eXP Technology

System Description and Configuration

REV. 4 – July 2017

Summary

1. THE VET-MR GRANDE – INTRODUCTION 3

2. VET-MR GRANDE CONFIGURATION TREE 4

3. VET-MR GRANDE, ACCESSORIES AND OPTIONS: ITEM DESCRIPTION 6

3.1 Vet-MR Grande small animal: options 12

3.2 Vet-MR Grande Equine options 14

3.3 Vet-MR Grande system options. 15

4. VET-MR GRANDE UPGRADES DESCRIPTION 18

4.1. Vet-MR Grande Systems (Rel. 9.x no eXP) 18

4.2. Vet.MR Grande System (Rel. 1 or Rel. 2 or Rel. 3 or higher no eXP) 21

4.3. Vet-MR Grande System (Rel. 3 or higher eXP systems) 24

1. The Vet-MR Grande – Introduction

The Vet-MR Grande dedicated MRI scanner represents one of Esaote's most important developments in MRI technology. The Vet-MR Grande is a member of the family of Esaote dedicated MRI scanners developed to address the veterinary market needs for horse and pet examinations. With respect to traditional MRI systems, thanks to its tailored patient bed, Vet-MR Grande provides easy accessibility for the operator, facilitating positioning and handling of the animal. The specific dimensions of the system allow the use of standard available MRI compatible anaesthesia equipment. The user interface has also been designed specifically for the "vet" setting featuring appropriate "vet" terminology.

Alongside specific imaging features, Vet-MR Grande is very easy to install as the whole system weighs 7000 Kg and the minimum space required for the installation is 5x5 m., using the standard Esaote RF shielding box, or 2,9x4,1m with a rectangular cage. The system uses a maintenance free permanent magnet and thanks to its low energy consumption (max 3 Kw), does not need any special power supply. These features make Vet-MR Grande a unique system.

