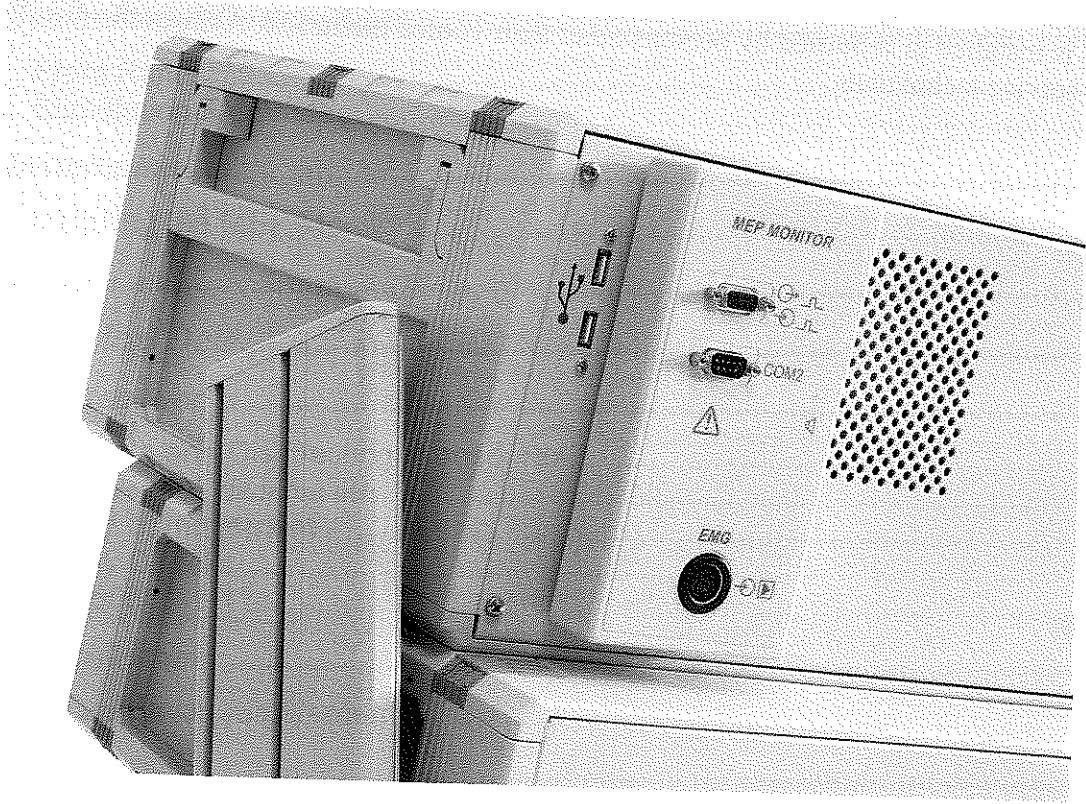




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# MEP MONITOR

## 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*

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## **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.

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## **Environment**

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

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## **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.

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## **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.

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## **Adverse Reaction**

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

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## **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).

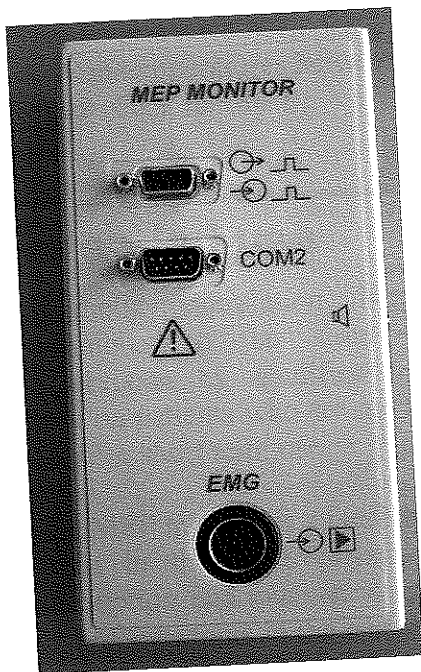
Assessment of Motor Evoked Potentials plays an important role in neurophysiology in diagnosis of ALS and MS. Furthermore, research with neuro modulation (e.g. as a possible augmentation therapy in neuro psychiatry) gives rise to the increasing need of an efficient and easy to use MEP monitoring technique,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


# Symbols and Connections

## Front Panel


 See the accompanying documentation.


