Elekta Neuromag® TRIUX
Functional brain mapping

The next level in functional mapping
Elekta Neuromag® TRIUX (art. no. NM23900N) is a comprehensive bio-electromagnetic measurement system for functional brain studies:
- 306-channel neuromagnetometer, which optimally combines both planar gradiometers as well as magnetometers
- Highest available information capture
- Uniquely effective interference elimination technologies with unparalleled robustness even in the presence of intense, nearby sources of interference
- Utmost flexibility in tailoring the system for the particular clinical and/or research needs thanks to a wide range of options

**Sensor array**
State of the art sensor array featuring densest spatial sampling and lowest intrinsic noise in the industry:
- Whole-head sensor array with realistic helmet shape
- 1,220 cm² sensor coverage
- 102 high-precision triple-sensor elements
- 204 planar gradiometers
- 102 magnetometers
- 35 mm average distance between each sensor element
- 20 mm effective channel separation
- 17.0 mm base length (planar gradiometers)
- <0.1 % geometrical imbalance
- ±20 nT dynamic range
- 18 mm average distance between pick-up coils and room temperature surface
- <1 second detrapping cycle for individual channels with integrated thin-film heaters
- 2.5 minute detrapping cycle for all channels
- Typical white noise levels:

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>White noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradiometer</td>
<td>3.6 fT/cm/√Hz</td>
</tr>
<tr>
<td>Magnetometer</td>
<td>3.5 fT/√Hz</td>
</tr>
</tbody>
</table>

- Guaranteed gradiometer noise levels (percentage of sensors):

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Noise¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–10 Hz</td>
<td>&lt;20 (100 %)</td>
</tr>
<tr>
<td>60–70 Hz</td>
<td>&lt;10 (100 %)</td>
</tr>
</tbody>
</table>

- Guaranteed magnetometer noise levels (percentage of sensors):

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Noise¹</th>
</tr>
</thead>
<tbody>
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</table>

¹ fT/cm/√Hz

- <0.1 % residual crosstalk between sensors (corrected)

**Data acquisition**
- Up to 474 simultaneously sampled channels
- 306 MEG channels
- Up to 128 EEG channels
- 12 bipolar analog input channels for physiological signals
- 12 auxiliary analog input channels (±10 V)
- 16 trigger (TTL) channels
- 1–5 kHz sampling rate, configurable by the user
- 24-bit output
- 2.0 fT/cm least significant bit (gradiometer channels)
- 2.5 fT least significant bit (magnetometer channels)
- MEG high-pass filter cutoff frequencies: DC–10 Hz
- EEG high-pass filter cutoff frequencies: DC, 0.03, 0.1, and 10 Hz

**Interference elimination**
Proprietary MaxFilter™ and signal space projection technologies for elimination of spatial and spatiotemporal interferences:
- Online signal space projection (SSP) for adaptive elimination of external interferences with up to 40 dB attenuation
- MaxFilter™ technology for offline spatial suppression of interferences with up to 40 dB attenuation for frequencies up to 100 Hz
- MaxFilter™ technology for offline spatiotemporal elimination of even intense artifacts from distant and nearby sources with up to 130 dB attenuation
- Automatic offline detection and exclusion of defective channels

**Movement compensation**
Patented movement compensation technology for continuous elimination of motion artifacts:
- Continuous head position tracking
- User-defined update frequency up to 1 kHz
- Offline compensation for temporary movements of the patient’s head
- Offline transformation of data between different head positions
**Gantry**

Motorized gantry with integrated connectors for auxiliary electrodes and stimuli:
- Reclined measurement positions (30° recline)
- Upright measurement position (22° recline)
- Supine measurement position
- Button-operated electric lifting motor
- Safety locking latch
- Integrated connectors for EEG and auxiliary channels
- Automatic detection of gantry position
- Weight (empty): 350 kg (772 lb)
- Dimensions (upright): 950 × 1,660 × 2,220 mm (37.4 × 65.4 × 87.4 in)
- Dimensions (supine): 950 × 1,340 × 1,990 mm (37.4 × 52.8 × 78.3 in)

