



# **Embrace human nature at 1.5T**

## **MAGNETOM Sola<sup>1</sup> with BioMatrix**



# Our journey to precision medicine

The world's population will grow by 30% to 9.6 billion by 2050, with life expectancy increasing by 10%.<sup>2</sup> A higher number of ill patients and chronic disease cases will lead to greater cost pressure on healthcare systems. Each and every patient, as well as their disease states, is different and individualized treatment paths are necessary.

The future of healthcare can be precision medicine: the right treatment for the right patient at the right point of time.

In order to pave the way for precision medicine in MRI, one of the greatest challenges – the variability of the individual patient – needs to be addressed. Only by overcoming the challenge of patient variability can healthcare institutions provide standardized results.

Standardization means robust, consistent results are made available, aiding in diagnosis. In the future, this will enable treatment decisions and therapy response assessment based on quantitative tissue characterization with MRI.

This will enable healthcare providers to deliver individualized therapy, as well as more accurately predict treatment success. MRI will play a major role in this context.



*“BioMatrix as a core technology on MAGNETOM Sola will make MRI even more consistent and robust, which is absolutely key for taking the next step to quantification, and then ultimately feeding into artificial intelligence guided systems to help drive clinical decision support.”*

Christoph Zindel, M.D.  
Senior Vice President, General Manager  
Magnetic Resonance, Siemens Healthineers



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# Embrace human nature with BioMatrix

Patients have unique, individual characteristics. Their different physiologies and anatomies – but also the way we interact with them and with technology – cause unwarranted variations.

These unique human characteristics – biovariabilities – pose significant challenges in MRI: Inconsistent exams. Poor image quality. Increased need for rescans. Unpredictable scheduling. They all can negatively impact the quality and cost of the care you provide.

BioMatrix technology helps to overcome these challenges with a whole new approach: by

embracing human nature. Instead of expecting patients to adjust to the technology, BioMatrix automatically adjusts to the patient. BioMatrix Sensors, Tuners, and Interfaces allow you to anticipate motion, adapt to the patient, and to simplify and accelerate patient preparation – no matter who comes next.

*“To provide our patients with individual therapies, we need every piece of information available. In imaging, this means we need robust, standardized, and reproducible image data, always of the same quality regardless of the patient or user. BioMatrix Technology gives us this data quality and comprehensive image information and is helping us on our way to quantitative radiology.”*

Professor Konstantin Nikolaou, M.D.  
University Hospital Tübingen, Germany



# BioMatrix Technology



**Anticipate motion for high-quality results with BioMatrix Sensors.**



**Adapt to challenging anatomies for reliable exams with BioMatrix Tuners.**



**Accelerate patient preparation for increased efficiency with BioMatrix Interfaces.**

# Embrace human nature at 1.5T with MAGNETOM Sola

MRI needs to provide high-quality results – cost-effectively and consistently. Therefore, it needs to better handle patient variability, to deliver robust results for all patients and in every scan.

.....●  
**First 1.5T BioMatrix system, reducing unwarranted variations**

.....●  
**New 1.5T magnet, 70 cm Open Bore and large 50 x 50 x 50 cm<sup>3</sup> FoV**

.....●  
**New BioMatrix Sensors for increased consistency – capturing respiratory, cardiac, and head motion**

.....●  
**Expanded BioMatrix Tuners for excellent homogeneity – adapting to challenging body regions**

.....●  
**Enriched BioMatrix Interfaces to ease patient preparation – enabling 30% faster patient positioning<sup>3</sup>**





MAGNETOM Sola, the first 1.5T system with BioMatrix technology, turns challenges into opportunities, delivering a whole new level of consistency, efficiency and new clinical capabilities.



- .....  
**Free-breathing exams with Compressed Sensing for higher patient comfort**
- .....  
**Push-button exams and GO technologies powered by AI technology for increased patient throughput**
- .....  
**New accelerated applications with Simultaneous Multi-Slice reducing scan time by up to 46% for comprehensive MSK exams<sup>3</sup>**
- .....  
**New anatomy-adaptive coils for improved patient experience**
- .....  
**New user environment with syngo MR XA11 for intuitive handling**
- .....  
**Efficient energy management with EcoPower for cost-effectiveness**

# Embrace consistency at 1.5T

## with BioMatrix Technology

MAGNETOM Sola, the first 1.5T system with BioMatrix technology, turns challenges into opportunities, delivering a whole new level of consistency. Overcome unwarranted variations with BioMatrix by automatically adjusting to patient variability. BioMatrix Sensors, Tuners, and Interfaces allow you to anticipate motion, adapt to any patient's body shape, and to accelerate patient positioning. The result: higher diagnostic confidence, fewer rescans, predictable patient scheduling, and consistent, high-quality personalized exams.



### Anticipate motion for high-quality results with BioMatrix Sensors

Motion is a challenge in MRI, as it can dramatically decrease image quality, limiting consistency in scans and leading to costly rescans. Deeply embedded in the system architecture, BioMatrix Sensors capture respiratory, cardiac<sup>4</sup> and head<sup>5</sup> motion for increased consistency. This allows the user to choose the optimal exam strategy, and ensure consistent high-quality results.



.....  
[siemens.com/  
BioMatrix-Sensors](https://www.siemens.com/BioMatrix-Sensors)

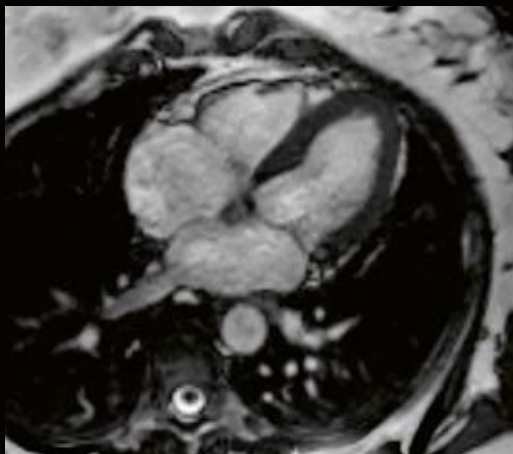
See how it works  
.....

