



Imaging Innovations bringing real benefit to researchers



Preclinical and Clinical

# Innovation is in our genes



THE QUEEN'S AWARDS  
FOR ENTERPRISE:  
INNOVATION

With over 30 years of experience, MR SOLUTIONS has continued to develop new and exciting technical innovations for the clinical and preclinical markets. MR SOLUTIONS' technology has become a game changer over traditional preclinical devices, with the introduction of cryogen-free MR up to 9.4T and advanced simultaneous PET/MR technology.

In recognition of MR SOLUTIONS innovation and worldwide commercial success, MR SOLUTIONS achievements have been recognised many times. MR SOLUTIONS has received two prestigious Queen's Awards Enterprise. One for Innovation in 2016 and one for International Trade in 2017.

The winner's reception was hosted by Her Majesty the Queen and His Royal Highness the Duke of Edinburgh. The Queen's Award is the most prestigious business award in the UK. It is presented to a select group of businesses having been recognized for outstanding business achievement.

MR SOLUTIONS has also received a prestigious R&D 100 Award, one of the highest honours in the research and development sector, often referred to as the "Oscars of Invention". In addition, the Innovation Award at "the Made in the South East Awards" and the SME business award further recognised MR SOLUTIONS achievements.







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# HEADQUARTERS

Guildford, England, UK



Administration

Sales

Service

Application

Marketing

Research

Development

Manufacturing

Shipment

## Distributors

MR SOLUTIONS has carefully selected qualified partners in most of the countries around the world.

Please contact us to know your point of contact

MR SOLUTIONS has its headquarters in the United Kingdom with offices in the United States of America and qualified distributors in Asia.

### About MR SOLUTIONS:

In 1985 Dr David Taylor founded SMIS Ltd., a manufacturer of research MRI systems and spectrometers. In 1999, David founded MR Research Systems Ltd., leveraging the technology developed by SMIS. Shortly afterwards he also co-founded Hallmarq Veterinary Imaging Ltd, a dedicated equine MRI systems supplier.

In 2004, following the exponential growth of both companies, MR Research systems and Hallmarq Veterinary Imaging restructured to target specific markets, and therefore MR SOLUTIONS was created to serve non-veterinary markets.

Subsequently MR SOLUTIONS completely re-engineered its market leading MRI spectrometer and launched a range of revolutionary preclinical MRI systems based on innovative cryogen free superconducting magnet technology.

The success of this product was immediate, and MR SOLUTIONS is now the worldwide leader in high field cryogen-free MRI. As only an MR company could understand MR based multimodality integration, MR SOLUTIONS was able to quickly launch its PET INSERT compatible with high field MR. Within a few months MR SOLUTIONS became market leader in this product segment too.

MR SOLUTIONS is a privately-owned company, not on any stock market. Profits are reinvested into long term product and business development without having to compromise to meet short term market share price expectations.



2 Offices in USA, Orlando and Boston  
Covering North America



Application support across Europe with  
staff locally based



# Research, Development, Manufacturing, Production by **MR SOLUTIONS**



## **MRS Magnetics**

Abingdon, England, UK

MRS Magnetics an MR SOLUTIONS' Company

**From manufacturing to the sale and installation, MR SOLUTIONS carries out all the stages:**

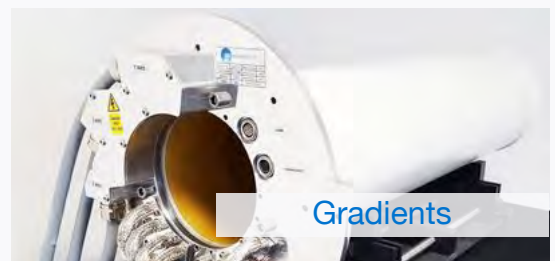
MR SOLUTIONS strength is in its ability to control all the steps from product development to manufacturing and delivery of its products. This enables the best product integration and therefore gives the best commercial products on the market.

MR SOLUTIONS manufactures its own nuclear imaging devices such as PET, SPECT and CT, and through its wholly owned company MRS Magnetics, manufactures its own magnets and gradients.

MR SOLUTIONS has set up a large production facility enabling it to manufacture not only preclinical systems but also clinical systems.



Magnets



Gradients



Nuclear system

# EVO2+ SPECTROMETER

## Clinical & Research

Future Proof MRI Spectrometers

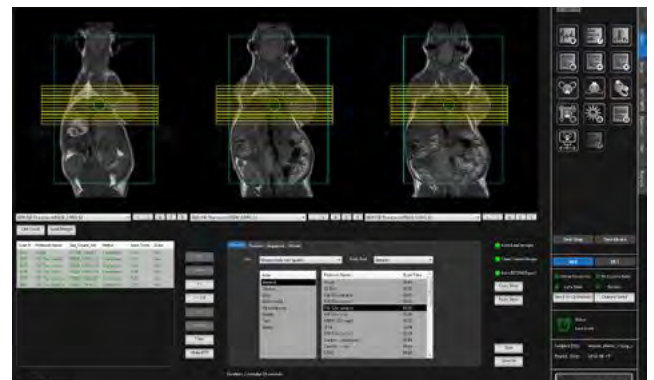
### The perfect tool for for OEM's and MR research:

MR SOLUTIONS is recognised as the leading supplier of MRI spectrometers for OEM's and end users, with over 2000 operational MRI spectrometers installed across the world.

Very many of our MRI spectrometers run clinical systems whilst the rest have been specified and bought for scientific research needs.

MR SOLUTIONS MRI spectrometers can be used for both preclinical and clinical MR imaging system control and operation.

- 2 TX to 16 TX
- 4 RX to 32 RX, extension to 64 RX and 128 RX
- Optional fibre optic RX communication
- Expanded pulse program and waveform memory
- TX direct digital synthesis to 500 MHz
- Pulse sequence floating point support
- Pulse sequence maths library support
- RX Real time, on board, configurable signal processor



### Sequence Library

Includes:

- 2D, 3D GRE and SE
- 2D, 3D FSE
- Steady state GRE
- Inversion recovery
- Pre saturation and MTC imaging
- Multi angle oblique imaging
- EPI
- Multiple echoes
- Diffusion weighted imaging
- Diffusion tensor imaging

### Software

- 'Powerscan' research and development environment
- Full control of the system
- Flexible pulse programming environment with user defined graphical wave shape generation
- Interactive setup mode for sequence parameter optimisation including real time display of images and/or spectra and time data
- Scripting of own set of modes of acquisition
- Customisable reconstruction processing
- 'Clinical Scan' user interface - Optional

### Hardware

- 4 RX minimum, expandable up to 32 RX in 6U enclosure
- 1TX minimum expandable up to 16 TX
- Extensions available to 64 RX and 128 RX
- Digital pre-emphasis and B0 compensation including cross terms
- 16 bit, 500 mega samples/sec ADC
- 2 Mbytes of pulse program memory
- 1 Gbyte of waveform memory
- Operation under Windows 10





Clinical MR

PET INSERT

# Clinical Scanners for OEMs



**PET/MR  
Research**

Providing Solutions for Clinical OEMs

**MR SOLUTIONS clinical division:**

MR SOLUTIONS developed some of the first 3.0T and 4.7T clinical research systems.

Based on its 30 years+ clinical MR experience and its proven success in developing high field PET / MR systems. MR SOLUTIONS can supply partial or complete clinical systems as an OEM sub-contractor.

MR SOLUTIONS has already developed a large bore PET INSERT available to clinical MR manufacturers for clinical research purposes.

The new MR SOLUTIONS' facility for manufacturing and production, MRS Magnetics (see page 5) has been scaled up to handle clinical projects.

PRECLINICAL

MR



# THE CRYOGEN-FREE REVOLUTION

by MR SOLUTIONS



## Superconducting and Rampable magnets from 0.1T to 9.4T:

MR SOLUTIONS has pioneered cryogen free superconducting technology and is now clearly established as the market leader.

Our technology doesn't require liquid helium or liquid nitrogen for cooling, hence the term dry magnets. Due to this revolutionary technology, options that were impossible on conventional wet magnets, such as changing the magnetic field strength without penalty in just a couple of hours, become possible. This is a great utility for researchers interested in translational imaging, contrast agent development, or ex-vivo studies.

All our MRI systems are compatible with our nuclear modules, PET & SPECT for simultaneous and sequential acquisition and can be upgraded at any time.

The MR SOLUTIONS' technology also has a huge advantage in providing systems that are very light and compact (220kg/1m40 high for a 3T for example), and do not require specific room requirements such as quench pipes or a liquid helium reservoir.



CRYOGEN-FREE

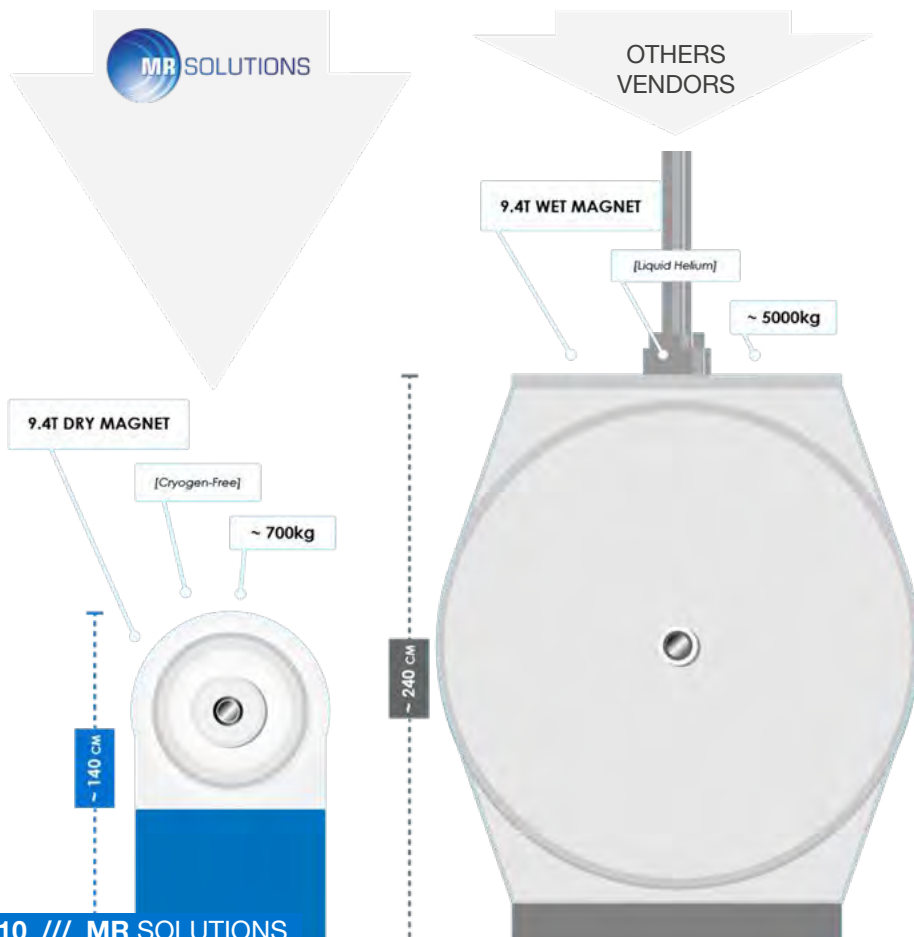
# Installation & use : Stress free

## Don't stress about installation and operational cost!

The site preparation for the installation of a traditional big wet magnet cooled with liquid helium requires a huge investment from the institute. Cryogen-free dry magnets from MR SOLUTIONS need very little infrastructure on site.

