same frame of reference
- Evaluation based on ROIs or combination of ROIs
- Summary table displaying results with .CSV export functionality

Scope of delivery:

- 1 x syngo.MR Neuro Perfusion Engine software package with
- MR Neuro Perfusion Evaluation
- MR Neuro Perfusion AIF
- MR Neuro Perfusion Mismatch

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. With the addition of Diffusion Spectrum Imaging (DSI), it is possible to acquire diffusion data in up to 514 different directions each with independent b-values.

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.

syngo.MR Tractography offers:

**Contrast alignment:**

Image-based registration to compensate for different acquisition times and/or different patient positions.

**Visualization of Tractography information:**

## Description

- Expanded / merged 2D and 3D displays of the paths of the white matter in the context of anatomical 2D or 3D records and DTI records (also fMRI results, if the license "syngo.MR Neuro fMRI" is available). The object is a deterministic approach based on the tensor model with configurable parameters.
- Interactive exploration of diffusion paths with multiple interactive VOI objects (VOI, fMRI voxels, planes, etc.) These can be grouped logically, as required, to filter complex diffusion paths, too. Realtime updates to the tract display while the VOI objects are in motion.
- The interactive exploration is conducted based on a global tract set, which is generated "on the fly" with configurable algorithm parameters for the tensor record currently in use.
- Creation of persistent / static tracts. These can be displayed or hidden to present them in their relation to other tracts or fMRIs. Each persistent / static tract can be further refined again at any time in interactive mode.
- Default parameters for typical cases of tractography use can be configured for the generation of static tracts. These enable the preconfiguration of the visualization and algorithm parameters to be used.
- A tract statistic can be displayed for each static tract or for the current interim result in interactive mode (the number of individual paths, mean FA value, mean diffusivity, mean radial diffusivity, mean axial diffusivity).
- The way the tracts are displayed can be adjusted on an individual basis. The following options are available: Lines / tubes, directional color coding / color coding using FA / flat solid coloring
- Multiple diffusion tensor records can be evaluated in one session – even at different times – in order to place tracts from different acquisitions in relation to each other.
- Fully integrated with syngo.MR Neuro fMRI. fMRI activations can be used as seeds for tractography. This requires the corresponding license

### Offline DTI functionality

- Capability to generate TENSOR data together with other diffusion maps from raw MDDW diffusion series. The TENSOR data can then be used for tractography post-processing
- The diffusion maps calculated include b0, TraceW (Trace-weighted), ADC (Apparent Diffusion Coefficient), FA (Fractional Anisotropy), AD (Axial Diffusivity) and RD (Radial Diffusivity) maps
- The processing settings (gradient diffusion information) are automatically derived from the DICOM header of the input data.
- The user can alternatively define the diffusion gradient map. Import of external gradient maps (.gra, .xml) is possible.

### Diffusion Evaluation

- Side by side display of multiple diffusion maps for quantitative evaluation of diffusion parameters.
- The evaluation can be performed using ROI, freehand ROI, VOI, VOI restricted to fMRI activated voxels (requires syngo.MR Neuro fMRI), or voxels of interest.
- The results are displayed in a table which can be exported in .csv format.

### Export

- Tracts can be depicted in reports using snapshots, as can their associated statistical values.
- Export to different formats (DICOM MR with integrated tract and fMRI display, DicomRGB).

Scope of delivery:

- 1 x syngo.MR Tractography software

### Single-Voxel Spectroscopy

Integrated software package including sequences and protocols for proton spectroscopy to examine metabolic changes. Includes optimizations for brain tissue and for the breast (GRACE).

In order to obtain best spectral quality in the breast, it is recommended to use one of the following breast coils: Breast 18, Breast BI 7, (2-/4-/)8-Channel or (2-/10-/)16-Channel Sentinelle Breast coil.

### 2D Chemical Shift Imaging

The 2D Chemical Shift Imaging option is used to measure 2D 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 8 minutes.