## BioMatrix Beat Sensors



The Beat Sensor<sup>4</sup> is seamlessly integrated into the BioMatrix Body 12. It is designed for automatic cardiac triggering – without the need for ECG leads.

### BioMatrix Beat Sensor – designed to capture heart motion



**Segmented cine 4-chamber**  
acquired without ECG



**Segmented cine short axis**  
acquired without ECG

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## BioMatrix Kinetic Sensor

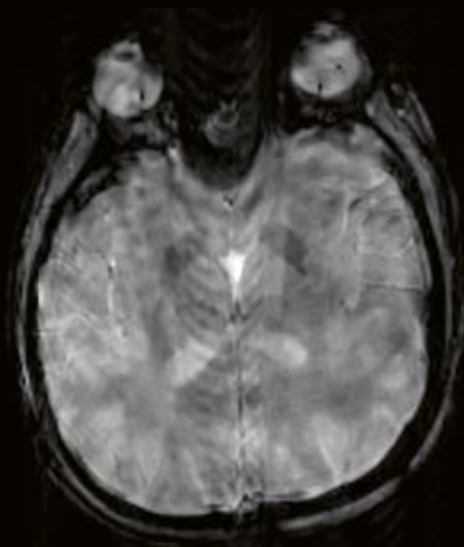


The Kinetic Sensor<sup>5</sup> in the scanner bore records real-time head motion information. It is designed for prospective motion correction for high-quality exams.

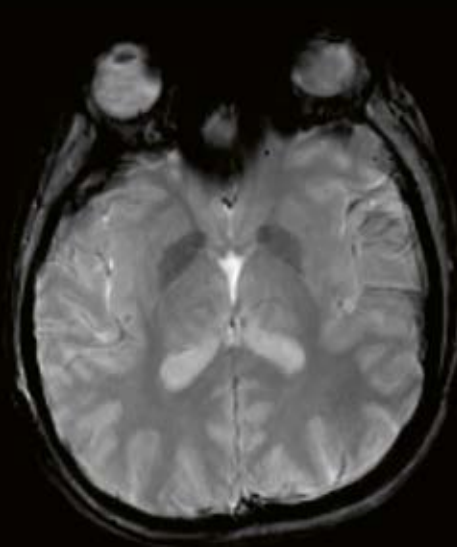


When used together with a marker that is positioned on the patient nose, the Kinetic Sensor allows for prospective motion correction.

### Motion correction with Kinetic Sensor – designed to improve diagnostic quality of imaging



Without motion correction



With motion correction

400000211

## BioMatrix Respiratory Sensors



The Respiratory Sensors automatically detect breathing patterns as soon as the patient lies on the table. This provides a simplified workflow as respiratory triggered scans can be performed without additional user interaction. (See images below.)

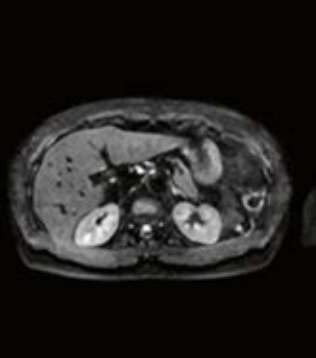


Display of patient's respiration data, acquired by BioMatrix Sensors.

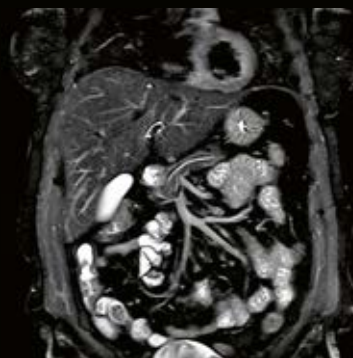
### Respiratory triggering with Respiratory Sensors – no navigator setup, no breathing belt



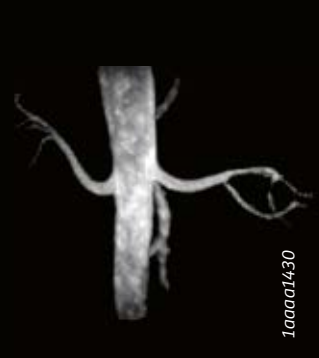
MRCP T2 SPACE MIP –  
respiratory triggered with  
Respiratory Sensors



SMS accelerated DWI b800 –  
respiratory triggered with  
Respiratory Sensors



T2 HASTE –  
respiratory triggered with  
Respiratory Sensors



NATIVE –  
respiratory triggered with  
Respiratory Sensors



siemens.com/  
BioMatrix-Tuners

See how it works



## Adapt to challenging anatomies for reliable exams with BioMatrix Tuners.



BioMatrix Tuners adapt to challenging anatomies, such as the head/neck area, the spine and the abdomen, for reliable exams. Even for difficult scan regions, our intelligent coil technology consistently delivers excellent homogeneity and fat saturation – driving robustness and reproducible high-quality imaging – for every patient, every time.

BioMatrix Head/Neck 20, tiltable (0° / 9° / 18°)  
with CoilShim

### Significantly improved fat saturation and image quality with BioMatrix Tuner CoilShim



Conventional Shim



With CoilShim

Integrated into the new BioMatrix Head/Neck coils, CoilShim increases diagnostic quality and reduces the need for repeat scans by delivering improved fat saturation and better DWI quality in the neck region. CoilShim technology ensures that the challenging area is automatically and optimally shimmed for reproducible quality in every patient.