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




 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



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

**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.

## Stimulation Electrodes

The recommended electrodes to be used in ordinary investigations are:

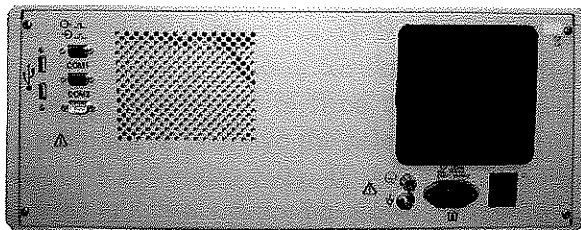
- 9013C014\_ Electrode Cable
- 9013S024\_ Disposable Electrode
- 9013S021\_ Disposable Reference Electrode

# Installation

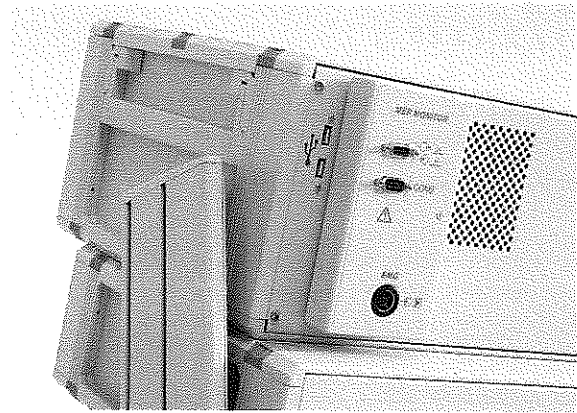
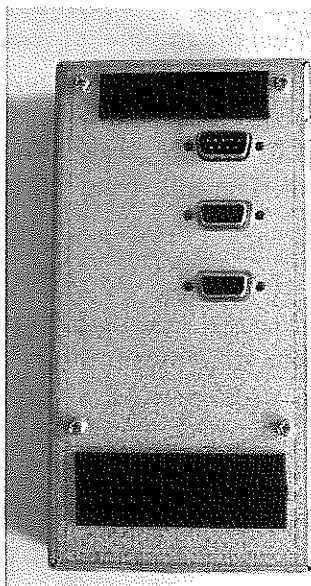
First make sure that the software version of the MagPro supports MEP – must be software version 3.21 or higher. The software version is displayed in the Configuration Menu in the Information Version field. Alternatively, the software version is listed during startup.

## 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.





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

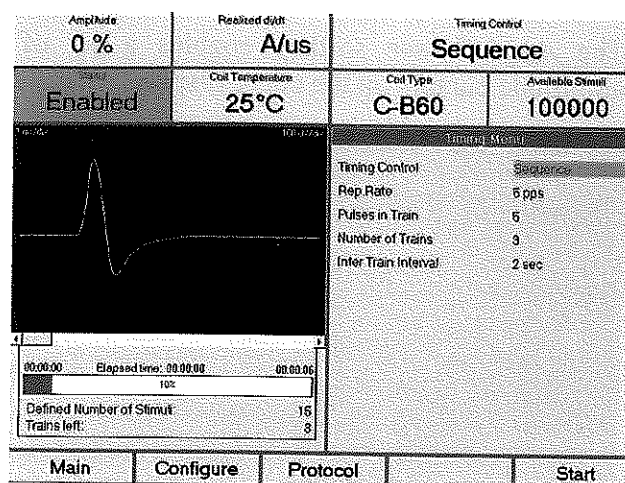
In *On Stimulus mode* (default), data is collected when a stimulus is fired. In *Level trig mode*, it starts to look for the selected trig level when a stimulus is fired and the signal level matches or is above the selected trig level (controlled by softkey 2). If the signal level does not reach the 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 within 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

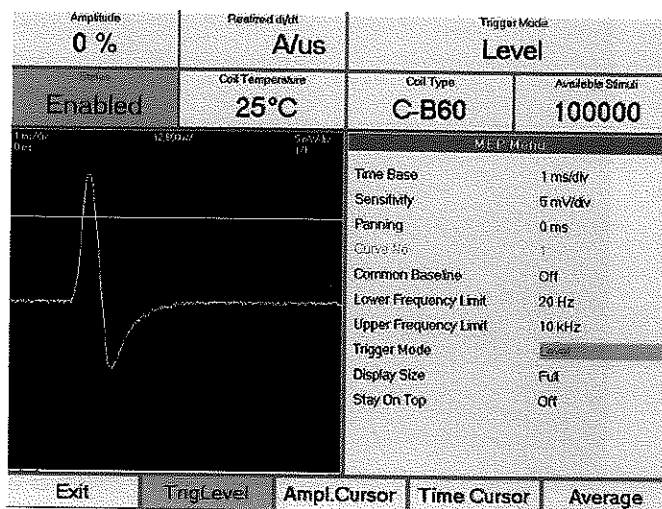
The reduced size leaves space at the bottom of the curve display for displaying the progress bar on the *Timing Menu*.