Small animal setup

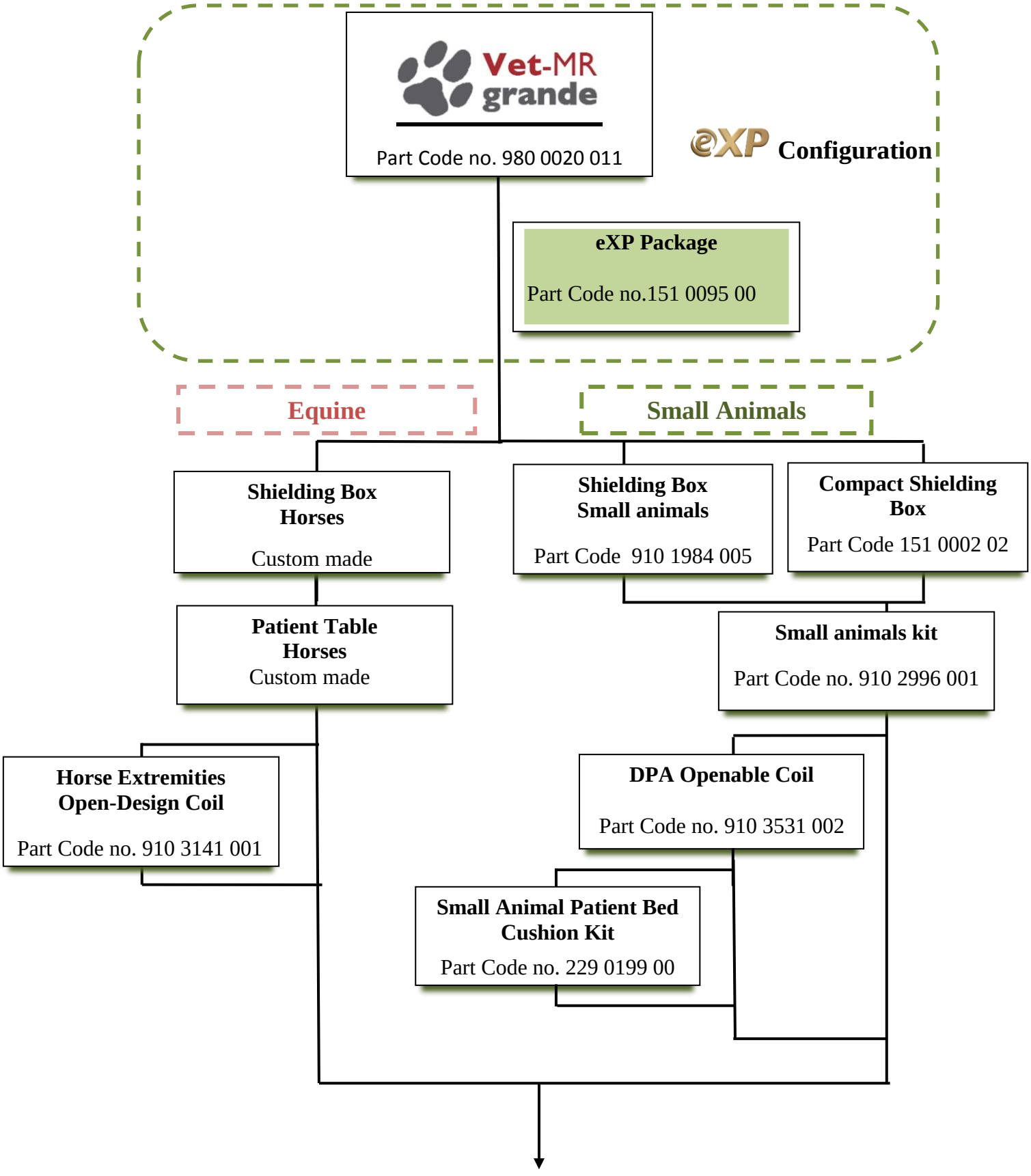
Large animal setup

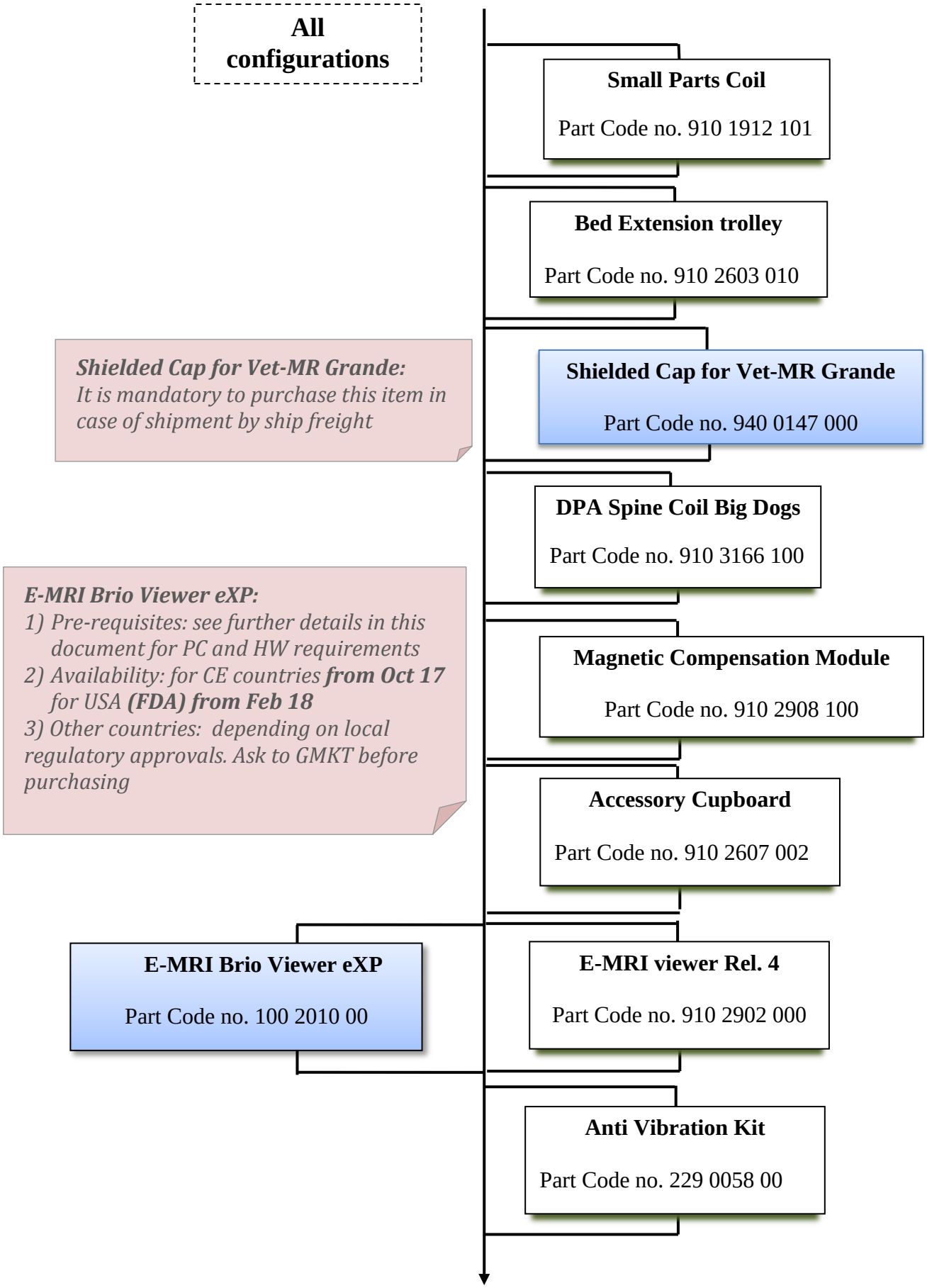
The following pages include a description of all the items regarding Vet-MR Grande: the main system, the accessories and the optional packages which can be installed.

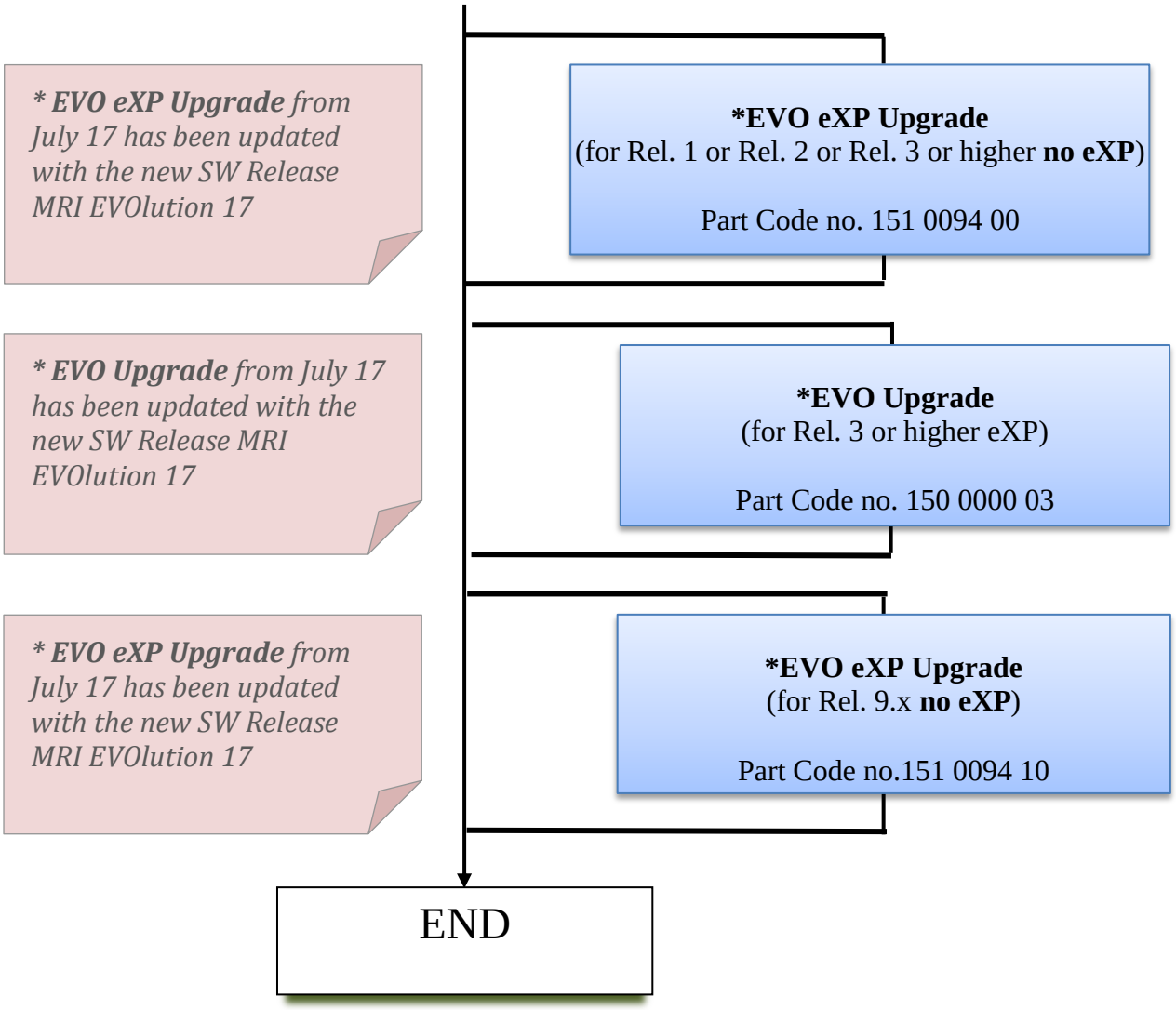
Vet-MR Grande specific configurations.

