NIHON KOHDEN

NEUROLOGY

EEG | EMG | IOM | PSG

MEB-9400 EMG/EP measurement system

Product Features & Technical Data

Neuropack S1

PRODUCT FEATURES

General

The Neuropack MEB-9400 EMG/EP Measuring System is designed to measure EMG, electric/auditory/visual evoked potential and nerve conduction in a clinical environment.

Fields of application are:

- Clinical neurophysiology
- Monitoring on intensive care units incl. brain death diagnostic

Typical configuration of MEB-9400 for clinical use:

- Main unit incl. Control panel
- Shuttle PC with minimum
  - Intel i3 / 3.3 GHz CPU
  - 4 GB RAM
  - 1 TB HDD
- 2 channel amplifier
- 1 electrical stimulator
- TFT screen
- Accessories for EMG, Nerve Conduction, ABR, and VEP
- Software package for EMG/NCS/SEP/AEP/VEP
- Polaris.one database
- Cart with integrated isolation transformer
- Printer

Typical configuration of portable MEB-9400:

- Notebook with minimum
  - Intel i5-3210M, 2.5 GHz CPU
  - 4 GB RAM
  - 320 GB HDD
- 2 channel amplifier
- 1 electrical stimulator
- Accessories for EMG, Nerve Conduction, ABR, and VEP
- Software for EMG/NCS/SEP
- Polaris.one database
- Dedicated suitcase for easy transportation

(For details of the composition in regards of standard and optional equipment please see technical data section)

Low noise, compact amplifier

The thin and compact electrode junction box provides mobility for use anywhere such as ward, examination room, office, and laboratory. Its low noise amplifier speeds up the examination by giving you clean waveforms easily and quickly. Integrated impedance check, which can be activated directly at the input box, ensures reliable placement of electrodes.

User friendly control panel

The simple and easy-to-use control panel allows smooth examination. You can change the electric stimulation duration and rate with easy, one-touch operation. The big main operation buttons <Monitor - Stimulate - Analysis - Stop> of the Neuropack series have been proven in many previous product generations.

Multi tasking window

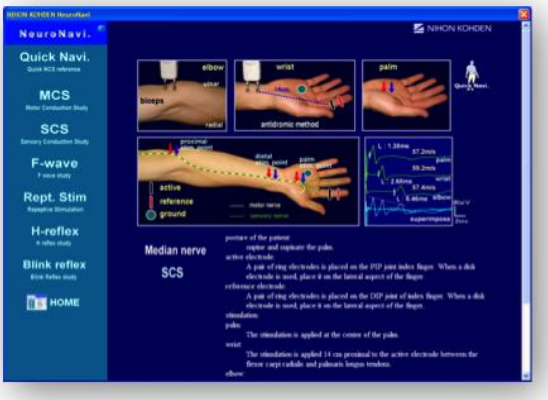
Up to 12 test protocols can be open simultaneously making it easy to switch back to previous steps of the examination series.

Reporting

NeuroReport is the new common reporting tool for all EEG, EMG, and IOM systems from Nihon Kohden. Various predefined templates can be used to create customized reports for different examination types, physicians or other criteria. A powerful auto-text function helps to create individual reports. Saved within the database in a license free format, the reports will be automatically converted into PDF after finalizing. This prevents those important medical documents from being tampered with and makes them available in a universal software format as well.

NeuroNavi

NeuroNavi on-screen examination guide shows examination information, electrode, stimulation positions for NCS and other examinations. By including technical and physiological background information, NeuroNavi goes way above the typical obligatory operation manual.
Onscreen operation manuals are also available. You can refer to Neuropack NeuroNavi and operation manuals anytime.



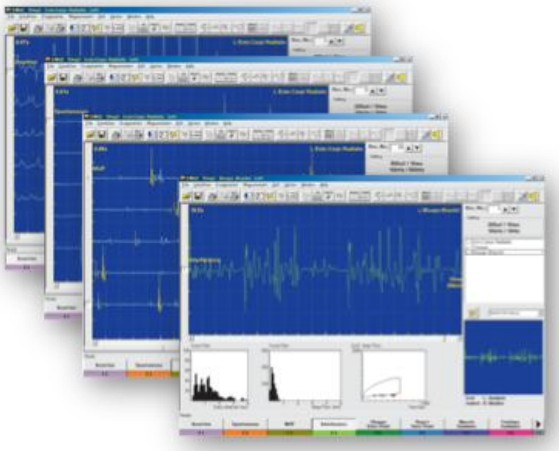
STANDARD EXAMINATION PROGRAMS

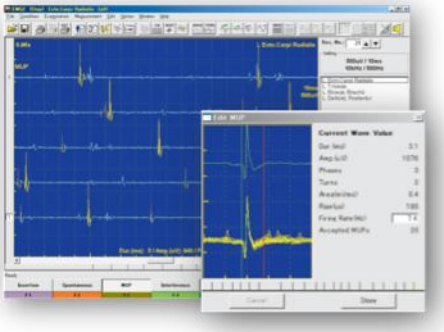
EMG examination program

The routine EMG program utilizes auto MUP detection and classification, and real time turns/amp analysis. A functional and sophisticated findings screen meets various needs in clinical use by easy and smooth operation.

Quick Display

You can easily switch between 4 measurement modes that you can define freely – for example for insertion activity, motor unit detection or turn / amplitude analysis or interference – by pressing a button at the bottom of the screen or on the control panel.



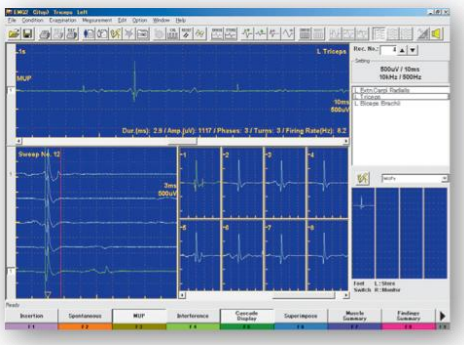


MUP

MUP waveforms are automatically detected and classified into groups of similar shaped MUPs. MUP measurement result (Duration, Amplitude, Phase, Turns and Firing Rate) are shown next to the waveforms or in a dedicated summary screen.
The averaged MUP of the same MUP groups are calculated and displayed with the numeric data.

