

# NEURO-MS

Diagnostic Monophasic Magnetic Stimulator

- ✓ Diagnostics of neurological disorders
- ✓ Powerful monophasic stimulus
- ✓ Ergonomic and lightweight coils of different shapes and sizes
- ✓ Configurations for single pulse, paired-, triple- and quadri-pulse stimulation (QPS)
- ✓ Compatible with EMG machines of many world-known manufacturers



TMS

# TMS IN ACCORDANCE WITH **INTERNATIONAL** STANDARDS<sup>1</sup>

The alternating magnetic field of TMS machine easily penetrates through clothes, skin, scalp, meninx and bones. It rapidly reaches the electroconductive tissues of central and peripheral nervous systems. Such field generates the alternating electric field. It, in turn, evokes the electrical current which is sufficient to activate the neurons as during the electrical stimulation. Such impact allows performing a wide range of diagnostic tests.

During the monophasic stimulation the current runs through the conductive tissues only in one direction invoking a relatively uniform group of neurons<sup>2</sup> compared with biphasic one.

The Neuro-MS capacity ensures obtaining the reproducible response both from the muscles of upper and lower limbs even in patients with high motor threshold.

Besides, the paired pulse stimulation configuration allows generating the power monophasic stimulus that can be used to make diagnostics in patients with various diseases of the central nervous system much easier owing to the increased pulse duration and intensity.

The Neuro-MS is a robust and high-performance device with comprehensive functionality. The single pulse stimulation, all types of paired pulse stimulation, triple- and quadri-pulse stimulation (QPS) can be done with Neuro-MS monophasic magnetic stimulator.

## Applications

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- the assessment of central and peripheral motor pathways in adults and infants;
- the examination of the cranial nerves;
- the early diagnosis, assessment and monitoring of such nervous diseases, as multiple sclerosis, amyotrophic lateral sclerosis, stroke, movement disorders, motor neurone disease, traumatic brain injuries, spinal cord injuries, and etc.;
- the investigation of neurotransmitter mechanisms in motor cortex, including pre- and post-synaptic GABAergic ones.



<sup>1</sup> Groppa S., et al. A practical guide to diagnostic transcranial magnetic stimulation: report of an IFCN committee. *Clinical Neurophysiology* 123.5 (2012): 858-882.  
Rossini P. M., et al. Non-invasive electrical and magnetic stimulation of the brain, spinal cord, roots and peripheral nerves: basic principles and procedures for routine clinical and research application. An updated report from an IFCN committee. *Clinical Neurophysiology* 126.6 (2015): 1071-1107.

<sup>2</sup> Taylor J. L., and Colleen K. Loo. Stimulus waveform influences the efficacy of repetitive transcranial magnetic stimulation. *Journal of affective disorders* 97.1-3 (2007): 271-276.

Arai N., et al. Differences in after-effect between monophasic and biphasic high-frequency rTMS of the human motor cortex. *Clinical Neurophysiology* 118.10 (2007): 2227-2233.



3 The Neuro-MEP-Micro digital EMG and EP system is not included in Neuro-MS delivery set.

# PLUG and PLAY

## “Coil change” button combined with “High voltage” indicator

For safe coil replacement press “Coil change” button which disables the stimulus delivery and discharges instantly the high-voltage capacitor for safe coil replacement.

## Multifunctional LCD display

The display shows information about stimulation parameters and state of electronic unit and coil.

## “Trigger” button

When stimulator is in “Armed” state, the single pressing of “Trigger” button activates the single pulse or paired stimulation depending on the current operational mode.

## “Stimulation parameters” knob

Press the knob to select the parameter to be set. Turn it to adjust either the intensity or inter-pulse interval (IPI).



**High-voltage connector to plug in the coil**

**“Arm” button**

If stimulator is in disarmed state, press “Arm” button to start capacitor charge. “Charging” symbol appears on display. On charge process completion, the stimulator enters to “Armed” state and is ready to deliver pulses.