MR SOLUTIONS MRI systems are extremely light and compact. There are no requirements for ceiling height beyond standard room construction, no need for quench pipes, or reservoirs of liquid helium or liquid nitrogen. There is also no need for a faraday cage as they are self-shielded. MR SOLUTIONS' MRI systems can be installed almost anywhere in rooms as small as 8m<sup>2</sup>.

*Drawing showing a comparison of a 9.4T DRY magnet from MR SOLUTIONS of 700kg on the left with a traditional WET magnet from other vendors weighing about 5 tons*



## Count the savings:

### MR SOLUTIONS:

- No major site preparation
- +No quench lines
- +No RF room
- +No liquid Helium
- +No liquid Nitrogen
- +No refill resources required

**= Money saved  
for your research**

## Be nice to our planet



Liquid helium is limited on earth, please don't waste it and use cryogen-free MRI from MR SOLUTIONS



# FLEXISCAN POWERSCAN

MR models for all requirements

## FLEXISCAN & POWERSCAN

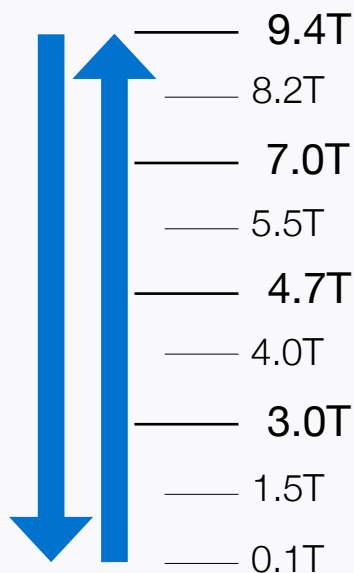
At MR SOLUTIONS, we understand that researchers have unique needs. Some researchers solely require high-end MR functionality, whilst others are more interested in multi-modality imaging. Flexiscan systems don't require specialist knowledge and can be operated by simply selecting predefined protocols. Powerscan systems allow pulse sequence programming, a wider variety of radio frequency coils, stronger gradients, and more transmitters and receivers. They also have a rampable magnetic field available as an option.

At MR SOLUTIONS, we are conscious that your research focus may change over time and therefore we have made it possible to upgrade onsite Flexiscan systems to the Powerscan standard.

### Rampable

All Powerscan models have, as an option, a rampable field feature. They can ramp down from 9.4T to 3T for translational imaging, to 1T for contrast agent development, to 0.5T for ex-vivo studies or any other field strength.

The system moves from one field to the other in a couple of hours. Up to 3 strengths are selectable on a system and are predefined by the customer.



### COILS

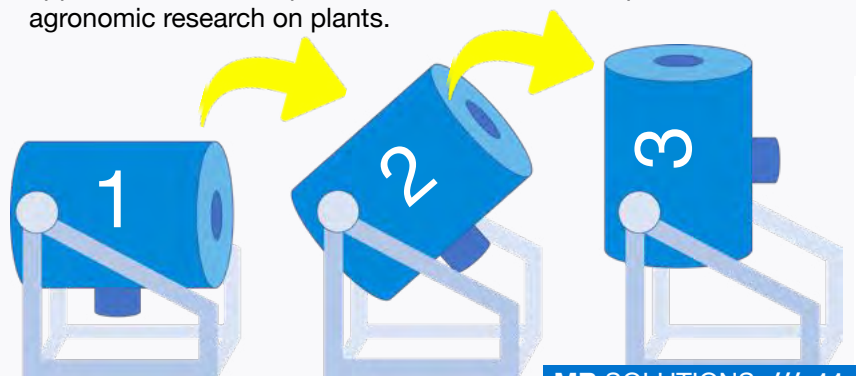
Flexiscan and Powerscan:  
Transmit/receive bird cages coils  
Whole body, cardiac, and brain  
Surface coils  
From mouse to large animals

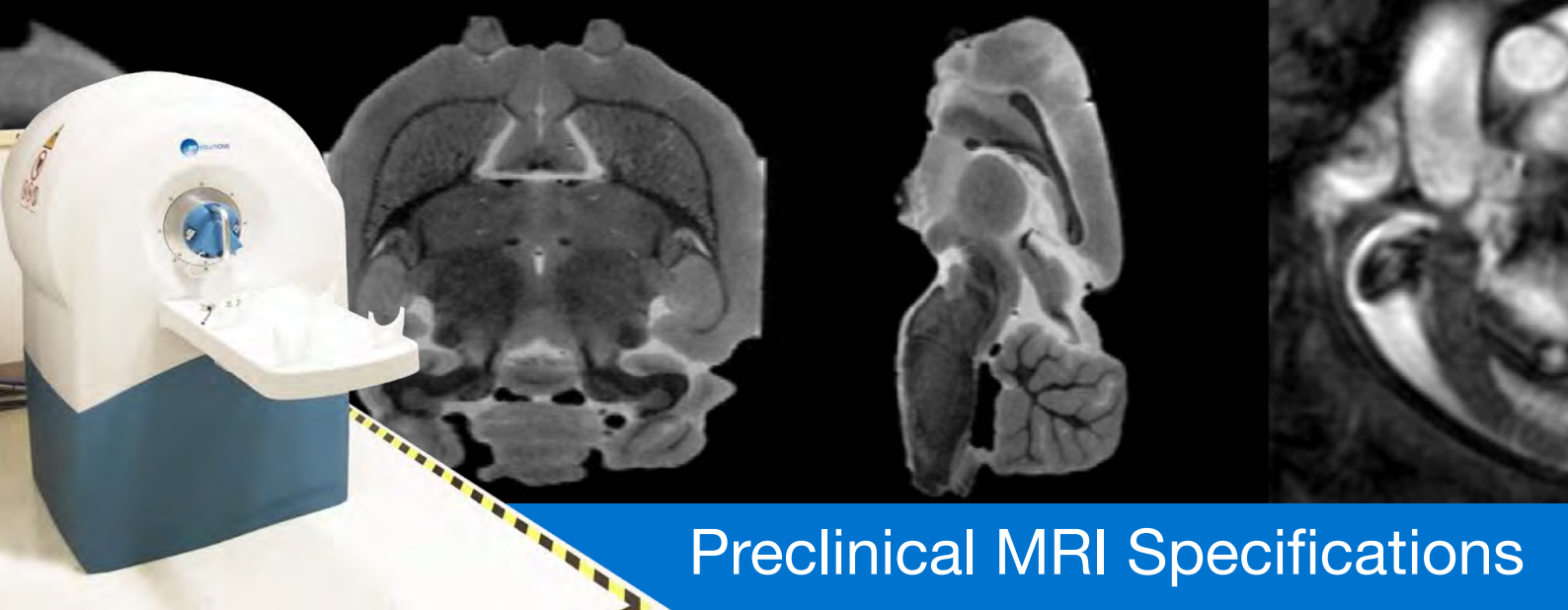
Powerscan models :  
Phased array coils  
Multinuclear coils: e.g.  
23Na, 150,19F, 31P, 13C  
Specific customized coils



### Rotating Magnet for Flexiscan and Powerscan

The compact size of MR SOLUTIONS magnet and the cryogen-free technology permits rotation of the magnet, expanding possible applications to examples such as fluid flow in porous media and agronomic research on plants.





# Preclinical MRI Specifications

## 9.4T

## 7.0T

**Dry Magnet Cryogen-free**  
No Liquid Helium - No Nitrogen

**Dry Magnet Cryogen-free**  
No Liquid Helium - No Nitrogen

System type	9.4T 17 cm bore size		9.4T 26 cm bore size	
Model	Flexiscan	Powerscan	Flexiscan	Powerscan
Reference	MRS-9417-FL	MRS-9417-PW	MRS-9426-FL	MRS-9426-PW
<b>Multimodality compatibility with:</b>				
PET-INSERT	Yes		Yes	
PET-CLIP-ON	Yes		Yes	
SPECT-CLIP-ON	Yes		Yes	
<b>System data</b>				
Animal type	Rodents & Marmosets		Rodents, rabbits and NHP	
Clear bore size (mm)	170		259	
FOV (mm)	70 mm radially x 100 mm axially		98 mm radially x 135 mm axially	
Homogeneity	over 35mm DSV +/- 0.05ppm		over 84mm DSV +/- 1ppm	
5 gauss line	105cm radially x120cm axially		135cm radially x 155cm axially	
Magnet stability	<0.05ppm/hour		<0.05ppm/hour	
Magnet type	Superconducting		Superconducting	
Rampable	No	Yes, Option	No	Yes, Option
Cooling	Cryogen free (no liquid helium and no nitrogen)			
Integral RF shield	Yes	Yes	Yes	Yes
Diameter gradient	158 mm OD, 100 mm ID		227 mm OD, 160 mm ID	
Gradient strength	600 mT/m , x, y, z		600 mT/m , x, y, z	
Gradient upgrade	up to 1500mT/m		up to 1500mT/m	
EVO Spectrometer	2 Transmitters - 4 receivers		2 Transmitters - 4 receivers	
channels upgrade	No		Up to 8 TX, 32 RX	
2000W Amplifier	No	Yes, option	No	Yes, option
<b>Software</b>				
PreclinicalScan Console	Yes acquisition, post processing, all modalities under one interface		Yes acquisition, post processing, all modalities under one interface	
Pulse Seq. program.	Option	Yes	Option	Yes
<b>Dimensions and weight</b>				
Magnet and stand	Magnet: H:1400mm, W: 843mm, D:977mm, Table: W:400mm x L:890mm		Magnet: H:1400mm, W: 900mm, D:1200mm, Table: W:400mm x L:890mm	
Magnet Weight	<700kg		<925kg	
* Additional technical specifications available on request.				