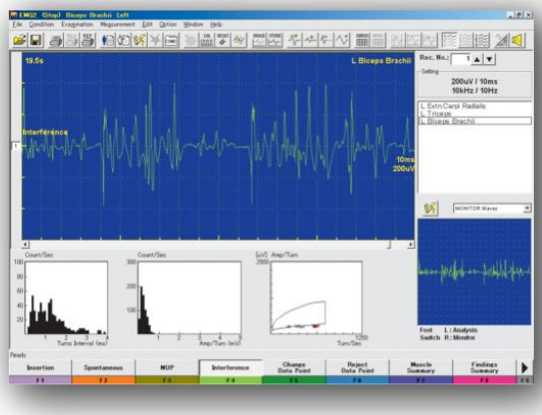
Trigger EMG

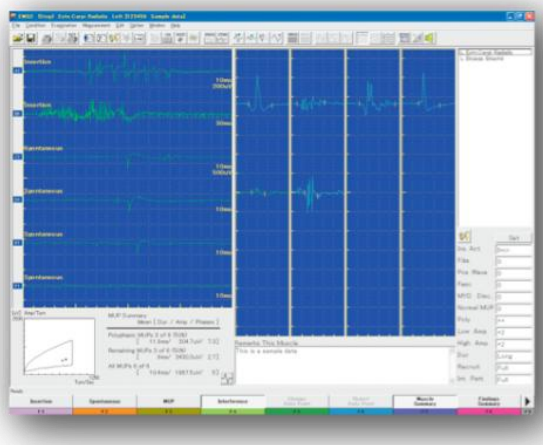
A cascading waveforms window displays the waveforms which are triggered by either level trigger, window trigger or rise time trigger in chronological order. You can change the duration (beginning and ending point). Up to new 8 sequential MUP waveforms are displayed on the MUP sweep window without scrolling.
You can easily select the waveforms just by the use of a button.



Interference

Turns/amp measurement is automatically performed. The measurement result at every one second is displayed on the Turns-interval histogram, turns/amp histogram and turns/amp graph.
The turns/amp normative data of several muscels are installed as default settings and its normative area is displayed in the turns/amp histogram. You can easily recognize whether or not the measuring waveforms are in the normative range.





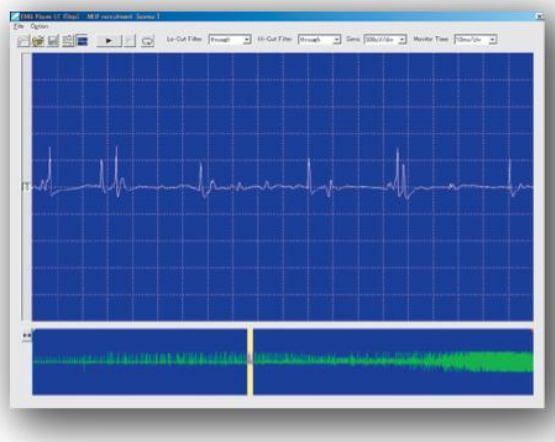
Muscle summary

Measurement results and saved waveforms can be displayed in the muscle summary window.
The summary window is the best place to start typing the EMG findings – right next to the results of the examination. The latest EMG findings screen shows up to 26 traces of waveforms with annotations in the MONITOR Waves window and up to 20 MUP waveforms in the MUP window on one screen for efficient and quick EMG findings.

EMG Playback Software

You can also easily review any acquired waveform with sound after measurement by clicking the EMG player button. This tool lets you also play back EMG files with sound on a review stations for presentations and lectures.

- EMG file moving display with EMG sound, up to 300 seconds
- Sweep speed, sensitivity, and filter settings can be changed afterwards; a great function for teaching purposes
- Compressed/cascaded waveform display

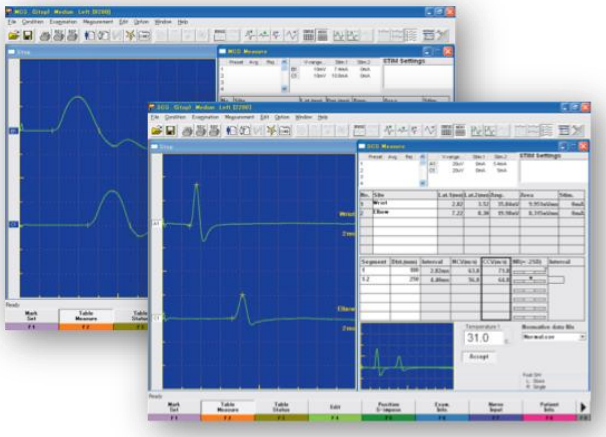


NERVE CONDUCTION STUDY (NCS)

The NCS program lets you perform MCS, SCS and F-Wave in one program. Up to 42 examinations can be created in your own custom routine protocol by selecting nerve, side and exam. You can change the examination by just clicking the item in the list box, or by clicking a button on the dedicated operation panel.

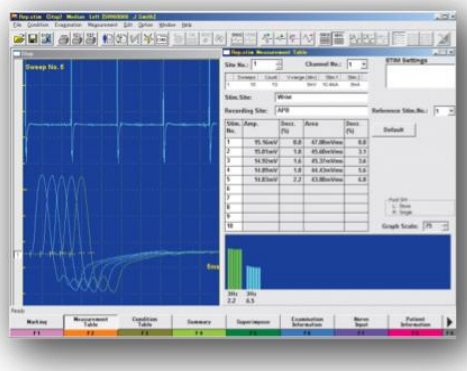
Motor NCS / Sensory NCS

- When measuring with the MEB there is no need to manually pick the stimulation site before starting the recording. The software does this automatically for you and, if necessary, it can be easily changed.
- Normative data are shown on the same screen.
- The superimposed waveform in real time is shown at the same time, so you can easily compare the amplitudes of all stimulation sites and thus judge the quality of your stimulation.