**“On/Off” button**

# NEW GENERATION OF COILS



## RC-03-125 Big ring coil

- cortical and peripheral nerve stimulation (cervical, lumbosacral nerve roots, pudendal nerve)
- stimulation of deep nerves



## AFEC-03-100 Angulated figure-of-eight coil

- deep cortical stimulation
- anatomic shape being congruent to head shape ensures closer fitting to the patient's head
- accurate focusing



Positioning grid  
for precise coil placement

Buttons to increase/  
decrease stimulus intensity

"Trigger" button

Handle with enhanced  
ergonomics

## FEC-03-100 Figure-of-eight coil

- focused cortical and peripheral nerve stimulation
- gold standard for TMS

# CREATE YOUR DIAGNOSTIC PLATFORM!

Neurosoft Company offers a wide range of equipment for magnetic stimulation.



**Neuro-MS  
monophasic magnetic  
stimulator (for single  
pulse stimulation)**



SDK for third-party software integration including MATLAB



**Neuro-MS  
monophasic magnetic  
stimulator (for paired  
pulse stimulation)**





**Neuro-MS monophasic magnetic stimulator (for quadri-pulse stimulation)<sup>4</sup>**



## Applications:

- the assessment of central and peripheral motor pathways in adults and children
- the evaluation of the cranial nerve functions
- the early diagnosis, assessment, prognosis and monitoring of multiple sclerosis, movement disorders, motor neuron diseases, spinal cord injuries, etc.

- the paired pulse stimulation to investigate neurotransmitter mechanisms in motor cortex, including pre/post-synaptic GABAergic ones
- inter- and intra-cortical interactions

- the quadri-pulse stimulation (QPS)

## Implemented Techniques:

- motor evoked potential (MEP)
- motor threshold (MT)
- central motor conduction time (CMCT)
- cortical silent period (CSP)
- transcallosal inhibition (ipsi-lateral CSP)
- paired associative stimulation (PAS)<sup>5</sup>
- short-latency afferent inhibition (SAI)<sup>5</sup>
- long-latency afferent inhibition (LAI)<sup>5</sup>
- triple stimulation test (TST)<sup>6</sup>

- short-interval intracortical inhibition (SICI)
- long-interval intracortical inhibition (LICI)
- intracortical facilitation (ICF)
- short-interval intracortical facilitation (SICF)
- long-interval intracortical facilitation (LICF)
- inter-hemispheric inhibition (IHI)
- thalamo-cortical inhibition (CBI) induced by cerebellar stimulation

- quadri-pulse stimulation (QPS)
- triple-pulse test (SICI/LICI, SICI/LICF)

<sup>4</sup> Neuro-MS configuration for quadri-pulse stimulation is not registered as medical equipment and can be used only for research purposes.

<sup>5</sup> If electrical stimulator is available.

<sup>6</sup> If 2-channel electrical stimulator is available.

# CUTTING EDGE EMG MACHINES



Neuro-MS can interface with EMG machines of most world-known manufacturers. If you have EMG device, you can definitely use it with our magnetic stimulator.

To work with TMS machines, Neurosoft offers 2-, 4-, 5- and 8-channel EMG systems with high noise immune hardware ensuring perfect signal quality. The delivery set includes high-performance accessories and professional Neuro-MEP.NET software that is in perfect synch with the device and manages the stimulation parameters.



	<i>Neuro-MEP-Micro</i>	<i>Skybox</i>	<i>Neuro-MEP</i>
EMG/EP channels	2	5	4/8
Electrical stimulation channels	1	2	1/2
Techniques in base delivery set	EMG	EMG, EP	
Design	<b>“All in one”</b> , stimulators, acquisition channels, controls, display		<b>Modular architecture:</b> connected USB modules are easily arranged at your workplace and make optimum confi- guration of your own
Operation with magnetic stimulator	If you purchase both Neurosoft EMG and TMS machines, you achieve maximum integration and scalability		



# EFFECT — IN PRECISION



## Coils

Together with Neuro-MS Neurosoft offers new generation coils of different sizes and shapes. You can choose any of them depending on the stimulation targets.

All models have enhanced ergonomics and are equipped with controls and positioning grid that maximizes the coil location precision.



## Comfort Chair

The special medical chair ensures comfort both for patient and trained personnel. Due to multiple adjustments of backrest and leg rest customized with several motors a patient can relax during the procedure. The chair also features easy maintenance and flexibility to personnel's needs including coil positioning.