*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:

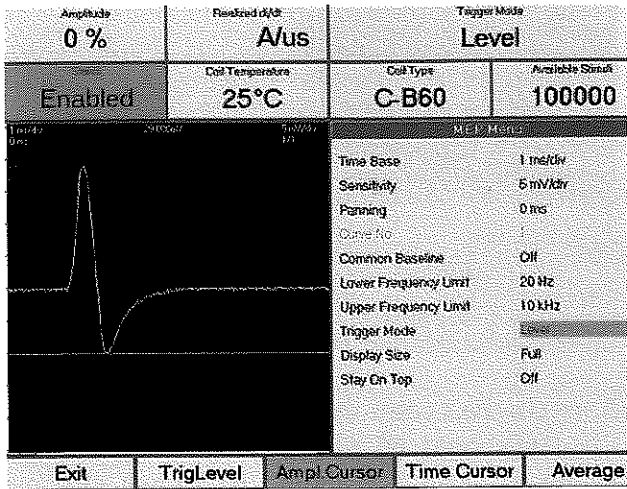
- On: MEP cursor display visible on other pages.
- Off: MEP cursor display only visible on MEP Menu Page.

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.

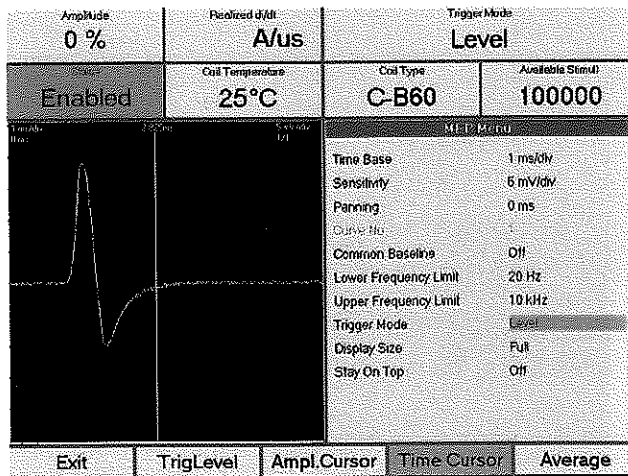
The *Ampl.Cursor* softkey enables a set of amplitude cursors on the curve display:



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.

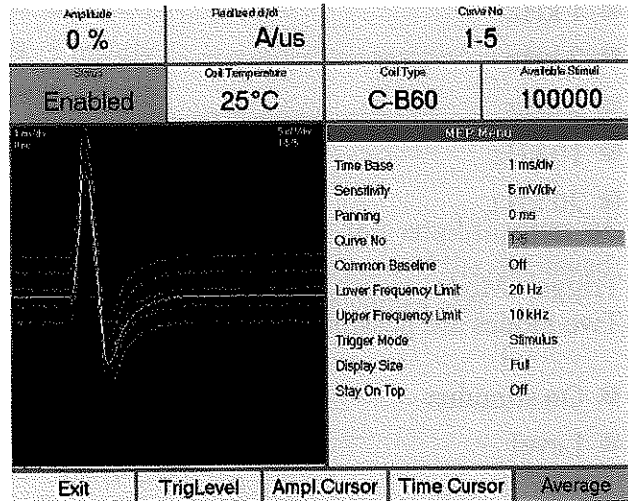
The *Time Cursor* softkey enables a set of time cursors on the curve display:



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).



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 $\Omega$ // 100 pF (balanced), >1000 M $\Omega$ // 50 pF (common mode)
Noise Level	Typical 0.6 $\mu$ Vrms 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
Sensitivity Factors	100, 200, 500 $\mu$ V/Div, 1, 2, 5, 10 mV/Div
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), 1 <sup>st</sup> 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 > 5 $\mu$ s TTL + CMOS levels accepted Input Impedance > 10kOhm Polarity: User Defined Default: Falling  Trigger Output: Pulse width: 30 $\mu$ s TTL-levels Output Impedance < 200Ohm Polarity: User Defined Default: Falling
Serial Port	PC-style: COM2 DSUB Connector 9 pin Male Standard RS232 connectivity
Accessories	Recommended accessories from MagVenture: Pre-gelled surface electrode 9013S021_ Electrode cable 9013C013_/9013C014_