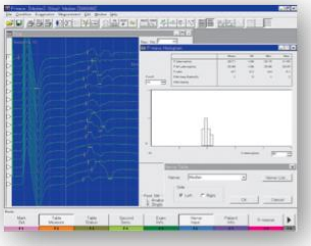


Repetitive Stimulation

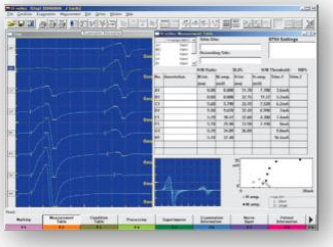
- The amplitude of each sequence is displayed as a bar graph on same screen. You can see the summary of Repetitive Stimulation study at a glance. The waveform of each sequence can be displayed by clicking the corresponding bar graph.
- Up to 12 sequences of stimulation patterns can be set for one automatic measurement (Automatic sequence function).
- Stimulation can be done with either high or low frequency or combined in the same protocol.



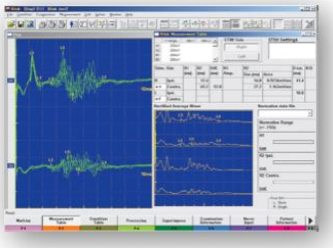
F-Wave / H-Reflex / Blink-Reflex



F-Wave:
With the Dual Sensitivity function, both M- and F-wave are displayed with a proper amplification. F-Wave latency is displayed in the F-Wave histogram window.



H-Reflex:
The intensity-amplitude graph and superimposed waveforms are displayed on the same window.

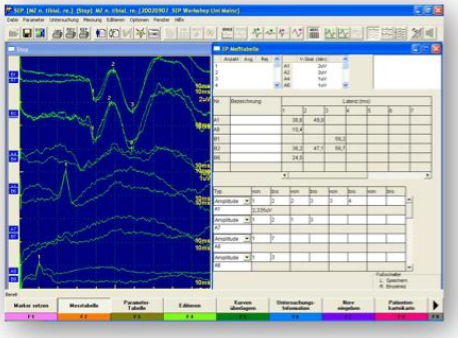


Blink-Reflex:
The relation between the mark position and the normative range is easy to see on the Blink Measurement Table window.

SEP

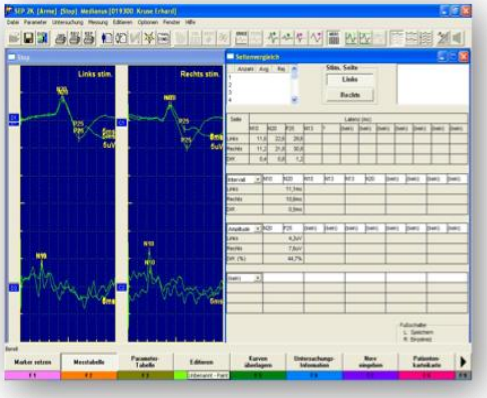
Standard SEP examination protocols are:

- SEP (somatosensory evoked potential)
- SSEP (short-latency SEP)
- ECG-SSEP (ECG-triggered SSEP)
- ESCP (evoked spinal cord potential)



ECG artifact-free SSEP

With ECG-SSEP protocol, stimulation and averaging is done during the flat period of the ECG waveform so artifact-free waveforms can be recorded.



Signal triggering and back averaging

Cortical potentials prior to muscle contraction can be recorded by using a rectified EMG signal trigger and back averaging.

Simultaneous SSEP and SEP measurement

Upper and lower extremity measurements can be conducted at the same time on the same screen.

Side comparison

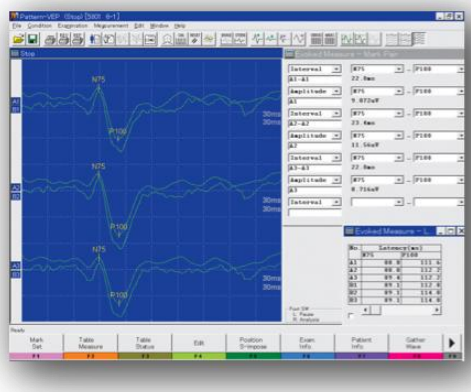
Split screen display allows for side comparisons on a glance.

OPTIONAL EXAMINATION PROGRAMS

VEP

Standard VEP examination protocols are:

- Pattern-VEP
- Goggle-VEP
- Flash-VEP
- ERG (Electroretinogram)
- EOG (Electrooculogram)



Flexible pattern stimulations

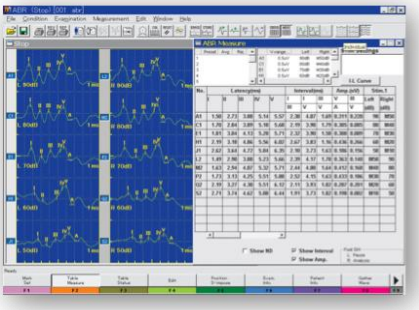
Pattern reversal stimulation can be selected from full, half, and quarter visual field.
4 to 128 horizontal divisions can be selected for patterns.

Variety of visual stimulations

A monitor for pattern reversal, LED goggles and flash stimulator options allow complete visual testing.

EOG velocity waveform display

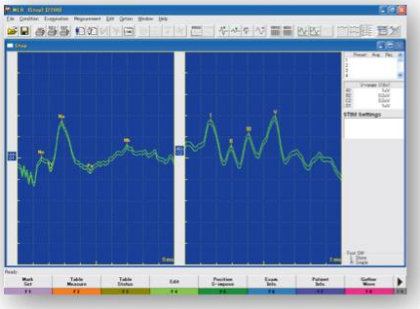
With the integrated differential amplifier, the velocity waveform can be simultaneously displayed with the original EOG signal.



