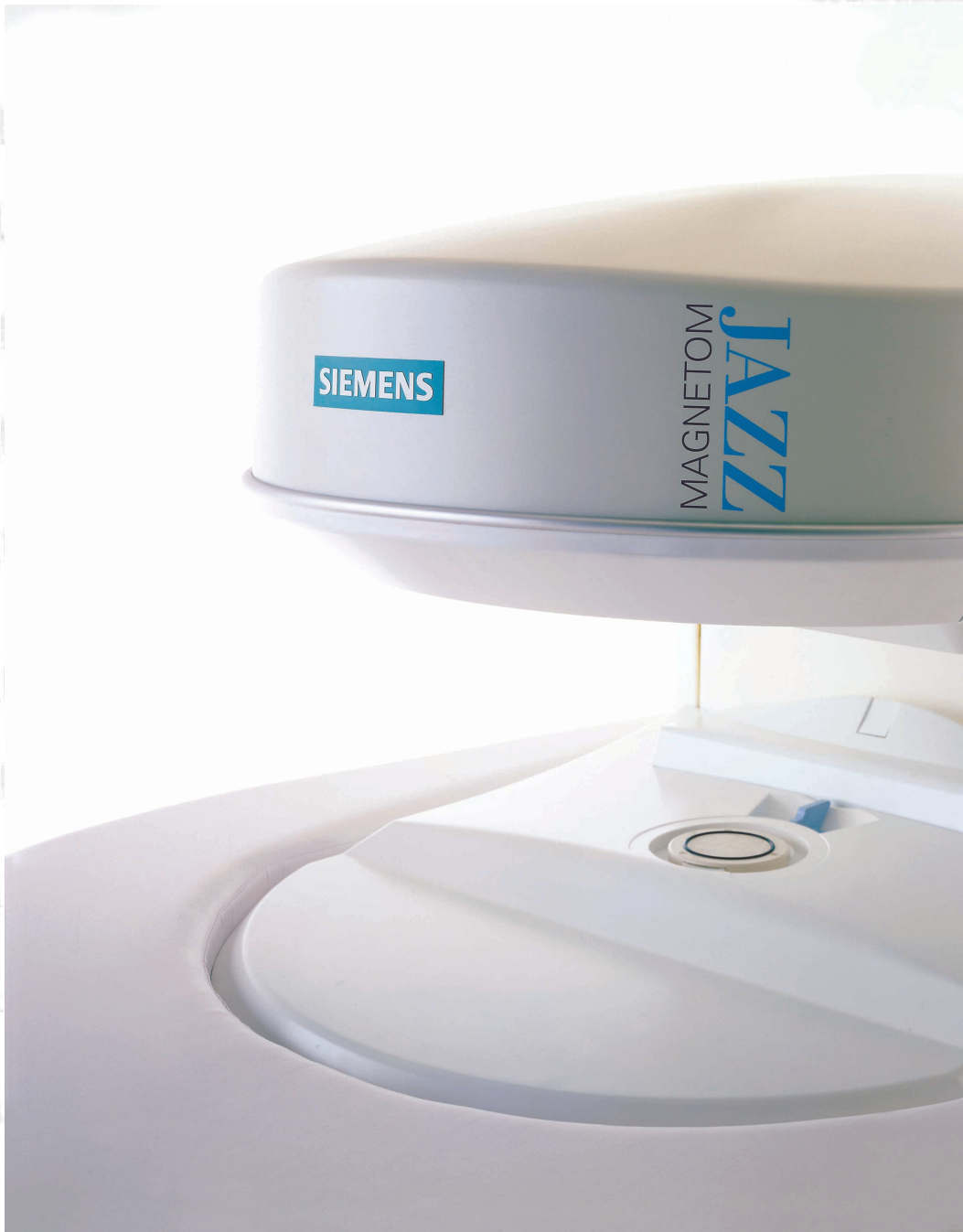


**SIEMENS**

# **MAGNETOM Jazz** Extremity Magnetic Resonance System



**DATA**

# MAGNETOM Jazz

## Extremity Magnetic Resonance System

**Maximum patient comfort**

with three-sided open magnet

**High-field applications**

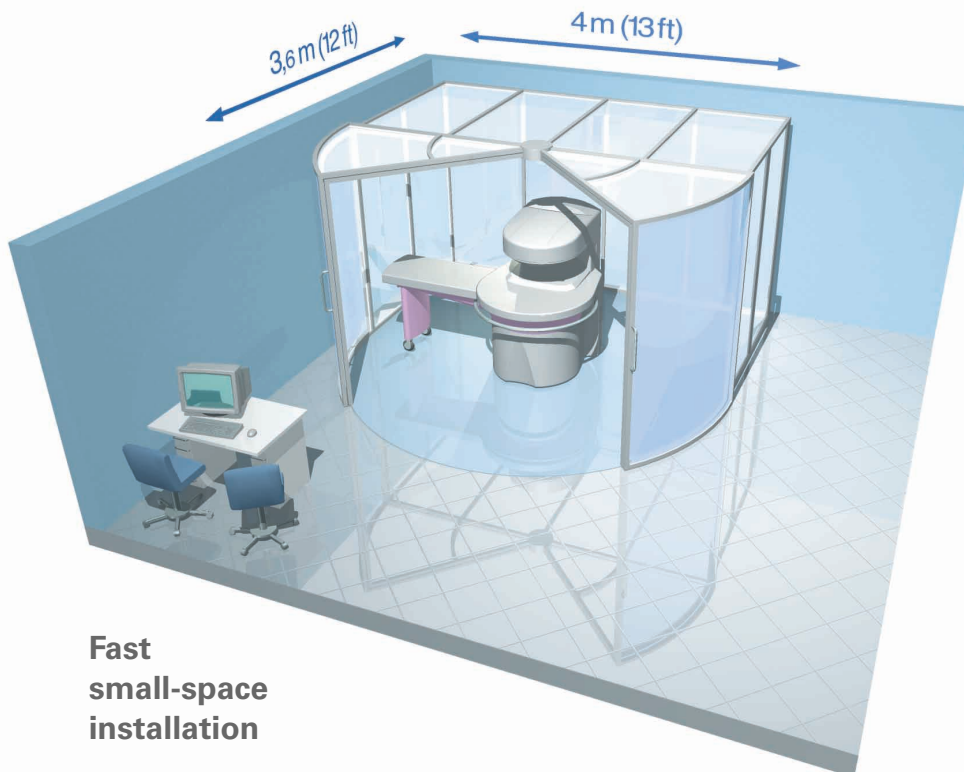
on low-field system

**Low life cycle costs**

due to permanent magnet

### Contents

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# Magnet System

## Magnet Design

|                          |           |
|--------------------------|-----------|
| Operating field strength | 0.2 Tesla |
|--------------------------|-----------|

C-shaped permanent magnet with vertical magnetic field

## Patient Aperture

|                                       |                  |
|---------------------------------------|------------------|
| Vertical gap distance (inner opening) | 24 cm (9.44 in.) |
| Vertical gap distance (outer opening) | 30 cm (11.8 in.) |

The open design provides free patient access from three sides

## Gradient System

|                              |          |
|------------------------------|----------|
| Max. gradient field strength | 20 mT/m  |
| Min. rise time (0–20 mT/m)   | 0.8 msec |

|                                |            |
|--------------------------------|------------|
| <b>Gradient Cooling System</b> |            |
| Gradient coils                 | air cooled |
| Power electronics              | air cooled |

Passive shielded flat gradient coil system for gradients in x, y, and z direction

Integrated into the magnet pole shoes

## Homogeneity

|                                                  |         |
|--------------------------------------------------|---------|
| <b>Max. inhomogeneity on a spherical surface</b> |         |
| Diameter 14 cm                                   | <±4 ppm |
| FWHM of proton spectrum                          |         |
| Magnetic field drift (10 min.)                   | <30 Hz  |
| Passive Shim                                     |         |