System type	7.0T 17 cm bore size		7.0T 24 cm bore size	
Model	Flexiscan	Powerscan	Flexiscan	Powerscan
Reference	MRS-7017-FL	MRS-7017-PW	MRS-7024-FL	MRS-7024-PW
<b>Multimodality compatibility with:</b>				
PET-INSERT	Yes		Yes	
PET-CLIP-ON	Yes		Yes	
SPECT-CLIP-ON	Yes		Yes	
<b>System data</b>				
Animal type	Rodents & Marmosets		Rodents, rabbits and NHP	
Clear bore size (mm)	170		240	
FOV (mm)	70 mm radially x 100 mm axially		98 mm radially x 135 mm axially	
Homogeneity	over 35mm DSV +/- 0.05ppm		over 84mm DSV +/- 1ppm	
5 gauss line	85cm radially x155cm axially		120cm radially x150cm axially	
Magnet stability	<0.05ppm/hour		<0.05ppm/hour	
Magnet type	Superconducting		Superconducting	
Rampable	No	Yes, Option	No	Yes, Option
Cooling	Cryogen free (no liquid helium and no nitrogen)			
Integral RF shield	Yes	Yes	Yes	Yes
Diameter gradient	158 mm OD, 100 mm ID		227 mm OD, 160 mm ID	
Gradient strength	600 mT/m , x, y, z		420 mT/m , x, y, z	
Gradient upgrade	up to 1500mT/m		up to 1500mT/m	
EVO Spectrometer	2 Transmitters - 4 receivers		2 Transmitters - 4 receivers	
channels upgrade	No		Up to 8 TX, 32 RX	
2000W Amplifier	No	Yes, option	No	Yes, option
<b>Software</b>				
PreclinicalScan Console	Yes acquisition, post processing, all modalities under one interface		Yes acquisition, post processing, all modalities under one interface	
Pulse Seq. program.	Option	Yes	Option	Yes
<b>Dimensions and weight</b>				
Magnet and stand	Magnet: H:1380mm, W: 843mm, D:880mm, Table: W:400mm x L:890mm		Magnet: H:1380mm, W: 843mm, D:977mm, Table: W:400mm x L:890mm	
Magnet Weight	<500kg		<600kg	
* Additional technical specifications available on request.				

PRECLINICAL MR





# Flexiscan and Powerscan models

## 4.7T

**Dry Magnet Cryogen-free**

No Liquid Helium - No Nitrogen

System type	4.7T 17 cm bore size		4.7T 24 cm bore size	
Model	Flexiscan	Powerscan	Flexiscan	Powerscan
Reference	MRS-4717-FL	MRS-4717-PW	MRS-4724-FL	MRS-4724-PW
<b>Multimodality compatibility with:</b>				
PET-INSERT	Yes		Yes	
PET-CLIP-ON	Yes		Yes	
SPECT-CLIP-ON	Yes		Yes	
<b>System data</b>				
Animal type	Rodents & Marmosets		Rodents, rabbits and NHP	
Clear bore size (mm)	170		240	
FOV (mm)	70 mm radially x 100 mm axially		98 mm radially x 135 mm axially	
Homogeneity	over 35mm DSV +/- 0.05ppm		over 84mm DSV +/- 1ppm	
5 gauss line	75cm radially x120cm axially		95cm radially x 115cm axially	
Magnet stability	<0.05ppm/hour		<0.05ppm/hour	
Magnet type	Superconducting		Superconducting	
Rampable	No	Yes, Option	No	Yes, Option
Cooling	Cryogen free (no liquid helium and no nitrogen)			
Integral RF shield	Yes	Yes	Yes	Yes
Diameter gradient	158 mm OD, 100 mm ID		227 mm OD, 160 mm ID	
Gradient strength	600 mT/m , x, y, z		600 mT/m , x, y, z	
Gradient upgrade	up to 1500mT/m		up to 1500mT/m	
EVO Spectrometer	2 Transmitters - 4 receivers		2 Transmitters - 4 receivers	
channels upgrade	No		Up to 8 TX, 32 RX	
2000W Amplifier	No	Yes, option	No	Yes, option
<b>Software</b>				
PreclinicalScan Console	Yes acquisition, post processing, all modalities under one interface		Yes acquisition, post processing, all modalities under one interface	
Pulse Seq. program.	Option	Yes	Option	Yes
<b>Dimensions and weight</b>				
Magnet and stand	Magnet: H:1400mm, W: 770mm, D:880mm, Table: W:400mm x L:890mm		Magnet: H:1400mm, W: 843mm, D:977mm, Table: W:400mm x L:890mm	
Magnet Weight	<400kg		<500kg	

\* Additional technical specifications available on request.

## 3.0T

**Dry Magnet Cryogen-free**

No Liquid Helium - No Nitrogen

System type	3.0T 17 cm bore size		3.0T 24 cm bore size	
Model	Flexiscan	Powerscan	Flexiscan	Powerscan
Reference	MRS-3017-FL	MRS-3017-PW	MRS-3024-FL	MRS-3024-PW
<b>Multimodality compatibility with:</b>				
PET-INSERT	Yes		Yes	
PET-CLIP-ON	Yes		Yes	
SPECT-CLIP-ON	Yes		Yes	
<b>System data</b>				
Animal type	Rodents & Marmosets		Rodents, rabbits and NHP	
Clear bore size (mm)	170		240	
FOV (mm)	70 mm radially x 100 mm axially		98 mm radially x 135 mm axially	
Homogeneity	over 35mm DSV +/- 0.05ppm		over 84mm DSV +/- 1ppm	
5 gauss line	60cm radially x80cm axially		85cm radially x110cm axially	
Magnet stability	<0.05ppm/hour		<0.05ppm/hour	
Magnet type	Superconducting		Superconducting	
Rampable	No	Yes, Option	No	Yes, Option
Cooling	Cryogen free (no liquid helium and no nitrogen)			
Integral RF shield	Yes	Yes	Yes	Yes
Diameter gradient	158 mm OD, 100 mm ID		227 mm OD, 160 mm ID	
Gradient strength	600 mT/m , x, y, z		420 mT/m , x, y, z	
Gradient upgrade	up to 1500mT/m		up to 1500mT/m	
EVO Spectrometer	2 Transmitters - 4 receivers		2 Transmitters - 4 receivers	
channels upgrade	No		Up to 8 TX, 32 RX	
2000W Amplifier	No	Yes, option	No	Yes, option
<b>Software</b>				
PreclinicalScan Console	Yes acquisition, post processing, all modalities under one interface		Yes acquisition, post processing, all modalities under one interface	
Pulse Seq. program.	Option	Yes	Option	Yes
<b>Dimensions and weight</b>				
Magnet and stand	Magnet: H:1400mm, W: 770mm, D:880mm, Table: W:400mm x L:890mm		Magnet: H:1400mm, W: 843mm, D:977mm, Table: W:400mm x L:890mm	
Magnet Weight	<220kg		<400kg	

\* Additional technical specifications available on request.

CRYOGEN-FREE

# MRI Upgrades



Bring your MRI back to life

Do you have an orphaned preclinical MRI system?  
Do you need the most advanced MR console?  
Does your former supplier charge too much for an upgrade or service?

MR SOLUTIONS can refurbish and enhance all or part of the following:

- Cryogenic magnets from Agilent™, Varian™ and Bruker™
- Multi TX and multi RX spectrometers
- Gradient and Shim amplifiers
- RF coils and RF Amplifiers
- RF and gradient amplifiers
- Gradient/shim coils
- Advanced electronics and hardware interface
- .

MR SOLUTIONS provides:

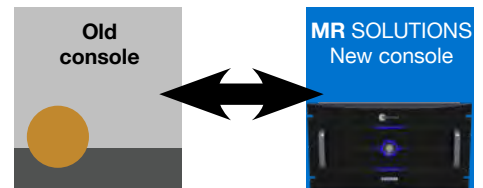
- The most advanced MR console: Preclinical Scan
- Powerscan software for pulse sequence programming
- Ready to use sequences, methods and protocols
- Assistance to transfer sequences from the old console to MR SOLUTIONS' console
- A broad range of RF coils
- On-site and online application assistance
- .

MR SOLUTIONS service and technical support:

- Magnet service
- Maintenance of the refrigerator and helium compressor
- Maintenance of all electronic components

## FLEXIBLE

Switch at any time from the old to the new MR SOLUTIONS console



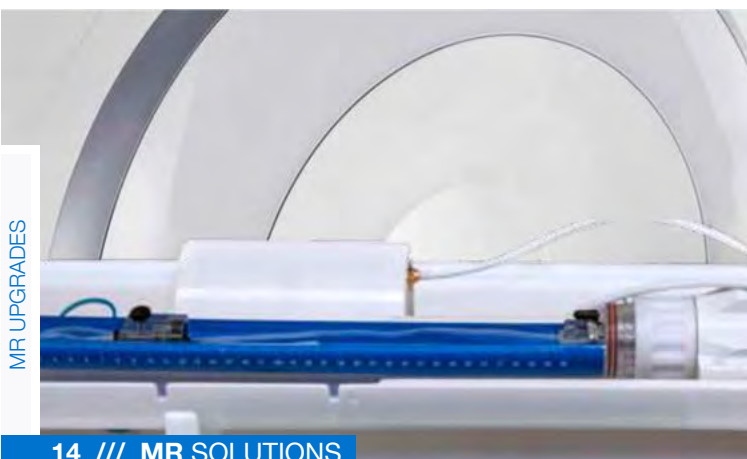
## An Investment for your next MRI

Some of the upgrade components can be re-used on MR SOLUTIONS cryogen-free magnets up to 9.4T for small animal imaging