## Description

The package comprises:

- 2D hybrid CSI measurement with Spin Echo and STEAM techniques
- Echo times 30-1500 msec for Spin Echo and 20-300 msec for STEAM
- Repetition times 0.5-10 sec.
- Voxel size down to a minimum of 1,7x1,7x5 mm<sup>3</sup> for Spin Echo and 2,5x2,5x5 mm<sup>3</sup> for STEAM in the three spatial directions
- Field of View down to a minimum of 55 mm for Spin Echo and 80 mm for STEAM, matrix size between 8x8 and 32x32 voxels
- Slices can be freely angulated
- Fully automatic adjustments including localized 3D volume shimming for optimized homogeneity of the large volumes with 2D Hybrid CSI
- All adjustments can still be performed manually with real-time guidance (as i.e. interactive shimming).
- Optimized B1-insensitive and T1-insensitive water suppression with variable suppression bandwidth
- Optimized protocols for CSI brain examinations
- Quality control using an FID technique
  - Fully excited Vol (Volume of Interest)
  - Outer Volume Suppression (OVS)
  - Spectral Suppression

### 3D Chemical Shift Imaging

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 package comprises:

- 3D hybrid CSI measurement with Spin Echo and STEAM techniques
- Echo times 30-1500 msec for Spin Echo and 20-300 msec for STEAM
- Repetition times 0.5-10 sec.
- Voxel size down to a minimum of 1,7x1,7x3,4mm<sup>3</sup> for Spin Echo and 2,5x2,5x5 mm<sup>3</sup> for STEAM in the three spatial directions
- Field of View down to a minimum of 55 mm for Spin Echo and 80 mm for STEAM, matrix size between 8x8x8 and 32x32x16 voxels
- Volumes can be freely angulated
- Fully automatic adjustments including localized 3D volume shimming for optimized homogeneity of the large volumes with 3D Hybrid CSI
- All adjustments can still be performed manually with real-time guidance (as i.e. interactive shimming).
- Optimized B1-insensitive and T1-insensitive water suppression with variable suppression bandwidth
- Quality control using an FID technique
  - Fully excited Vol (Volume of Interest) within the partitions
  - Outer Volume Suppression (OVS)
  - Spectral Suppression

### **syngo.MR Spectro Engine**

syngo.MR Spectro SVS provides evaluation of proton MR Single Voxel Spectroscopy (SVS) data with comprehensive workflow guidance.

syngo.MR Spectro SVS includes the possibility of an integrated reading of MR images and spectroscopy data for breast exams.

syngo.MR Spectro CSI provides evaluation of proton MR Chemical Shift Imaging (CSI) data with comprehensive workflow guidance.

syngo.MR Spectro CSI includes the possibility of an integrated reading of MR images and spectroscopy data for

## Description

prostate exams.

syngo.MR Spectro Extension provides comprehensive evaluation of proton MR spectroscopy data with workflow guidance.

Both Single Voxel Spectroscopy (SVS) and Chemical Shift Imaging (CSI) data are supported.

syngo.MR Spectro Research offers workflow and data processing solutions for research customers, such as export of raw data, quantification of multi nuclear data and expert curve value etc. It extends the clinical routine package (syngo.MR Spectroscopy) with additional features to fulfil the needs of research customers.

Scope of delivery:

1 x syngo.MR Spectro Engine software package with

- Single Voxel Spectroscopy
- Chemical Shift Imaging
- Spectroscopy Extension
- Spectro Research

The UltraFlex Small 18 can be wrapped around or placed flat on top of the area of interest. This rectangular coil measures approx. 19 cm x 41 cm and connects with only one SlideConnect Plug which allows for fast and easy patient preparation. The positioning aids that come with the coil enhance positioning flexibility and help minimize involuntary patient motion artifacts.

This enables studies with very high spatial resolution and very short scan time. The upper part of the coil is detachable and can be fitted with a mirror allowing the patient a rear view out of the magnet. Displaceable cushions are provided with the coil for positioning. The coil is suited for head proton imaging and brain spectroscopy.

The table design matches the MED-wide uniform design with silver-finished rim, use of friendly colors for MAGNETOM and SOMATOM.

This table can electrically be adjusted to the ergonomically most suitable height via buttons at the front.

- Width 138 cm
- Depth 80 cm
- Height electrically adjustable between 71 cm and 110 cm