Depending on the specific use of the system, the Vet-MR Grande can be configured either for small animals only or for small animals and horse examinations. For details see page 12.

2. Vet-MR Grande configuration tree




All configurations
Small Parts Coil
Part Code no. 910 1912 101
Bed Extension trolley
Part Code no. 910 2603 010
Shielded Cap for Vet-MR Grande:
It is mandatory to purchase this item in case of shipment by ship freight
Shielded Cap for Vet-MR Grande
Part Code no. 940 0147 000
DPA Spine Coil Big Dogs
Part Code no. 910 3166 100
E-MRI Brio Viewer eXP:
1) Pre-requisites: see further details in this document for PC and HW requirements
2) Availability: for CE countries from Oct 17 for USA (FDA) from Feb 18
3) Other countries: depending on local regulatory approvals. Ask to GMKT before purchasing
Magnetic Compensation Module
Part Code no. 910 2908 100
Accessory Cupboard
Part Code no. 910 2607 002
E-MRI Brio Viewer eXP
Part Code no. 100 2010 00
E-MRI viewer Rel. 4
Part Code no. 910 2902 000
Anti Vibration Kit
Part Code no. 229 0058 00



3. Vet-MR Grande, accessories and options: item description

Vet-MR Grande **part code no. 9800020011**

The magnetic resonance system Vet-MR Grande is a scanner specifically designed for imaging in veterinary settings with a tailored patient table and a software interface featuring appropriate “vet” terminology.

Vet-MR Grande is very easy to install: in the small animals configuration the minimum space required for installation is 25 m2 using the standard Esaote shielding box. To perform MRI horse examinations more space is needed and Esaote can help you with defining the most suitable site layout. The complete system weights 7000 Kg and uses a maintenance free permanent magnet. Thanks to its low energy consumption, the system does not need any special power supply.

System composition

1. Magnetic unit, including:
   - Permanent magnet C-shaped in neodymium with 0.25 Tesla nominal vertical field; the size of the opening: 35,5 cm.
   - Fast gradient coils with ±20 mT/m gradient strength and 56 mT/m/ms slew rate.
   - Radio frequency transmission coil
   - Total weight of the magnet unit is about 6700 Kg.

2. Set of 5 high sensitivity, self-centering receiving coils with automatic recognition that greatly speeds up and facilitate patient positioning; 3 coils are equipped with the Dual Phased Array (DPA) technology, for optimal performances.

Coil #1 - This coil (elliptical 14.5x17.5x12.6 cm) can work both by placing the anatomy against its solenoid and by inserting the region to be scanned directly inside the coil. It can be used for spine examinations on medium large dog breeds, for the head of large dogs, for extremities of large horses. Dogs' shoulders and hip can also be scanned.

Coil #11 – The multipurpose flex coil can be used for different districts on small and large animals.
Small animals: for better adapting the anatomy of the animal when the dedicated coils are not suitable.
Large animals: mainly used for horse cranium examinations (neurocranium and splanchnocranium).
Coil comes with proper locking belts to be fixed around the animal's anatomy.

Coil #2 - This DPA coil (elliptical 14.3x16.0x18.3 cm) is used on most dogs' cranium. It is also used for the spine of small dogs or large cats and for standard horse extremities. Dogs' shoulders and hip can also be scanned.

Coil #4 - With this DPA coil (elliptical 14.5x10.0x28.5 cm) you can scan both on the head and the spine of most cats. It can be used for cranium exams on small dogs. Dogs' shoulders and hip can also be scanned.

NOTE: this coil is included as standard in the Small Animal Kit.

Coil #13 - This coil improves daily spine examinations especially on large dogs. Its DPA technology improves image quality with a better signal distribution and signal to noise ratio. The accurate design makes positioning easier for medium/large breeds. This coil is provided with a dedicated phantom support.

NOTE: this coil is included as standard in the Small Animal Kit.

All the coils come with dedicated sets of padding to facilitate patient positioning and to avoid movement.

3. Two radio frequency power amplifiers : 3000 W total peak output power.

4. RF penetration panel: RF filters necessary for the interface are included in the system with RF screening which is either the shielding box (part code 910 198 4002) or a custom made RF shielding (to be provided locally).

5. Pulse sequences:

   - Multi planar scout
   - spin echo T1 (SET1)
   - spin echo T2 (SET2)
   - multi echo (SE_PD_T2)
   - inversion recovery (IR)
   - short TI inversion recovery (STIR, STIR T2 S, STIR T2 A)
   - spin echo half echo (SET1HE)
   - spin echo half scan (SET1HF)
   - turbo SE T2 weighted (TSE)
   - turbo ME (TME)
   - gradient echo (GE, GE T2, GE T2 FC)

- short time inversion recovery gradient echo (GE-STIR)
- gradient echo 3D (T3D_T1)
- FSE T1, FSE T2, FSE STIR, FSE PD/T2, FAST FLAIR
- X Bone, T1/T2
- 3D steady state sequences : HYCE, SHARC, SST1, SST2
- real time

6. Imaging parameters:

- Field of view : 27 cm
- Minimum slice thickness 2mm in 2D e 0,6 mm in 3D
- Image matrix up to 512 x 512
- Maximum number of slices 128
- Scan planes : sagittal, coronal, transversal, oblique and double oblique
- Multi pack multi slice in 2D and 3D (axial spine)
- Saturation slabs for artefact reduction with graphic positioning.
- Relaxation technique
- Flow compensation

7. Data control, imaging and display system including:

- Reconstruction times < 0,4 sec/image
- Display : 24” high contrast 16:10 format flat panel monitor.
- PC based control unit with Pentium® I5 processor @ 3.33 GHz or superior
- 32 GB of memory RAM or superior
- Control processor, 100 MIPS, 1,28 Mb Ram.
- Hard disk 1 Tera byte, 7200 rpm or superior
- CD DVD combo unit (CD - 7000 images at 256 matrix, DVD - 30.000 images at 256 matrix)

