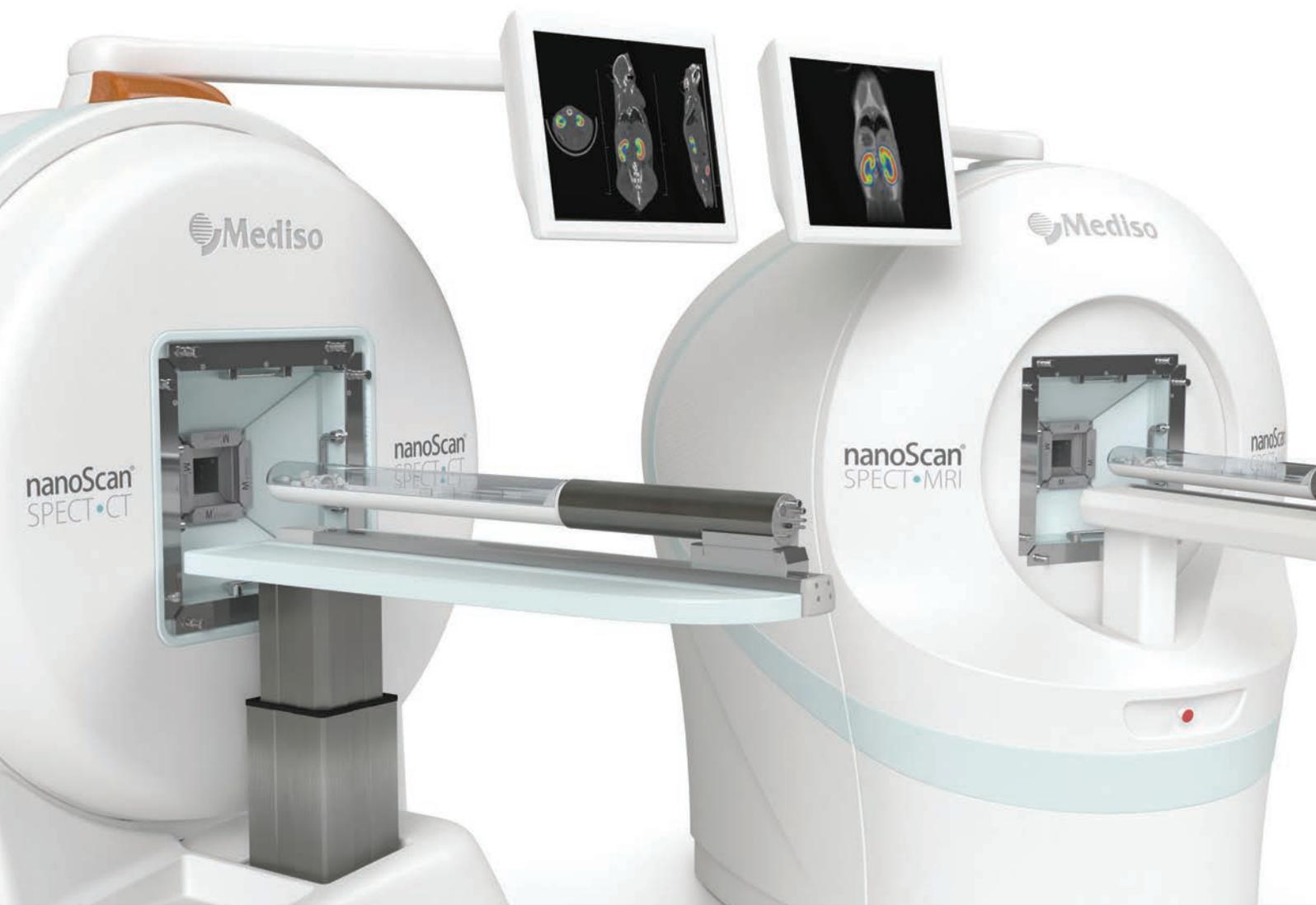


nanoScan[®] SPECT

Preclinical Imaging Systems



nanoScan[®] SPECT/MRI
nanoScan[®] SPECT/CT

High throughput versatile imaging system
with absolute quantification

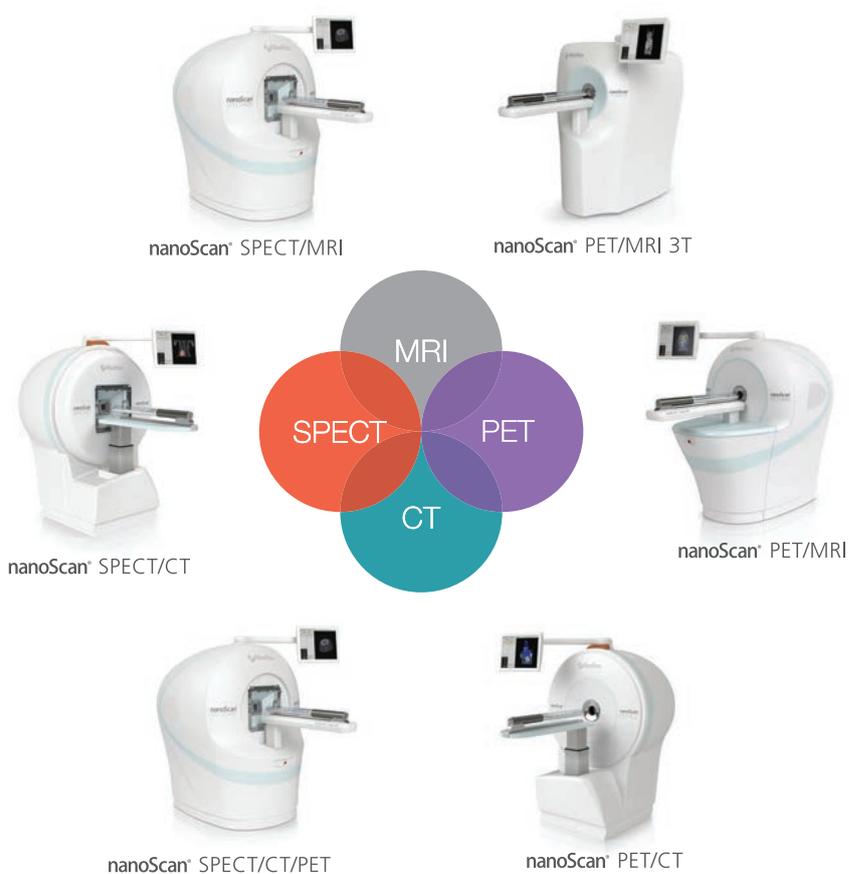


Preclinical imaging systems

nanoScan® Family

With the nanoScan® Family concept Mediso provides a unique and flexible solution for the demands of your imaging facility. Members of the nanoScan® Family share the user friendly Nucline™ acquisition software platform for all modalities, with intuitive workflow and effortlessly customizable protocols.

Both post-processing programs of InterView™ FUSION and VivoQuant™ are able to co-register and analyze multiple images across all modalities.



Main advantages of the nanoScan® SPECT systems

- **More than 100+ installed SPECT-based cameras worldwide**
 - ensuring reliable systems with matured technology
 - supported by proven and experienced service and application network
- State-of-the-art Tera-Tomo™ 3D SPECT image reconstruction engine
- **Highest volume sensitivity** with single bed position even with large FOV
- Imaging capability of rabbit or even monkey whole body
- Unprecedented uniformity in projections and detector coverage by 4 detector heads
- Easy access to the animal from both the front and the back of the SPECT/CT gantry
- The only SPECT system to be fully integrated with MRI