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## Improved image quality in the entire imaging volume with BioMatrix Tuner SliceAdjust

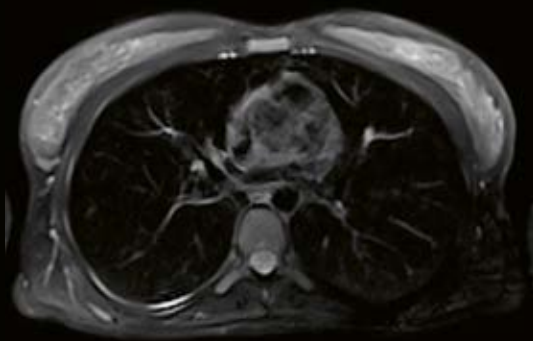


Conventional Volume Adjust

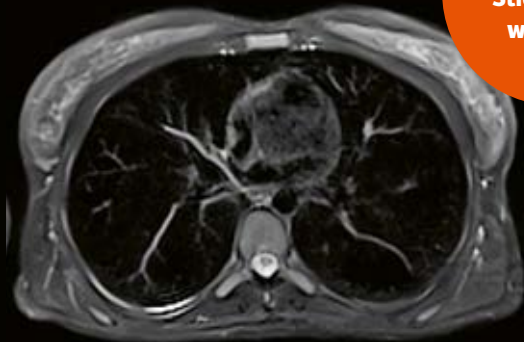


With SliceAdjust

SliceAdjust technology provides reliable fat saturation for both TSE and DWI sequences, as well as distortion-free whole-body DWI scans<sup>1</sup>. It avoids broken spine artifacts in whole-body DWI for excellent correlation with anatomical scans.



Conventional Volume Adjust



With SliceAdjust  
Integrated in Multi-concatination TSE acquisitions

**NEW**  
SliceAdjust  
with TSE





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BioMatrix-Interfaces

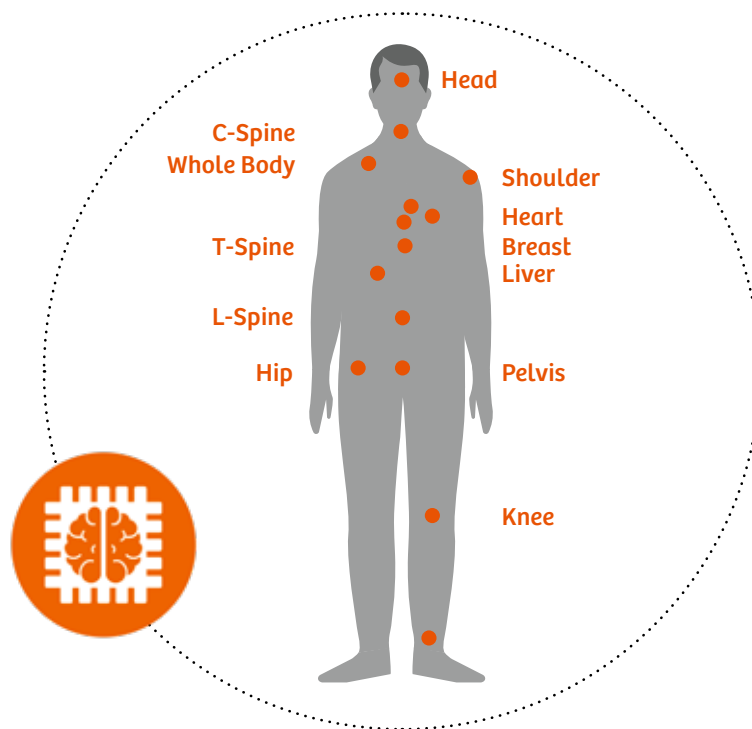
See how it works



## Accelerate patient preparation for increased efficiency with BioMatrix Interfaces.

BioMatrix Interfaces simplify how the user interacts with the scanner and the patient, accelerating patient preparation in order to increase quality and improve cost-effectiveness. No matter how tall, big, or mobile a patient is – or how experienced the technologist is – BioMatrix Interfaces speed up the workflow for increased efficiency.

The BioMatrix dockable table with eDrive support provides motorized assistance so that even the heaviest patient can be effortlessly moved to and from the scanner.



With one-touch positioning on the Select&GO touch display based on the underlying BioMatrix Body Model **artificial intelligence** is employed to accelerate patient positioning by up to 30%.<sup>3</sup> Delays due to incorrect positioning

can now be avoided. The user simply selects the region or organ to be scanned on the touch display and the patient is automatically and precisely positioned for the respective scan.





Simplify and speed up patient transportation with BioMatrix Interfaces and eDrive support.



Fast and easy positioning with the Select&GO display.

# Embrace efficiency at 1.5T

## with GO technologies and Simultaneous Multi-Slice

For routine MR examinations, reimbursements are falling and referrals are increasing due to changing demographics. MAGNETOM Sola, with new *syngo* MR X user environment, embraces efficiency at 1.5T and makes push-button examinations a clinical reality. GO technologies help you accelerate the entire workflow from patient positioning to result distribution, powered by artificial intelligence. New speed technologies such as Simultaneous Multi-Slice TSE can dramatically reduce scan times for routine examinations. Enhance your efficiency to optimize clinical operations.



### Preparation with Select&GO:

BioMatrix Select&GO enables exam positioning with one touch on the display – by anyone, on any patient.



### Acquisition with DotGO:

An intuitive Dot workflow with automatic placement of the imaging slices, e.g. using AI powered AutoAlign Spine, turns whole-spine imaging into a push-button exam.

Spine examinations – as an example – can pose a challenge as a result of varying anatomies, such as scoliosis and kyphosis. This can often cause delays and lead to diminished image quality.

**GO technologies** accelerate workflow beyond scan time reduction, enabling higher throughput and robustness in clinical routine.



#### **Reconstruction with Recon&GO:**

Recon&GO automatically performs postprocessing steps in the background. For example: vertebrae in the sagittal, axial, and coronal views are automatically labeled in all contrasts.