8. Software Release MRI EVOlution 17 offers:

- a powerful and user friendly graphic interface
- a full set of pre-programmed protocols and sequences that can be modified and memorized to create a set of customized examination protocols.
- customized image enhancement: three different type of Image Enhancement filtering can be choose by customer to customize image quality
- new Dicom Softcopy Grayscale: changes of LUT, Zoom, Pan and Clip can be saved on image overlay during image export and sending operations
- Service dongle key management to guarantee security access to the system
- Improved management of streaming acquisition when images are sent to PACS
- Cine movie acquisition can be saved on CD/DVD with a new compressed format file
- Image quality and clinical protocols optimization
- a real time imaging tool which allows quick and effective patient positioning and examination set up
- Optimized X Bone sequence (Fat/Water separation): both in T1 and T2; the sequence offers more detail and a better contrast, thanks to a new gradient management and a new acquisition technique.
- Fast Spin Echo PD/T2, Fast FLAIR:
  - ✓ FSE PD/T2: Fast PD-T2 sequence allows you to produce two different images, one with PD contrast and the other with T2 contrast, within the same sequence with good signal/noise ratio and a shorter acquisition time with respect to the acquisition of two single sequences.
  - ✓ Fast FLAIR sequence: the FLAIR technique is very useful for neurological imaging, in particular for brain studies as it provides CSF nulling.

9. Patient CD with Viewer Lite
   The viewer Lite which has the basic image manipulation functions Window, Pan and Zoom, is a simple PC compatible DICOM reader that is copied onto the CD/DVD when using the export function to write images to a CD/DVD. Images on the CD/DVD can be viewed on any Windows based PC by simply clicking the Viewer Lite icon. Viewer lite is compatible with Windows 98, Windows NT, Windows 2000, Windows XP, Windows Vista and Windows 7 operating systems.

10. User manual

11. Vet-MR Grande can be connected to the laser printer using:

    - DICOM® print via Ethernet connection (managed directly from the operator interface).
    - Windows compatible printers can be connected via USB port

12. DICOM® functionality (IHE Compliant)

13. Vet-MR Grande features full DICOM® capabilities:

    - Storage – transmission of images to other modalities (workstations, PACS). Enabling the "Autosend" (also called "Auto-push") function will automatically send all the images to the destination of choice without the need for operator interaction. Transmission rate depends on the Workstation type and Network speed
    - Media Exchange for storing images on a removable media (MOD or Cdrom), in DicomDir modality ("export function)
    - Print management SCU (for Dicom print)
    - Worklist Management (the Vet-MR Grande receives the patients list of the day directly from the HIS / RIS of the hospital).
    - Storage commitment (the system is integrated in hospital's network workflow)
    - MPPS (our interface can easily be in continuous communication with HIS/RIS forwarding all information about examination status).
    - Dicom Query Retrieve; SCU Classes: Study Root Information Model Find and Study Root Information Model Move.

14. Console "Comfort": a compact design and with optimal ergonomics that minimizes the space required for installation even when the console is in the magnet room.

3.1 Vet-MR Grande small animal: options

Shielding box for small animals **part code no. 9101984005**

Special lightweight Faraday Cage with innovative design; thanks to its open structure it can be used with the existing lightning and air-conditioning system thus reducing installation costs and time.

- Dimensions: 3.85 x 3.65 (± 20mm) x 2.34 m (WxLxH) (outer dimensions including filters, but excluding the ramp at the box entrance and the external door handles).
- Attenuation: 70 dB.
- Weight of the Shielding box : 515 Kg.

Compact Shielding Box **part code no. 151000202**

Specific RF light cage with a dimension of 300 cm x 300 cm, to be used when the RF noise level is outside of specifications. It is specifically designed for Vet MR Grande requirements.

Small animal kit **part code no. 9102996001**

The small animal kit consists of :

- a patient table that enables easy access for the operator to facilitate the positioning of the animal. A dedicated set of cushions is provided to facilitate patient positioning. Thanks to the reduced dimensions of the this configuration, the complete system can be installed in 25 m2 using the standard Esaote RF shielding box.

Small Parts Coil **part code no. 9101912101**

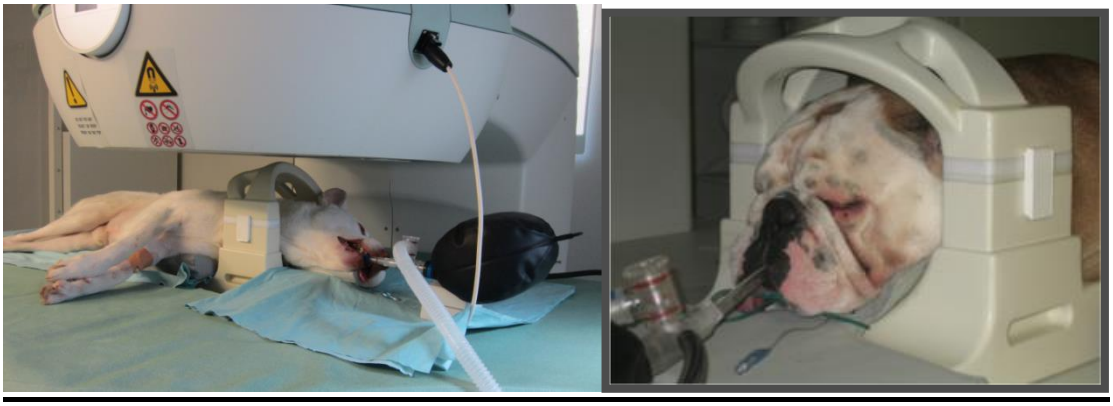
Dual Phased Array coil elliptical : 11.9 x 7.2 x 20.0 cm for high resolution imaging of very small animals and small body parts, such as small animal extremities and cat's head and spine.

DPA Openable Coil part code no. 9103531002

Thanks to its open design, this multi-purpose coil can be used on pets with a very large cranium both for the cranial districts and on cervical and cervico-thoracic spinal districts providing very good image quality.

Important note

1) The coil can be used only with systems with software release 1.3B E-MRI Brio or above.
2) For small animal systems with serial numbers up to s/n 6062 (included) **it is mandatory to order the small animal patient bed code: 229019900.**



Shielded Cap for Vet-MR Grande part code no. 940 0147 000

Special crate for the shipment of system by ship freight; this crate includes suitable metal plates to shield the magnet fringe field.

IMPORTANT NOTE: it is mandatory to add it in the system purchase order when the shipment is done by ship freight.

3.2 Vet-MR Grande Equine options

RF Cage **custom made**

The RF cage for the horse and small animal configuration must be custom made as the size placement of the dorrs and windows are different from site to site.

Patient Table **custom made**

For MRI of the horse, a dedicated MRI compatible patient table should be used. The table should be height adjustable and preferable with a shape adapted to the Vet-MR Grande to facilitate patient positioning. Esaote personnel is available for support.