nanoScan[®] SPECT subsystem

Mediso has 15 years of experience in SPECT development supported by strong and reliable team and several international cooperation partners. Thanks to this high-level knowledge and experience, Mediso has a proven, sizeable installation base from its SPECT-based cameras.

Proprietary and patented* multi-pinhole aperture technology

- Cutting-edge aperture design resulting in market leading imaging performance
- Versatile, well-balanced, multi-pinhole apertures providing large single position field of view, high sensitivity and sub-mm resolution at the same time
- Flexible system design allowing not only mouse and rat, but also larger animal (e.g. rabbit, monkey) imaging using parallel-hole collimators.



M³ Multifocus Multisize Multi-pinhole aperture for full stationary, large FOV dynamic imaging (144-pinhole aperutre design)

	FOV	Number of pinholes	Sensitivity	Resolution
M ³ Standard Mouse Aperture	ø30x300 mm	64	7500 cps/MBq	0.85 mm
M ³ Standard Rat Aperture	ø60x300 mm	64	3000 cps/MBq	1.1 mm

Optional multi-pinhole apertures and parallel-hole collimators

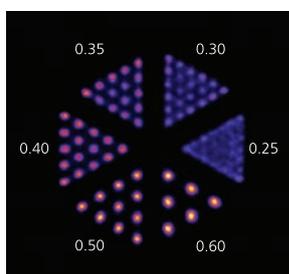
- High energy whole-body apertures (for ¹³¹I, 511 keV version is available from 12.2017);
- High resolution whole-body and focusing apertures;
- Full stationary dynamic imaging aperture;
- Parallel-hole collimators for large animal imaging.