## Fringe Field

|                                             |                   |
|---------------------------------------------|-------------------|
| X-axis: horizontal (in front of the magnet) | 1.2 m (47.2 in.)  |
| X-axis: horizontal (behind the magnet)      | 0.95 m (37.4 in.) |
| Z-axis: horizontal (left/right)             | 1.2 m (47.2 in.)  |
| Y-axis: vertical                            | 1.1 m (43.3 in.)  |

Distances of the 0.5 mT line (pacemaker safety limit) from the magnet isocenter

# Patient Handling RF System

## Patient Table

|                      |                           |
|----------------------|---------------------------|
| Swinging table (L×W) | 105×63 cm (41.3×24.8 in.) |
| Table (diameter)     | 110 cm (43.3 in.)         |
| Table height (fixed) | 91 cm (35.8 in.)          |
| Position accuracy    | ±1 mm                     |
| Max. patient weight  | 200 kg (440 lbs)          |

Swinging patient table with an adjustable fixation at 6 different positions. Allows a fast and flexible patient positioning.

## Patient Positioning Tools

Manual transfer to center of imaging volume

Coils automatically centered in imaging volume

Positioning tools for comfortable and stable positioning of the patient

Head rest

## Antimagnetic Step

For easier access of patients with reduced mobility due to orthopedic injury or elderly patients and kids on the patient table

The step has four wheels so it can be easily rolled into place

As soon as weight is placed on the step, the wheels disappear inside the leg of the step

The legs are finished with rubber for a non-slip grip on the floor



## Digital Signal Processing System

|                              |                         |
|------------------------------|-------------------------|
| Operating frequency          | 8 MHz                   |
| Frequency stability (15 min) | $\leq 8 \times 10^{-8}$ |

Digital transmit and receive signal processing for fast and flexible modulation and demodulation of the radio frequency signals

- Single sideband modulation with suppressed carrier
- Computer-controlled pulse shape and phase
- Quadrature demodulation
- Highly linear transfer characteristics via software correction

## Transmitter Amplifier

|                |        |
|----------------|--------|
| Power output   | 600 W  |
| Bandwidth      | 2 MHz  |
| Gain stability | 0.1 dB |

## Transmit Coil

Flat linear polarized (LP) transmit coil integrated inside magnet enclosure

## Receiver Amplifier

|                    |                                  |
|--------------------|----------------------------------|
| Receiver bandwidth | ±350 kHz                         |
| Gain               | 38 dB/113 dB (automatic control) |
| Noise figure       | <1.0 dB                          |

## Low Pass Filter

|                                  |                     |
|----------------------------------|---------------------|
| Frequency range (digital filter) | 8.0 kHz to 78.0 kHz |
|----------------------------------|---------------------|

# Computer System and Console

## Host computer

|                          |                 |
|--------------------------|-----------------|
| Host CPU                 | Pentium MMX 200 |
| Main memory (RAM)        | 32 MByte        |
| Hard disk (raw capacity) | 4.3 GByte       |
| Image capacity (256×256) | approx. 20,000  |

## MR Console MRC

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

- Patient registration
- Scanning
- Post-processing
- Archiving
- Filming

## Magneto-Optical Disk Drive

|                                 |               |
|---------------------------------|---------------|
| Cartridge capacity              | 640 KByte     |
| Image capacity (matrix 256×256) | approx. 4,500 |

3 1/2" for MOD (re-writable) media

## DSP Board

2 DSP Boards for measurement control and image reconstruction

|                                            |          |
|--------------------------------------------|----------|
| Dynamic memory (RAM)                       | 65 MByte |
| Image reconstruction time (matrix 256×256) | < 150 ms |

## Color Monitor

High-resolution flicker-free color monitor




|                       |                                           |
|-----------------------|-------------------------------------------|
| Screen size           | 43 cm (17")                               |
| Screen matrix         | 1280×1024                                 |
| Video standard        | 525 lines/60 Hz, non-interlaced Multisync |
| Image display matrix  |                                           |
| Full screen           | 510×478                                   |
| Four segments         | 254×238                                   |
| Number of grey levels | 256                                       |



# Coil Kit

**Special receiving coils for optimized signal-to-noise ratio and high-resolution imaging.**

All coils are passively decoupled and automatically tuned.