## Navigation System

To find the treatment spot, the most clinicians use the anatomical landmarks. Due to individual skull anatomy such stimulation can often be inaccurate. Recently, there was developed a new technique that allows entering MRI data of a particular subject to computer before the stimulation session and perform MRI-guided stimulation using the 3D target markers on patient's brain rendering. Neuro-MS stimulators can be used together with such navigation systems.

# NEW DIAGNOSTIC OPTIONS

Nowadays, the transcranial magnetic stimulation is the only non-invasive method to assess neurotransmitter mechanisms in human motor cortex *in situ*.

With Neuro-MS stimulator you can assess the functional state of GABA<sub>A</sub> and GABA<sub>B</sub> receptors.

## Single Pulse Stimulation to Record MEP

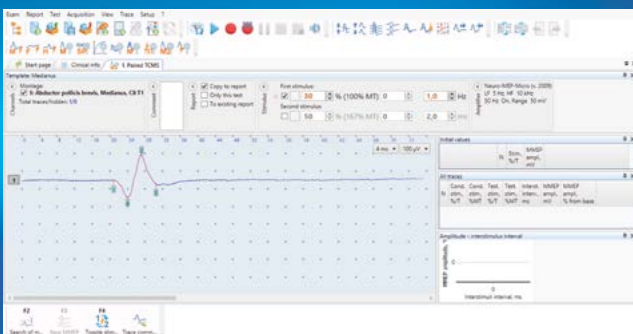
The recording electrodes placed on the peripheral muscle are plugged in the EMG machine. At that, the muscle representation in the motor cortex is stimulated with the coil. Thus, the motor evoked potential (MEP) is recorded. The study of the obtained waveform, its amplitude and latency allows estimating the state of the motor pathway starting from the cortex.

## Paired-pulse Magnetic Stimulation

Our Neuro-MS stimulator together with Neurosoft EMG device is a smart solution assigned to solve your diagnostic needs faster and easier! The Neuro-MEP.NET software has implemented standard protocol templates to assess the short-interval intra-cortical inhibition (SICI) and facilitation (SICF) and many others.

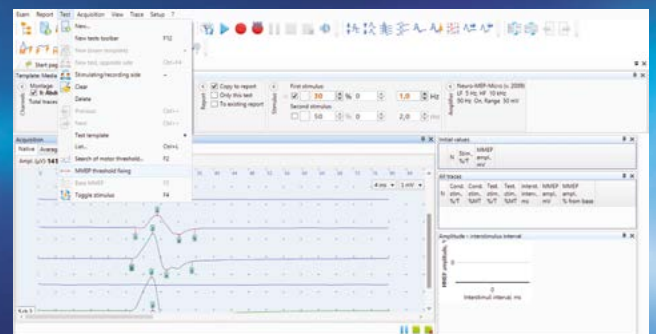
There's no need to remember the steps, just run the test and the software performs automatically all necessary steps and shows you results as tables and graphs.

Using the predefined protocol templates you can perform the tests **much faster:**



1

Record the motor evoked potential.



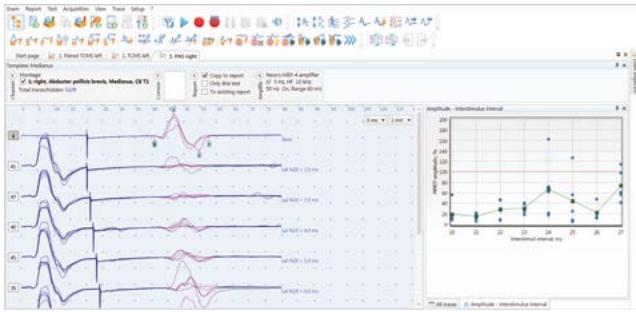
2

Determine the motor threshold. This value is used to calculate the intensity of conditioning stimulus (sub-threshold).