Tera-Tomo[™] 3D SPECT reconstruction software

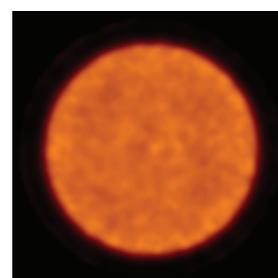


SPECT performance

Imaging performance with Tera-Tomo[™] 3D SPECT reconstruction software using 60 MBq ^{99m}Tc pertechnetate SPECT acquisition in a micro Derenzo phantom. Size of the rods: 0.25 mm – 0.60 mm

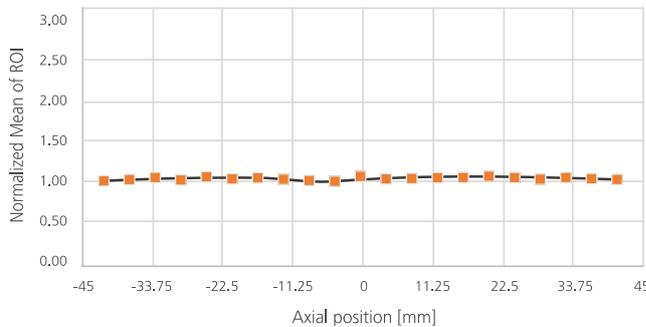


Uniformity phantom reconstructed slice with Tera-Tomo[™] 3D SPECT reconstruction using full system modelling



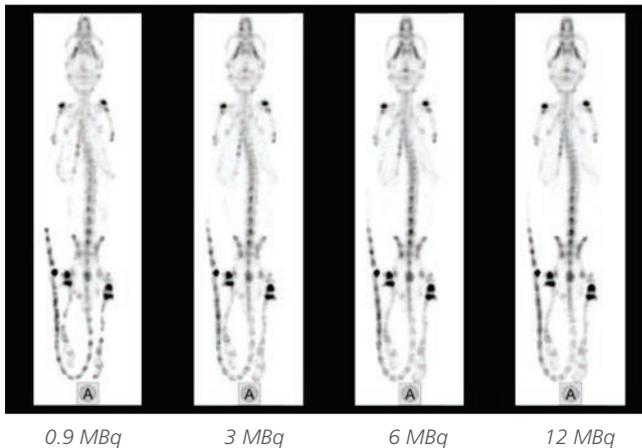
nanoScan[®] SPECT subsystem

SPECT performance



Axial uniformity plot of a 80 mm long cylindrical phantom

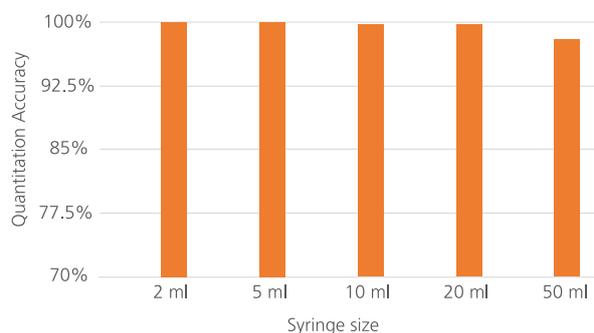
Exclusive imaging performance with ultra-low activity



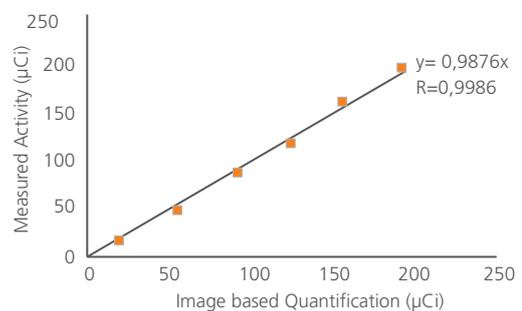
MIP images of whole-body helical mouse scan. Injected: ^{99m}Tc MDP 4 hours p.i. Scan time: 45 min Fine details reserved even with 0.9 MBq activity in the animal.

Market leading absolute quantification even with ¹²⁵I injected in rat

Absolute quantitative SPECT images are the result of a fully integrated SPECT and CT/MRI modality and state-of-the-art, robust SPECT reconstruction engine. The highest level of integration means not only a perfectly co-registered multimodality system, but also the incorporation of CT- or MRI-based anatomical information in SPECT reconstruction for attenuation and scatter correction. This ensures absolute quantification independent of isotope energy, size or number of animals imaged at the same time.