Horse Extremities Open-Design Coil **part code no. 9103141001**

This coil has been designed specifically for better satisfying the clinical needs of horse extremity examinations.

The open-design coil for horse extremities was specifically designed taking account of the horse's anatomy: in fact the hoof of this animals is usually big, whilst the remaining part of the limb is pretty thin. This new coil with its open-design can wrap the anatomy in the best way with the minimum coil dimensions and for this reason it can guarantee the best signal sensitivity.
Two flexible belts are provided with the coil to better fit the size of the anatomical part to be scanned.

3.3 Vet-MR Grande system options.

EVO eXP Package part. code no.151 009 500

The eXP Package consists in a combination of hardware and software that improves the S-scan system performance in acquisition speed and image quality. It comprises a special GPU card for faster reconstruction and sophisticated imaging sequences like Speed-Up, MAR and True Motion for advanced image acquisition. All eXP system are recognizable by their eXP logo on the front cover.
Contents:

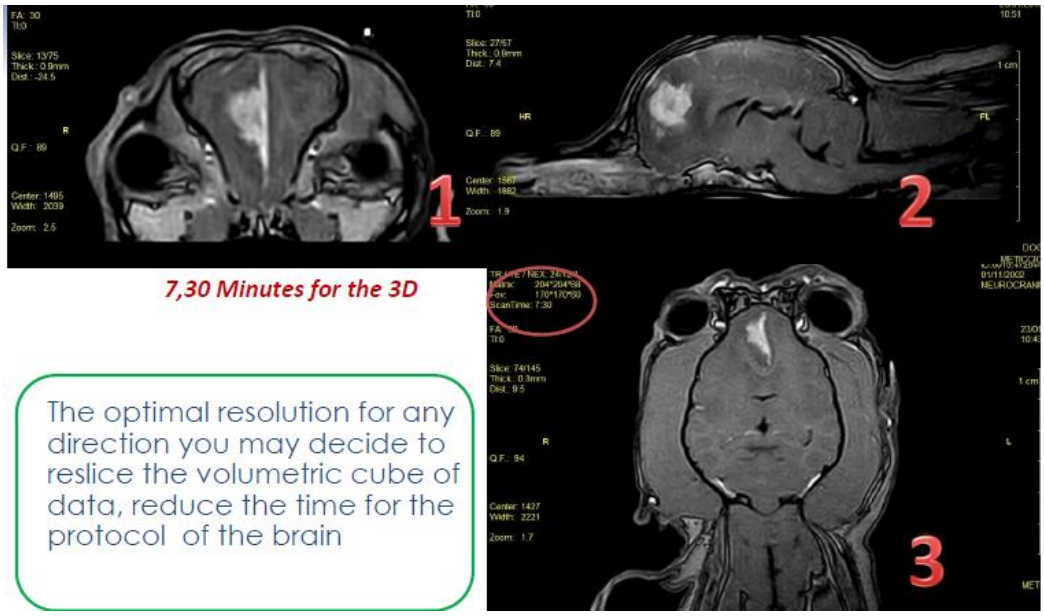
- Advanced GPU board
- 2D Speed-Up technology
- 3D Speed-Up technology
- 3D fully Isotropic
- Tr Reduction
- MAR
- X-MAR
- True motion
- Myelographic contrast
- eXP cover logo

Advanced GPU based reconstruction.
The special GPU board included in the eXP package makes it possible to use a new and sophisticated multi-threading reconstruction algorithm for a faster overall system response. The combination of GPU hardware and Rel 3 software enable the implementation of the sophisticated 2D and 3D Speed-Up sequences.

2D and 3D Speed-Up technology.
Speed-UP is an advanced acquisition/reconstruction method (patend pending) that reduces the scan time of 2D and 3D pulse sequences up to 30%. Speed-Up applies sophisticated mathematics algorithms that take advantage of intrinsic K-space redundancy to properly manage the number of acquisition data and consequently to reduce the acquisition time.

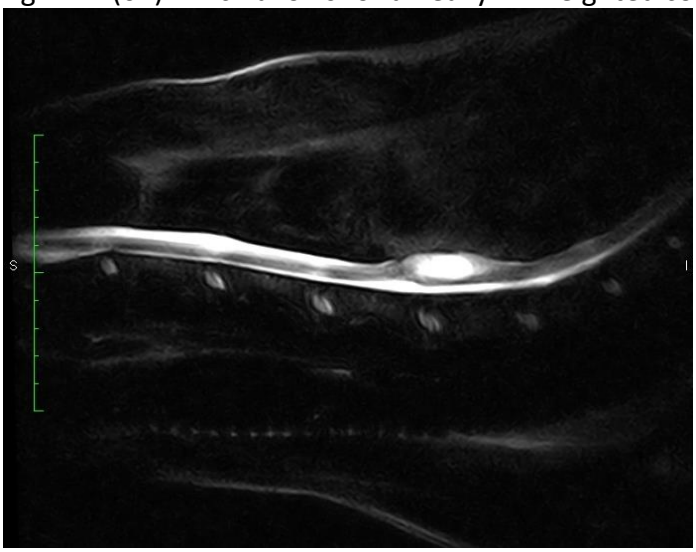
- Speed-Up can be applied to most of 2D and 3D pulse sequences used in daily practice except Half Fourier, Half Echo, TSE and TME
- The operator manages the “Speed up” factor by simply selecting the appropriate value under “Special Parameter” in the sequence parameter menu.
- Like always in MRI, time and quality are interchangeable so Speed-Up can also be used to improve image quality of the examination like e.g. higher resolution or thinner slices without compromising scan-time.

3D fully Isotropic
The use of 3D-isotropic voxel can substantially reduce examination time. Starting from the isotropic acquisition, it is possible to reconstruct any subsequent scan plane with the same high quality using the MPR function thus avoiding additional acquisitions for the various scan planes.
This new feature allows a sensible reduction of the scan time needed for the brain protocol.



Myelographic contrast.

The myelographic like contrast for the spine canal and subarachnoid space can be acquired by using an FSE sequence with a high ETL (64) which allows for a heavy T2 weighted contrast.



MAR

This technique allows to reduce the susceptibility artefact created by metal implants, such as the microchip placed under the skin, thanks to a proper gradients management in FSE family sequences.

X-MAR

As the demand for post-surgical examinations is constantly rising, Esaote introduced the X-MAR technique, an evolution of the previous MAR, to reduce the artifacts caused by metal implants. X-MAR is a sophisticated technique able to reduce the artifacts also from the older cobalt-chrome based implants. In veterinary application this technique substantially reduces artifacts in the equine examination especially in the hoof application, due to the small pieces of metal when removing the horse shoes.

