The Nicolet EDX system combines state of the art technology with over 60 years of proven clinical knowledge and innovation to set new standards for EMG, EP and IOM testing.

Based on proven EMG software, users can benefit from a familiar clinical workflow and user interface together with full patient and protocol compatibility with existing Viking and Synergy products.

The rich feature set and clinical automation, together with the high signal quality, artifact rejection and environmental noise suppression of the Nicolet EDX system, are intended to result in improved patient comfort as well as examination time.

Hardware Features

- Scalable, built to grow
- Compact base unit
- Advanced technology amplifiers
- Ergonomic design
Software Features
Innovative features developed into the EMG v21 Software focus on improving ease of use and workflow. The software offers a multitude of electrodiagnostic test functionalities to provide the flexibility to meet various testing needs:

- Direct Access to Roll Back, Roll Forward
- Replicate
- Integrated F-Wave and Motor Nerve Conduction
- Hide and Show Sites Dynamically
- Quality Meter and Rate Meter
- Muscle, Nerve, and Electrode Placement Reference Pictures
- Reference Values
- Monitor Trace and Data Export

Exam Options for Nicolet EDX

Motor Nerve Conduction
Sensory Nerve Conduction
Combined Sensory Index
Combined Motor & Sensory
F-Wave
H-Reflex
Blink Reflex
Repetitive Nerve Stimulation
Inching Studies
Needle EMG
Single Fiber EMG
Multi-MUP Analysis

Turns and Amplitude Analysis
Macro EMG
Somatosensory Evoked Potential
Auditory Evoked Potential
Visual Evoked Potential
P300
Contingent Negative Variation
R-R Interval
Sympathetic Skin Response
Galvanic Skin Response
Intra Operative Monitoring
Reference Help

Service
Natus Neurology is committed to providing exemplary service to our customers. Our dedicated and experienced Customer Service Team will assist with every aspect of an order. To support our products, we provide factory-trained Field Technicians and Clinical Application Specialists for onsite support. Additionally, we provide an in-house Technical Support Team, staffed with experts, and a strong distribution network in International Markets to offer a wide range of service options. Allowing our customers more time to care for their patients is our goal. Customer loyalty is our reward.

Supplies
Natus Neurology offers a full range of neurodiagnostic accessories and supplies promoting patient comfort. Our dedicated customer service team provides a streamlined order and shipping process to save you time and money.

To learn more about Natus Neurology Service Programs or our full line of Supplies and Accessories, contact your local distributor or sales representative.

US Customers Call: 1-800-356-0007
Synergy & Viking Nicolet® EDX

Technical Specifications

System Overview
Nicolet® EDX Systems with EMG Software are intended for the acquisition, display, analysis, reporting, and management of electrophysiological information from the human nervous and muscular system during routine clinical electromyography (EMG) and evoked potential (EP) testing. The Nicolet EDX system can also be used in the Operating Room (OR), Emergency Room (ER) and Intensive Care Unit (ICU) for monitoring of the nervous and muscular system. The Nicolet EDX can be portable or cart-based.

General Description
Nicolet EDX with EMG Software consists of a base unit, an amplifier, a control panel, an electrical stimulator probe, a computer, and EMG Software. The base unit contains an integrated speaker, the electrical and auditory stimulators, and all the connectors for stimulators and other peripheral devices. Two amplifier types are available: 2 channel (AT2) with two (2) non-switched amplifier channels and an 8 channel (AT2+6) with two (2) non-switched and six (6) switched amplifier channels. Both amplifiers include a connector for temperature measurement. Two types of electrical stimulator probes are available: Comfort Probe (RS10) and the Comfort Probe Plus (WR50). In addition to delivering the stimuli, the Comfort Probe Plus allows direct control of stimulus parameters as well as the examination workflow. The 8 channel (AT2+6) amplifier can be used with an optional head box (HB-6) or the compatible HB-7.

The Nicolet EDX Base Unit

Integrated Stimulators
Two electrical stimulators, one auditory stimulator and one visual LED stimulator are integrated in the base unit.

Stimulator Switching
Up to 12 switchable output sites plus 1 low-level independent output for each electrical stimulator.

Audio Speaker
Built-in audio speaker available for output of both live signals as well as playback of recorded data (line-out, line-in, and speaker-out connections). Audio Speaker Notch filter adjustable to 50 Hz, 60 Hz, or off.

Computer Interface
The base unit is connected through a single USB (2.0) connection to the computer. The base unit also contains an USB hub with two additional USB ports.

Trigger Input/Output
The base unit has two trigger inputs and two trigger outputs for connection to external devices.

Additional Devices
The base unit also has connections for a patient response unit, footswitch (single or triple footswitch), control panel, LED goggles, audio transducers (headphones, bone conductors, ear inserts, etc.), and reflex hammer.

Integration with external acquisition system
All eight channels are available to external acquisition equipment for on-line analysis through the Analog Out connector.

Disconnect/Reconnect
A built-in safety feature will stop any stimulation after a few seconds of lost communication between the base unit and the computer. Restoring the communication will automatically bring the system back to running condition without any need for additional user intervention. The same recovery procedure will apply when power is restored after an unintentional power loss.

Digital Signal Processing
A powerful built-in Digital Signal Processor (DSP) provides advanced signal processing functionality such as signal filtering, sound optimization, analog output, etc. The base unit firmware and DSP software can easily be field upgraded to incorporate most recent enhancements and updated functionality.

Computer
The Nicolet EDX operates with either a laptop or desktop computer. Please contact your Natus representative for the latest computer specifications.