#### **Distribution with MR View&GO:**

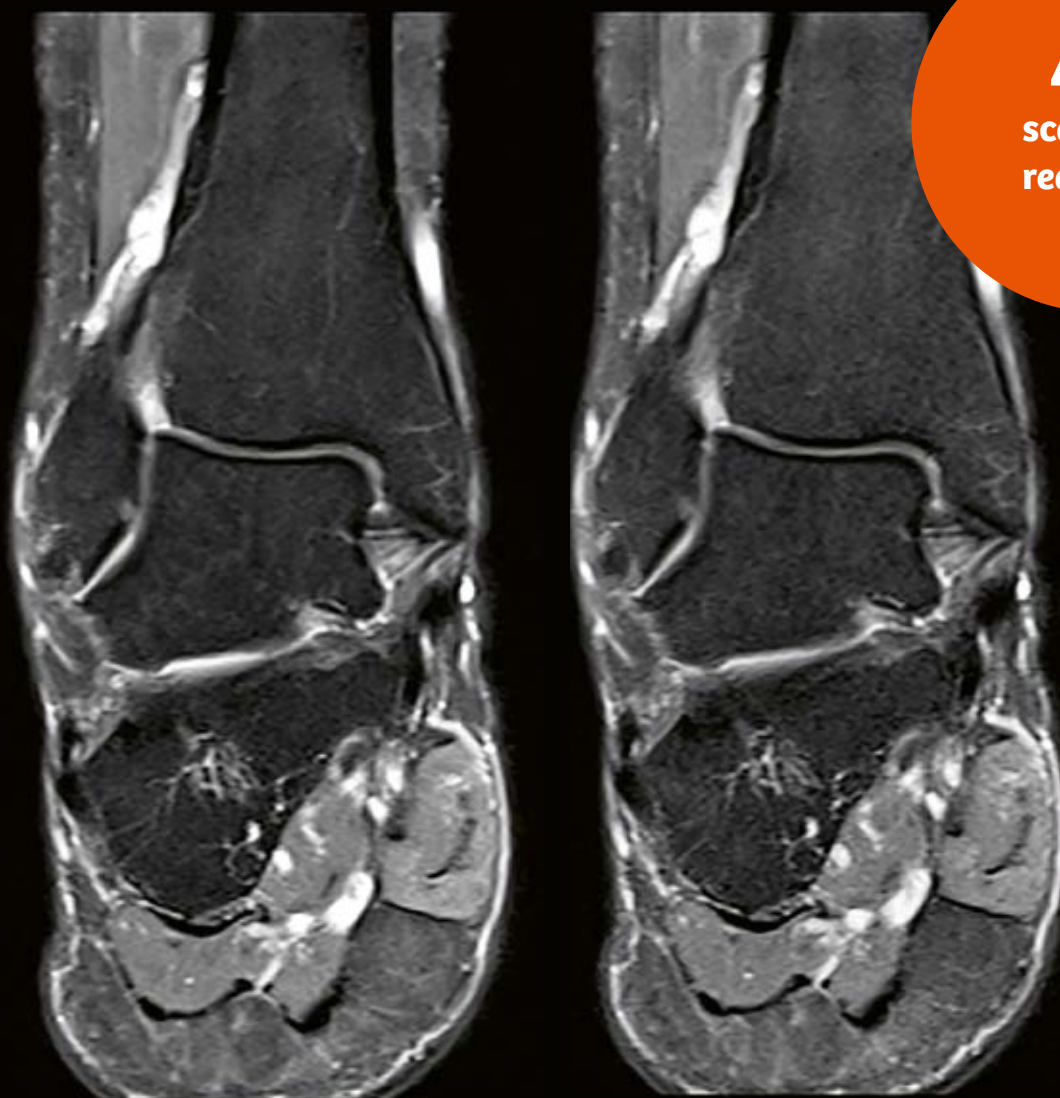
Dual screens allow the user to control scans on the left monitor while checking the results on the right monitor in real time.

# Simultaneous Multi-Slice TSE

Accelerate anatomical imaging.



New speed applications with Simultaneous Multi-Slice  
reducing scan time without compromising image quality.



PAT 2, TA 2:44 min

PAT 2 + SMS 2, TA 1:25 min

PD fs, coronal,  $0.4 \times 0.4 \times 3.0 \text{ mm}^3$   
acquired with the Foot/Ankle 16 coil

**New accelerated applications with Simultaneous Multi-Slice  
reducing scan time without compromising image quality.**

PAT 2 + SMS 3, TA 1:35 min



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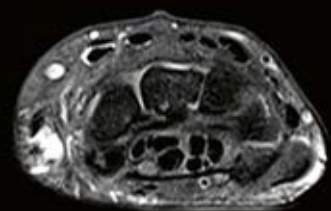
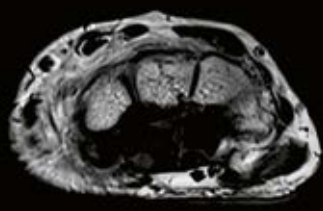
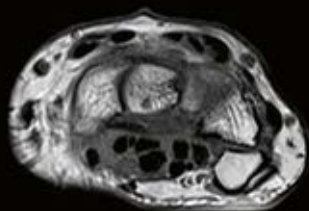
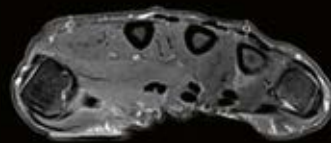
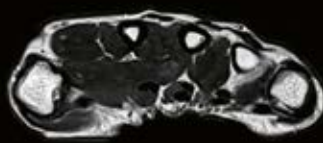
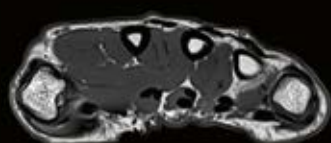
PAT 2, TA 4:14 min



PD, coronal,  $0.3 \times 0.3 \times 3 \text{ mm}^3$  acquired  
with the Tx/Rx Knee 18 coil



SMS TSE enables full hand coverage with thinner slices and all relevant contrasts in less than 5 minutes.