# C2P

## Clinical To Preclinical

Conversion kit: small animal imaging with clinical MRI



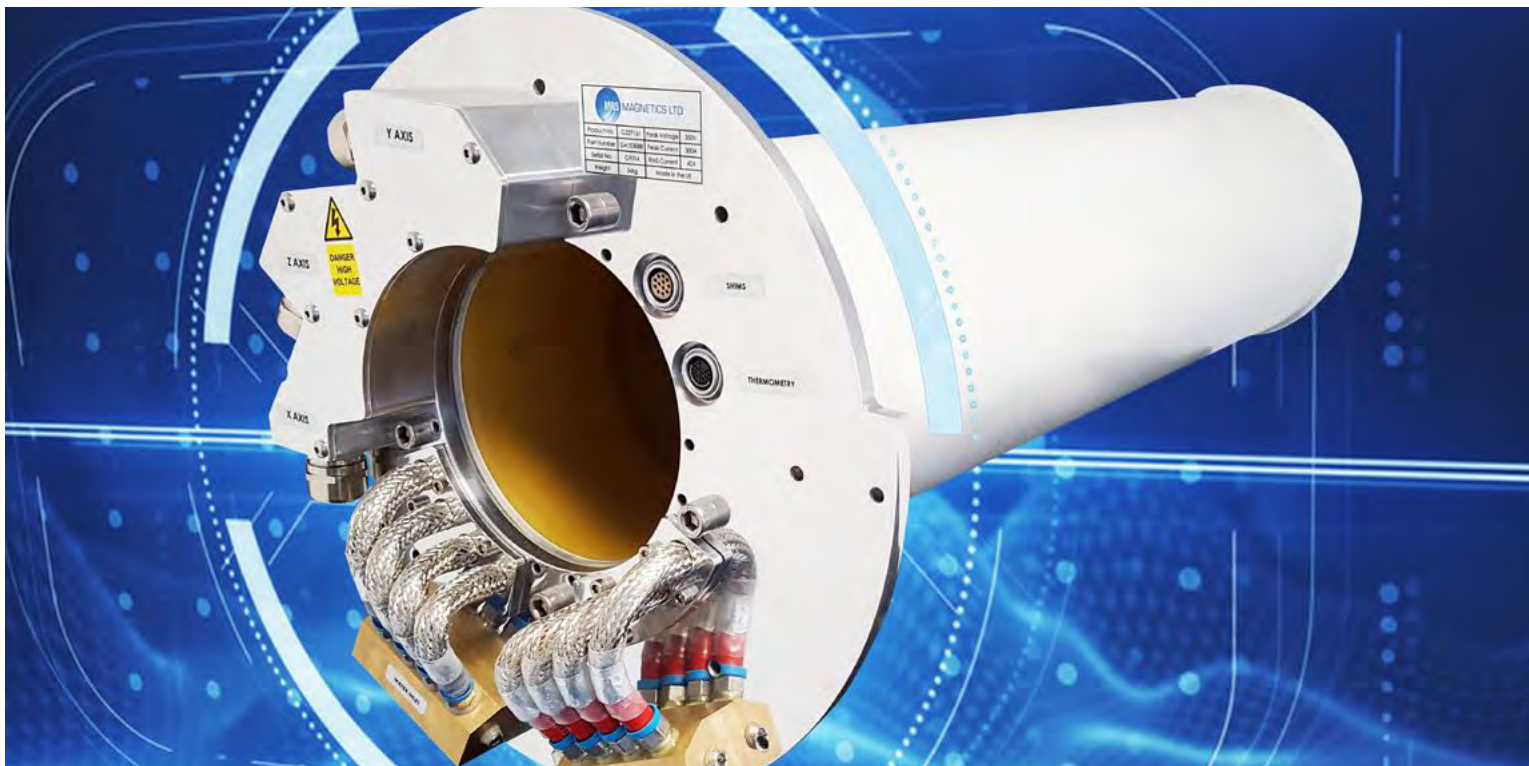
C2P is a conversion kit, that enables small animal imaging using only the magnetic field of a clinical MRI system. There is no dependency on the clinical systems' hardware and software.

**C2P kit Includes:**

- Operator workstation
- Preclinical Scan Software
- Extensive Sequences library
- Electronics rack
- Gradient coil
- RF Coils
- Animal Handling







# Gradient Upgrades

**Pre-clinical MRI systems from all vendors can be upgraded with MRS Magnetics gradients**

MRS Magnetics™, an MR SOLUTIONS' company, manufactures gradient coils that are fully compatible replacements for Bruker™, Magnex™, Varian™, Agilent™ or RRI™ gradient coils. It is possible to change the temperature sensor type and interface configuration to match the gradient being replaced.

Smaller high strength gradient coils such as the G113060 can be supplied as an additional removable INSERT, to be mounted inside a larger gradient coil for experiments demanding higher gradient strength.

## Compatibility Matrix

MRS Magnetics™	Bruker™	Agilent™ / Varian™ / Magnex™	RRI™
G113060	B-GA 6S	SGRAD115/60/S SGRAD115/60/HD/S	BFG 113/60-S
G152090	B-GA 9S B-GA 9S HP	SGRAD155/90/HD/S	
G157100		SGRAD155/100/S SGRAD155/100/HD/S	BFG 155/100 S
G198116	B-GA 12S B-GA 12S2 B-GA 12S HP		BFG 200/115-S
G205120		SGRAD205/120/S SGRAD205/120/HD/S	
G302200	B-GA 20S B-GA 20S HP		
G307210		SGRAD305/210/S SGRAD205/210/HD/S	BFG 305/210 S

## Happy Users:

«MRS Magnetics provided a new gradient coil for our Agilent™ MRI system with a custom interface to fit our magnet. The MRS Magnetics' team is lovely, professional, highly knowledgeable, and very friendly.

They provided a well-engineered and very high-quality product that has substantially improved our capabilities. The coil's performance is excellent and the price was extremely competitive.

The system is quite literally an order of magnitude better in every respect, and functions perfectly. The duty cycle, GMax and SMax are much better than our previous gradient set, while the new set uses less power (and therefore requires less cooling).

The new gradient set has allowed us to completely remove what was otherwise a substantial hardware limitation with our system»

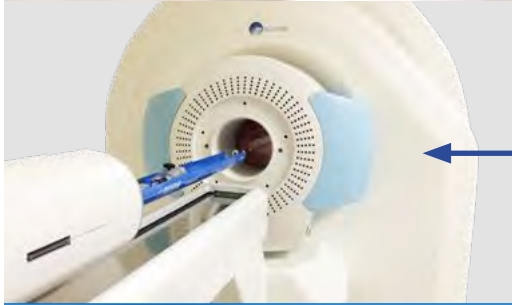
Prof. Damian Tyler, Associate Professor  
Department of Physiology, Anatomy & Genetics



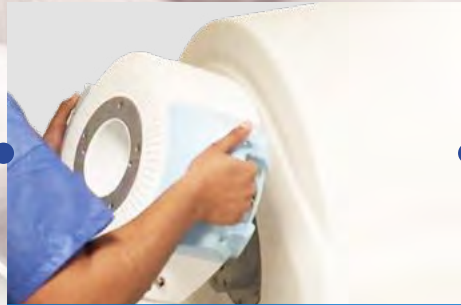
PRECLINICAL  
PET  
SPECT  
CT

# EXTENDED MULTIMODALITY IMAGING

by MR SOLUTIONS



**PET/MR and SPECT/MR  
INSERT and CLIP-ON  
up to 9.4T**



**Move the PET or SPECT**



**PET/CT and SPECT/CT**



**Benchtop PET and SPECT  
Stand alone operation**

## The most efficient Plug and Play design for multimodality imaging:

MR SOLUTIONS has developed a unique plug and play concept for multimodality imaging. The same PET and SPECT imaging systems can be mounted directly on MRI and CT systems to provide all of the possible combinations: PET/CT, PET/MR, SPECT/CT and SPECT/MR. It only takes moments to clip a PET or SPECT module on to either a CT or MRI system and be ready for multimodality imaging.

## Compact and light

The PET and SPECT modules are extremely compact and weight only a few kilos. All the electronics are built into the rings and therefore only power and data cable connections are required to have them ready to run. If the CT and the MR systems are not in the same room, or if stand-alone operation is required, this is no problem.

## Optimising the workflow and investment

This modular approach offers significant advantages in efficiency and workflow, and most importantly reduces considerably the investment for the research institute.

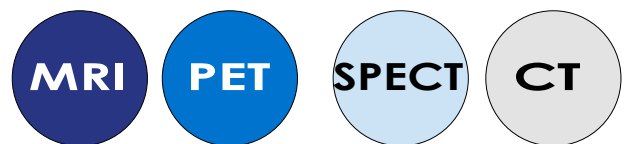
## PET and SPECT are compatible with all MR models up to 9.4T and all CT models

Any MR and CT from MR SOLUTIONS can be upgraded at any time with PET or SPECT.

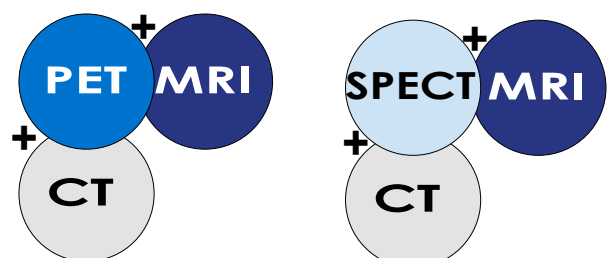
## Motorized Bed for all multimodality configuration

A high precision motorized bed is included for multimodality imaging configuration, whether sequential or simultaneous.

