SIMPLIFYING NEUROSURGERY

Stereotactic & Functional Neurosurgery
Global leaders for innovative and dependable microelectrode recording systems

Research Applications
Integrated neuroscience research

Medical Consumables
NeuroProbe, cannulae, & electrode input cables for any MER system

Technical Support
On-site and remote case support, training, maintenance and more
Since its inception in 1993, Alpha Omega has played a leading role in fostering innovation and development in three main areas - functional neurosurgery, clinical research, and neuroscience research. Over more than two decades, we have pioneered cutting-edge technology in both fields and humbly received international recognition from numerous global experts. One of the key factors in our success is the unique and personal relationships we have maintained with our customers.

Alpha Omega offers a comprehensive neurosurgery suite, with built-in analysis and visualization functions, designed to fit your needs and exceed your expectations, day after day, with the utmost precision and reliability.

**We are constantly innovating**

Embracing innovative technology is imperative for improved patient outcomes. We are here to support you through the transition, and are glad to welcome you into the Alpha Omega family!
Vision

Simplification of the DBS procedure by implementing sophisticated software and hardware for brain mapping and navigation to allow increased treatment productivity in Neurological and Psychiatric disorders, awake or asleep, resulting in better patient outcomes.

Don’t take it from us…
here’s what some of our customers have to say

Alpha Omega is the world’s best company for producing technologically sophisticated, versatile, and highly usable physiological recording equipment. The devices are highly robust and functional. In the clinical setting, this translates into excellent and reliable recordings which result in optimal localization and maximum benefit for the patient. In the research setting the same qualities allow the scientist to focus on the experiments and the resulting data and not on trouble-shooting the system. The company is instantly responsive and willing to modify their products to suit the needs of each individual user. They are without question the best in the field.

Emad Eskandar, MD Boston MA.

I have used Alpha Omega equipment for well over a decade, after having used equipment from a number of other vendors in the past. I have found the Alpha Omega equipment to be the most reliable, with by far the best noise reduction hardware and software available, as well as easy-to-use and powerful data analysis tools. Furthermore, the company’s support staff is without peer.

Alon Y. Mogilner, MD, PhD, NYU Langone Medical Center

Over the years, I have had experience with all of the major microelectrode recording systems, and have found Alpha Omega to be superior in terms of clinical and research applications. The support staff is extremely responsive to questions and helpful in troubleshooting any problems that arise. In fact, the cadre of support people employed by Alpha Omega are some of the most hardworking, intelligent, and insightful in the field, and a credit to the company that they serve. The nimbleness of the company in responding to end-user requests for design improvements in everything from electrodes to software, is admirable.

Aviva Abosch, M.D., PhD., University of Colorado
Why MER?

Microelectrode Recording (MER) remains the gold standard for optimal localization of DBS targets
Assessment of electrophysiological activity confirms the structural location
Real-time feedback to account for inaccuracies during planning stage
Critical research tool for exploration of DBS targets

“Ultimate spatial localization of the DBS electrode should be based on the electrophysiological properties of the tissue, ie, the underlying neuronal activity, rather than the anatomically defined location.”

“Functional imaging and neuroelectrophysiological data will be essential to the development of targets, trials, and unbiased assessment of clinical response.”

“Factors that call for physiological mapping to refine electrode location following initial anatomical targeting include imaging inaccuracy or distortion (particularly MRI); the need to refine target selection related in part to incomplete understanding of the relationship of anatomy, physiology, and clinical outcome; inaccuracy of frame- or frameless-guided navigation; and/or brain shift due to positioning, loss of cerebrospinal fluid, pressure shifts, and/or pneumocephalus”

“…a relatively inaccurate anatomical placement can be refined (and presumably improved) based on intraoperative physiological or neurological data.”

“Despite improvements in anatomic imaging of the basal ganglia, microelectrode recording is still an invaluable tool in locating appropriate targets for neurosurgical intervention.”