Quantitation accuracy depending on the size of the object

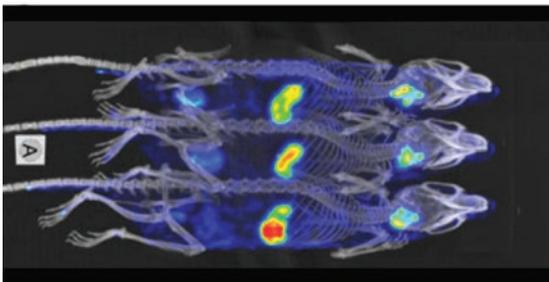


Results of quantification test performed by inviCRO, Boston

nanoScan[®] SPECT subsystem

Packages for specific applications - from animal preparation to sophisticated/ automatized evaluation

Beside the core application capabilities nanoScan SPECT/CT or SPECT/MRI offers a large number of specific application options. Mediso provides application packages including dedicated HW components, acquisition protocol, optimized reconstruction parameters, high-end evaluation solution and a comprehensive application note describing the whole imaging procedure from animal preparation to available publications in the field.

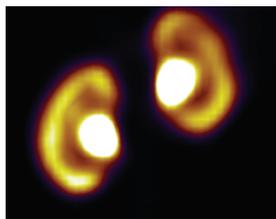


Highest throughput three-mouse imaging

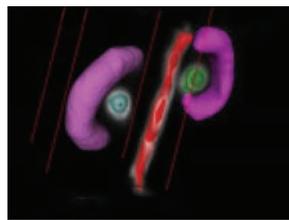
Thanks to the largest single bed position FOV on the market and the high sensitivity multi-pinhole apertures, three-mouse imaging can be done routinely, resulting in unprecedented throughput. CT acquisition and reconstruction takes two minutes additionally to SPECT imaging.

Pertechnetate ^{99m}Tc imaging (Mouse 1: 18,37 MBq, Mouse 2: 16,6 MBq, Mouse 3: 17,7 MBq) with Helical whole body static scan. Scan time: 20 min

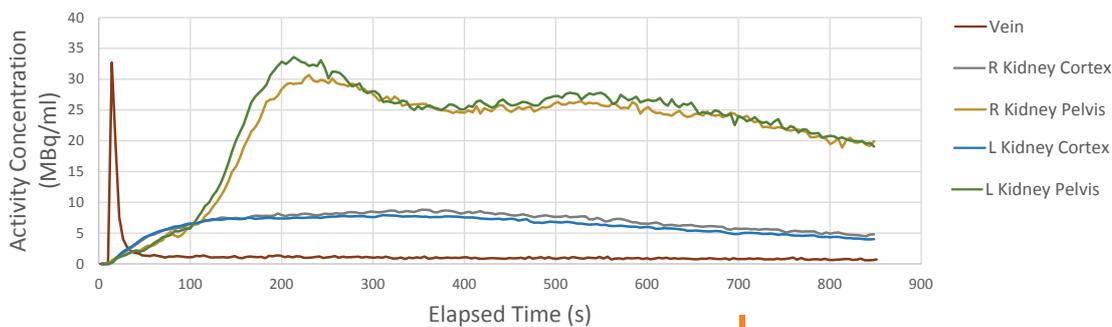
Full stationary ultra-fast dynamic SPECT imaging



MIP image of uptake in mouse kidney, sum of all time frames. 18.3 MBq ^{99m}Tc MAG3 was injected.

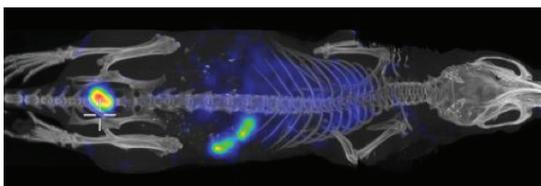


3D visualization of VOI selection for TAC evaluation

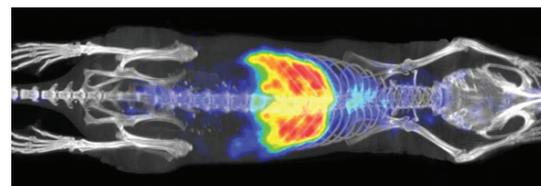


Time Activity Curve of full stationary ultra-fast dynamic imaging

High energy imaging



Mouse model; Radiopharmaceutical: Iodohippurate ¹³¹I sodium
Injected activity: 2.7 MBq; Acquisition time: 50 min



Mouse model; Radiopharmaceutical: ¹³¹I Albumin
Injected activity: 2.5 MBq; Acquisition time: 1:45 min

Additional application packages

- Cardiac gated imaging from mouse to rabbit
- Multi isotope imaging
- Ultra high resolution imaging
- Dynamic whole-body rat or rabbit imaging

MRI subsystem

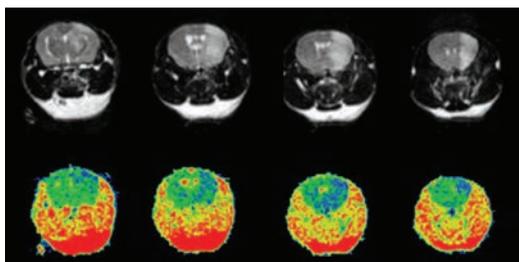
High imaging performance - Excellent soft tissue contrast

Easy-to-use workflow

The ease of use of the MRI subsystems matched with their powerful imaging capabilities, makes it simple to correlate functional SPECT data with anatomical morphology.