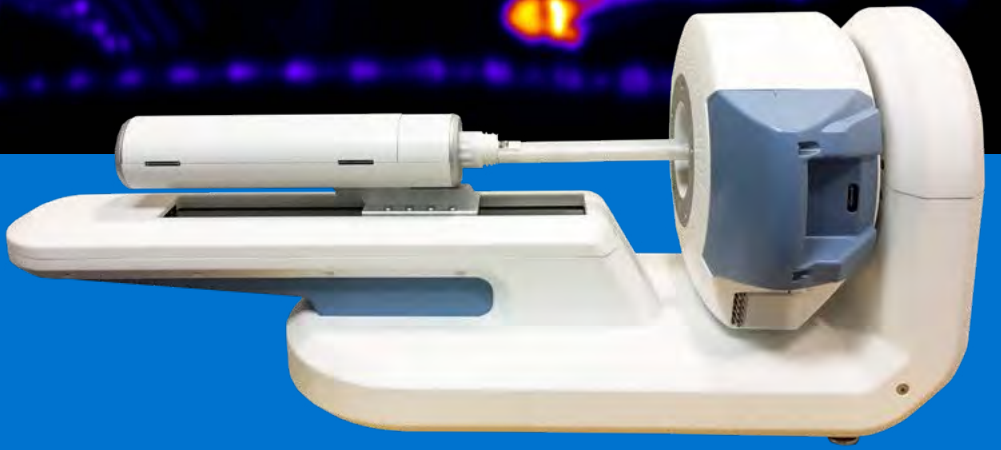
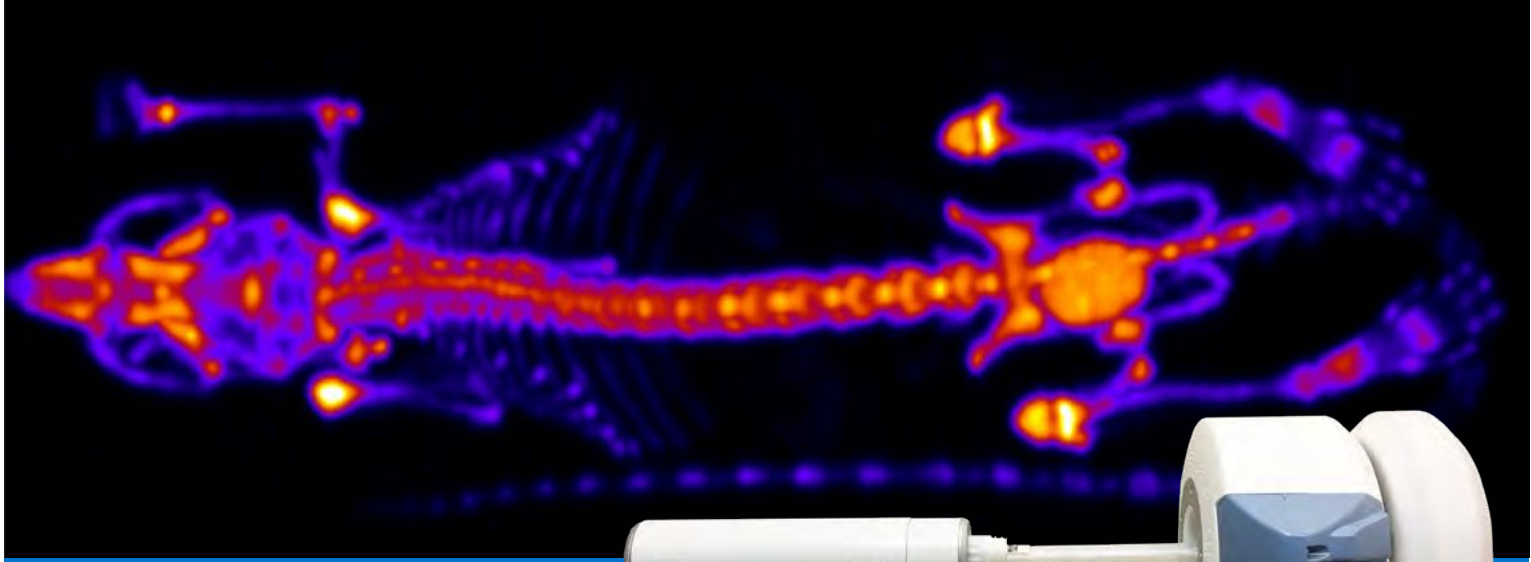
One component of each imaging modality



Dual modality imaging configurations without duplicating imaging components







# PET Specifications

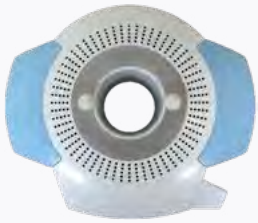
## SEQUENTIAL IMAGING PET/MR - PET/CT

### PET CLIP-ON 800 series

Mice, Rats & Marmosets

### PET CLIP-ON 1200 series

Mice, rats, Marmosets & Rabbits



## SIMULTANEOUS IMAGING PET/MR $\leq 9.4T$

### PET INSERT 400 Series

Whole body Mice and Rat head

### PET INSERT 800 Series

Mice, Rat, marmosets

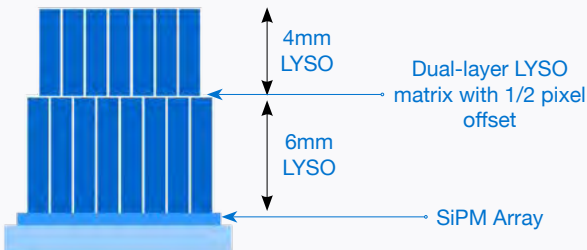


The PET CLIP-ON and PET INSERT for small animal imaging are based on the latest silicon photomultiplier (SiPM) technology. The detector assembly (crystal/SiPM) allows true DOI (depth of interaction) with two pixelated layers of scintillator crystal with different matrices.

This enables the MR SOLUTIONS PET module to achieve a resolution below 0.8mm. Both PET models, CLIP-ON and INSERT are fully compatible with all MRI systems from MR SOLUTIONS up to 9.4T and all CT models.

# TRUE DOI

All the PET systems from MR SOLUTIONS are built up with true depth of interaction hardware allowing a uniform high resolution across the entire field of view. All systems have dual-layer LYSO matrix with 1/2 pixel offset between the top and bottom layers.



PRECLINICAL PET

System type	PET CLIP-ON		PET INSERT	
Reference	PET-CO-800	PET-CO-1200	PET-I-400	PET-I-800
<b>Multimodality compatibility with:</b>				
MR 24cm bore	Yes	Yes	Yes	Yes
MR 17cm bore	Yes	Yes	Yes	No
CT	Yes	Yes	Yes	Yes
<b>System data</b>				
Clear bore size (mm)	120	160	60	112
Transaxial. FOV (mm)	80	120	40	80
Axial FOV (mm)	50.40 (one ring), 102.48 (two rings), 154,6 (three rings)			
Extended aFOV	300 mm with motorized bed			
Crystals thickness	Double Layers of LYSO: LYSO/LYSO: 10mm			
PMT	Silicon PM			
Depth of Interaction (DOI)	Yes- true DOI from hardware configuration			
Spatial Resolution with 3D OSEM (mm)	0.7	0.7	0.7	0.7
Spatial Resolution NEMA NU 4-2008 (mm)	1,28	1,28	1,28	1,28
Sensitivity	4.6% (one ring), 8.7% (two rings), 12% (three rings)			
Timing Resolution	1 nanosecond			
Average Energy Resolution	15%			
<b>Software</b>				
PreclinicalScan Console	Yes acquisition, post processing, all modalities under one interface		Yes acquisition, post processing, all modalities under one interface	

\* Additional technical specifications available on request.

# SIMULTANEOUS PET/MR

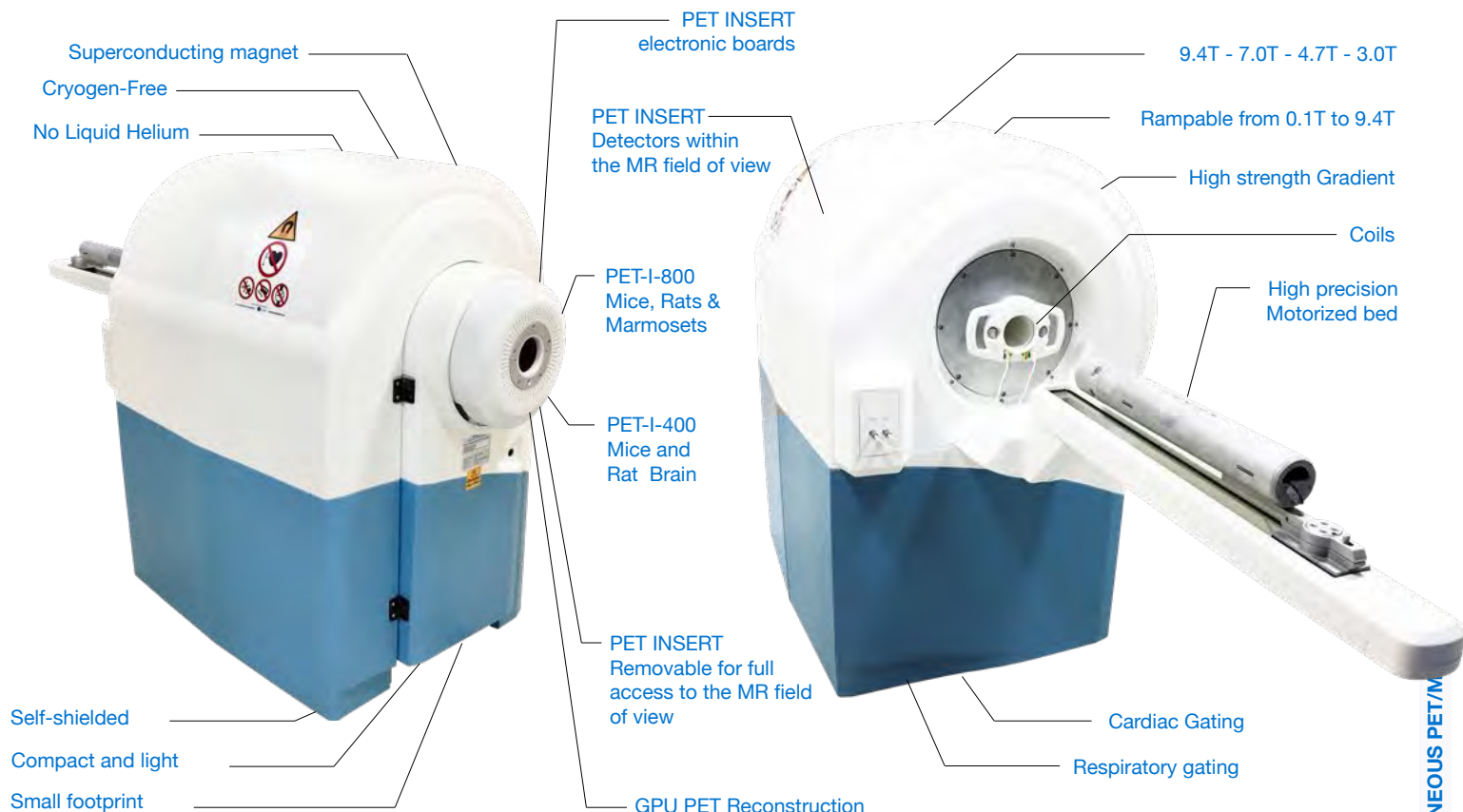
PET INSERT for 9.4T 7.0T 4.7T 3.0T

## PET INSERT for CRYOGEN-FREE MR from MR SOLUTIONS

The PET INSERT is designed for simultaneous imaging in combination with MR SOLUTIONS cryogen-free MRI up to 9.4T.

Two models of the PET-INSERT are available. The 800 series for large bore MRI systems allows simultaneous whole body imaging of mice, rats and marmosets whilst the 400 series for smaller bore MRI systems enables simultaneous whole body imaging of mice and simultaneous brain imaging of rats.

The PET INSERT can be removed on the Powerscan MRI models to give access to the full bore size of the MR. Each PET INSERT can be operated as a stand-alone device and/or alternatively linked to a Powerscan CT for sequential imaging.



