

MEP MONITOR User Guide



UK-edition



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At the time of printing this manual correctly described the device and its functions. However, as modifications may have been carried out since the production of this manual, the system package may contain one or more addenda to the manual. This manual including any such addenda must be thoroughly read, before using the device.

The following situations void any guarantee(s) and obligations for Tonica Elektronik A/S:

- The device is not used according to the enclosed manuals and other accompanying documentation
- The device is installed or modified by persons other than Tonica Elektronik A/S or other authorized service technicians

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Safety Information

Safety Requirements

The MEP Monitor is designed to be used as an accessory for MagPro Magnetic Stimulators. For further description regarding safety requirements: Please refer to the MagPro User Guide.

Environment

The devices have been designed for indoor use at room temperatures between +10°C to +30°C (from +50°F to +86°F).

Intended use

Magnetic stimulation is a non-invasive technique to be used under constant supervision by qualified medical personal, only on patients who are not anaesthetized and only for short term use.

The MEP monitor is a medical tool intended to assist in the electrophysiologic monitoring, description and evaluation of muscles, nerves and of structures in the central nervous system in normal and pathological conditions.

Contraindications

Do not use the equipment on patients with cardiac pacemakers, cochlear implants or other implanted electronic devices. Do not apply the magnetic stimuli to the head, neck or abdomen of pregnant women.

Adverse Reaction

Do not use this equipment for anything else than it is intended for by the manufacturer.

Interference

WARNING Electrical equipment for medical use requires special EMC precautions and needs to be installed and serviced according to the EMC documentation of the device.

WARNING Connection of a patient to a high frequency surgical equipment and to an EMG or evoked potential equipment simultaneously may result in burns at the site of the electrical stimulator or biopotential input part electrodes and possible damage to the electrical stimulator or biological amplifiers; operation in close proximity (for example 1m) to a shortwave or microwave therapy equipment may produce instability in the electrical stimulator output.

Introduction to Motor Evoked Potential

Magneto electrical energy, induced over a motor cortex area, introduces a change in the cell membrane potential of the pyramid cells, causes depolarization of cells and following the descending motor nerve pathways of the central nervous system, the result is a contraction of the related muscle. Using an EMG Amplifier, the Muscle Action Potential can be recorded and analyzed as a Motor Evoked Response (MER) or Motor Evoked Potential (MEP).

Assessment of Motor Evoked Potentials plays an important role in neurophysiology in diagnosis of ALS and MS. Furthermore, research with neuro modulation (e.g. as a possible augmentation therapy in neuro psychiatry) gives rise to the increasing need of an efficient and easy to use MEP monitoring technique, guiding and supporting the investigator in mapping of Motor Cortex and assessment of Motor Threshold (MT)

Symbols and Connections

Front Panel

A

See the accompanying documentation.

CAUTION Electric shock hazard. Do not remove cover. Refer servicing to qualified service personnel.



Stimulation Electrodes

The recommended electrodes to be used in ordinary investigations are:

IMPORTANT Do not connect any patient

electrode to the protective earth connection on the rear panel of the Power Supply Unit or to

any other "earth/ground" connections, as the electrode inputs are galvanically isolated.

9013C014_ 9013S024_ Electrode Cable Disposable Electrode

9013S021_ Disposable Reference Electrode

→∏ Trig in/Trig out →∏

COM2 COM2 Serial port

Amplifier socket including Patient ground

Loudspeaker output (located on the side of the unit)

Storage temperature range. Packaging label

SN xxx Serial Number.

P/N Part Number



- \mathbb{P}

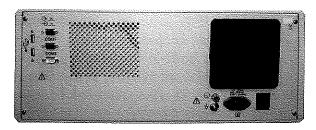
The device complies with the EC directive 93/42/EEC on medical device.

Installation

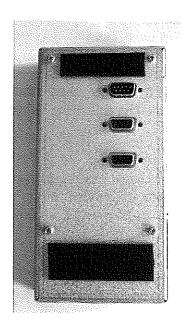
First make sure that the software version of the MagPro supports MEP – must be software version 3.21 or higher. The software version is displayed in the Configuration Menu in the Information Version field. Alternatively, the software version is listed during startup.

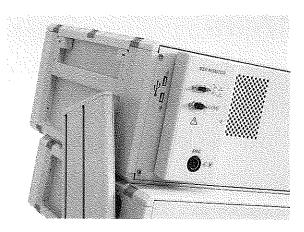
Installing the MEP Monitor

- Power off the MagPro and disconnect the power cord from the equipment.
- On the back of the MagPro there are three connectors (Trig in/out, COM1 and COM2) at the left side (seen from the back side).



Remove the protective tape from the Velcro strips on the back of the MEP Monitor. Align the MEP Monitor's backside with the three connectors on the MagPro and then press firmly to connect the MEP Monitor.





- Connect the power cord to the MagPro and switch the power on. When the MagPro is up and running, the MEP Monitor is automatically detected and MEP features are available.
- Connect the patient electrode cable (DIN connector) to the MEP connector in the MEP Monitor.