Available RF coils

- Whole-body mouse
- Whole-body rat
- Dedicated coils for mouse brain (optional)
- Dedicated coils for rat brain (optional)



Several 2D and 3D pulse sequences

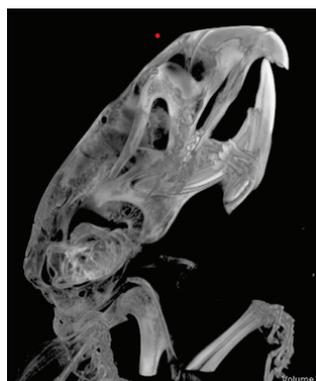
- 3D Localiser
- Quick sagittal Localiser
- Spin Echo (SE) 2D and 3D
- Fast Spin Echo (FSE) 2D and 3D
- Gradient echo 3D (GRE)
- Inversion Recovery Echo (IR-SE, IR-GRE)
- Angiography with contrast agent
- Fat-water imaging (Dixon-method)
- Perfusion imaging
- T1, T2 and T2*-mapping
- Multi-field-of-view sequences with up to 240 mm extended axial FOV



Angiography - MIP of Mn-based contrast media
Images courtesy of CROMed, Budapest

Stroke model - Extension of induced perfusion defect, visualized by T2 weighted FSE sequence and by Apparent Diffusion Coefficient map obtained from DWI sequence
Images courtesy of CROMed, Budapest

CT subsystem



High resolution reconstruction of mouse head 20 μm voxel size
70 kV 750 μA

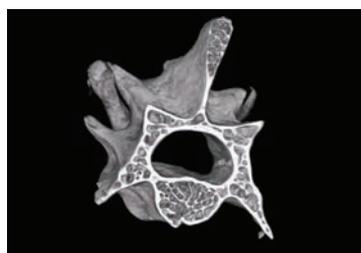
To complement the nanoScan[®] SPECT's exceptional qualities Mediso designed unique combination of low dose, high resolution and high speed CT with real time reconstruction to further improve the throughput of the system.

The large bore size of the CT allows even larger rodents to be examined such as rabbits or small monkeys.

Advantages of the CT subsystems

Available in different configurations to further tailor the system to the researchers needs. For detailed information please contact your local sales representative.

- Large bore size
- Variable zoom (up to x 7.6 magnification)
- Real time CT reconstruction
- Low animal dose
- Fast speed (whole body mouse less than 36 sec)
- Large bore transaxial field of view (up to 12 cm)



High resolution reconstruction of mouse vertebra 10 μm voxel size, 35 kVp, 1000 μA



High resolution ex-vivo scan of mouse liver 20 μm voxel size, 35kVp, 1000 μA



Mouse lung CT imaging 50 μm voxel size 50 kV 750 mA

* In collaboration with RS2D

** Manufactured by Aspect Imaging

Animal handling

Available MultiCell™ imaging chambers



<p>Mouse Standard* Inner space: 36 x 290 mm Outer dimensions: 40 x 460 mm Up to 80 g</p>	<p>Rat Standard* Inner space: 65 x 440 mm Outer dimensions: 70 x 540 mm Up to 600 g</p>	
<p>Two-Mouse Inner space: 2 x 24 x 260 mm Outer dimensions: 56 x 470 mm Up to 2 x 35 g</p>		
<p>Three-Mouse Inner space: 3 x 24 x 220 mm Outer dimensions: 60 x 500 mm Up to 3 x 35 g</p>	<p>Rat - XXL Inner space: 102 x 510 mm Outer dimensions: 110 x 650 mm Up to 1.5 kg</p>	<p>Rabbit Inner space: 150 x 600 mm Outer dimensions: 160 x 760 mm Up to 6.5 kg</p>
		

* Dimensions are valid for the standard SPECT/CT imaging chambers.

