ClinScan

- Small Animal MRI Solution for Molecular Imaging and Translational Research
With ClinScan you enter the field of translational research and molecular imaging

The ClinScan, a 7 T animal MRI and MRS scanner is designed to further facilitate translational research from ‘mice to men’ in the field of preclinical and molecular imaging.

ClinScan is Bruker BioSpin’s solution for an emerging market of research MRI systems that allows a direct and fast transfer of preclinical studies on animal models to clinical studies on humans.

By virtue of the strategic alliance with Siemens Medical Solutions on human high-field MR systems, ClinScan uses the clinical user interface syngo® MR. Its operation is identical to that of Siemens MAGNETOM TIM systems.
Product Description

- 7 T Bruker USR magnet (Ultra Shielded Refrigerated, bore size 20 cm or 30 cm)
- Bruker gradient and shim coil (gradient strength of 290 mT/m or 630 mT/m, slew rate of 1160 T/m/s or 6300 T/m/s)
- Bruker RF array coil technology in combination with numerous animal handling accessories
- Siemens MAGNETOM Avanto technology with up to 32 receive channels
- Clinical routine user interface syngo MR to enable efficient workflow and highly automated state-of-the-art MRI and MRS applications on small animals

ClinScan systems are designed for translational molecular MRI and provide the clinical routine user interface syngo MR that facilitates straightforward transfer of protocols from bench top to bedside and vice-versa.
**Magnets Technology**
Modern magnets are available with shielding of the external magnetic field. This is achieved by use of a second superconducting coil which compensates the magnetic field outside the magnet. Bruker’s UltraShield technology drastically reduces the stray field to close to the magnet and thus strongly reduces the magnetic field to which the operator is exposed.

All Bruker USR magnets include refrigeration technology for long helium hold time and minimum number of maintenance intervals.

**Gradients Technology**
We offer ClinScan with a water-cooled actively shielded gradient system that is optimized for high gradient strength, shortest rise time, and high gradient linearity. Our gradients have been constructed using ‘streamline design’ technology which strongly reduces the amplitudes and decay times of any induced eddy currents.

**RF Coils Technology**
A body coil for transmission and reception covering a large FOV is permanently integrated in the system. In addition, a comprehensive line of dedicated receive-only surface coils is provided in order to support many individual applications.

Bruker provides state-of-the-art multi-channel array coil technology for parallel imaging applications. Integrated preamplifiers guarantee an optimal signal-to-noise ratio over a large dynamic range from 3D fast imaging to single voxel spectroscopy.

Standard proton RF coils do not require manual tuning or matching to enable automated and routine workflow.

**MRI CryoProbe™**
This unique innovation delivers an increase in sensitivity by a factor of typically 2.5 compared to standard room temperature RF coils. This results in even higher spatial or temporal resolution and shorter scan times. Cold surface contact with the animal is eliminated by a special patented provision.
ClinScan features syngo MR, the graphical user interface optimized for clinically-oriented workflow.

**Clinical User Interface syngo® MR**

- Parallel working and one-click examinations are supported efficiently.
- Parallel scanning and reconstruction are standard. Images can be loaded and used for graphical slice planning during reconstruction.
- iPAT (integrated Parallel Acquisition Techniques) further increase the acquisition speed. iPAT is fully compatible with the optional phased array coils.
- Dynamic Analysis evaluation and Mean Curve software enable the calculation of functions and dynamic examinations.
- IDEA sequence development environment with research agreement.
Application Packages

Application packages for animal MRI resemble the application packages you already know from clinical MRI. Sequences and protocols are optimized for the specific needs in animal MRI.

Standard Imaging

The application suite is a full set of programs and protocols optimized for a wide range of high field applications.