Automatic coil detection.

| Coil                                                                                                                           | Features                                                                                                                               | Applications                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <p><b>Dual-Phased-Array Knee Coil</b></p>     | <ul style="list-style-type: none"> <li>• Array coil with 2 integrated preamplifiers</li> <li>• Open patient-friendly design</li> </ul> | <ul style="list-style-type: none"> <li>• Examinations of the knee, thigh, calf and arm</li> </ul>      |
| <p><b>Dual-Phased-Array Ankle Coil</b></p>    | <ul style="list-style-type: none"> <li>• Array coil with 2 integrated preamplifiers</li> <li>• Open patient-friendly design</li> </ul> | <ul style="list-style-type: none"> <li>• Examinations of the foot, ankle, elbow and forearm</li> </ul> |
| <p><b>Dual-Phased-Array Wrist Coil</b></p>  | <ul style="list-style-type: none"> <li>• Array coil with 2 integrated preamplifiers</li> <li>• Open patient-friendly design</li> </ul> | <ul style="list-style-type: none"> <li>• Examinations of the hand, wrist and elbow</li> </ul>          |

| Coil                                                                                                              | Features                                                                                                                                 | Applications                                                                                     |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Regular Shoulder Coil</b><br> | <ul style="list-style-type: none"> <li>• Solenoid coil</li> <li>• Anatomically shaped</li> <li>• Open patient-friendly design</li> </ul> | <ul style="list-style-type: none"> <li>• Shoulder examinations</li> </ul>                        |
| <b>Large Shoulder Coil</b><br>   | <ul style="list-style-type: none"> <li>• Solenoid coil</li> <li>• Anatomically shaped</li> <li>• Open patient-friendly design</li> </ul> | <ul style="list-style-type: none"> <li>• Examinations of the shoulder and large knees</li> </ul> |
| <b>Hip Coil</b>                                                                                                   | <ul style="list-style-type: none"> <li>• WIP</li> </ul>                                                                                  | <ul style="list-style-type: none"> <li>• Hip examinations</li> </ul>                             |

### Coil Storage Cart

Specially designed non-ferromagnetic cart for easy storage of the coils and accessories. May be rolled to convenient locations in the pavilion.

Coil storage cart (L×W×H) 91×55×124 cm (35.8×21.7×48.8 in.)

Dedicated storage locations:

- DPA Knee coil
- DPA Ankle coil
- DPA Wrist coil
- Regular Shoulder coil
- Large Shoulder Coil
- Knee support
- Head rest
- Positioning tools

Furnished with a lockable shutter



# Scanning

# Image Processing

## Clinical Imaging

---

Full range of protocols optimized for a wide range of clinical applications for all extremities.

- Spin Echo (Single and Double Echo)
- Inversion Recovery
- Short Time Inversion Recovery (STIR)
- Gradient Echo (2D and 3D)
- Turbo Spin Echo (TurboSE)

## User-Defined Protocols

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The sequence parameters of the protocols may be modified according to individual needs

The user can define individual protocols and store them in a user-specific menu

## Scan Preparation

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Frequency, transmitter power and receiver gain are adjusted automatically (in-line adjustment).

## Scout

---

Time saving, start of scout scan within the patient register window. Several orthogonal images with a short acquisition time will be acquired.