Bed Extension trolley part code no. 9102603010

The bed extension trolley is an additional trolley to be positioned next to the Vet MR Grande magnet in order to better position large pets when the system is used both for horses and pets

Magnetic Compensation Module part code no. 9102908100

Special device that may allow the installation of Vet-MR Grande also in difficult sites where there are external magnetic fluctuations. The compensation module is composed of probes able to measure external magnetic field variations and compensate them. The module can compensate magnetic field variations caused for example by metal masses moving nearby the magnet, such as an elevator or a train or by AC magnetic disturbances.

Accessory cupboard part code no. 9102607000

The accessory cupboard for the Vet-MR system gives the user a suitable place for storing all the material used during routine activities such as coils, cushions, manuals, etc. The color and shape of the cabinet is to the same as the electronics cabinet inside the RF cage.

E-MRI viewer Rel. 4 part code no. 9102902000

The E-MRI Viewer is an application software for the display, storage and communication of digital images acquired by Esaote MRI equipment.
The user interface of E-MRI viewer is the same as the operator interface of the MRI systems so this makes the viewer very easy to use.
Prerequisites:

- Windows 7 Professional 32 or 64-bits, Windows 8, 32 and 64-bits Windows 8.1 operating systems.
- a USB hardware key to enable the software which is delivered with the package
- **IMPORTANT NOTE:** the dongle USB key for the new E-MRI Viewer SW 4.1 is not anymore compatible with previous software version of the E-MRI Viewer.

E-MRI Brio viewer eXP part code no. 100 2010 00

The E-MRI Brio Viewer eXP is an advanced version of the standard E-MRI Viewer for the display, storage and communication of Dicom images acquired by Esaote MRI equipment. This advanced version contains also the new 3D Viewer introduced with the SW Release MRI EVOlution 17.
The user interface of E-MRI Brio Viewer eXP is the same as the operator interface of the MRI systems so this makes the viewer very easy to use. Moreover, to enable the software an USB dongle key is delivered with the package.

Minimum Hardware requirements:

- Windows 7 64 bit Service Pack 1, Windows 8 64 bit, Windows 8.1 64 bit (tested OS)
- PC of a GPU certified for DirectX 10. Note that the performances of the 3D Viewer environment could be very slow on integrated GPU's (Intel HD Graphics), so a separate (non-integrated) GPU is recommended (e.g. NVidia GTX 950 or higher)

IMPORTANT NOTE: the new E-MRI Brio Viewer eXP will be available for CE countries on October 2017 (CE Mark) and for USA on February 2018 (FDA).

Anti Vibration Kit **part code no. 229005800**

The kit must be included in systems configurations when there are problems related to floor vibration.
In fact, the kit reduces the vibration motion towards the system in those cases where the intensity of the vibration exceeds the values reported in the technical specifications and in the site planning manual.

4. Vet-MR Grande Upgrades description

4.1. Vet-MR Grande Systems (Rel. 9.x no eXP)

EVO eXP upgrade (from Rel.9.x no eXP) **part code 151 0094 10**

Availability: end of July 2017

IMPORTANT NOTE: during the purchase order of the EVO eXP Upgrade code 151 0094 10, it is necessary to communicate the following information:
1) System Host Id in order to be able to generate the proper SW Option codes
2) SW Release previously installed

The EVO eXP Upgrade is the last step in terms of system performance guaranteed by eXP technology. It consists in a combination of advanced hardware and new software features that improves the S-scan system capabilities in terms of acquisition time and image quality.
It comprises a new 24" monitor, a new SDSP board, a new workstation, a special GPU card for faster reconstruction and sophisticated imaging sequences like Steady State, Fat&Water Separation, Speed-Up, MAR and True Motion for advanced image acquisition.
All eXP system are recognizable by their eXP logo on the front cover.

The EVO eXP Upgrade for S-scan Rel 9 systems includes:
- New workstation I5 with 32GB RAM and the new Power Supply.
- New 24" LCD Wide Monitor
- New SDSP 8M
- Windows 7 64 bit operating system.
- 1 Terra byte high-speed storage.
- - High performance GPU board.
- SW Release MRI EVOlution 17
- Speed Up 2D SW licence
- Speed Up 3D SW licence
- T-Spine Imaging Option (only for system serial number >= 7086)
- True Motion SW licence

- MAR Technique SW licence
- X-MAR Technique SW licence
- Myelo SW licence
- 3D Steady State Sequences SW licence
- Fat&Water Separation SW licence
- 3D Viewer SW licence
- S-scan eXP cover logo
- Viewer Lite.

IMPORTANT NOTE: From July 2017 the new SW Release EVO 17 has been included in the EVO eXP Upgrade.

New High Performance workstation, GPU, SDSP board and monitor

The new technical features introduced with the SW Release MRI EVOlution 17 require more computational power to work with the new fast sequences. Therefore, a new I5 workstation with 32Gb RAM in combination with a high level GPU and new SDSP board will be installed. System storage capacity is 1 Terra byte. The 24" LCD monitor will improve system performance in image visualization.

Software Release MRI EVOlution 17 (CE available from July 17)

The SW Rel. MRI EVOlution 17 includes important improvements that make the system faster and easier to use. Here after the new improvements:

- A completely newly developed reconstruction algorithm based on parallel computation.
- Geometric distortion correction
- Speed Up 2D for faster & better acquisition in 2D
- Speed Up 3D for faster & better acquisition in 3D
- Fully Isotropic 3D capabilities
- True Motion imaging capabilities
- MAR (Metallic Artifact Reduction): technique for reduction of susceptibility artefact caused by metal implant
- X-MAR (Metallic Artifact Reduction): advanced technique for reduction of susceptibility artefact caused by metal implant
- Advanced DCE MRI Analysis (according to its registration it is not available for all countries).
- Improved FSE Proton Density sequence, by better management of the ETL
- X-Bone acquisition with higher acquisition matrix
- Rectangular FOV for more flexibility and faster acquisition
- Elliptical Acquisition (3D sequences)

- Optimized package of 3D Steady State sequences, that includes: 3D HYCE, 3D SHARC, 3D SST1, 3D SST2, sequences, that substantially improve the image capabilities of the S-scan. In particular the 3DSHARC sequence has been developed for high resolution imaging of the cartilage, while 3DHYCE is particularly useful in visualization of the spinal cord and nerve roots thanks to its specific hybrid contrast.
- New custom image enhancement settings (low, medium, high)
- Dicom Grayscale Softcopy Presentation State class to preserve image overlay during exporting and sending operations.
- Dicom Query Retrieve; SCU Classes: Study Root Information Model Find and Study Root Information Model Move.