“We therefore suggest that optimization of DBS outcome in patients with Parkinson’s disease could be achieved by intraoperative analysis of STN beta oscillations by microelectrode (as in this study) or macroelectrode (Chenet al., 2006) recording.”
# Table of Contents

06  NeuroSmart  
*Smart Portable MER system with advanced target localization capabilities*

08  Neuro Omega  
*Integrated research platform*

10  NeuroNav  
*Portable MER Solution*

12  NeuroFortis  
*Motorized Drive HeadStage*

13  HaGuide  
*Real Time Subthalamic Nucleus Navigation*

14  Medical Consumables  
*Wide selection of customizable peripherals for all MER systems*

15  Application & Technical Support  
*Thorough and dedicated service options*
NeuroSmart

Smart Portable MER system with advanced target localization capabilities

- Automatic Navigation
- Online Data Replay
- Lead Confirmation Tools
- Integrated Research Capabilities

NeuroSmart brings automatic navigation and advanced connectivity tools in a portable, accessible and affordable package to fit your surgical and research needs. NeuroSmart was designed with robustness in mind. With the built-in, FDA & CE approved HaGuide, the NeuroSmart allows the user to automatically locate the target with enhanced confidence. With the MATLAB data access, NeuroSmart is ideal for DBS centers interested in basic research capabilities.

Key Qualities

- 5 Spike (SPK) and 5 Local Field Potential (LFP) channels
- Advanced capabilities for enhanced target localization based on HaGuide automatic navigation
- Conformance with highest Production and Quality Control standards
- Online data replay offers a review of the entire trajectory data both during and after the procedure
- Analog output & digital input allow syncing with third-party systems
- Data streaming through MATLAB and C++ enables online data access and processing during surgery
- Stimulation pedal for hands-free kinesthetic testing

Remote Control

- The NeuroSmart is equipped with a remote control for enhanced user experience
- Ergonomic design for ease of use in the OR
- Smart Button for automatic navigation including automatic adjustment of movement step size
- Volume, Impedance and Data Save control buttons
- Speed adjustable controller for convenient Drive control
- Built-in LCD screen with channel control
- Stimulation ON/OFF and Amplitude control buttons

*Pending FDA & CE approval
User interface

1 **Flexible workspace builder**
   Up to 5 channels for spikes (SPK) and up to 5 channels for Local Field Potentials (LFP)

2 **Wide stimulation range** for micro and macro threshold stimulation tests

3 **Switch from recording to stimulation** with the push of a button

4 Gradual increase and decrease of **stimulation current** during stimulation for added safety

5 **Current monitor** system ensures accurate delivery of stimulation current

6 **On-screen trajectory view**, automatically builds electrophysiological map as the electrode advances in the brain

7 Electrode **depth and distance from target** are both clearly displayed on screen, with easy reference to macro and micro tip locations

8 **Built-in HaGuide** automatic navigation assistant with stimulation recommendation capability

9 **Measure the impedance of all micro contacts simultaneously** to ensure recording integrity

10 **Save** data for post-case analysis in **MATLAB** or other formats

11 Pre-set **Step Size** option to maximize precision of the drive and improve safety and control

12 **Adjustable threshold** for spike detection

13 **Online Data Replay** of all the recordings from the procedure

Stimulation Pedal

**For hands-free stimulation**

The pedal is fully-integrated with a simple USB plug-and-play interface and enables delivering electrical stimulation from within the sterile field.

The Stimulation Pedal allows for uninterrupted kinesthetic testing while applying electrical stimulation. The pedal is designed to be waterproof as well as compliant with EMC and electrical safety standards.
Neuro Omega

Integrated research platform
Closed loop and 3D stimulation possibilities
Expandable channel count
User-friendly built-in EEG montages

Innovative software and hardware implemented in the Neuro Omega making it the ideal system for both clinical MER applications and for advanced clinical research applications. With the built-in, FDA & CE approved HaGuide, the Neuro Omega allows the user to automatically locate the target with enhanced confidence. MER users gain total experimental control while benefiting from Alpha Omega’s highest performance, quality and clinical efficacy.