**Cryogenics**

Cryogenics featuring industry-lowest helium boil-off and fastest stabilization after refill or change of measurement position:
- 78-liter (20.6 gal) liquid helium dewar
- <70 l/week (<18.5 gal/week) boil-off rate (excluding transfer loss)
- 7-day refill interval
- <48-hour warmup-cooldown cycle
- Exhaust line for venting evaporating helium
- Safety exhaust line to an outdoor vent
- Helium level indicator on the gantry (readable via the acquisition system)
- Continuous logging of helium level
- Two liquid helium transfer siphons
- Liquid helium gauge for storage dewars
- Helium transfer accessories

**Head phantom**

Precision-engineered head phantom with both current and magnetic dipoles for verification of localization accuracy:
- 32 current dipoles
- 4 magnetic dipoles
- 89 mm (3.5 in) radius
- Guaranteed localization accuracy (aggregate): ≤5.0 mm (≤0.2 in)
- Typical localization accuracy (aggregate): ≤2.0 mm (≤0.08 in) for current dipoles

**Co-registration**

Landmark-based co-registration of patient’s anatomy with magnetic resonance images:
- Co-registration using anatomical landmarks
- Digitization of additional surface points for visual verification

**Acquisition workstation**

Powerful workstation for data acquisition and post-processing of measurements:
- High-end graphical quad-core workstation
- Linux operating system
- 6 GB RAM
- 1 TB SCSI hard disk
- CD/DVD+RW writer
- 30” TFT monitor
- Real-time visualization of raw data for user-selected channels
- Recording of raw data
- Programmable stimulation sequences and timing
- Online averaging of 1–32 categories
- Automatic rejection of signal epochs containing artifacts
- Visualization of online averages
- Noise level monitoring
- Automatic and manual noise optimization
- Loadable acquisition presets
- Post-acquisition interference elimination

**Operating environment**

Required operating environment within the magnetically shielded room:
- Air temperature: 20–28 °C (68–82 °F)
- Minimum air flow: 30 l/s (8 gal/s)
- Relative humidity: 40–70 %

**Power**

- Input voltage: 100, 115, 200, 230, or 240 V (47–63 Hz)
- Power consumption: 4,700 W (typical) or 6,000 W (max)
Built-to-order options

32-channel EEG
Art. no. NM23904N
Integrated EEG subsystem with 32 channels:
• 32 unipolar EEG channels
• <0.4 µVrms (0.5–100 Hz) noise at 10 kΩ impedance
• 100 MΩ input impedance at DC
• Software-controllable gain for individual channels (640, 2,000, or 20,000)
• 100 dB common-mode rejection ratio (with active ground)
• Fixed analog high-pass filters: 0 Hz (DC), 0.03 Hz, 0.1 Hz, and 10 Hz

64-channel EEG
Art. no. NM23889N
Integrated EEG subsystem with 64 channels:
• 64 unipolar EEG channels
• <0.4 µVrms (0.5–100 Hz) noise at 10 kΩ impedance
• 100 MΩ input impedance at DC
• Software-controllable gain for individual channels (640, 2,000, or 20,000)
• 100 dB common-mode rejection ratio (with active ground)
• Fixed analog high-pass filters: 0 Hz (DC), 0.03 Hz, 0.1 Hz, and 10 Hz

128-channel EEG
Art. no. NM23893N
Integrated EEG subsystem with 128 channels:
• 128 unipolar EEG channels
• <0.4 µVrms (0.5–100 Hz) noise at 10 kΩ impedance
• 100 MΩ input impedance at DC
• Software-controllable gain for individual channels (640, 2,000, or 20,000)
• 100 dB common-mode rejection ratio (with active ground)
Patient couch
Art. no. NM23125N
Roll-away patient couch on wheels:
- Moveable (length-wise) mattress and bottom
- Removable sidewalls
- Safety belt
- Detachable neck support
- Weight: 75 kg (165 lb)
- Dimensions: 2,220 × 740 × 760 mm (87.4 × 29.1 × 29.9 in)
- Maximum load: 135 kg (298 lb)