1a0ca1681

T1 TSE tra  
60 slices, PAT 2 + SMS 2  
0.3 x 0.5 x 3.0 mm<sup>3</sup>  
TA 1:43 min

T2 TSE tra  
60 slices, PAT 2 + SMS 2  
0.3 x 0.5 x 3.0 mm<sup>3</sup>  
TA 1:35 min

PD TSE FS tra  
60 slices, PAT 2 + SMS 2  
0.4 x 0.5 x 3.0 mm<sup>3</sup>  
TA 1:36 min

# Embrace new clinical capabilities at 1.5T

## with Inline Compressed Sensing

With MAGNETOM Sola, grant patients access to MRI that previously had to be excluded because of their medical condition or due to the exam's complexity. Free-breathing Compressed Sensing applications help improve the patient experience, while extending your range of services. Significantly simplified procedures with automated workflow strengthen clinical fields with growth potential such as whole-body MRI.





### **Compressed Sensing GRASP-VIBE<sup>6</sup>**

Dynamic contrast-enhanced imaging is a key exam for the characterization of abdominal lesions. Yet, it is often challenging for many patients, because it requires several breathholds over a short period of time, with correct timing of contrast agent administration. For patients who cannot hold their breath for the whole duration of the scan, the result is often a non-diagnostic image.

Compressed Sensing GRASP-VIBE enables push-button, free-breathing examinations of liver dynamics with an extremely simplified workflow. An intelligent framework automatically recognizes the relevant phases of liver dynamics and only the clinically relevant phases are reconstructed with automatic labeling (e.g. arterial phase). Reliable dynamic contrast-enhanced imaging can now be performed for patients previously excluded from MRI.



### **Compressed Sensing Cardiac Cine**

MR cardiac function imaging is the gold standard for the diagnosis and prognosis in a variety of cardiac diseases, but it is time-consuming and requires a challenging number of breathholds. Image quality is impaired in particular for patients with arrhythmia.

Compressed Sensing Cardiac Cine provides image quality and resolution equal to conventional CINE imaging in free-breathing instead of 7–14 breath-holds. In combination with additional leading applications for cardiac imaging, this enables free-breathing cardiac MRI exams in high quality.

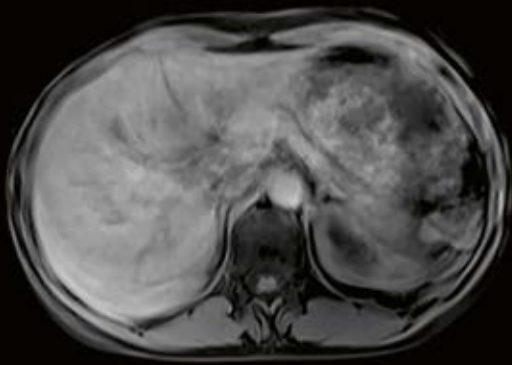
**Beyond  
speed.**

## Compressed Sensing GRASP-VIBE<sup>6</sup>

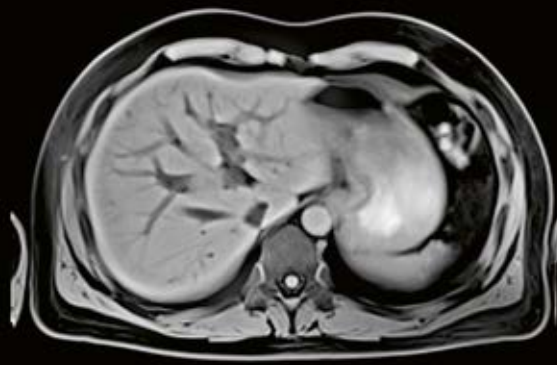
Beyond speed. Beyond motion.

- Push-button, free-breathing liver dynamics
- Removes timing challenges in dynamic imaging and respiratory artifacts
- Outperforms Cartesian VIBE acquisition under free breathing

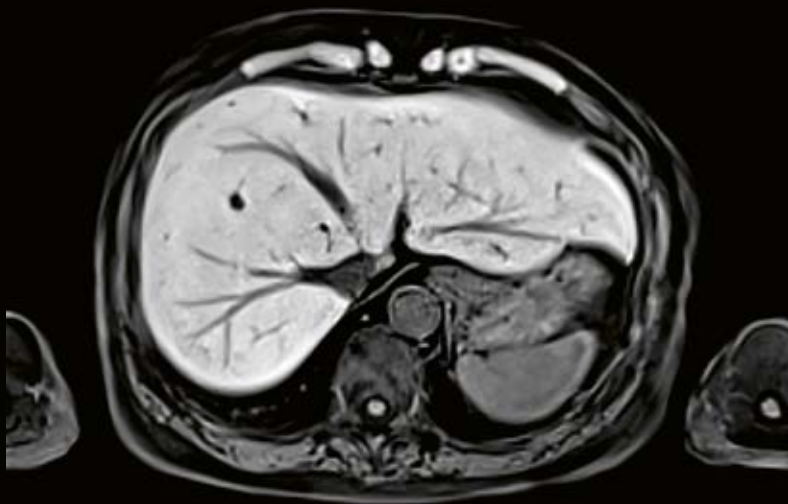
For patients with limited or no breath-hold capabilities, free-breathing acquisitions with Compressed Sensing GRASP-VIBE make a difference