- More flexible film composer with virtual on screen film.
- Selective sending/export of the X-Bone images
- Viewer Lite, creation of patient CD with viewer
- Several improvements in the system service environment making remote service more efficient.
- Improved Service security by using a dedicated dongle key.
- Improved management of streaming acquisition when images are sent to PACS
- Cine movie acquisition can be saved on CD/DVD with a new compressed format file
- Image quality and clinical protocols optimization
- 3D Viewer to enhance MPR capabilities: optimized workflow and improved 3D data volume displaying

In particular, the EVOlution software delivers these advanced acquisition techniques and imaging options:

2D and 3D Speed-Up acquisition technology

The Speed Up **i**s an advanced acquisition/reconstruction method, which reduces the scan time up to 30% and 50% respectively of 2D and 3D pulse sequences. Speed-Up applies sophisticated mathematics algorithms that take advantage of intrinsic K-space redundancy to properly manage the number of acquisition data and consequently to reduce the acquisition time. In particular:

- Speed-Up can be applied to most of 2D and 3D pulse sequences used in daily practice except Half Fourier, Half Echo, TSE and TME.
- The operator manages the “Speed up” factor by simply selecting the appropriate value under “Special Parameter” in the sequence parameter menu.
- Seed-Up can also be used to improve image quality of the examination increasing spatial resolution, without compromising scan-time.

TR REDUCTION

A sophisticated technique able to reduce the Repetition Time (TR) by means of an optimization in the Echo Train Length (ETL) management hence reducing scan times.

ADVANCED ISOTROPIC 3D

Fully Isotropic 3D imaging in combination with the Speed-Up technology allows for fast acquisition of high resolution 3D image data which enables post-processing reconstruction (MPR) in any direction maintaining high level of image quality. With a single acquisition all 3 scan planes are acquired.

ELLIPTICAL ACQISITION

This technique allows to achieved further reduction time in 3D sequences thanks to a proper management of data in K-space.

TRUE MOTION

Real-time motion imaging with True Motion. True Motion imaging uses a 2DHYCE high frame rate of the acquisition sequence with streaming technique to scan and visualize a joint in motion. The movie is created in real time while the patient slowly moves the joint and the images are stored in movie format.

MAR
This technique allows to reduce the susceptibility artefact created by metal implants thanks to a proper gradients management in FSE family sequences.

X-MAR (not FDA clearance)
As the demand for post-surgical examinations is constantly rising, Esaote introduced a sophisticated technique called X-MAR technique, an evolution of the previous MAR, to reduce the susceptibility artifacts caused by metal implants.
IMPORTANT NOTE: this features could be not available in some countries according to its registration status.

3D Viewer
This new advanced 3D viewer environment allows a better viewing of 3D data volumes acquired by using the suitable 3D isotropic sequences. It allows 3D MPR reconstructions by drawing up oblique and orthogonal planes, rendered as MPR. Also curved MPR is available to generate curved slices particularly useful in some specific applications.
IMPORTANT NOTE: this feature is available only for CE coutries (CE mark). For USA the FDA Approval is expected on October 2017. For other countries where other registrations are required ask to GMKT department for its availability.

4.2. Vet.MR Grande System (Rel. 1 or Rel. 2 or Rel. 3 or higher no eXP)

EVO eXP upgrade (from Rel. 1.x, Rel. 2.x and Rel. 3.x or higher no eXP)
part code 151 0094 00

IMPORTANT NOTE: during the purchase order of the EVO eXP Upgrade code 151 0094 00, it is necessary to communicate the following information:

1) System Host Id in order to be able to generate the proper SW Option codes
2) SW Release previously installed

The EVO eXP Upgrade is the last step in terms of system performance guaranteed by eXP technology. It consists in a combination of advanced hardware and new software features that improves the S-scan system capabilities in terms of acquisition time and image quality.
It comprises a new workstation, a special GPU card for faster reconstruction and sophisticated imaging sequences like Speed-Up, MAR and True Motion for advanced image acquisition.
All eXP system are recognizable by their eXP logo on the front cover.
The EVO eXP upgrade for S-scan no eXP Rel 1/ Rel 2 /Rel 3 systems includes:
- New workstation I5 with 32GB RAM and the new Power Supply.
- Windows 7 64 bit operating system.
- 1 Terra byte high-speed storage.
- High performance GPU board.
- SW Release MRI EVOlution 17
- Image Enhancement upgrade license 64 bit.
- Speed Up 2D SW licence
- Speed Up 3D SW licence

- TR Reduction
- True Motion SW licence
- MAR Technique SW licence
- X-MAR Technique SW licence
- Myelo SW licence
- 3D Viewer SW licence

IMPORTANT NOTE: From July 2017 the new SW Release EVO 17 has been included in the EVO eXP Upgrade.

New High Performance workstation and GPU.
The new technical features introduced with the SW Rel. MRI EVOlution 17 require more computational power to work with the new fast sequences. Therefore a new I5 workstation with 32Gb RAM in combination with a high level GPU and new SDSP board will be installed. System storage capacity is 1 Terra byte

Software Release MRI EVOlution 17 (CE available from July 17)
The SW Rel. MRI EVOlution 17 includes important improvements that make the system faster and easier. Here after the new improvements:

- A completely newly developed reconstruction algorithm based on parallel computation.
- Geometric distortion correction
- Speed Up 2D for faster & better acquisition in 2D
- Speed Up 3D for faster & better acquisition in 3D
- Fully Isotropic 3D capabilities
- True Motion imaging capabilities
- MAR (Metallic Artifact Reduction): technique for reduction of susceptibility artefact caused by metal implant
- X-MAR (Metallic Artifact Reduction): advanced technique for reduction of susceptibility artefact caused by metal implant
- Advanced DCE MRI Analysis (according to its registration it is not available for all countries).
- Improved FSE Proton Density sequence, by better management of the ETL
- X-Bone acquisition with higher acquisition matrix
- Rectangular FOV for more flexibility and faster acquisition
- Elliptical Acquisition (3D sequences)

- Optimized package of 3D Steady State sequences, which includes: 3D HYCE, 3D SHARC, 3D SST1, 3D SST2, sequences, that substantially improve the image capabilities of the S-scan. In particular, the 3DSHARC sequence has been developed for high resolution imaging of the cartilage, while 3DHYCE is particularly useful in visualization of the spinal cord and nerve roots thanks to its specific hybrid contrast.

- New custom image enhancement settings (low, medium, high)
- Dicom Grayscale Softcopy Presentation State class to preserve image overlay during exporting and sending operations.
- Dicom Query Retrieve; SCU Classes: Study Root Information Model Find and Study Root Information Model Move.
- More flexible film composer with virtual on screen film.