PrepaCell™ Preparation station



- Two one-click docking stations
- Closed, temperature controlled system (up-tight container) with transparent removable cover
- Vital function monitoring
- Embedded anesthesia connection to any isoflurane system
- Closed circuit tubes integrated into the wall of the imaging chamber delivering anesthetic gas to the mouse/rat nose cone
- Integrated ear bars for ultra-precise and reproducible stereotactic animal head positioning
- Fully compatible with all **nanoScan®** and **MultiScan** Family systems



Under the hood SPECT/MRI

Touchscreen interface

- Shared interface for SPECT and MRI
- Bed movement control through touchscreen interface or from the acquisition workstation
- Online animal vital function monitoring
- SPECT persistence scope function

MRI Magnet

- 1 Tesla permanent magnet
- Gradient strength: 450 mT/m
- < 5 ppm homogeneity
- 100 μ m spatial resolution
- Integrated gradient coil
- Integrated RF shielding

RF Coils

- Back door access for easy coil exchange
- Multiple solenoid coils available
- 35 mm Tx/Tr for mouse whole body imaging
- 60 mm Tx/Tr for rat whole body imaging
- Custom coils available upon request



Animal handling

- Direct access possibility to the animal during scan
- Zero dead space: easy manipulation of the animal (injection, blood sampling, etc.)
- Automated bed positioning
- Integrated heating and gas anaesthesia possibility
- Physiology monitoring
- ECG/respiratory gating

SPECT Detector

- Up to 250 mm transaxial FOV
- 300 μ m spatial resolution
- 13 000 cps/MBq sensitivity
- Patented M³ multi-pinhole technology
- Up to 144 pinholes

Fast, Easy Instrument Installation

- Cryogen-free design
- Compact size: 1136 x 2177 x 1550 mm
- Weight: 1880 kg
- Zero magnetic fringe field
- No need for additional RF shielding in the lab

Under the hood SPECT/CT

Touchscreen interface

- Shared interface for SPECT and CT
- Bed movement control through touchscreen interface or from the acquisition workstation
- Online animal vital function monitoring
- SPECT persistence scope function

SPECT Detector

- Up to 250 mm transaxial FOV
- 300 μ m spatial resolution
- 13 000 cps/MBq sensitivity
- Patented M³ multi-pinhole technology
- Up to 144 pinholes



Upgrade with PET subsystem to an integrated triple modality nanoScan® SPECT/CT/PET

PET Subsystem

Coincidence based full LYSO ring PET subsystem with various detector configurations (module / block): 8/1, 8/2, 12/1, 12/2

Full functionality Tera-Tomo™ 3D PET reconstruction software with embedded corrections for accurate quantification with high resolution up to 0.7 mm and high sensitivity 8%

For further details on this option please refer to the PET based preclinical imaging system brochure or contact your local sales representative.

Animal handling

- Direct access possibility to the animal during scan
- Zero dead space: easy manipulation of the animal (injection, blood sampling, etc.)
- Automated bed positioning
- Integrated heating and gas anaesthesia possibility
- Physiology monitoring
- ECG/respiratory gating

High Precision Gantry

- Precise and robust rotational bearing and drive
- Exceptionally stable gantry with 3 axis movements
- Large bore size up to 200 mm
- Touchscreen interface
- Vibration free rubber pads

X-Ray CT System

- 80 W/1 mA X-ray tube power
- <10 mGy exposure CT dose
- 2-12 cm variable TFOV
- x 7,6 zoom
- < 10 μ m isotropic voxel size