\*For more information on Cryogen-free MR, please refer to pages 9 to 13 and for PET page 18

# SEQUENTIAL PET/MR

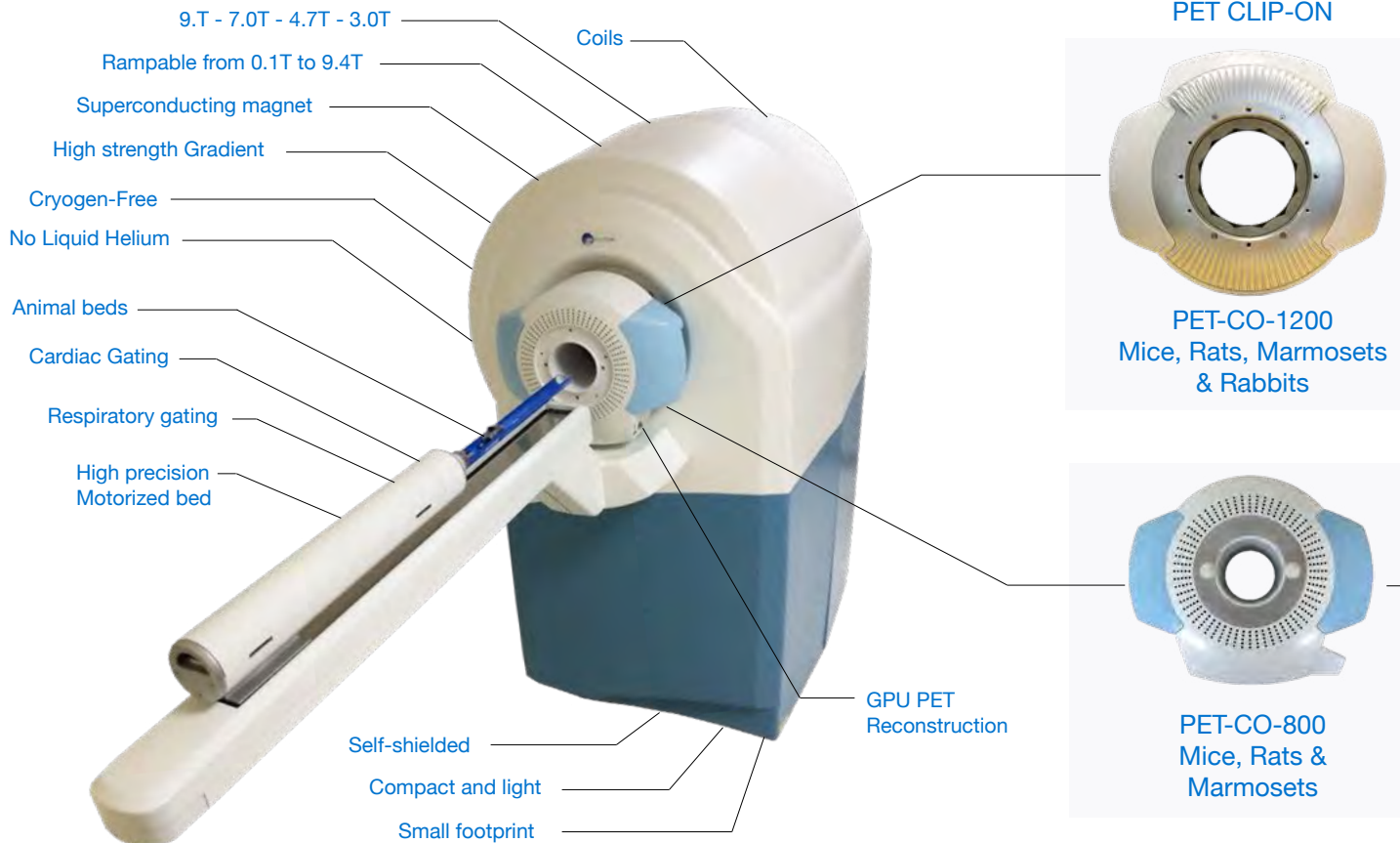
PET CLIP-ON for 9.4T 7.0T 4.7T 3.0T

## PET CLIP-ON for CRYOGEN-FREE MR from MR SOLUTIONS

The PET CLIP-ON is designed for sequential imaging in combination with MR SOLUTIONS cryogen-free MRI up to 9.4T.

The PET CLIP-ON is mounted at the mouth of the bore of the MRI, allowing sequential acquisition of PET and MR imaging of rodents and larger animals up to 3kG. Two models of PET CLIP-ON are available. The 800 series for whole body imaging of mice, rats and marmosets and the 1200 series for whole body imaging of rodents up to large animals.

All models of PET CLIP-ON can be easily removed and operated as stand-alone devices, or equally easily mounted on a MR Solutions' CT for sequential PET/CT imaging

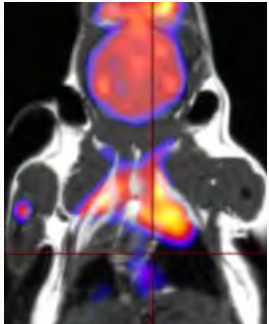


\*For more information on Cryogen-free MR, please refer to pages 9 to 13 and for PET page 18



# SEQUENTIAL PET/CT

## PET CLIP-ON for Powerscan and Flexiscan CT



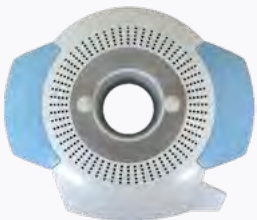
## PET CLIP-ON for Preclinical CT from MR SOLUTIONS

The PET CLIP-ON is designed for sequential imaging in combination with MR SOLUTIONS CT scanners. The PET CLIP-ON can be mounted on the CT system allowing sequential PET/CT imaging of rodents and larger animals up to 3KG. Two models of PET-CLIP-ON are available, the 800 series for whole body imaging of mice, rats and marmosets and the 1200 series for rodents up to large animals. Four models of CT are available with small and large bore up to 5kg animals and with high resolution functionalities. The PET CLIP-ON's can be removed on all CT models, Flexiscan and Powerscan and be operated as a stand-alone device and alternatively associated to a Flexiscan or Powerscan cryogen-free MR for sequential PET/MR imaging.

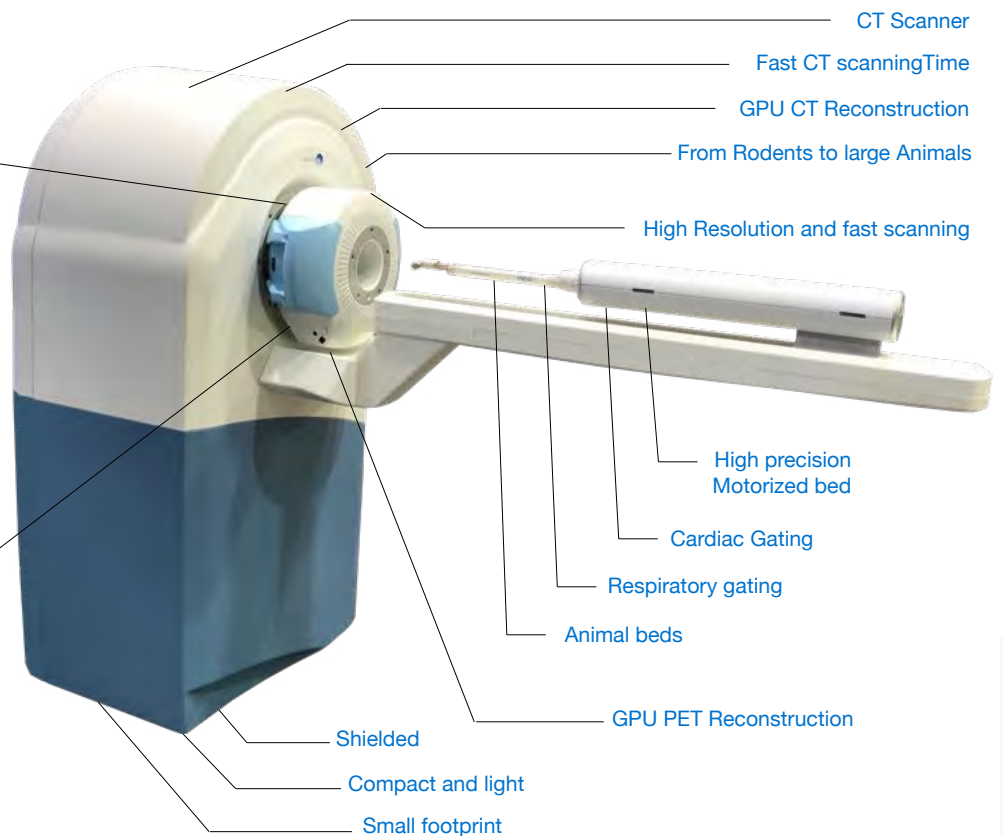
### PET CLIP-ON



**PET-CO-1200**  
Mice, Rats, Marmosets & Rabbits



**PET-CO-800**  
Mice, Rats & Marmosets



\*For more information on CT, please refer to pages 24 and for PET page 18

# LARGE BORE PET-CT-MR



## PET/CT and PET/MR scanner for Non-Human Primate

### The highest PET resolution for NHP imaging

The PET-NHP and CT-NHP are designed for large animal imaging such as Monkeys. The PET-NHP has an inner bore size of 311 mm and provides an active transaxial field of view of 220mm. The system offers the latest technology with true Depth of Interaction (DOI). This enables resolutions of below 1,1mm across the whole field of view to be achieved. The PET/CT-NHP is an in-line system.

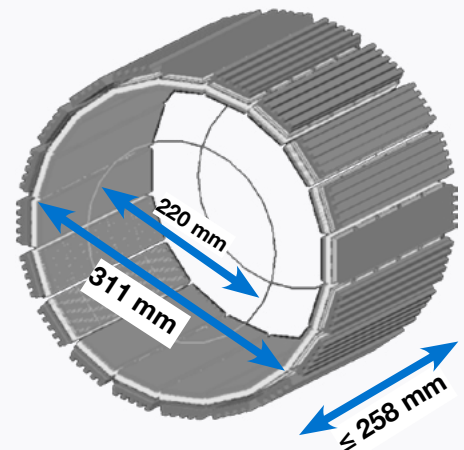
The 3T MR is a large bore cryogen-free system with 40cm outer diameter. The PET-NHP can be coupled either on the CT-NHP or on the MR 3T (MRS-3040). For more information about the large bore 3T MR, please contact MR SOLUTIONS.