AEP

Standard AEP examination protocols are:

- ABR (auditory brainstem response)
- MLR (middle latency response)
- SVR (slow vertex response
- EcochG (Electrocochleogram)



3 types of auditory stimulation

Click, tone burst, and tone pip stimulation are available.

ABR auto marking

In the ABR protocol, automatic waveform marking allows time saving measurement of latency, amplitude, and interval.

Automatic separation of AP and CM waveforms

In EcochG examination, AP and CM can be automatically separated from the original waveforms in real time. The original, AP and CM waveforms are simultaneously displayed on the screen.

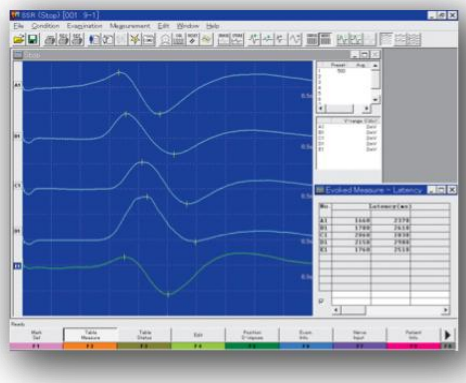
Simultaneous ABR and MLR

ABR and MLR can be measured simultaneously on the same screen.

Autonomic Nerve System Testing

Available examination protocols are:

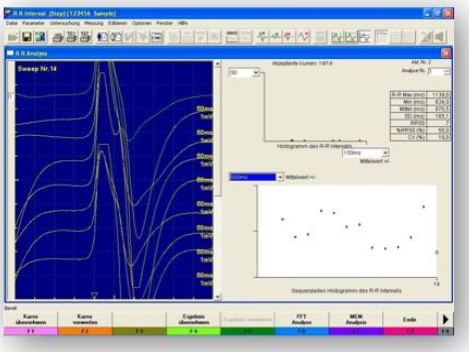
- Microneurography
- R-R Interval
- SSR (sympathic skin response)



Microneurogram

A microneurogram is recorded by inserting a microelectrode directly into the sympathetic nerve

- Up to 600 second 16 channel recording can be temporarily saved.
- Evoked waveforms with electric, auditory or visual stimulation can be averaged.



R-R interval

For the heart rate variability testing the rate variations can be evaluated by either FFT or MEB analysis additionally to the classic sequential evaluation.

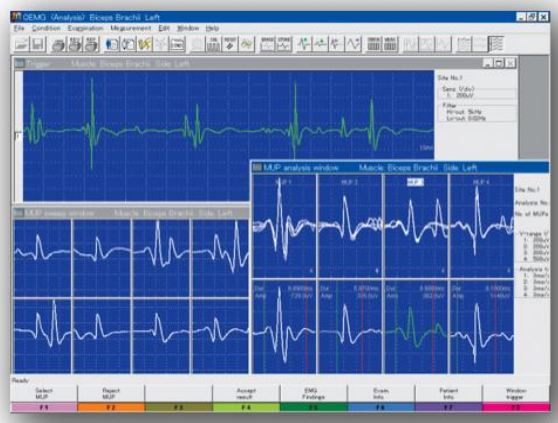
SSR

SSR measures potential change of the skin which is evoked by somatosensory, auditory or visual stimulation. Up to 9999 evoked waveforms can be temporarily saved in memory.

QUANTATIVE EMG (QEMG)

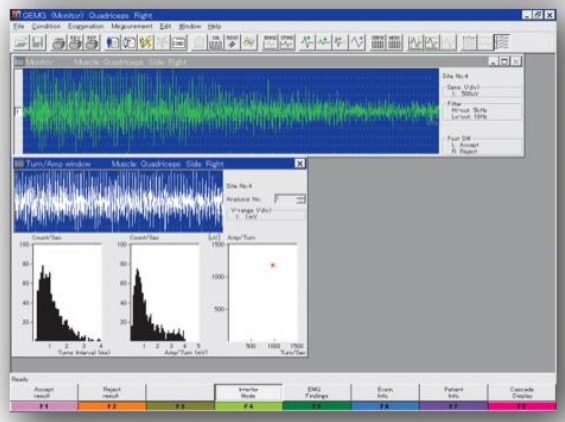
Real-time MUAP analysis

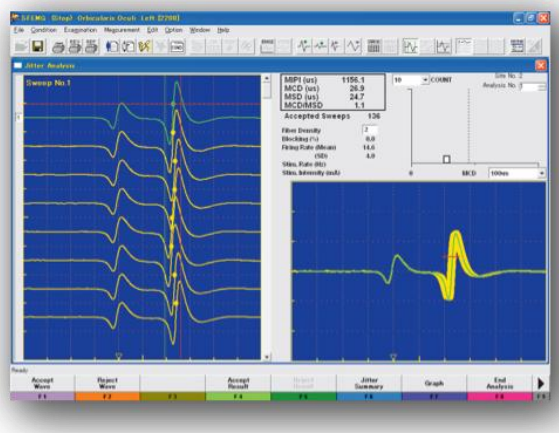
With the template matching method, MUAP are automatically classified into several patterns and the amplitude, phase, turns, area, rise time and firing rate are quantitatively analyzed in realtime. There are two methods of analysis: triggered and continuous. The analysis results can be statistically processed.



Real-time interference pattern analysis

Interference patterns can be analyzed in two ways: turns/amp analysis and power spectrum analysis with FFT.





SINGLE FIBRE AND MACRO EMG

Single fiber jitter analysis

Jitter reanalysis is possible at different trigger levels for all acquired waveforms. MCD, MSD, MIPI, firing rate and blocking can be automatically analyzed. Two single fiber modes are available: voluntary contraction and stimulated.