When Neuro-MS magnetic stimulator is used together with digital EMG and EP system, you can perform:

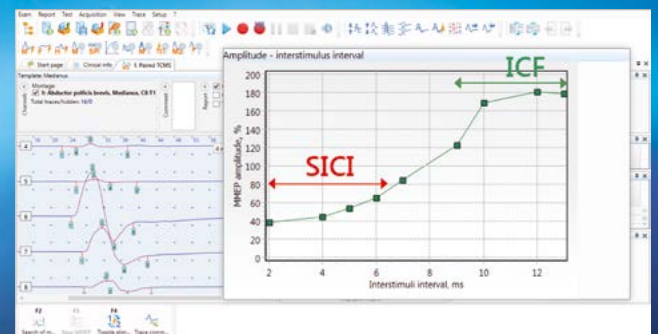
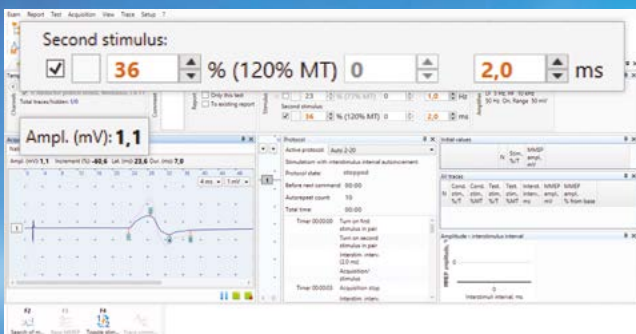
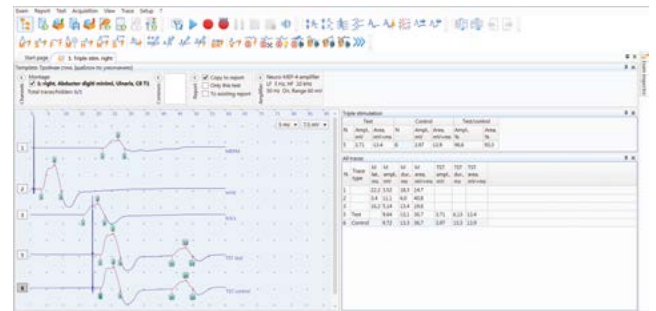
## Paired Associative Stimulation (PAS)<sup>7</sup>

The paired associative stimulation is intended to study the plasticity of motor cortex. The test assumes the use of two stimuli: 1 - the electrical stimulus is delivered to sensory fibers of target muscle nerve, 2 – magnetic one is delivered to muscle representation in the motor cortex.



## Triple Stimulation Test<sup>8</sup>

Owing to use of two collisions, the triple stimulation test avoids such disadvantages of conventional transcranial magnetic stimulation as variability of motor responses. Therefore, this test allows defining more accurately the relative number of axons which do not participate in the conduction by corticospinal tract.



3

Find the intensity of stimulus which evokes MEP of 1 mV amplitude. It is the testing stimulus intensity (supra-threshold) for the next steps.

4

Run automatic protocol. The software automatically delivers the pairs of stimuli with different inter-stimulus intervals (ISI). Finally, the software displays the graphs of response amplitude dependence on ISI.

<sup>7</sup> If electrical stimulator is available.

<sup>8</sup> If 2-channel electrical stimulator is available.

# PRODUCT LINE

## OF MAGNETIC STIMULATORS



Neuro-MS/D  
advanced  
therapeutic



Neuro-MS/D  
therapeutic



Neuro-MS/D  
diagnostic



Neuro-MS  
monophasic  
for paired pulse  
stimulation

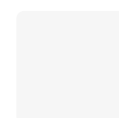
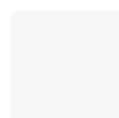
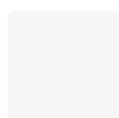
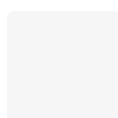


Neuro-MS  
monophasic  
for single pulse  
stimulation

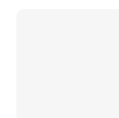
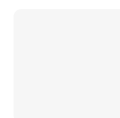
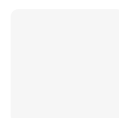
**Diagnostic TMS:**  
MEP, CSP,  
CMCT, MT<sup>9</sup>



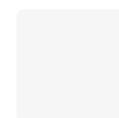
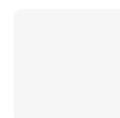
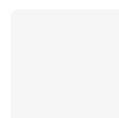
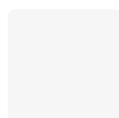
**Advanced diagnostic  
TMS:** paired stimu-  
lation, SICl, LICl, ICF  
(GABAergic  
mechanisms)<sup>9</sup>



**Therapeutic rTMS**



**Advanced thera-  
peutic rTMS**  
up to 100 Hz, TBS



<sup>9</sup> if EMG and EP system is available.



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