Patient chair
Art. no. NM23124N
Roll-away patient chair on wheels:
- Adjustable height
- Removable table
- Safety belt
- Weight: 80 kg (176 lb)
- Dimensions: 1990 × 620 × 910 mm (78.3 × 24.4 × 35.8 in)
- Maximum load: 135 kg (298 lb)

Stim² stimulus presentation workstation
Art. no. NM21711N
Stimulus presentation system:
- Stim² (Compumedics Inc., El Paso, Texas, United States of America)
- Stimulus generation software
- Dedicated stimulation workstation
- TTL-based synchronization with data acquisition

High-fidelity visual stimulator
Art. no. NM24034N
High-fidelity video projection system:
- Native 16:9 three-panel DLP video projector
- Symmetric black-to-white and white-to-black transition time
- 26 ms delay from trigger presentation
- <1 ms jitter (frame-to-frame) at 60 Hz refresh rate
- 1,400 × 1,050 pixel native resolution
- 16-bit color depth
- 24–120 Hz refresh rate
- 112 cm (44 in) standalone back-projection screen on wheels

Auditory stimulator
Art. no. NM24035N
Stereophonic auditory stimulus delivery system:
- Non-magnetic tubal-insert earphone set
- Independent delivery of auditory stimuli to each ear
- >80 dB sound pressure level (SPL)
- >60 dB channel separation
- <1 ms jitter between trigger and stimulus onset
- 50 disposable foam eartips

Somatosensory stimulator
Art. no. NM21709N
Somatosensory stimulus delivery system:
- One electric somatosensory stimulator with controllable amplitude
- 0–99.9 mA output current
- 50, 100, 200, 500, 1,000, or 2,000 μs pulse duration
- Triggered via the acquisition workstation or from within the stimulus presentation workstation

Response device
Art. no. NM20999N
Non-magnetic, single-finger optical response pad:
- Finger-press mode
- Finger-lift mode
- Trigger output
- <1 ms delay between response and recorded event

Video monitoring system
Art. no. NM21712N
A CCTV video monitoring system.
- CCTV video camera
- Monitor
- Cabling

Pediatric chair insert
Art. no. BC20899N
Non-magnetic booster seat for pediatric patients and subjects.
**Bidirectional intercom system**  
Art. no. NM21632N  
A bidirectional intercom system for two-way communication between the patient, operator, and nurse.  
- Intercom system with half-duplex and simplex modes  
- Microphone  
- Cabling

**Acquisition system UPS**  
Art. no. NM24062N  
An uninterruptible power supply unit for maintaining the Elekta Neuro-mag TRIUX data acquisition system operational during power outage or voltage fluctuation.  
- A 3,000 VA uninterruptible power supply for the data acquisition electronics  
- Cabling

**Workstation UPS**  
Art. no. NM24063N  
An uninterruptible power supply unit for maintaining a workstation operational during power outage or voltage fluctuation.  
- A 1,000 VA uninterruptible power supply for a single workstation and peripherals  
- Cabling
Consumables

Head position coils
- Head position coil set with five coils in a ready-to-use assembly (art. no. NM23880N)

32-channel EEG caps
- Small (size 46–52 cm) 32-channel EEG cap (art. no. NM23905N)
- Medium (size 52–58 cm) 32-channel EEG cap (art. no. NM23906N)
- Large (size 58–64 cm) 32-channel EEG cap (art. no. NM23907N)

64-channel EEG caps
- Small (size 46–52 cm) 64-channel EEG cap (art. no. NM23890N)
- Medium (size 52–58 cm) 64-channel EEG cap (art. no. NM23891N)
- Large (size 58–64 cm) 64-channel EEG cap (art. no. NM23892N)

128-channel EEG caps
- Small (size 46–52 cm) 128-channel EEG cap (art. no. NM23894N)
- Medium (size 52–58 cm) 128-channel EEG cap (art. no. NM23895N)
- Large (size 58–64 cm) 128-channel EEG cap (art. no. NM23896N)
Elekta is a global human care company pioneering significant innovations and clinical solutions for treating cancer and brain disorders. Elekta provides intelligent and resource-efficient technologies that improve, prolong and save patient lives.