## Slice Positioning

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Automatic slice positioning with interactive graphical interface based on multiple localizer images,

Paging possible through reference images during graphical positioning

- Multi-slice imaging with variable parameters
- Multiple slices and angles
- Previous positioning can be recalled (History function)

## Measurement Queue

---

Allows queuing of multiple protocols during an examination for streamlined operation. Pending Queued protocols which are not yet started may be modified and removed from queue.

## Image Recall

---

Images are stored in a series-oriented order allowing fast image access and recall. Each single measurement correlates to one series.

Image preview within image select window

Automatic image display after image reconstruction

## Image Display

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The image display screen can be organized in various subdivisions

Different series or patients can be displayed simultaneously

Configurable Mother and Child Image

Window setting with mouse

Text manipulation and image annotation

# Image Evaluation      Sequence Performance

## Post-Processing

---

Sorting of images  
 Area and distance determination  
 Intensities and profiles  
 Image scrolling  
 Image rotation and mirroring  
 Histograms  
 Image magnification and roaming  
 (shifting of magnified area)  
 Statistical evaluation of ROI's  
 Labeling of images with graphics or text

## Spin Echo

---

|                    |            |
|--------------------|------------|
| Echo time TE       | min. 12 ms |
| Repetition time TR | min. 50 ms |

## Turbo Spin Echo

---

|                    |             |
|--------------------|-------------|
| Echo time TE       | min. 80 ms  |
| Repetition time TR | min. 200 ms |

## Inversion Recovery (IR)

---

|                    |             |
|--------------------|-------------|
| Inversion time TI  | min. 200 ms |
| Echo time TE       | min. 18 ms  |
| Repetition time TR | min. 260 ms |

## Gradient Echo

---

|                    |            |
|--------------------|------------|
| Echo time TE       | min. 8 ms  |
| Repetition time TR | min. 24 ms |

- TR, TE and TI (in steps of 10/2/5 ms)
- Flip angle (in steps of 5°)

## Image Filter

---

For noise reduction in the MR images. Uses high-pass and low-pass filtering and automatically adjusts to the local image content (adaptive filtering).

## Short Time Inversion Recovery (STIR)

---

|                    |             |
|--------------------|-------------|
| Inversion time TI  | min. 50 ms  |
| Echo time TE       | min. 18 ms  |
| Repetition time TR | min. 100 ms |

## Gradient Echo-STIR (GE-STIR)

---

Gradient echo sequence with an additional inversion-pulse which allows the suppression of bright signal from fatty tissue e.g. bone marrow

## DESS (Double Echo in Steady State)

---

Gradient echo sequence for better visualization of cartilage lesions. Gives you a high contrast between cartilage and synovial fluid.

# Acquisition Parameters

## General Acquisition Parameters

### Reduced number of Fourier lines

Selectable from  $n/2 \times n$  to  $n \times n$

Also combined with rectangular FoV

### Averaging

Number of data acquisitions 1/2, 1, 2, 3, 4,...32

1/2 acquisition corresponds to Half Fourier Imaging

### Rectangular field of view

**Half-Fourier-Imaging.** Reduction of acquisition time by approx. 50% without loss of spatial resolution

## Parameters for 2-D Acquisitions

### Acquisition matrix

Square matrices 256×256

### Spatial resolution

Highest in-plane resolution 0.4 mm

Field of view 100–300 mm

### Slices

Slice thickness 2–10 mm  
(in steps of 0.5 mm)

Number of slices max. 96

Slice gap selectable

Slice orientation transverse, sagittal, coronal, oblique, double oblique (in steps of 1°)

Slice order interleaved

## Parameters for 3-D Acquisitions

### Acquisition volume

Square matrices 256×256

Number of 3-D partitions 8...128

### Spatial resolution

Field of view 100–300 mm

Thickness of excited 3-D volume 40–200 mm

Max. number of slabs (3-D volumes) 1

Slice thickness (partition) min. 0.6 mm

## Digital Camera Interface

Interface for connection of a laser imager

The Numaris Ortho software supports a wide range of manual filming features

|                   |                |
|-------------------|----------------|
| Image matrix size | 480×512×8 bit  |
| Digital output    | 8 bit parallel |