#### SPECIFICATIONS PET/CT-NHP:

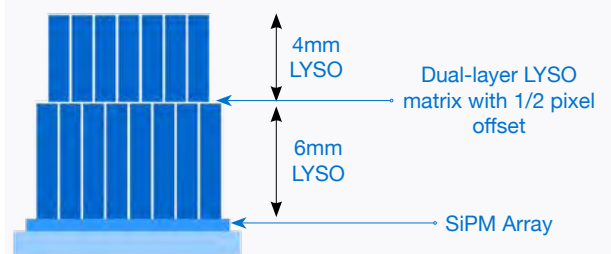
System type	PET-NHP	System type	CT-NHP
Reference	PET-2204	Reference	CT-NHP
PET System data		CT System data	
Clear bore size (mm)	311	Stand alone CT operation	Yes
Transaxial. FOV (mm)	220	Attenuation correction for PET and SPECT	Yes
Axial FOV (mm)	206,64	Power Output /Tube (W)	39W
Extended aFOV	400 mm with motorized bed	X-Ray Tube Voltage Range	40 - 130 kV
Crystals thickness	Double Layers of LYSO: LYSO/LYSO: 10mm	X-Ray Tube Current Range	10 to 300 µA
PMT	Silicon PM	Detector Pixel Matrix	3072 x 3072
Depth of Interaction (DOI)	Yes- true DOI from hardware configuration	Smallest isotropic voxel size	40 µm
Spatial Resolution with 3D OSEM (mm)	<1,1mm	Spatial Resolution	80 µm
Sensitivity	8.90%	Low dose system / Shielded	Yes
Timing Resolution	1 nanosecond	Fast scanning capability	Yes <20s
Average Energy Resolution	15%	Prospective cardiac and respiratory gating	Yes, Option
Monkey phantom	Provided	Inner diameter (mm)	311
Gating PET	Cardiac and respiratory	Transaxial FOV (mm)	240
Native PET File Format	List Mode Data/Interfile/DICOM	Axial FOV (mm) with Motorized Bed	
Software		Dual Energy CT	No
PreclinicalScan Console		Software	
		PreclinicalScan Console	

\* Additional technical specifications available on request.

## PET-NHP



All the PET systems from MR SOLUTIONS are built with true Depth of Interaction (DOI) hardware allowing a uniform high resolution across the entire field of view. All systems have a dual-layer LYSO matrix with half pixel offset between the top and bottom layers.





# SPECT/MR & SPECT/CT

SPECT CLIP-ON for MR  $\leq 9.4T$  and CT

## SPECT CLIP-ON for CT & MR from MR SOLUTIONS

The SPECT CLIP-ON series is designed for sequential multimodality imaging in combination with MR SOLUTIONS CT and MRI up to 9.4T. It can also be operated as a stand-alone SPECT system. The module can image whole body mice and rats depending of the SPECT model selected. The SPECT is also available as an INSERT to acquire simultaneous SPECT/MR images.

The SPECT module is mechanically independent; hence it can be used as a stand-alone unit or coupled to either an MR SOLUTIONS MRI or CT system. This dramatically improves the workflow of the laboratory whilst reducing cost since only one SPECT module is required for SPECT/CT and SPECT/MR imaging.

### SEQUENTIAL IMAGING SPECT/MR - SPECT/CT

### SIMULTANEOUS IMAGING SPECT/MR $\leq 9.4T$

#### SPECT CLIP-ON M series

Mice and Rats head

#### SPECT CLIP-ON R series

Whole body Mice and Rats

#### SPECT INSERT M Series

Whole body Mice

System type	SPECT CLIP-ON		SPECT INSERT
Reference	SPECT-CO-M	SPECT-CO-R	SPECT-I-M
<b>Multimodality compatibility with:</b>			
MR 24cm bore	Yes	Yes	Yes
MR 17cm bore	Yes	Yes	No
CT	Yes	Yes	No
<b>System data</b>			
Stationary Imaging	Yes	Yes	Yes
Detectors / Pinholes	4 / 100	4 / 100	4 / 100
Detector Intrinsic resolution	<1mm	<1mm	<1mm
Maximum resolution achievable with smallest pinhole	$\leq 0.5mm$	$\leq 0.5mm$	$\leq 0.5mm$
Apertures for whole body mouse and rat head	Yes	Yes	Yes
Apertures for whole body rat	No	Yes	No
Axial FOV (mm)	12mm	22mm	12mm
Extended aFOV	300 mm with motorized bed		
Transaxial FOV (mm)	30mm	60mm	30mm
Sensitivity (cps/MBq)	3026	3191	3026
Collimator material	non-ferromagnetic		
Preclinical/Scan Console	Yes acquisition, post processing, all modalities under one interface		
* Additional technical specifications available on request.			

## Stationary Imaging MULTI-PINHOLE 100 PINHOLES 4 HEADS



The SPECT module implements the latest in multi-pinhole technology with up to 100 pinholes in total. The detectors are based on the SMT-type array, 6 mm pixels, 35  $\mu m$  micro cells, 7.2 mm pitch with 3 mm CsI(Na) crystals and MLE positioning. Depending on the collimator, the system can achieve a resolution of  $< 0.5$  mm



# FLEXISCAN

# POWERSCAN

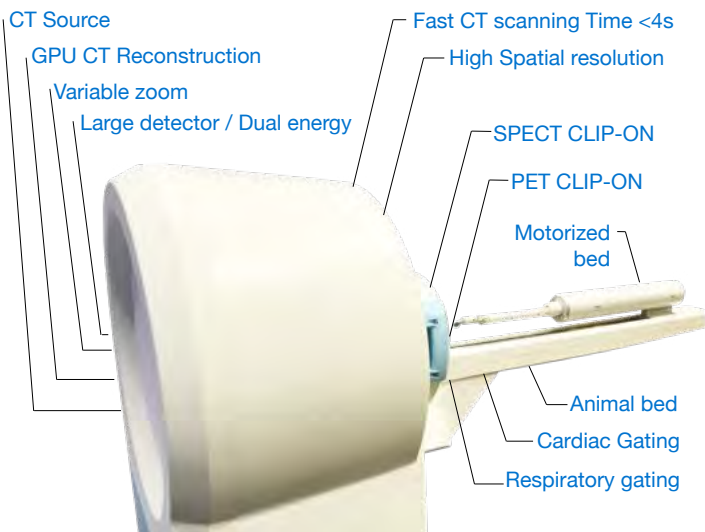
# CT

## Four CT models for everyone's needs

### FLEXISCAN CT & POWERSCAN CT

At MR SOLUTIONS, we understand that the needs of researchers can be different. Some scientists need very high-resolution CT and a large field of view for large animal scanning, whilst others require a cost-effective CT for multimodality imaging or for straightforward CT studies.

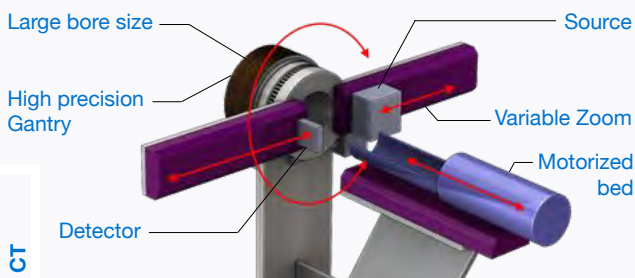
MR SOLUTIONS has developed four models: From small bore for rodents imaging to large bore for 5KG animals imaging. Our PET CLIP-ON and SPECT CLIP-ON can be attached to either CT model for PET/CT and SPECT/CT operation.



### SPECIFICATIONS:

System type	Preclinical CT			
Model	Flexiscan	Powerscan	Powerscan	Powerscan
Reference	CT-FL-8	CT-PW-8	CT-PW-14	CT-NHP
<b>Multimodality compatibility with:</b>				
Stand alone CT operation	Yes	Yes	Yes	Yes
Sequential imaging for PET/CT and SPECT/CT	Yes	Yes	Yes	Yes
Attenuation correction for PET and SPECT	Yes	Yes	Yes	Yes
<b>System data</b>				
Animal type	Whole body mouse, rats & Marmosets	Whole body mouse, rats & Marmosets	Whole body Rodents & rabbits	Rodents, large animals and NHP
Power Output /Tube (W)	60W	39W	39W	39W
X-Ray Tube Voltage Range	4 - 60kV	40 - 130 kV	40 - 130 kV	40 - 130 kV
X-Ray Tube Current Range	10 to 300 $\mu$ A	10 to 300 $\mu$ A	10 to 300 $\mu$ A	10 to 300 $\mu$ A
Detector Pixel Matrix	1944 x 1536	1944 x 1536	3888 x 3072	3072 x 3072
Variable Zoom	No	Yes	Yes	No
Smallest isotropic voxel size	21 $\mu$ m	> 5 $\mu$ m	> 7.5 $\mu$ m	40 $\mu$ m
Spatial Resolution	50 $\mu$ m	up to 15 $\mu$ m	up to 15 $\mu$ m	80 $\mu$ m
Low dose system / Shielded	Yes	Yes	Yes	Yes
Fast scanning capability	Yes <4s	Yes <4s	Yes <4s	Yes <20s
Prospective cardiac and respiratory gating	Yes, Option	Yes, Option	Yes, Option	Yes, Option
Inner diameter (mm)	115	100	160	311
Transaxial FOV (mm)	80	80	140	240
Axial FOV (mm) with Motorized Bed	From 132,95 mm up to 300 mm (400mm for CT-NHP)			
Dual Energy CT	No	Yes, option	Yes, option	No

### Inside POWERSCAN CT



The Powerscan CT model has advanced features such as variable zoom, large bore size, dual energy, large detector.

The system is suitable for in-vivo and ex-vivo applications

Preclinical CT

# ANIMAL HANDLING



Mice - Rats - Rabbits - Marmosets - Non-Human Primate

## Advanced Animal Handling for MR SOLUTIONS systems

The Imaging beds on MR SOLUTIONS imaging systems are designed to provide important support functions to the animal during the preparation stage and throughout the imaging process. The beds provide anesthetic gas to the animal and thermo-regulation of the animal during the scan.

The animal beds are available in multiple sizes for whole body and mouse head imaging, whole body rat imaging, rat head imaging (MR), rabbits, marmosets and other non-human primates.

For high throughput imaging, a mouse and rat hotel is available allowing the imaging of 3 animals at the same time.

For each imaging modality, PET, SPECT, CT and MR the gating functionalities are available for cardiac and respiratory.