8 channels of Marco EMG

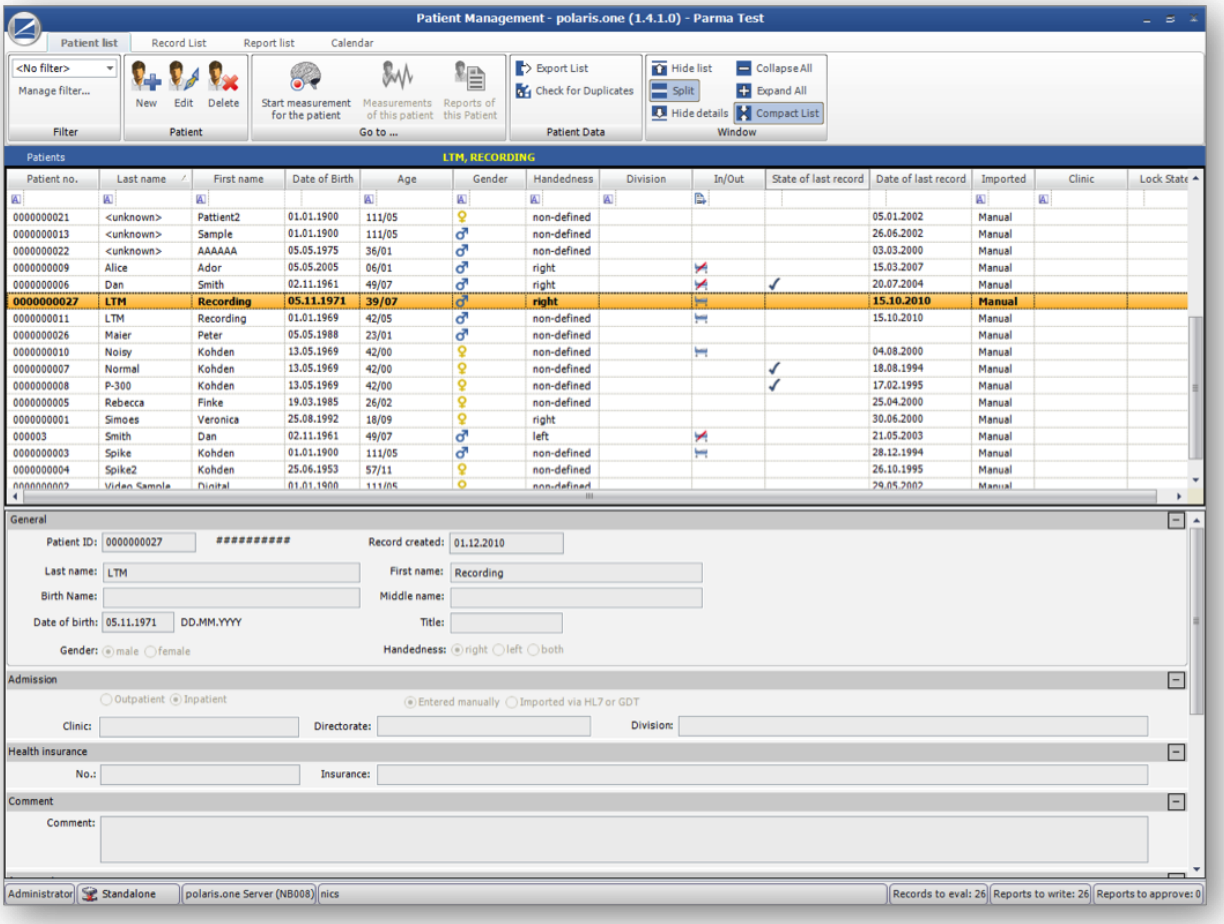
Simultaneous 8 channel macro EMG recording is possible. Acquired waveforms can be reanalyzed. Triggered waveforms and averaging result can be simultaneously displayed.

DATA INTEGRATION AND MANAGEMENT

Polaris.one

Polaris.one allows you to easily manage data and examination schedules.

- SQL based database for EEG, EMG/EP, and ECG data
- Connection to Hospital Information System via HL7 interface
- Calendar view and to-do lists
- Copies of data can be stored for personal or global use while still being managed by the database
- Auto-proposing for text input fields
- Manual, semi-automatic, and automatic transfer and archive as background service
- Integrated NeuroReport, featuring a multitude of templates for all examinations
- Offline functionality for acquisition and review stations, making your workflow immune against network communication losses at any time
- Multi-client-capability with user-related filtering of patients
- Extensive user rights management (via groups)
- Activity log records all changes to medical data
- Integrated DVD/CD burning



TECHNICAL DATA

AMPLIFIERS

Number of channels:	2
Input impedance:	200 MΩ ±10% (Differential mode), ≥ 1000 MΩ (Common mode)
Noise:	< 0.6 µVrms or less at 1 Hz to 10 kHz with input shorted
Common mode rejection ratio:	≥ 106 dB (Balanced mode), ≥ 112 dB (Isolation mode)
Sensitivity:	1, 2, 5, 10, 20, 50, 100, 200, 500 µV/div, 1, 2, 5, 10 mV/div ±5%
Low-cut filter:	0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200, 500 Hz, 1, 2, 3 kHz at 6 dB/oct (±20%)
High-cut filter:	10, 20, 50, 100, 200, 500 Hz, 1, 1.5, 2, 3, 5, 10, 20 kHz at 12 dB/oct (±20%)
AC interference notch filter:	50 or 60 Hz (Rejection ratio: < 1/20)
Amplitude calibration:	1, 10, 100 µV, 1, 10 mV (within ±5%)
Electrode impedance check:	2, 5, 10, 20 kΩ indication (within ±20%)