## DICOM 3.0 and Pacsnet

Network interface for fast and reliable image transfer of MR images. Includes DICOM Send

| Local Network                 | Ethernet       |
|-------------------------------|----------------|
| Data transfer rate            | max. 10 MBit/s |
| Transfer time (256×256 image) | approx. 4 s    |

## Power Requirements

|                      |                                                                    |
|----------------------|--------------------------------------------------------------------|
| Line voltage         | 100, 110, 220, 230, 240 V                                          |
| Stability tolerances | ±10%                                                               |
| Line frequency       | 50/60 Hz, ±2 Hz                                                    |
| Power requirement    | 1.1 kVA<br>0.8 kVA (during normal operation)<br>0.2 kVA (stand-by) |

## Cameras to be connected

|        |                                                            |
|--------|------------------------------------------------------------|
| Dupont | LP 400                                                     |
| Agfa   | Matrix Compact L LR 3300                                   |
| Kodak  | 1120                                                       |
| 3M     | P831R<br>M952<br>M959 XL<br>Dry View 8300<br>Dry View 8700 |
| Fuji   | FM-DP L, IM 3543                                           |
| Konica | LI-10A, LI-10                                              |

## Remote Diagnostics

Direct computer link between the MR system and the local Siemens service department, or the Siemens service centers (via telephone modem)

- Image transfer for further evaluation
- Reading of entries in the error logbook
- Remote trouble shooting
- Remote access to Service Site Data Base
- Start of preventive maintenance and quality assurance routines

Remote diagnostics is provided in conjunction with a service contract with Siemens (*UPTIME* Services)

## Radio Frequency Shielding

For shielding of the examination room from external RF sources a special "Modular Shielding Pavilion" is used

Light and air can freely pass through the attractive MSP which is tailored to the system design, so no additionally lighting, air-conditioning as well as an intercom system is required

|                       |         |
|-----------------------|---------|
| RF attenuation factor | >70 dB  |
| Frequency Range       | 7–9 MHz |

## Analog Camera Interface

|                   |                 |
|-------------------|-----------------|
| Image matrix size | 510×478×6 bit   |
| Output            | RS 170 composed |

## Space Requirements

|                              |                                |
|------------------------------|--------------------------------|
| Min. total space requirement | 18 m <sup>2</sup> (194 sq.ft.) |
|------------------------------|--------------------------------|

# Dimensions

|                             | Width<br>[cm]  | Depth<br>[cm]  | Height<br>[cm]             | Weight<br>[kg]  | Heat<br>Dissipation <sup>1</sup><br>[W] |
|-----------------------------|----------------|----------------|----------------------------|-----------------|-----------------------------------------|
| <b>Examination Room</b>     |                |                |                            |                 |                                         |
| Magnet (incl. covers)       | 125 (49.2 in.) | 150 (59.1 in.) | 156 (61.4 in.)             | 1930 (4263 lbs) | 350                                     |
| Patient table               | 63 (24.8 in.)  | 105 (41.3 in.) | 91 <sup>2</sup> (35.8 in.) | 110 (243 lbs)   |                                         |
| Required min. room height   |                |                | 240 (88.6 in.)             |                 |                                         |
| <b>Control Room</b>         |                |                |                            |                 |                                         |
| MRC Console (incl. monitor) | 84 (33.1 in.)  | 94 (37 in.)    | 81 (31.9 in)               | 150 (331 lbs)   | 350                                     |

- 1 Heat dissipation into air  
2 Above floor level

As is generally true for technical specifications, the data contained herein varies within defined tolerances.

Siemens reserves the right to modify the design and specifications contained herein without prior notice. Please contact your local Siemens representative for the most current information.

This product bears a CE marking in accordance with the provisions of directive 93/42/EEC of June 14th, 1993 for medical products



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CAPE design

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