- Selective sending/export of the X-Bone images
- Viewer Lite, creation of patient CD with viewer
- Several improvements in the system service environment making remote service more efficient.
- Improved Service security by using a dedicated dongle key.
- Improved management of streaming acquisition when images are sent to PACS
- Cine movie acquisition can be saved on CD/DVD with a new compressed format file
- Image quality and clinical protocols optimization
- 3D Viewer to enhance MPR capabilities: optimized workflow and improved 3D data volume displaying.

In particular, the EVOlution software delivers these advanced acquisition techniques and imaging options:

2D and 3D Speed-Up acquisition technology

The Speed-UP is an advanced acquisition/reconstruction method, that reduces the scan time up to 30% and 50% respectively of 2D and 3D pulse sequences. Speed-Up applies sophisticated mathematics algorithms that take advantage of intrinsic K-space redundancy to properly manage the number of acquisition data and consequently to reduce the acquisition time.

- Speed-Up can be applied to most of 2D and 3D pulse sequences used in daily practice except Half Fourier, Half Echo, TSE and TME.
- The operator manages the “Speed up” factor by simply selecting the appropriate value under “Special Parameter” in the sequence parameter menu.
- Speed-Up can also be used to improve image quality of the examination increasing spatial resolution, without compromising scan-time.

TR REDUCTION

A sophisticated technique able to reduce the Repetition Time (TR) by means of an optimization in the Echo Train Length (ETL) management hence reducing scan times.

ADVANCED ISOTROPIC 3D

Fully Isotropic 3D imaging in combination with the Speed-Up technology allows for fast acquisition of high resolution 3D image data, which enables post-processing reconstruction (MPR) in any direction maintaining high level of image quality. With a single acquisition all 3 scan planes are acquired.

ELLIPTICAL ACQUISITION

This technique allows to achieved further reduction time in 3D sequences thanks to a proper management of data in K-space.

TRUE MOTION

Real-time motion imaging with True Motion. True Motion imaging uses a 2DHYCE high frame rate of the acquisition sequence with streaming technique to scan and visualize a joint in motion. The movie is created in real time while the patient slowly moves the joint and the images are stored in movie format.

MAR
This technique allows to reduce the susceptibility artefact created by metal implants thanks to a proper gradients management in FSE family sequences.

X-MAR (not FDA clearance)
As the demand for post-surgical examinations is constantly rising, Esaote introduced a sophisticated technique called X-MAR technique, an evolution of the previous MAR, to reduce the artifacts caused by metal implants.

IMPORTANT NOTE: this features could be not available in some countries according to its registration status.

3D Viewer
This new advanced 3D viewer environment allows a better viewing of 3D data volumes acquired by using the suitable 3D isotropic sequences. It allows 3D MPR reconstructions by drawing up oblique and orthogonal planes, rendered as MPR. Also curved MPR is available to generate curved slices particularly useful in some specific applications.
IMPORTANT NOTE: this feature is available only for CE coutries (CE mark). For USA the FDA Approval is expected on October 2017. For other countries where other registrations are required ask to GMKT department for its availability.

4.3. Vet-MR Grande System (Rel. 3 or higher eXP systems)

EVO upgrade (from Rel. 3 or higher eXP systems) part code 150 0000 03

IMPORTANT NOTE: during the purchase order of the EVO Upgrade code 150 0000 03, it is necessary to communicate the following information:

1) System Host Id in order to be able to generate the proper SW Option codes
2) SW Release previously installed

The EVO Upgrade based on eXP technology introduces important features improving system performances and including new imaging capabilities.

The EVO upgrade includes:
- Memory extension to 32GB
- SW Release MRI EVOlution 17
- T-Spine Imaging SW license
- MAR Technique SW license
- X-MAR Technique SW license
- 3D Viewer SW licence

IMPORTANT NOTE: From July 2017 the new SW Release EVO 17 has been included in the EVO Upgrade.

Software Release MRI EVOlution 17 (CE available from July 17)

The SW Rel. MRI EVOlution 17 includes important improvements that make the system faster and easier to use. Here after the new improvements:

- Custom image enhancement settings (low, medium, high): the user can choose the type of Image Enhancement to apply to the image.
- Dicom Grayscale Softcopy Presentation State class: to preserve image overlay during exporting and sending operations.
- Improved management of streaming acquisition when images are sent to PACS
- Cine movie acquisition can be saved on CD/DVD with a new compressed format file
- Image quality and clinical protocols optimization
- 3D Viewer to enhance MPR capabilities: optimized workflow and improved 3D data volume displaying.

In particular, the EVOlution software delivers these advanced acquisition techniques and imaging options:

ADVANCED ISOTROPIC 3D

Fully Isotropic 3D imaging in combination with the Speed-Up technology allows for fast acquisition of high resolution 3D image data which enables post-processing reconstruction (MPR) in any direction maintaining high level of image quality. With a single acquisition all 3 scan planes are acquired.

MAR

This technique allows to reduce the susceptibility artefact created by metal implants thanks to a proper gradients management in FSE family sequences.

X-MAR (not FDA clearance)

As the demand for post-surgical examinations is constantly rising, Esaote introduced the X-MAR technique, an evolution of the previous MAR, to reduce the artifacts caused by metal implants.
X-MAR is a sophisticated technique able to reduce the artifacts also from the critical implants.
IMPORTANT NOTE: this features could be not available in some countries according to its registration status.

3D Viewer

This new advanced 3D viewer environment allows a better viewing of 3D data volumes acquired by using the suitable 3D isotropic sequences. It allows 3D MPR reconstructions by drawing up oblique

and orthogonal planes, rendered as MPR. Also curved MPR is available to generate curved slices particularly useful in some specific applications.
IMPORTANT NOTE: this feature is available only for CE coutries (CE mark). For USA the FDA Approval is expected on October 2017. For other countries where other registrations are required ask to GMKT department for its availability.

Remark

- All of the Vet-MR Grande sales configurations and accessories meet all safety requirements applicable to medical electrical equipment, fulfill the 93/42/EEC Medical Device Directive and carry the CE mark. The use of accessories different to those specified in this document or the connection of S-scan to other devices, with characteristics different to those specified in the User Manual, do

- not guarantee that the final configuration is in compliance with the previous regulations.

- For a detailed definition of system performance and all related service issues please refer to the user \ service manual.

- When ordering an item for systems already delivered on the field, make sure that the system is compatible. Contact your local Esaote representative for further information.

- Products and Features might not be available for sale in all countries. Contact Esaote personnel for further information