AVERAGER

A/D converter:	16 bits
Conversion speed:	10 µs/channel max.
Monitor time base:	5, 10, 20, 30, 50 ms/div, 0.1, 0.2, 0.5, 1 s/div (within ±5%)
Analysis time base:	With a list box: 0.1, 0.2, 0.5, 1, 2, 3, 5, 10, 20, 30, 50 ms/div, 0.1, 0.2, 0.5, 1 s/div (within ±5%) With a keyboard: 0.1 to 0.9 ms in 0.1 ms steps (within ±5%) 1 to 99 ms in 1.0 ms steps (within ±5%) 100 to 1000 ms in 10 ms steps (within ±5%)
Time base modes:	Individually selected for each channel
Number of averages:	1 to 9999
Artifact reject inhibit range:	±1, ±2, ±3, ±4 to ±5 div on screen or off (No artifact rejection)

STIMULATOR COMMON FUNCTIONS

Trigger mode:	Recurrent, Random, Foot switch, Signal, External, Somato1
Trigger wave mode:	Single, Double, Train
Stimulation rate:	With a keyboard: 0.1 to 100 Hz in 0.1 Hz steps (within ±5%) With a list box: 0.1 to 0.9 Hz in 0.1 Hz steps (within ±5%) 1 to 10 Hz in 1 Hz step, 13, 15, 17 Hz (within ±5%) 20 to 100 Hz in 10 Hz steps (within ±5%)
External trigger signal	
Amplitude:	> 4 V (polarity selectable)
Duration:	> 10 ms
Trigger signal output	
Amplitude:	5 V (within ±5%)
Duration:	1, 5, 10 ms (within ±20%)

ELECTRIC STIMULATOR

Stimulation intensity:	0.1 to 100 mA (in 0.1, 0.2 or 1 mA steps) 2.1 mA to 100 mA: within ±5% When set to 2 mA or less, the delivered intensity must not exceed the selected stimulation intensity setting.
Stimulation pulse duration:	1, 0.5, 0.3, 0.2, 0.1, 0.05, 0.03, 0.02, 0.01 ms 0.1 ms to 1 ms: within ±10% 0.05 ms: within ±20% 0.03 ms or less or when stimulation intensity is set to 2 mA or less: The stimulation pulse duration must not exceed the selected stimulation pulse duration setting.
Range of load resistance:	R = V/I (0 Ω ≤ R ≤ 50 kΩ) R: load resistance V: internal voltage I: stimulation intensity

AUDITORY STIMULATORS

Output type:	Headphone, Earphone
Stimulation waveform:	Click, Tone burst
Stimulation phase (polarity):	Condensation (positive), Rarefaction (negative), Alternating
Stimulation intensity:	0 to 135 dB SPL in 1 or 5 dB steps (within ±2 dB)
Contralateral white noise masking:	0, −10, −20, −30, −40 dB or off (no masking) (within ±5 dB)
Click pulse duration:	0.1 to 1.0 ms in 0.1 ms steps (within ±5%)
Tone burst frequency:	With a keyboard: 50 to 125 Hz in 25 Hz steps (within ±5%) 150 to 450 Hz in 50 Hz steps (within ±5%) 500 Hz to 2.9 kHz in 100 Hz steps (within ±5%) 3 to 10 kHz in 500 Hz steps (within ±5%) With a list box: 125, 250, 500 Hz, 1k, 1.5 k, 2 k, 3 k, 4 k, 6 k, 8 kHz (within ±5%)
Plateau time of tone burst:	With a keyboard: 0 to 1,000 ms in 1 ms steps (within ±5%) With a list box: 0, 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 ms (within ±5%)
Rise/fall time of tone burst:	With a keyboard: 0.1 to 9.9 ms in 0.1 ms steps (within ±5%) 10 to 3,000 ms in 1 ms steps (within ±5%) With a list box: 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 10 ms (within ±5%)

VISUAL STIMULATORS

Stimulation modes:	Pattern reversal, LED goggles, External visual stimulation
Pattern reversal	
Field format:	Full, left half, right half, upper half, lower half, upper left, lower left, upper right and lower right field
Patterns:	Checkerboard, horizontal bars, vertical bars
Number of horizontal divisions:	4, 8, 16, 32, 64, 128
Display time (duration) :	20 to 1,000 ms in 10 ms steps
Flash (with LED goggles)	
Stimulation site:	Full, left half and right half
Display time (duration):	20 to 1,000 ms in 10 ms steps

DIMENSIONS AND WEIGHT

Main unit:	350 (W) × 62 (H) × 395 (D) mm, 3.1 kg
Isolation unit:	Depends on the model
Desktop:	200 (W) × 300 (H) × 180 (D) mm, 4.8 kg (depends on model)
Notebook:	375 (W) × 260 (H) × 37 (D) mm, 2.9 kg (depends on model)
Electrode junction box:	217 (W) × 174 (H) × 34 (D) mm, 0.71 kg
Cart for desktop model:	614 (W) × 861 (H) × 625 (D) mm, 53 kg
Cart for notebook model:	540 (W) × 848 (H) × 580 (D) mm, 36 kg

POWER REQUIREMENTS

Line voltage and frequency:	100 to 240 V, 50/60 Hz
Power / isolation unit:	< 1000 VA

ENVIROMENT

Operating temperature:	10 to 35°C (50 to 95°F)
Operating humidity:	30% to 80%
Operating atmospheric pressure:	70 to 106 kPa
Storage temperature:	−20 to +65°C (−4 to +149°F)
Storage humidity:	20% to 80%
Storage atmospheric pressure:	70 to 106 kPa

SAFETY

Safety standard:	IEC 60601-1: 1988 EN 60601-1-1: 2001
	IEC 60601-1 Amendment 1: 1991 EN 60601-1-2: 2001
	IEC 60601-1 Amendment 2: 1995 EN 60601-1-2 Amendment 1: 2006
	IEC 60601-1-1: 2000 EN 60601-2-40: 1998