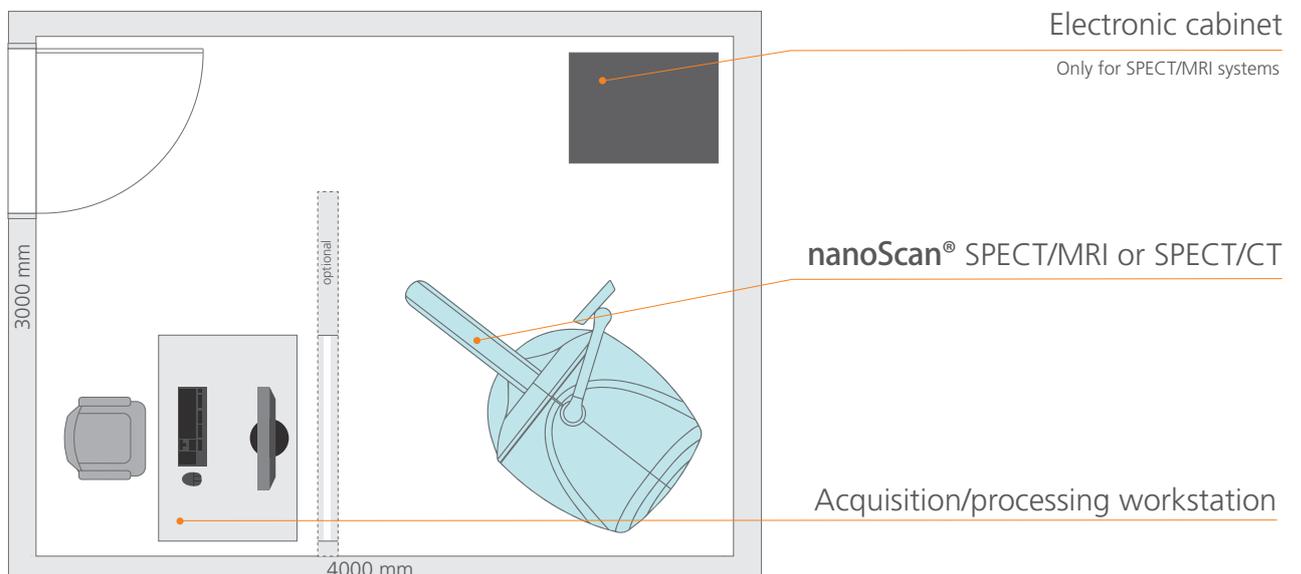
Operating hardware



Room requirements

- Minimum room size: 12 m²
- Weight: 1880 / 830 kg
- Size (W x D x H): 1136 x 2177 x 1550 mm / 1345 x 1757 x 1678 mm
- No additional RF shielding required
- Single phase operation 115 / 230 V
- Power consumption 2500 W / 1700 W
- No cryogen or water cooling required
- Ordinary air conditioning is sufficient
- Ethernet connection for remote servicing

(parameters refer to SPECT/MRI and SPECT/CT respectively)



Software solutions

Nucline™ all modality acquisition software

Nucline™ is an easy to use and intuitive interface for high throughput workflow across all the nanoScan® Family systems - there is no need to learn different software solutions. In a 21CFR Part 11 compliant data management environment predefined and customizable acquisition protocols make experiments daily routine.

The integrated gantry with common coordinates gives the opportunity to seamlessly co-register images allowing for accurate image quantification. Furthermore, list mode data collection provides wide range of flexibility in data analysis according to study requirements.

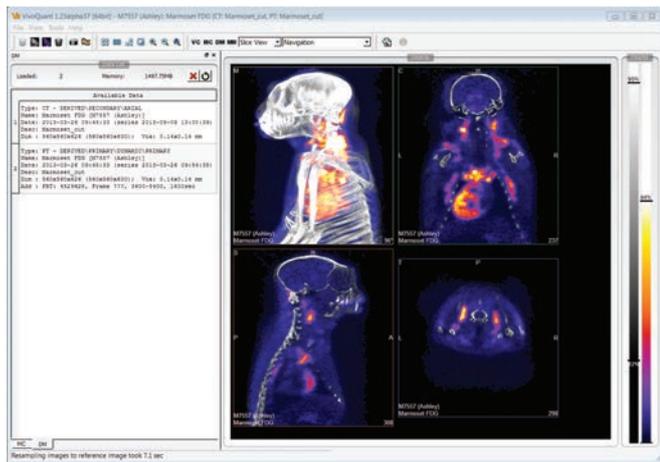
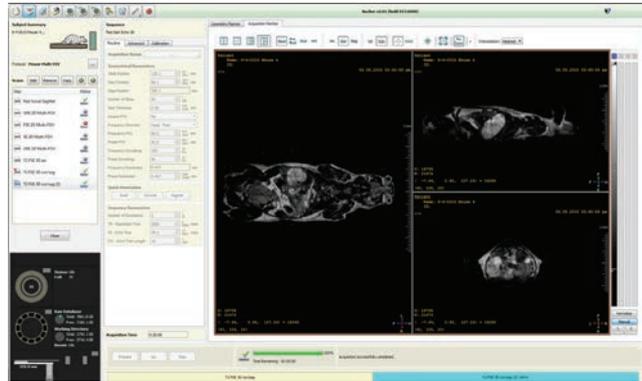
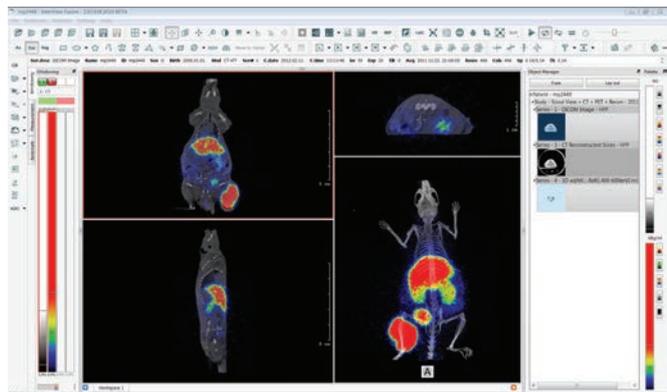