The Trig in/out and COM2 connector are available on the front side of the MEP Monitor.

Menu

If the MEP Monitor is attached to the MagPro during power-up, the *MEP softkey* is available in the Configuration Menu:

Analiste 0 %	A/us	A			
Enabled	⁰⁰¹ 6₩₩₩ 25°C	C4475944 C-B60	Joseph Simuli 100000		
A (18) (4) (5)		Contraction Means			
Size i Persikherin Size i Persikherin Size i Steric Limet O'rettam Size i Steric Limet Size I Steric Friego Pirur Limet O'rettam Friego Pirur Limet O'retam Friego	2 Separation 5 Sep	Save Setup Charge Datay Auto Discharge Tare Language Prior Warning Sorand Coli Type Display Information	9 mase 6 mm English On On Version		

Press the MEP softkey and the MEP Menu appears:

Ampflide 0 %	Resized d/dl A/US	1 ms/div		
Enabled	Cult Temporetary 25°C	C-B60	Aredoble Simuli 100000	
±250¢ α:	S S Victor	WEIGHT TO SEE		
		Time Base	Smath S	
<u> </u>		Sensitivity	5 mV/div	
[]		Panning	0 ms	
		Curve No	1	
		Common Baseline	Oll	
romonar A	parage of a paragraphy and a superior construction	Lower Frequency Limit	20 Hz	
1		Upper Frequency Limit	10 kHz	
		Trigger Mode	Stimulus	
V		Display Size	Ful	
		Stay On Top	Off	
Exit	rial.evel Ampl	Cursor Time Curs	or Average	

Each time a stimulus is fired; the MEP Monitor collects 100 ms of data and updates the curve display with the new data using the settings chosen at the right. Up to 10 curves are collected.

The Time Base controls the time display of the curve field to the left. Possible values are:

- 1 ms/div
- 2 ms/div
- 5 ms/div
- 8 ms/div
- 10 ms/div

The Sensitivity controls the amplification of the MEP Monitor and the gain of the displayed curve on the left. Possible values are:

- 100 μV/div
- 200 μV/div
- 500 μV/div
- 1 mV/div
- 2 mV/div
- 5 mV/div
- 10 mV/div

The Pan controls panning along the time axis of the curve. This can be used to select a short time base (1 ms/div) and then panning through all 100 ms of collected data.

The Curve No controls switching between the different collected curves. In the top right corner the current curve number is listed. It is possible to select all curves to be shown at the same time with a vertical offset.

The Lower frequency Limit controls the High Pass filter cut-off frequency used during sampling of the signal. The following values a possible:

- 1 Hz
- 2 Hz
- 5 Hz
- 10 Hz
- 20 Hz
- 50 Hz
- 1000 Hz

The Upper frequency Limit controls the Low Pass filter cut-off frequency used during sampling of the signal. The following values a possible:

- 1 kHz
- 2 kHz
- 5 kHz
- 10 kHz
- 20 kHz

Trigger Mode controls how to collect data. Two modes are possible:

- On stimulus
- Level

In On Stimulus mode (default), data is collected when a stimulus is fired. In Level trig mode, it starts to look for the selected trig level when a stimulus is fired and the signal level matches or is above the selected trig level (controlled by softkey 2). If the signal level does not reach the selected trig level within the first 50 msec, then data is collected at this time and the Curve No counter on the display is set to 0 indicating that trig did not occur with the 50 msec after the stimulus was fired.

In the *Level trig mode*, it is only possible to display one curve at the time. Therefore the Curve No line is grayed.

Display Size controls the size of the curve display to the left. Possible values are:

- Full
- Reduced

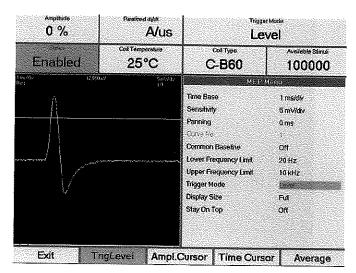
The reduced size leaves space at the bottom of the curve display for displaying the progress bar on the *Timing Menu*.

Amplitude 0 %	Resilted divid A/US	Timing Corbot Sequence			
	cos Temperature 25°C	сытурь С-B60	Availeble Semuli 100000		
in-16	100-1475				
Λ		Timing Control	Sequence		
, i		Rep.Rate	брря		
/ }		Pulses in Train	5		
		Number of Trains	3		
		Inter Train Interval	2 sec		
10:00:00 Elapsed time: 80	190,00 08.60.06	5-12-2-2-2			
Defined Number of Stimut Trains left:	16 8				
Main Co	onfigure Pro	locol I	Start		

Stay On Top controls whether the MEP curve display should be visible only on this MEP Menu page or if it should be shown also on other pages. Possible values are:

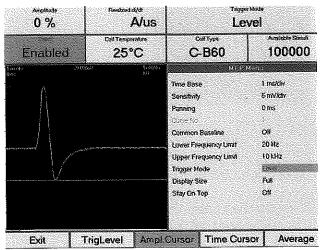
- On: MEP cursor display visible on other pages.
- Off: MEP cursor display only visible on MEP Menu Page.