	IEC 60601-2-40: 1998 CAN/CSA-C22.2 No. 601.1-M90
	IEC 60601-1-2: 2001 CAN/CSA-C22.2 No. 601.1S1-94
	IEC 60601-1-2 Amendment 1: 2004 CAN/CSA-C22.2 No. 601.1B-90 (R2002)
	EN 60601-1: 1990 CAN/CSA-C22.2 No. 60601-1-1-02
	EN 60601-1: Amendment 1: 1993 CAN/CSA-C22.2 No. 60601-1-1-03
	EN 60601-1: Amendment 2: 1995 CAN/CSA-C22.2 No. 60601-2-40-01
Type of protection against electric shock:	Class I
Degree of protection against electric shock	
Type BF applied part:	Electrode jacks and/or electrode lead jacks on the electrode junction box, SOMATO, AUDITORY, GOGGLE and TEMP connectors on the main unit
Degree of protection against harmful ingress of water	
Protected against dripping water (IPX1):	Foot switch
Non-protected (IPX0):	Other parts
Degree of safety of application in the presence of a flammable anaesthetic mixture with air, oxygen or nitrous oxide:	Not suitable for use in the presence of a flammable anaesthetic mixture with air, oxygen or nitrous oxide
Mode of operation:	Continuous operation

ELECTROMAGNETIC COMPATIBILITY

	IEC 60601-1-2: 2001
	IEC 60601-1-2 Amendment 1: 2004
	IEC 60601-2-40: 1998
	IEC 60601-2-10: 1987
	IEC 60601-2-10 Amendment 1: 2001

ELECTROMAGNETIC EMISSIONS

This MEB-9400 is intended for use in the electromagnetic environment specified below.

The customer or the user of the MEB-9400 should assure that it is used in such an environment.

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The MEB-9400 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The MEB-9400 is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Complies	

ELECTROMAGNETIC IMMUNITY

This MEB-9400 is intended for use in the electromagnetic environment specified below. The customer or the user of the MEB-9400 should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ± 1kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of the MEB-9400 requires continued operation during power mains interruptions, it is recommended that the MEB-9400 be powered from an uninterruptible power supply.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the AC mains voltage prior to application of the test level			

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment- guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the MEB-9400, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Conducted RF IEC 61000-4-6	3 Vrms	3 Vrms	**Recommended separation distance** d = 1.2√
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	1 V/m*1 80 MHz to 2.5 GHz (EP measurement setting)	d = 3.5√ 80 MHz to 800 MHz d = 7.0√ 800 MHz to 2.5 GHz
		3V/m 80 MHz to 2.5 GHz (EMG measurement setting)	d = 1.2√ 80 MHz to 800 MHz d = 2.3√ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as deter mined by an electromagnetic site survey*2, should be less than the compliance level in each frequency range*3. Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

*1 There is more noise interference in EP measurement than in EEG measurement because the high-cut frequency is high. However, 1 V/m is applied because evoked potential waveforms are averaged.

*2 Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones andland mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered, If the measured field strength in the location in which the MEB-9400 is used exceeds the applicable RF compliance level above, the MEB-9400 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the MEB-9400.

*3 Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 1 V/m for EP measurement. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m for EMG measurement.

Recommended separation distances between portable and mobile RF communications equipment and the MEB-9400

The MEB-9400 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the MEB-9400 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the MEB-9400 as recommended below, according to the maximum output power of the communications.

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)		
	150 kHz to 80 MHz $d = 1.2 \sqrt{P}$	80 MHz to 800 MHz $d = 1.2 \sqrt{P}$ $(d = 3.5 \sqrt{P})$*	800 MHz to 2.5 GHz $d = 2.3 \sqrt{P}$ $(d = 7.0 \sqrt{P})$*
0.01	0.12	0.12 (0.35)*	0.23 (0.70)*
0.1	0.38	0.38 (1.1)*	0.73 (2.2)*
1	1.2	1.2 (3.5)*	2.3 (7.0)*
10	3.8	3.8 (11)*	7.3 (22)*
100	12	12 (35)*	23 (70)*

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

* EP measurement (1 V/m)

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

SYSTEM COMPOSITION FOR EMC TEST

The MEB-9400 EMG/EP Measuring System is tested to comply with IEC 60601-1-2: 2001 and Amendment 1: 2004 with the following composition. If any part which is not specified by Nihon Kohden is used, the EMC specifications may not comply.

Units	Cable length
MEB-9400 EMG/EP Measuring System	-
Cable between main unit (DC-940BK) and junction box (JB-942BK)	1.8 m
Electrode leads	1.5 m
Headphone cable (DR-531B-14)	3 m
LED goggle cable (LS-102J)	3 m
Pattern reversal VGA cable	3 m
Trigger BNC cable	3 m
USB cable between main unit (DC-940BK) and PC unit (CC-941BK/942BK)	1 m
External speaker cable	2 m
Thermistor probe	3.5 m

REFERENCE FOR ELECTRICAL STIMULATOR

CURRENT DENSITY OF THE STIMULATION ELECTRODE

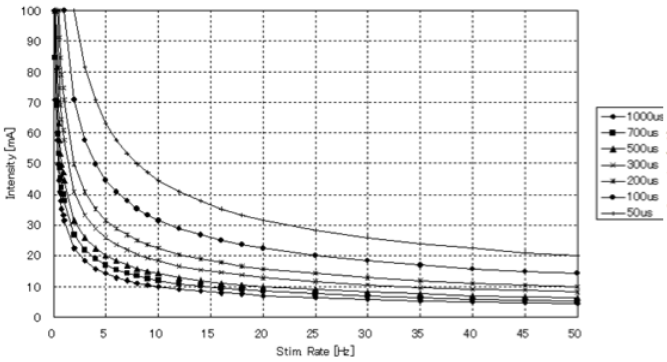
CAUTION

The current density from the electric stimolator might be over 2mA rms/cm^2 depending on the dimensions of the electrode, width of pulse, intensity and frequency of stimulation.

High current density at the stimulation electrode causes high temperature that might cause burn.
The current density when using disk electrodes is calculated by the stimulation intensity and frequency as follows.