Key Qualities
> Expandable up to 122 channels
> Online data streaming to MATLAB and C++
> **Closed loop stimulation** control through data streaming or direct-to-processor scripting
> Unparalleled stimulation capabilities including **conditional stimulation**, **programmable stimulation**, and arbitrary wave definition
> Multi-source, multi-polar stimulation allows for **3D stimulation control**
> **Single cable** exiting the sterile field for electrode positioning, recording and stimulation
> **Online statistics** including evoked potentials
> Unique dual screen display and customizable workspace
> Integrated analog outputs and digital inputs

Neuro Omega Stimulation Foot Pedal
> A **hands-free solution** for uninterrupted kinesthetic testing while simultaneously controlling the application of stimulation currents
> Enables delivering **electrical stimulation from within the sterile field**
> A fully-integrated **USB plug-and-play interface** seamlessly connects to Neuro Omega for independent control via software and handheld remote
> **Waterproof** as well as compliant with EMC and electrical safety standards

---

Neuro Omega
NeuroMic

The NeuroMic is a microphone fully-integrated in our data acquisition systems via USB plug-and-play interface. This enables seamless voice recording fully time-synchronized with electrophysiological recordings*, annotations of an event like patient feedback and side effects for both clinical and research applications. The data recorded using NeuroMic can also be easily imported into MATLAB for analysis along with electrophysiological recordings.

* Alpha Omega Sonus microphonic-free electrodes recommended for speech artifact suppression in electrophysiological recordings.

Headbox Module

- Up to 7 additional modules
- 16 channels per module with referential and differential recording for EEG, EMG, & ECoG
- Portable and compact
- Advanced multi-source stimulation capabilities for peripheral nerve and ECoG
- Medical grade, industry standard touch-proof connectors

User interface

- **Trajectory view** with pattern recognition for increased neural activity
- **10 channels built into the drive** for recording and stimulation with micro and macro spike and LFP recordings
- **Configurable with up to 122 channels** integrated all in one system:
  - Micro and Macro electrodes
  - LFP
  - EEG
  - EMG
  - ECoG
- One click **impedance check** for all channels and electrode types
- **Flexible stimulation** current ranges for microelectrode test stimulations, peripheral nerve stimulation and other stimulation research requirements
- Complete **stimulation control** on the basic stimulation parameters and the ability to create unique waveforms
- **Save data** for post-case analysis in MATLAB or other formats
- **User-defined Events** allow for easy marking and commenting onto data file

Record physician voice annotations
Record patient voice during kinesthetic testing and speech-related research
Start and stop recording with the click of a button
USB plug and play connectivity
Voice recordings are timestamped and synchronized with electrophysiological recordings
Recordings are saved in a simple WAV audio format

<table>
<thead>
<tr>
<th>Drive depth and controls</th>
<th>Save</th>
<th>Impedance</th>
<th>Stimulation</th>
<th>Scripting</th>
</tr>
</thead>
</table>

| Trajectory map |

NeuroMic

The NeuroMic is a microphone fully-integrated in our data acquisition systems via USB plug-and-play interface. This enables seamless voice recording fully time-synchronized with electrophysiological recordings*, annotations of an event like patient feedback and side effects for both clinical and research applications. The data recorded using NeuroMic can also be easily imported into MATLAB for analysis along with electrophysiological recordings.

* Alpha Omega Sonus microphonic-free electrodes recommended for speech artifact suppression in electrophysiological recordings.
The NeuroNav is a compact, field-proven MER system, used clinically in the localization of surgical targets for the implantation of Deep Brain Stimulation (DBS) electrodes, in the treatment of neurological and psychiatric diseases. The NeuroNav allows safe and accurate insertion of electrodes into the brain, while recording neural activity, stimulating neural tissue, and guiding the user to the optimal target. This system is ideal for all DBS centers and community hospitals interested in flexible usability, affordability, and compact size.