- Spin Echo (Single, double, multi echo)
- 2D/3D FLASH
- 2D FLASH segmented
- Inversion recovery (IR)
- 2D/3D Turbo Spin Echo (TSE)
- Dark Fluid TSE
- 2D/3D PSIF
- 2D/3D TSE Restore (DEFT), with Gain Switching
- Hyperecho TSE for SAR reduction
- Variable flip angle 3D TSE
- 2D/3D Turbo FLASH
- 2D/3D Time-of-Flight (TOF) Angiography
- Single shot and segmented gradient and spin echo EPI

Parallel Imaging

- iPAT (integrated parallel Imaging) techniques including GRAPPA & mSENSE
- Integrated Auto-Calibration: no time-consuming reference scan
- Higher speed and temporal resolution
- Increased image resolution
- Reduced image distortion
- iPAT is integrated with all relevant imaging techniques
Spectroscopic Imaging & Spectroscopy
- Spin Echo & STEAM, PRESS and CSI
- Fully automated adjustments including localized shimming and adjustment of water suppression pulses
- Hybrid CSI technique including volume selection and FoV encoding
- 2D & 3D acquisition
- k – space weighted averaging
- Multi-nuclei option

Diffusion and Perfusion Imaging
Echo Planar Imaging (EPI)
- Multi directional diffusion weighting
- Tensor calculation including tractography
- Perfusion applications including processing

Cardiac Imaging
- True FISP & 2D/3D FLASH segmented
- Magnetization prepared TrueFISP
- Prospective triggering & retrospective gating
- Retrospectively gated cine imaging
- Phase sensitive IR

BOLD Imaging
- Single Shot EPI with PACE for BOLD-Imaging
- Mosaic images for efficient storage and transfer of large data sets
- Automatic image reconstruction as well as on-the-fly t-test calculation in real-time for variable paradigms
The ClinScan S-line is Bruker’s cost-efficient solution for clinically-oriented animal MR on small animals such as rats and mice.

It consists of a 7 T magnet with 20 cm inner bore and is equipped with the water-cooled BGA-12S. The ClinScan S-line is equipped with an automatic positioning system for animal beds which also serves as the Faraday shield.

Thanks to the compact size of the magnet, its minimum stray field and the included Faraday shield, very cost-efficient siting is assured.

- For rats and mice
- Cost-efficient siting
- Low stray field
- Low weight
- Small dimensions of magnet

**ClinScan S-line**

<table>
<thead>
<tr>
<th>Magnet</th>
<th>7 T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter of clear bore</td>
<td>&gt; 200 mm</td>
</tr>
<tr>
<td>Stray field (5 Gauss)</td>
<td>+/- 1.45 m axial, +/- 1.4 m radial</td>
</tr>
<tr>
<td>Gradient</td>
<td></td>
</tr>
<tr>
<td>Active shielding</td>
<td>Yes</td>
</tr>
<tr>
<td>Integrated shim set up to 2nd order</td>
<td>Yes</td>
</tr>
<tr>
<td>Outer / inner diameter</td>
<td>(198 / 114) mm</td>
</tr>
<tr>
<td>Gradient amplitude</td>
<td>630 mT/m</td>
</tr>
<tr>
<td>Slew rate</td>
<td>6300 T/m/s</td>
</tr>
<tr>
<td>Linearity</td>
<td>80 / 50 mm dsv / ± 4.5 % / ± 1 %</td>
</tr>
</tbody>
</table>
ClinScan

The ClinScan is Bruker’s animal MR system for clinical translational studies on animals from mice to small rabbits. Its 7 T magnet with 30 cm inner bore is ideal for combining MRI with other modalities like PET for molecular imaging.

It is equipped with the water-cooled BGA-20S. For perfect homogeneous excitation a body coil with inner diameter of 154 mm is used.