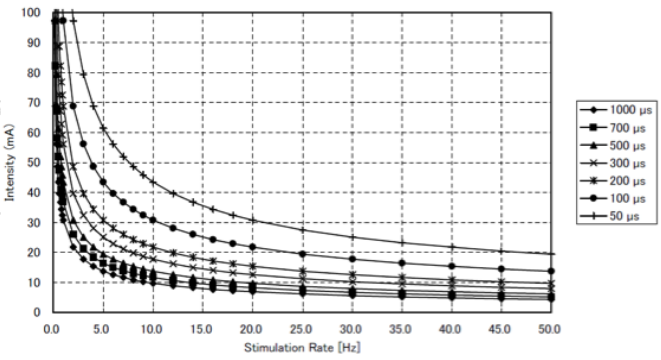
When using the NM-420S surface stimulation electrode

2 mArms/cm^2 Operating Area



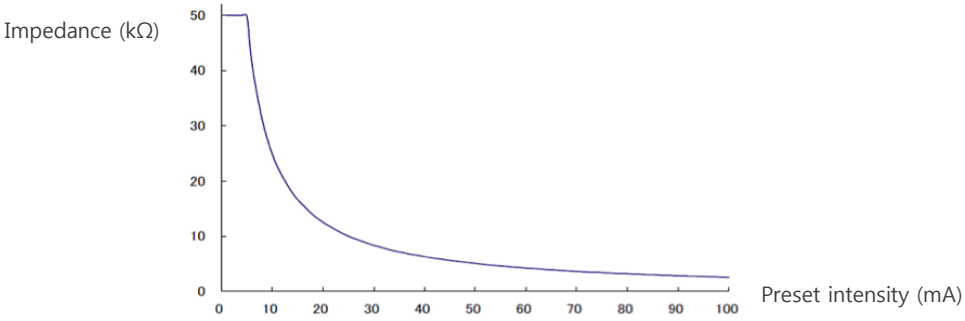
When using the RY-441IB somato control box

2 mArms/cm^2 Operating Area



RELATIONSHIP OF THE PRESET ITENSITY AND THE IMPEDANCE FOR ELECTRIC STIMULATION

Though the electric stimulator is designed to output a setting current regardless of the skin-electrode impedance, if the skin-electrode impedance is extremely high, the electric stimulator cannot output the set current and the system shows a message "Overload: XXXX (XXXX: stimulator name)".
The skin-electrode impedance must be kept lower than the impedance calculated by the following expression so that the electric stimulator output the set current. Impedance (Ω) = 200 (V)/Preset intensity (A) When the skin-electrode



STANDARD COMPOSITION

Desktop Systems	Notebook Systems
Desktop system with cart: • PC unit, main unit, • Cart with integrated power unit, • Input box, 2 channel, (JB-942BK), • Software for EMG, NCS and SEP, • Polaris.one database system, • Electrodes and accessories **Desktop system without cart:** • PC unit, main unit, isolation unit, • Input box, 2 DIN inputs, (JB-942BK), • Software for EMG, NCS and SEP, • Polaris.one database system, • Electrodes and accessories	**Notebook system with cart:** • Notebook, main unit, isolation unit, cart, • Input box, 2 DIN inputs, (JB-942BK), • Software for EMG, NCS and SEP, • Polaris.one database system, • Electrodes and accessories **Notebook system without cart:** • Notebook, main unit, isolation unit, • Input box, 2 DIN inputs, (JB-942BK), • Software for EMG, NCS and SEP, • Polaris.one database system, • Electrodes and accessories **Notebook system with suitcase:** • Notebook with medical grade power unit, • main unit, dedicated suitcase • Input box, 2 DIN inputs, (JB-942BK), • Software for EMG, NCS and SEP, • Polaris.one database system, • Electrodes and accessories

STANDARD ACCESSORIES

Description	Qty.	Order Code
Skinpure	1	F020/1
Elefix	1	F509
Stimulation electrode (adults)	1	H636
Surface electrode	1	H638
Finger electrode	1	H653
Ground electrode (adults)	1	H662
Surface electrode (5pcs)	1	H852A
Disposable concentric EMG needles (25pcs)	1	NKD-NM437
Cable for EMG needle	1	NKD-BM113
Adapter 5 pin DIN to 8 pin DIN	1	YZ-0172

EXAMINATION PROGRAMS

Standard Examination Programs	
EMG • EMG • MUP detection and pattern classification (EMG2) • Real time Turns/Amp Analysis (EMG2) **Somatosensory Evoked Potentials** • SEP (Somatosensory Evoked Potential) • SSEP (Short Latency SEP) • ECG-SSEP (ECG-triggered SSEP) • ESCP (Evoked Spinal Cord Potential)	**Nerve Conduction Study** • NCS (MCS, SCS and F-wave) • MCS (Motor Nerve Conduction Study) • SCS (Sensory Nerve Conduction Study) • Repetitive Stimulation • F-wave • H Reflex • Blink Reflex

Optional Examination Programs	
Auditory Evoked Potentials, (QP-202BK) • ABR (Auditory Brainstem Response) • MLR (Middle Latency Response) • SVR (Slow Vertex Response) • EcochG (Electrocochleogram) **Visual Evoked Potentials, (**QP-202BK) • VEP (Visual Evoked Potentials) with pattern, flash, goggle and external stimulator • ERG (Electroretinogram) • EOG (Electrooculogram)	**Quantitative EMG Software, (**QP-946BK) • Realtime MUAP • Interference Pattern Analysis • Turns/Amp Analysis • FFT Power Spectrum **Single Fiber/Macro EMG Software, (**QP-947BK) • Single Fiber EMG • Stimulated Single Fiber EMG • Macro EMG **Autonomic Nerve System Software, (**QP-948BK) • Microneurography • SSR (Sympathetic Skin Response) • R-R INT (R-R INTERVAL)

This brochure may be revised or replaced by Nihon Kohden at any time without notice.

NIHON KOHDEN EUROPE GMBH
Raiffeisenstrasse 10
61191 Rosbach
Germany