Free breathing acquisition with conventional techniques



Free-breathing acquisition with Compressed Sensing GRASP-VIBE



Free-breathing acquisition with  
Compressed Sensing GRASP-VIBE



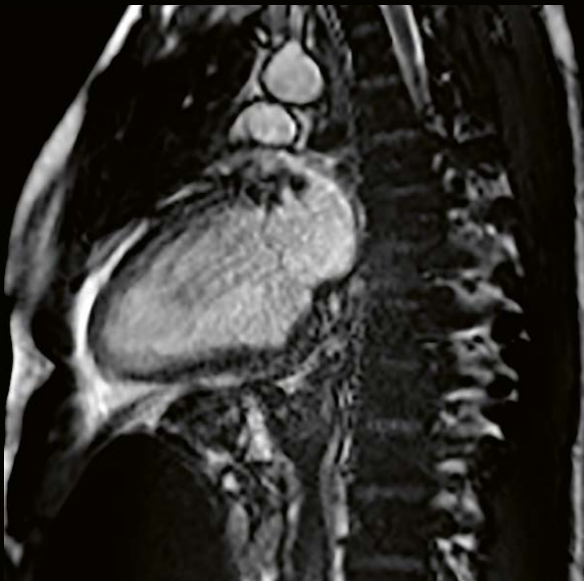
ID SO 003

Motion-robust imaging of the pelvis  
with Compressed Sensing GRASP-VIBE

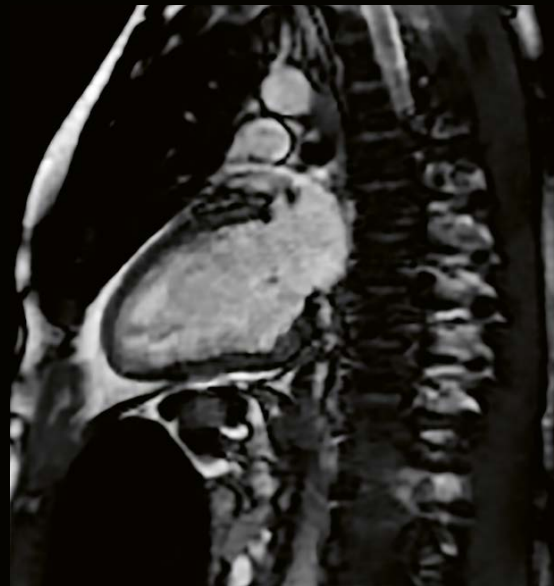
## Compressed Sensing Cardiac Cine Beyond speed. Beyond breath-holds.

- Cardiac function evaluation can now be offered to all patients – even those with arrhythmia.
- Acquire free-breathing, high-resolution Cardiac Cine images
- Capture the whole cardiac cycle for precise quantification
- Expand patient population eligible for Cardiac MRI

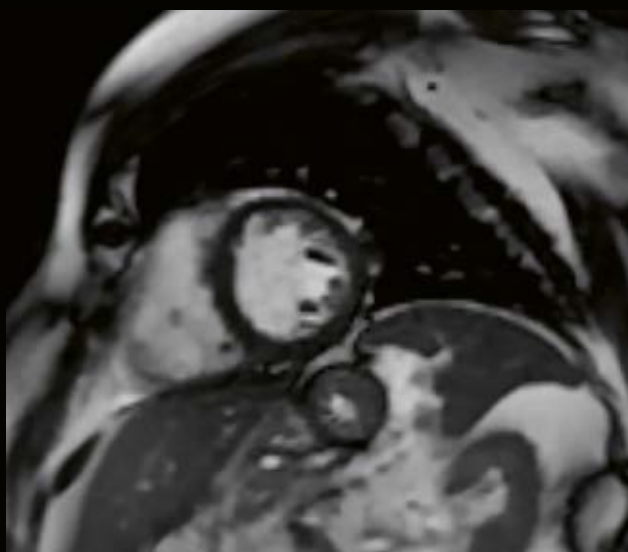
For patients with irregular heartbeats or limited breathhold capabilities, free-breathing acquisitions with Compressed Sensing Cardiac Cine make a difference



Conventional cine acquisitions are susceptible to breathing motion or irregular heart beats



Free breathing acquisition with Compressed Sensing Cardiac Cine



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Real-time cine short axis  
acquired with Compressed Sensing Cardiac Cine