Key Qualities

- Quick set-up with user-friendly interface & seamless operation capabilities
- The handheld remote allows completely independent operation from within the sterile field
- Straightforward software interface specifically designed to streamline the MER procedure
- Single cable exits the sterile field for electrode positioning, recording and stimulation

NeuroNav Headstage

- Pre-assembled drive for quick and easy setup in the sterile field
- Built-in capability for recording and stimulation
- Lightweight, low impact on frameless or frame based procedure
- XY stage and 5-hole bengun allows trajectory adjustments without frame manipulation
- Direct implantation of DBS electrode without backing up the drive or removing the cannulae
- Fully compatible with all stereotactic frames or frameless procedure
- Precision movement with an electronic frames
- Automatic or manual drive capabilities
User interface

1 **Multi-channel recording capabilities.** A total of up to 10 recording channels: up to 5 for spike activity measured from electrode micro contact and up to 5 for local field potentials (LFP) measured at the macro contact.

2 **Wide stimulation range** for micro and macro threshold stimulation tests.

3 **Switch from recording to stimulation** with the push of a button.

4 Gradual increase and decrease of stimulation current during stimulation for added safety.

5 **Current feedback** system ensures accurate delivery of stimulation current.

6 **Clear on-screen trajectory view**, automatically builds electrophysiological map as the electrode advances in the brain.

7 Electrode depth and distance from target are both clearly displayed on screen, with easy reference to macro and micro tip locations.

8 Proprietary **On-line Pattern Recognition Algorithm** for optimal localization of increased neural activity.

9 Measure the **impedance of all micro contacts simultaneously** to ensure recording integrity.

10 **Save** data for post-case analysis in MATLAB or other formats.

11 Pre-set **Step Size** option to maximize precision of the drive and improve safety and control.

12 Adjustable **threshold** for spike detection.

13 User-friendly, **handheld remote control** allows control of all system functions from outside or inside the sterile zone.
NeuroFortis

Automatic, motorized drive
Compatible with all Alpha Omega systems

Alpha Omega utilized its 25 years of experience in designing and building OR equipment and reflected this vast experience in the NeuroFortis Drive Headstage design and manufacturing.

- Preassembled with built-in recording and stimulation capability
- Operated by remote control or manually
- Drive with micrometer resolution feedback for precision movement
- High amplifier input range allows non-stimulating channels to record throughout stimulation
- Signal digitization and broadband filtering
- 10 channels capable of recording unfiltered raw, high-frequency spike and low-frequency LFP signals*
- Drives 5 microelectrodes simultaneously
- Ergonomic knob design for user-friendly and accurate manual driving
- A single cable connects the drive to all electrodes
- A single cable crossing the sterile field for all channels recording, and stimulation
- High-quality material, durable design and production control for maximum durability in OR environment
- XY stage and 5-hole Bengun allows trajectory adjustments without frame manipulation
- Direct implantation of DBS electrode without altering the position of the drive or removing the cannulas
- Lightweight, low impact on frameless or frame based procedure
- Fully compatible with all stereotactic frames or frameless procedure

* Available for Neuro Omega only. NeuroSmart is capable of recording 5 channels high-frequency spike and 5 channels low-frequency LFP signals, no raw recording.

Also Available

Autoclavable, washable, manual drive headstage with built-in digitizer and amplifier
HaGuide Software

Real Time Subthalamic Nucleus Navigation

Alpha Omega together with Prof. Hagai Bergman and Prof. Zvi Israel and their colleagues from The Hebrew University – Hadassah medical school Jerusalem, Israel, developed HaGuide. A real time software solution designed to accurately detect the STN region and its entrance and exit boundaries using microelectrode recording during surgery.

The software robustly detects the Dorso Lateral Oscillatory Region (DLOR) and Ventro Medical non-oscillatory region (VMNR) boundary and recommend the optimal location for stimulation to the neurosurgeon.

The HaGuide SW is integrated into the Neuro Omega and NeuroSmart systems for targeting the STN during deep brain stimulation (DBS) procedures.