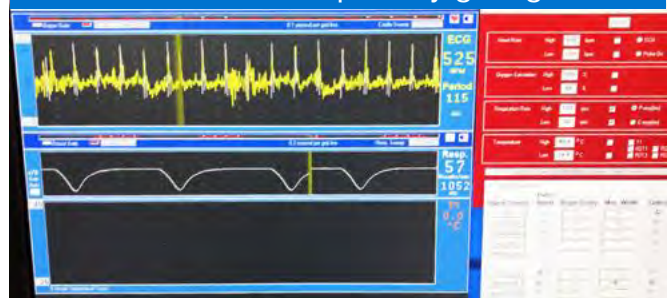
### ANIMAL IMAGING BEDS MRI COMPATIBLE

Mice Rats Marmosets Rabbits Large Animals

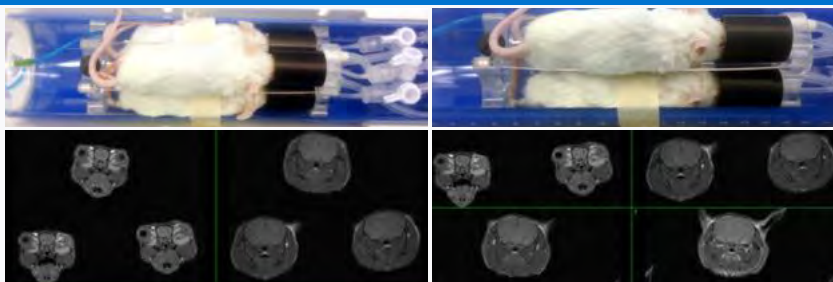
Ø38mm Ø70mm Ø115mm Ø150mm



### Cardiac & Respiratory gating



### High-throughput imaging: 3 mice - 3 rats simultaneously



### Easy connexion: Fast and reliable

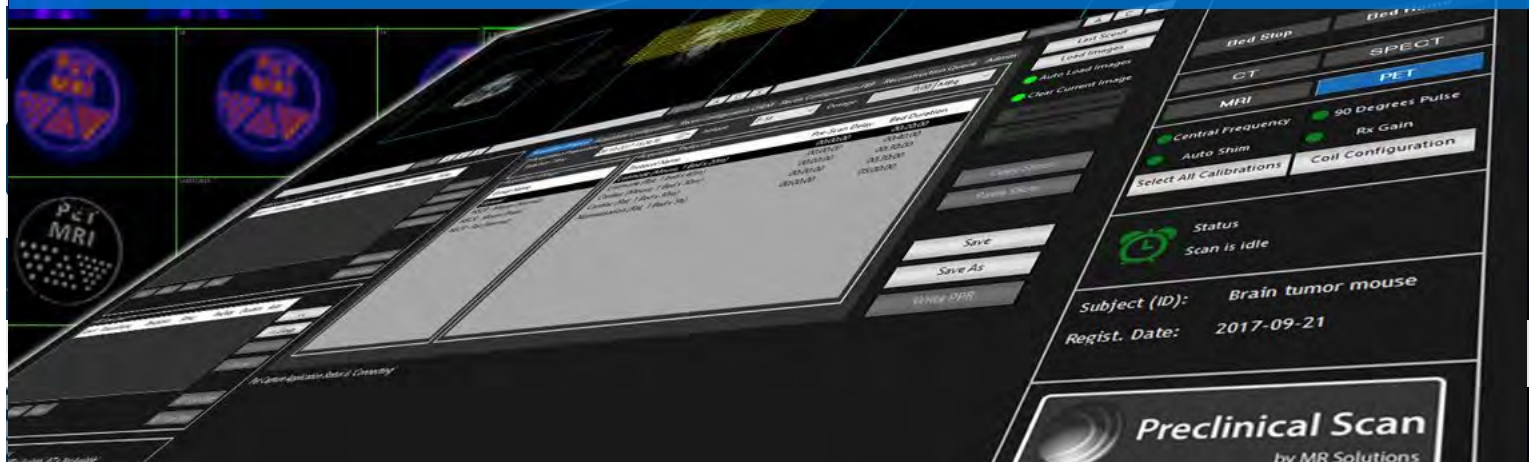


### Anesthesia





# SOFTWARE



## PRECLINICAL SCAN

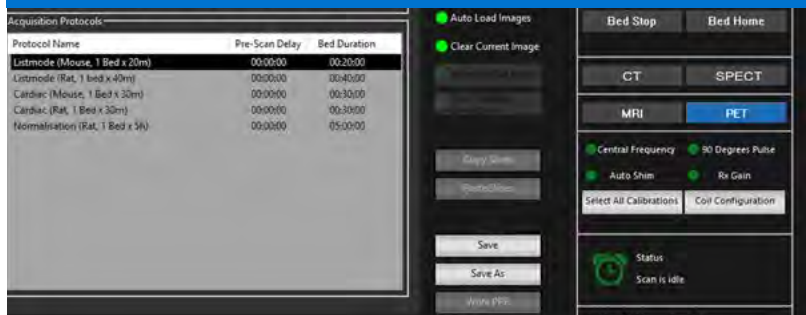
### The most advanced multimodality imaging software

Preclinical Scan is the multimodality interface for preclinical imaging. Under one interface users have access to all MRI functionality such as adjusting MRI pulse sequences parameters, but also have access to the PET, SPECT and CT extended functionalities.

There is no need for our users to move from one console to another as they change imaging modality. Everything is covered within the Preclinical Scan software.

We have designed the graphical user interface in the way to be friendly and easy to set up, even for the new user. For the advanced user, real-time optimization and advanced functionalities are available. Preclinical Scan software can be configured with different access of management depending of their role.

#### All imaging modalities under one interface



From Preclinical Scan software, researchers can select their modality of interest, it could be MR, PET, SPECT or CT and just run the scan.

MR SOLUTIONS develops and manufactures all the components of its preclinical systems including software. As all our team is under the same roof, we have been able to develop the most powerful platform for multimodality preclinical imaging under one common interface. We also take into consideration the valuable feedback of our users and we continue to implement new functionalities.

Auto-Shim, RX Gain, Calibration, Central Frequency etc... all the major parameters for the MRI are built in.

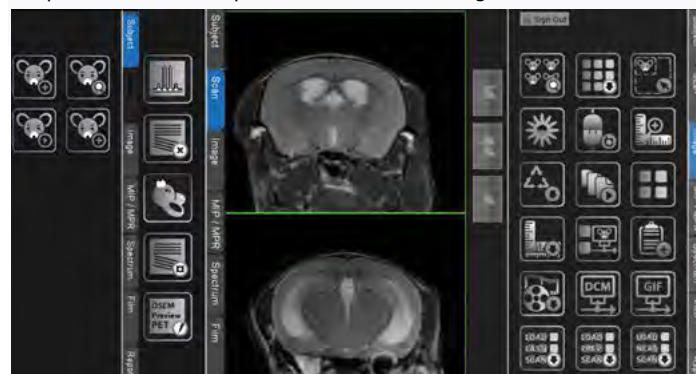
#### Simultaneous imaging: take the control



Preclinical Scan software integrates all the functionality to acquire and process simultaneous PET/MRI scans.

#### Subject, Scan, Image, MIP, Spectrum, Reports

Move from tab to tab - from acquisition to image processing. Export the data in the preferred format, including DICOM files.



#### PACS, data export and advanced post-processing

Connect the Preclinical Scan console to the PACS server of the institute. MR SOLUTIONS provides compatibility with most well-known post-processing packages for preclinical imaging.





## POWERSCAN Software

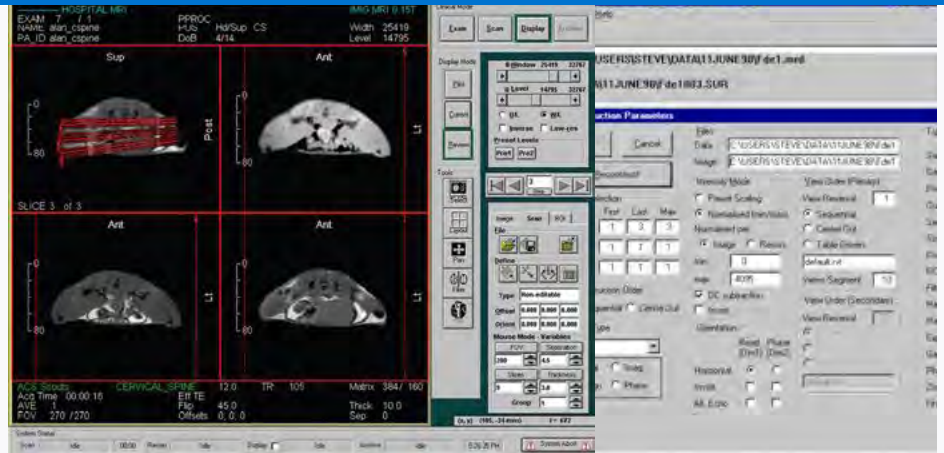
### Pulse Sequence Programming

Powerscan allows the MRI physicist full access to all functions of the MRI system. Pulse sequences may be written and/or modified and new reconstruction algorithms incorporated. Full source code to all pulse sequences is supplied.

All sequences developed by MRI physicists can be uploaded to Preclinical Scan Software once validated. MR SOLUTIONS also provides assistance and services for development of new pulse sequences.

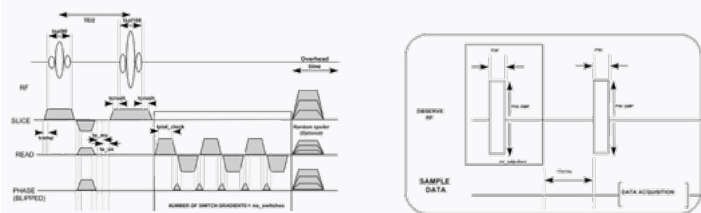
### Powerscan Software main features

- Full control of the system
- Access to individual components such as reconstruction software
- Interface to user programs
- Flexible pulse programming environment with user defined graphical wave shape generation
- Interactive setup mode for sequence parameter optimization including real-time display of images and/or spectra and time data
- Scripting of own set of modes of acquisition
- Customizable reconstruction processing
- DICOM export
- DICOM worklist
- User customizable text with international language display



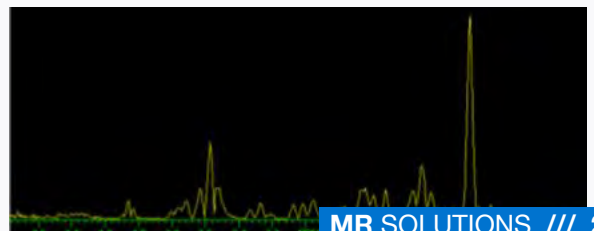
### PULSE SEQUENCES

MR SOLUTIONS has more than 30 years' experience in developing pulse sequences for clinical and preclinical applications. All our systems are provided with a large library of sequences ready to use. Contact MR SOLUTIONS for more information.



### SPECTROSCOPY

Full spectroscopy functionality is available for all our preclinical MRI systems. A comprehensive set of sequences is included the spectroscopy package. Contact MR SOLUTIONS for more information.





Imaging INNOVATION

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