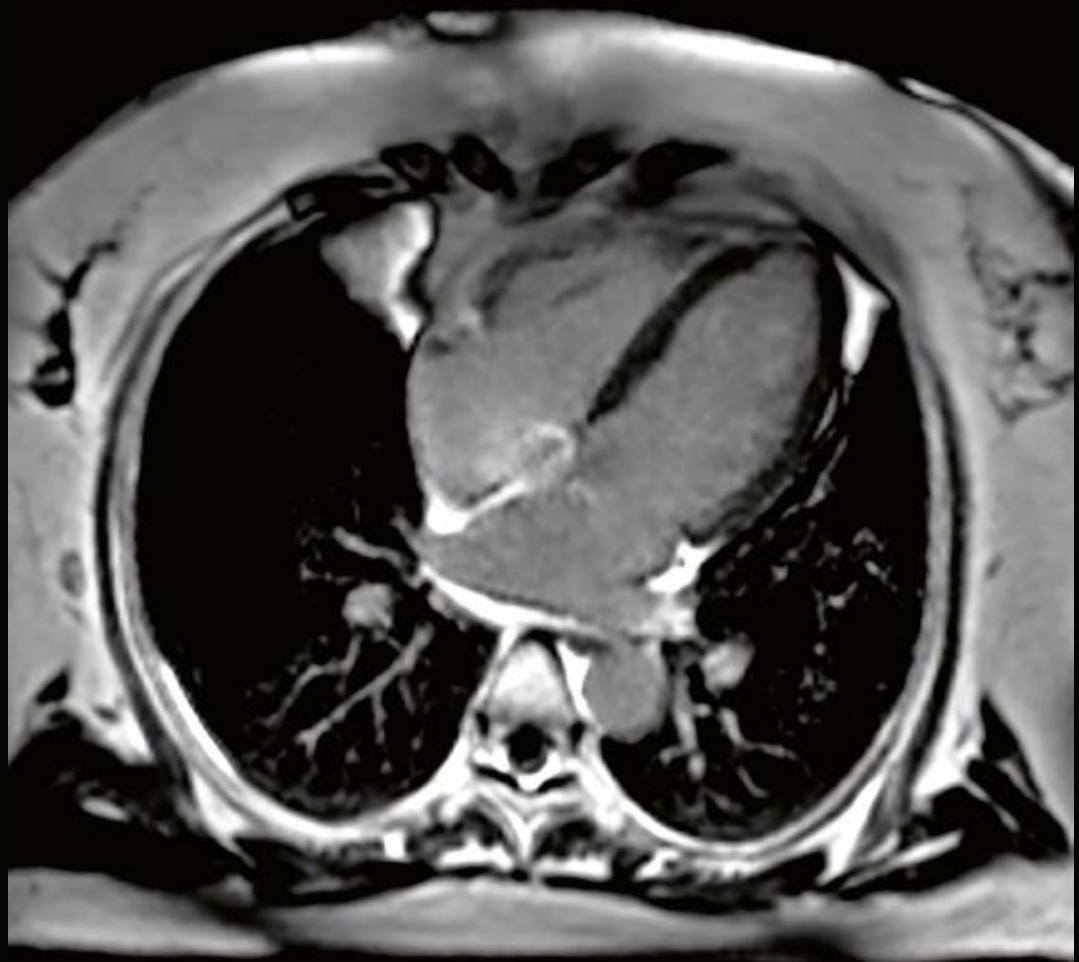


100001524

Real-time cine 2-chamber  
acquired with Compressed Sensing Cardiac Cine

## Phase-sensitive inversion recovery with HeartFreeze

Motion-robust, inversion recovery contrast imaging is now feasible in free breathing. With motion-corrected PSIR HeartFreeze.



PSIR HeartFreeze

100001430



Advanced cardiac applications are now greatly simplified and standardized with the Cardiac Dot Engine. New automated view positioning is now available for easy flow measurements, for standardized flow measurements of the aortic or mitral valve.

Automated slice positioning  
with the Cardiac Dot Engine

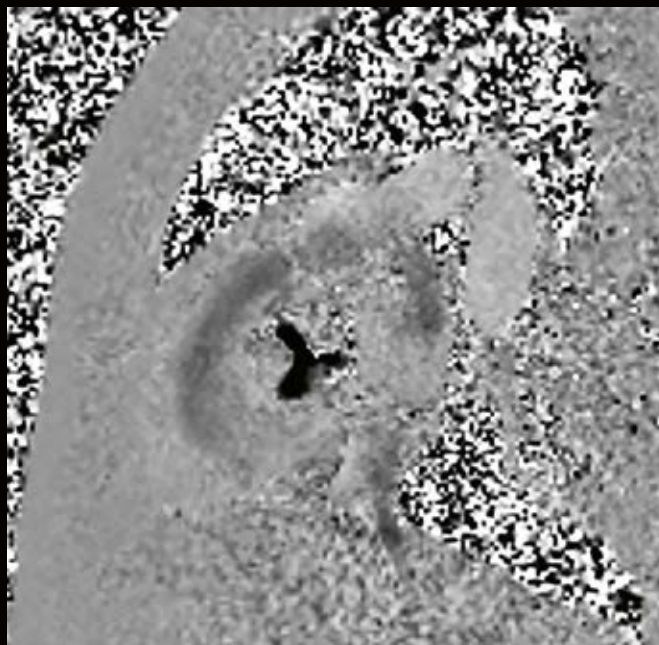
Magnitude image of the  
aortic valve



100001430

Automated slice positioning  
with the Cardiac Dot Engine

Phase image of the  
aortic valve



**Perform complete whole-body exams from head to pelvis in less than 30 minutes<sup>7</sup>**

**The new Whole-Body Dot Engine reduces the planning and execution of complex whole-body exams to a few clicks by simply selecting which regions need to be scanned, whether a focus region should be investigated, and setting a few patient-specific settings, e.g. breath-hold capability.**

All core protocols for bone and lymph node metastasis detection are covered.



T2 HASTE STIR

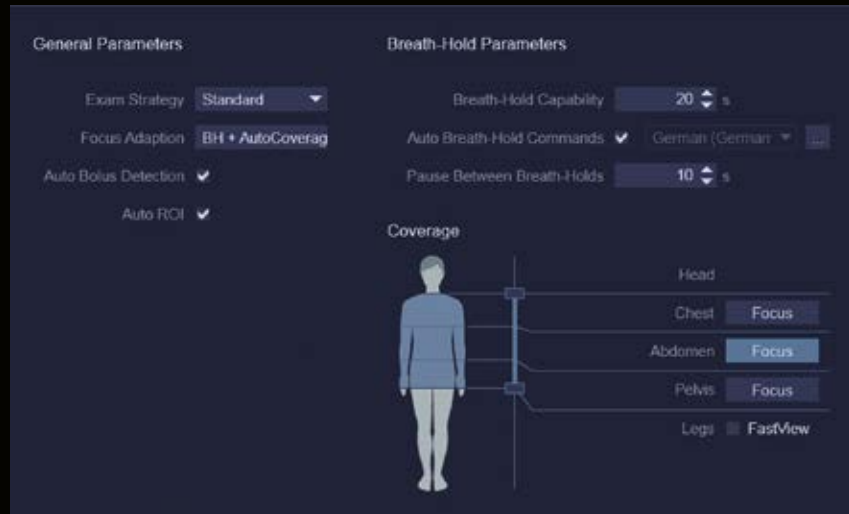
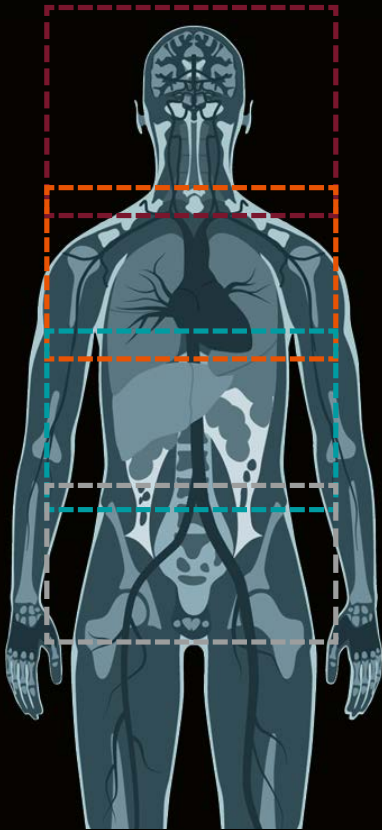