- **Simplifies the analysis** of the recorded data real time analysis
- **Displaying accurately the location** of the electrode in the brain, by integrated additional software solutions for Intraoperative Planning
- **Stimulation recommendation**

  “After thirty years of experience with microelectrode recording in different settings, I decided to test HaGuide in some surgeries: HaGuide is the ultimate advising tool for interpreting microelectrode recording.”

  - José Luis Relova, MD, PhD, Santiago Clinic Hospital

  “Automatic systems overcome the bias of human operators and enable better STN targeting where electrophysiology interpretation of MER data is not available”

  - Prof. Hagai Bergman, MD, PhD, Hadassah Medical Center

**ASSFN 2016 abstract**

“A semi-automated software for estimating subthalamic nucleus boundaries and assisting optimal target selection for deep brain stimulation implantation surgery”

Conclusion: These data demonstrate that the software can reliably and accurately estimate entry into and exit from STN, and select the optimal track for DBS implantation.

**WSSFN 2017 abstract**

“Automated navigation system for detection of the subthalamic nucleus reduces deep brain stimulation surgery time”

Conclusion: Automatic navigation (AN) is safe and has a high level of reliability. Results of an MER track can easily be displayed in an inbuilt, user friendly & graphical form.
Medical Consumables

Sonus

Neuroprobe Sonus features
- Continue recording during drive movement
- Eliminates drive noise
- Recording while communicating with patient
- Record and listen at full volume
- Enhanced signal recording quality

Alpha Omega delivers the highest standard in MER performance. Our new Sonus Neuroprobes are uniquely designed to record high quality and clean signal.

Signal Quality Testing

Prof. Hagai Bergman & Prof. Zvi Israel on their Sonus experience:

“Sonus has a unique signal quality facilitating faster, easier and clearer target identification. Using Sonus we were able to freely communicate with patients having no microphonic artifacts. In my experience Sonus electrodes streamlines our procedure and have become my new standard of choice.”

Prof. Hagai Bergman MD, PhD
Professor of Brain Research
The Hebrew University – Hadassah medical school
Jerusalem, Israel

Prof. Zvi Israel MD
Director, Center for Functional and Restorative Surgery, Dept. of Neurosurgery. Jerusalem, Israel
Alpha Omega manufactures a large selection of sterile electrodes, cannulae, and electrode input cables of the highest quality and performance. The diverse selection can be further customized and is compatible with all drives and MER systems.

**Key Qualities**
- Customizable specifications upon request
- Compatible with any drive
- Compatible with any MER system
- Superior recording quality, impedance consistency
- Variety of microelectrodes in different materials
- Tapered or standard guide tubes

**Sterile Option Benefits**
- Increase case efficiency by eliminating sterilization procedure
- Avoid electrode tip damage during processing
- Safer handling of the microelectrodes
- Open only the electrodes needed for the operation

*Free samples upon request!*

**NeuroProbes** are intended to be used in neurosurgery for temporary stimulation, or recording of electrical signals of a small area in the brain.

**Cannulae** are intended for guiding the NeuroProbes in Neurosurgery for temporary stimulation of, or recording electrical signals of a small area in the brain.

**Electrode Input Cable** connects the micro and macro contacts of the electrode to the Headstage.

**Application & Technical Support**
Alpha Omega prides itself on the extraordinary level of service and personal attention we dedicate to each and every one of our clients to all products:

- Remote & On-site Case Support
- Rentals and fee-per-use plans
- Service Contracts
- Performance Maintenance
- System Refurbishment Plans
- System Upgrades
- Installation Packages
- In-Service Training for OR Staff
- Software Upgrades
- Warranty extension
Resources
Continue recording during drive movement
Eliminates drive noise
Recording while communicating with patient
Record and listen at full volume
Enhanced signal recording quality

*Alpha Omega* delivers the highest standard in MER performance.
Our new Sonus Neuroprobes are uniquely designed to record high quality and clean signal

Signal Quality Testing Prof. Hagai Bergman & Prof. Zvi Israel