The *Trig Level softkey* controls the trig level at which the MEP Monitor starts collecting data. Both positive and negative trig levels are possible.



To disable the *TrigLevel* cursor, press the *TrigLevel* softkey again.

The Ampl.Cursor softkey enables a set of amplitude cursors on the curve display:



When the *Ampl.Cursor* softkey is highlighted, two amplitude cursors are displayed and their positions are controlled with the right wheel for moving a cursor and up/down arrow keys for selecting which cursor.

To disable amplitude cursor control, press the *Ampl. Cursor* softkey again.

The *Time Cursor* softkey enables a set of time cursors on the curve display:

Amplitude 0 %	Redized d/dt A/US	Trigger Mode Level		
Enabled	Cull Terripler eturé 25°C	C-B60	Available Stimul) 100000	
1200 1	90 \$ 49.462 171	MLD Menu		
		Timo Base	1 ms/dly	
		Sensitivity	6 mV/div	
		Panning	0 ms	
		CUNE No		
		Common Baseline	011	
	gyaggi kiyatoon saariigaa iiri sa saasatii a saasatii iiri	Lower Frequency Limit	20 Hz	
		Upper Frequency Limit	10 kHz	
		Trigger Mode	Level	
V		Display Size	Full	
		Stay On Top	Off	
Exit	rigLevel Ampl	Cursor Time Curs	or Average	

When the Time Cursor softkey is highlighted two times, cursors are displayed and their positions are controlled with the right wheel for moving a cursor and up/down arrow keys for selecting which cursor.

To disable time cursor control, press the *Time Cursor* softkey again.

The Average softkey displays an average curve on the screen, when several curves are displayed (only possible in On Stimulus trig mode).

Anphide 0 %	Padized dijol A /US	Curve No. 1-5			
Enabled	Out Temperature		olType -B60	Availeble Stimuli 100000	
Emvilo Per	5 el V/4v 15/5	MED Menu			
		Time Base Sensitivity Paining Curre No Common Baseline Lover Frequency Limit Upper Frequency Limit Trigger Mode Display Size Stay On Top		1 ms/dlv E mt/(tlv 0 ms 1-25 Off 20 Hz 10 kHz Silmulus Ful	
Exit T	rigLevel Ampl.	Cursor	Time Curso	r Average	

When the average curve is displayed, the other curves are grayed.

To disable the average curve display, press the Average softkey again.

NOTE: When the MEP Menu is entered, a 100 msec Charge Delay (see Configuration Menu) is automatically added. This is removed when the MEP Menu is left again. This delay is added to avoid interference from the charge system on the collected MEP curve.

Technical Data

Dimensions

(HxWxD:) 184 x 94 x 40mm

Weight

0.7kg

Number of Inputs

1 input protected against electrostatic discharge. Balanced inputs. 1 pc. 5-pol DIN 240° connector for electrode cable (Pin 1 and 2:

Electrode input, Pin 5: Patient Ground)

Sound

Output for external loudspeaker, 3.5mm jack

Patient Safety

EMG channel galvanically isolated 1.5 kV RMS

Input Impedance

200 M Ω // 100 pF (balanced), >1000 M Ω // 50 pF (common mode)

Noise Level

Typical 0.6 μVrms at bandwidth 2 Hz to 20 kHz and shorted input

Common Mode Rejection Ratio

From surface electrode, through cable and amplifier: >55 dB.

Direct: >100 dB

Isolation Mode Rejection Ratio

From input to power ground: >160 dB 100, 200, 500 µV/Div, 1, 2, 5, 10 mV/Div

Sensitivity Factors
Time Scales

1, 2, 5, 8, 10 mS/Div

Trigger Mode

Level, Autotrig on stim

Lower Frequency Limits (-3dB): DSP

1, 2, 5, 10, 20, 50, 100 Hz,

Upper Frequency Limits (-3dB): DSP

1, 2, 5, 10, 20 kHz,

Anti Aliasing

20 kHz (-3 dB), 1st order

Sample Rate

100 ks/s, 16 bit

Temperature and humidity

Operating Temperature: 10 – 30°C Operating Humidity: 30-60 % RH

Storage Temperature: 0 – 50°C Storage Humidity: 20-80 % RH

Connections

Trigger Connector:
DSUB 9 pin Female
Pin 1: Trigger Input
Pin 2: Trigger Output
Pin 3: Ground. (Reference)

Trigger Input:

Pulse width > 5µs

TTL + CMOS levels accepted Input Impedance > 10kOhm Polarity: User Defined

Default: Falling

Trigger Output:

Pulse width: 30µs

TTL-levels

Output Impedance < 2000hm

Polarity: User Defined Default: Falling

Delault. 1 a

PC-style: COM2

DSUB Connector 9 pin Male Standard RS232 connectivity

Accessories

Serial Port

Recommended accessories from MagVenture:

Pre-gelled surface electrode 9013S021_ Electrode cable 9013C013_/9013C014_