Image processing and quantification by VivoQuant™ software

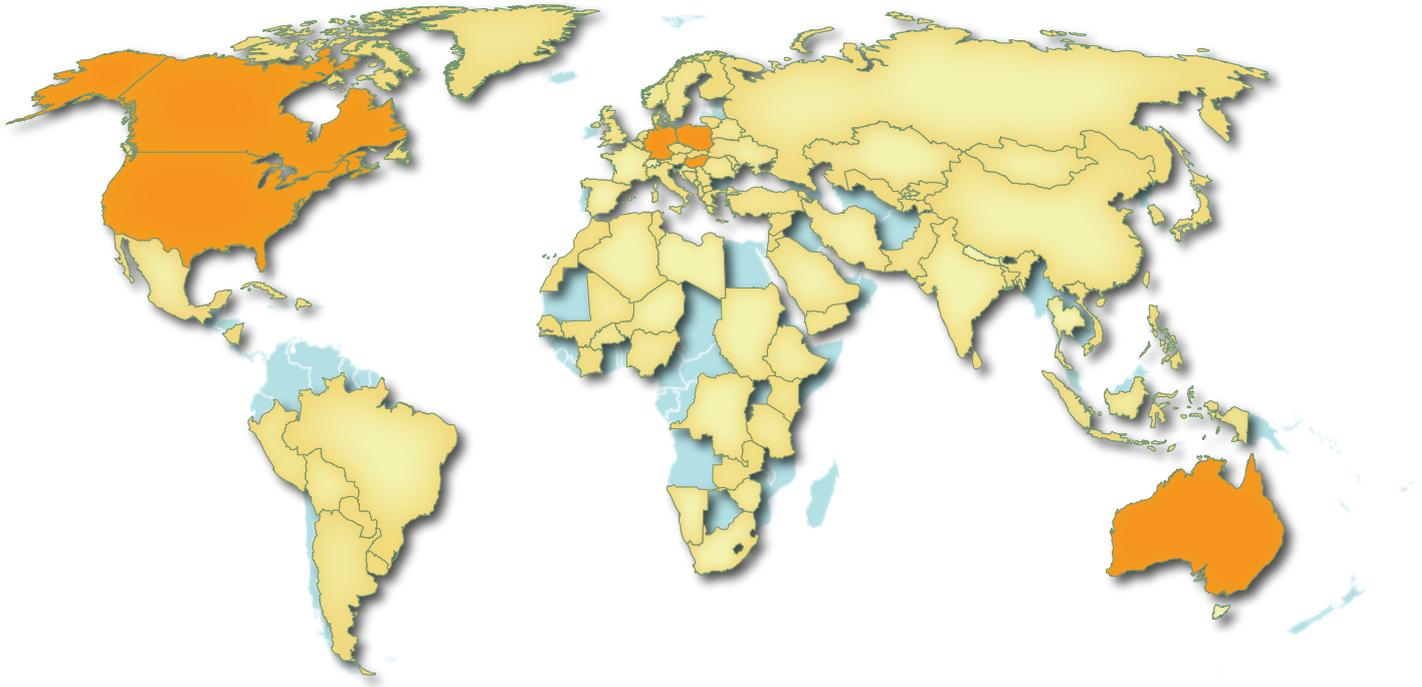
VivoQuant™ is an image viewing, processing and analysis software suite from inviCRO, LLC., supporting data from both nuclear medicine and magnetic resonance imaging systems. Advanced co-registration, viewing, processing and quantification of data with plug-in modules dedicated to neurology and oncology applications address the challenging bottlenecks imaging laboratories face in day-to-day operations.

Post-processing by InterView™ FUSION software

InterView™ FUSION developed by Mediso, is a multi modal application and essential part of system. A wide range of functionalities are provided to evaluate PET, SPECT, CT and MRI preclinical data. 2D single, orthogonal and tiled, as well as 3D MIP and Volume Rendering viewers represent fast and flexible visualization techniques built on GPU acceleration. Viewers provide dual, triple and quadruple fusion to accurately compare and enhance multi-modal single and follow-up studies. Dynamic PET images together with CT or MRI can be fused and PET images can be studied over time.



More than 1200+ clinical and 200+ preclinical Mediso manufactured single and multimodality imaging systems were distributed in 90 countries of the world.



Conformance Statement

Quality management system operated by Mediso complies with Council Directive 93/42/EEC Annex II.

Product design, development, production and services comply with EN ISO 13485 and EN ISO 14971.

Safety labels are attached to appropriate places on equipment and appear in all operation manuals.

The supplied software complies with DICOM standard.

The technical information provided here is not a detailed specification.

For details and up to date information please contact your local distributor or Mediso.

Trademarks:

nanoScan® is registered trademark of MEDISO.

Nucline™, InterView™ FUSION, Tera-Tomo™ 3D PET, MultiCell™, PrepaCell™ are trademarks of MEDISO.

VivoQuant™ is registered trade mark of InviCRO LLC.

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