VIBE DIXON Water image

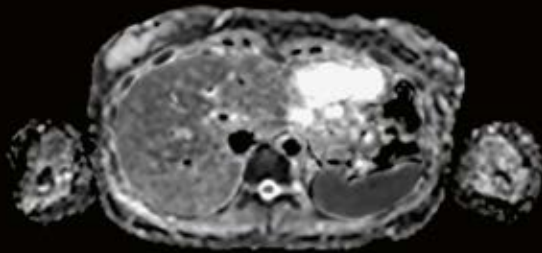


DWI b800

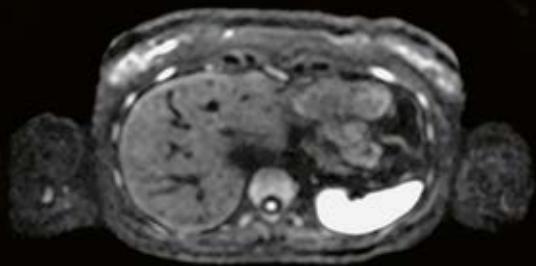




Whole-Body Dot Engine: intuitive and guided workflow



ADC map



DWI b800



T2 STIR



T1 TSE



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magnetom-world**

Visit MAGNETOM World

## Service and exchange – peer-to-peer information

**MAGNETOM World**  
Online MRI community



**IDEA**  
Development platform



**MAGNETOM Flash**  
MRI publication



### MAGNETOM World

The global MRI community from Siemens Healthineers offers peer-to-peer support and information. Radiologists, cardiologists, technologists, and physicists have all contributed with protocols, presentations, application tips, case studies, and more – all freely available to you via this unique network.

[www.siemens.com/magnetom-world](http://www.siemens.com/magnetom-world)

### MAGNETOM Flash

MAGNETOM Flash is the MR magazine. Published quarterly, it features up-to-date clinical case studies, application tips, as well as technical and product information relevant to you. All content is carefully compiled by experts to meet the needs of today's MRI users in both clinical and research scenarios. In fact, 98.5% of readers report that MAGNETOM Flash is clinically relevant.<sup>8</sup>

[siemens.com/magnetom-flash](http://siemens.com/magnetom-flash)

### IDEA

IDEA<sup>9</sup> is an open development platform supporting the largest and most active MR research community in the world. It brings users from across the globe together and fosters innovation in the field of MRI. Members collaborate online at [www.mr-idea.com](http://www.mr-idea.com)

# Technical specifications

## MAGNETOM Sola Technical specifications

Field strength	1.5 Tesla
Bore size	70 cm Open Bore design
System length	157 cm cover to cover
System weight (in operation)	4.2 tons
Minimum room size <sup>10</sup>	28m <sup>2</sup> / 302 ft <sup>2</sup>
RF technology	
Maximum number of channels <sup>11</sup>	204
Number of independent receiver channels that can be used simultaneously in one single scan and in one single FoV, each generating an independent partial image	32, 48, 64
Gradient strength	XQ gradients 45/200 simultaneously [2.03 MVA]
	XJ gradients 33/125 simultaneously [1.25 MVA]
Helium consumption	Zero Helium boil-off technology



## Why Siemens Healthineers?

At Siemens Healthineers, we enable healthcare providers to achieve better outcomes at lower costs by expanding precision medicine, transforming care delivery, improving patient experience, and digitalizing healthcare.

Healthcare providers around the world have long relied upon our engineering excellence – leading-edge, high-quality medical technologies across a broad portfolio. Our technologies touch an estimated 5 million patients<sup>12</sup> globally every day. At the same time, they help hospital departments to continuously improve their clinical, operational, and financial outcomes.

We now consolidate this unprecedented volume of data and insights and turn them into pioneering enterprise and digital health services. With those, we maximize opportunities and share risks of your entire health system.

Partnerships are built on people. With Siemens Healthineers there is no team more committed and more connected than we are to realize your success together.



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The information in this document contains general technical descriptions of specifications and optional features which do not always have to be present in individual cases. Siemens reserves the right to modify the design, packaging, specifications, and options described herein without prior notice. Please contact your local Siemens sales representative for the most current information.

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For accessories, please visit:  
[siemens.com/medical-accessories](http://siemens.com/medical-accessories)

- 1 *The product is still under development and not commercially available yet. Its future availability cannot be guaranteed.*
- 2 *United Nations report by United Nations Department of Economic and Social Affairs, June 13, 2013, New York.*
- 3 *Data on file.*
- 4 *Cardiac Triggering is still under development and not commercially available yet. Its future availability cannot be ensured.*
- 5 *The motion correction framework and all associated sequences are still under development and not commercially available yet. Its future availability cannot be ensured.*
- 6 *510(k) pending. Compressed Sensing GRASP-VIBE for other regions than liver is not for sale in the U.S.*
- 7 *Values for a 196 cm person.*
- 8 *2013 MAGNETOM Flash reader survey. Data on file.*
- 9 *This website provided by Siemens AG may be used solely in accordance with the general terms and conditions of use, available prior to registration/login on the website itself.*
- 10 *Minimum total space requirement for magnet, electronics and console room.*
- 11 *Channels (coil elements) that can be connected simultaneously.*
- 12 *Siemens AG, "Sustainable healthcare strategy – Indicators in fiscal 2014", page 3–4*

.....

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