- Large bore flexibility: from mice to rabbits
- Space for monitoring equipment
- Combination with other modalities (MRT/PET, MRT/opt,...) possible
- Larger field of view in z-direction
- Future gradient/shim upgrades offer flexibility
- Body coil for large homogenous excitation

<table>
<thead>
<tr>
<th>ClinScan</th>
<th>Magnet</th>
<th>7 T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter of clear bore</td>
<td>&gt; 302 mm</td>
<td></td>
</tr>
<tr>
<td>Stray field (5 Gauss)</td>
<td>+/- 3 m axial, +/- 2 m radial</td>
<td></td>
</tr>
<tr>
<td>Gradient</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active shielding</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Integrated shim set up to 2nd order</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Outer / inner diameter</td>
<td>(302 / 201) mm</td>
<td></td>
</tr>
<tr>
<td>Gradient amplitude</td>
<td>290 mT/m</td>
<td></td>
</tr>
<tr>
<td>Slew rate</td>
<td>1160 T/m/s</td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>130 / 100 mm dsv</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;= ± 3 % / &lt;= ± 2 %</td>
<td></td>
</tr>
</tbody>
</table>
For delivering high animal throughput with controlled animal welfare and monitoring, the integrated animal accessory system is a core component of every ClinScan.

Positioning system
A preparation table is attached to the magnet and holds a manual slider system or an automatic positioning system onto which the different animal beds are placed for fast and reproducible positioning of the animals.

The concept enables several animals beds to be used in parallel e.g. one on the slider in the magnet for data acquisition, one for animal preparation and one is undergoing cleaning.

Animal Beds & Cradles
A variety of animal beds tailored for different animal species, applications and RF coils are available. Most of them are equipped with a nose-cone for gas anaesthesia, three point-fixation system (tooth-bar and ear-plugs), openings for throat access and body temperature stabilization. In addition, animal beds can be equipped with a temperature controlled warming blanket.

Monitoring & Triggering
Many MRI/MRS applications require triggered acquisition to avoid motion artefacts. In addition, animal care regulations require continuous monitoring of the status of the animal in the magnet. For this, Bruker offers a stand-alone unit that can trigger and gate on a variety of biological signals (ECG, respiration, temperature) and can record all those tracks for later correlation to an image time series. The ECG-sensors are equipped with special filters to suppress gradient/RF-interference and additional user-defined sensors can be incorporated.
Bruker BioSpin’s commitment to providing the highest quality service results in more productivity from your ClinScan system. From the initial site evaluation, through system installation, and throughout the life-time of your instrument, Bruker BioSpin’s service program is dedicated to providing personalized support. By investing heavily in the training of our engineers and support staff, we ensure their up-to-date expertise in the latest MRI technologies. Whether through Bruker BioSpin’s support centers, the application, service and software hotlines, or an on-site visit, you can be confident that your Bruker service representative is trained, experienced, and prepared to work diligently to quickly complete your support request.

Site planning
Proper site planning for your MRI scanner is the first step in ensuring optimum system performance. Bruker BioSpin engineers have considerable experience in siting large and small high-field systems, both in existing and new buildings. Thus, expert advice is available for solving virtually any complex siting problem.

Application Support
Bruker BioSpin provides a worldwide network of senior application scientists to support your research programs. In addition to the training immediately after installation customers can join the Bruker BioSpin Application Continuity Program.

Responsive Technical Support
Should you ever have questions or require assistance with your ClinScan system, our service & support hotlines are your gateway to a solution. The support center engineers and scientists will quickly and efficiently gather key information and suggest relevant diagnostics. Worldwide support centers arrange for parts to be delivered to your laboratory for trouble-shooting and repair.

Training courses
Bruker BioSpin offers training courses from introductory classes to advanced operator and programming courses. The courses cover a wide range of applications and include hands-on lab sessions in our dedicated application support centers. For the training schedule and registration, please visit www.bruker-biospin.com/mri-training.

Contact
Hotline Service: mri-hardware-support@bruker-biospin.de
Hotline Application: mri-application-support@bruker-biospin.de
For additional information please visit: www.bruker-biospin.com/mri

Application support center including training and demo facilities in Germany.