Amplifiers

Amplifier Types
The Nicolet EDX system is available with two different amplifiers. The 2 channel (AT2) has two (2) non-switched amplifier channels or the 8 channel amplifier (AT2+6) has two (2) non-switched and six (6) switched channels that can be used in any combination. The 8 channel amplifier can be licensed for 3, 5, 6 or 8 simultaneously active channels. The six switched channels can be configured to use any of the 22 input connectors available on the amplifier and supports optional remote head boxes, the HB-6 for clinical EPs or the HB-7 for OR use.

Analog to Digital Converter
The amplifier utilizes a 24 bit Analog to Digital Converter (ADC) with 48 kHz sampling rate per channel.

Disconnect/Reconnect
Due to the advanced system design it is possible to disconnect and reconnect the amplifier without powering off the base unit. Restoring the connection to the amplifier will automatically bring the system back to running condition without any need for additional user intervention.

Stimulus Artifact Suppression
The amplifiers contain new and patented stimuli artifact rejection hardware. This technology prevents the stimuli artifact from saturating the amplifier resulting in a quicker baseline recovery making it easier to detect and measure small responses.

Electrode Impedance Measurement
The amplifier has built-in impedance measurement capability measuring the impedance at 20 Hz with a range from 500 Ω to 450 kΩ.

Calibration
The amplifier has a built-in rectangular calibration pulse selectable between 2, 20, 200, 2,000, 20,000 μV.

Sensitivity
Hardware gain can be adjusted from 10 nV to 100 mV/division in 22 steps. Low Frequency (-6 dB/octave High Pass) Hz: 0.2, 1, 2, 5, 10, 20, 30, 50, 100, 150, 200, 250, 300, 500, 1K, 2K, 5K. Fixed input channels also support 0.5 Hz and 3 Hz. Switched input channels also support 0.05 Hz. High Frequency (-12 dB/octave Low Pass) Hz: 30, 50, 100, 200, 250, 300, 500, 1K, 1.5K, 2K, 3K, 5K, 10K. Fixed input channels also support 20 kHz.

Notch Filter
Notch (line) filter can be set to 50 Hz, 60 Hz, or Off.

Amplifiers continued on next page
Amplifiers (continued)

Common Mode Input Impedance (CMII)
- > 1000 MΩ (fixed channels).
- > 100 MΩ (switched channels).

Common Mode Rejection Ratio (CMRR)
- > 110 dB (316,277:1) at 50 to 60 Hz. Typical values: fixed input channels = 115 dB,
  switched input channels = 112 dB.
- > 80 dB (100,000:1) at 10 KHz.

Noise
Fixed input channels:................. < 0.6 μV RMS from 2 Hz to 10 kHz with inputs shorted.
Switched input channels:............. < 0.7 μV RMS from 2 Hz to 10 kHz with inputs shorted.

Temperature Measurement
An optional temperature probe can be connected to the amplifier providing automatic temperature measurement synchronized with the recording.

Safety Isolation
The electrical stimulator outputs are Type BF.

Amplifier Holder and Arm
A universal amplifier holder is supplied with the amplifier that fits both the AT2 (2 channel) and AT2+6 (8 channel) amplifier. A holder for both the Comfort Probe and Comfort Probe Plus can be attached to either side of the amplifier holder. A needle holder can also be attached to either side of the amplifier or amplifier holder. The holder is attached to an arm that can be inserted into either side of the cart or can be inserted into a holder attached to an optional desk clamp.

HB-6 Head Box (Optional)
The optional clinical head box (HB-6) is intended for clinical use for instance, Evoked Potential studies. The head box is connected to the amplifier by a cable available in different lengths, 1.8 m (6 Foot) and 4.5 m (15 Foot). The head box has 22 electrode inputs configured according to the 1020 EEG electrode layout. The user can re-label each electrode input using a writable overlay.

HB-7 Head Box (Optional)
The optional head box (HB-7) is intended for use in the OR environment. The HB7 provides the same functionality as the HB6, but also includes built-in ESU protection devices for each electrode. The head box is connected to the amplifier by a cable available in different lengths, 1.8 m (6 Foot) and 4.5 m (15 Foot). The head box has 22 electrode inputs configured according to the 1020 EEG electrode layout. The user can re-label each electrode input using a writable overlay.

Electrical Stimulator
Electrical stimulator options and functionality may vary between different test types.

Electrical stimulators
Two independent electrical stimulators are available. The stimulator outputs are isolated (transformed coupled).

Stimulus Intensity
Stimulus output can be set either to constant-voltage or constant-current mode delivering, 0 – 400V / 0 – 100 mA stimulus into a 4 kΩ load. The stimulus intensity is continuously adjustable with a user definable maximum level. The stimulus intensity can be adjusted with a resolution of 0.01 mA. The stimulus intensity can be adjusted either from the control panel or directly from the Comfort Probe Plus stimulator probe. The stimulus intensity is stored for each trace.

Stimulus Intensity Monitoring
Delivered stimulus is monitored and “Short-circuit” and “Open-circuit” conditions are indicated. Additionally in constant-current mode a deviation between requested and delivered stimulus intensity, due to high electrode impedance, is indicated using color codes.

Stimulus Duration
The stimulus duration can be adjusted within 0.02 – 1 ms.

Stimulus Modes
The stimulus can be set to either monophasic or biphasic stimulation using Single, Double (Pair), or Train.

Stimulus Rate
The stimulus can be set to non-recurrent or recurrent stimulation. The stimulus rate can be varied between: 0.06 – 200 stimuli per second (Hz).

Safety Isolation
The electrical stimulator outputs are Type BF.

Electrical Stimulator Probes (Optional)
The Comfort Probe and Comfort Probe Plus stimulator probes are small and light weight and designed for maximal comfort. Ergonomically designed handles allows for a comfortable grip even when examining difficult to reach sites. Both Comfort probes can be used with any of the five available probe heads. The probe cable is partially coiled to allow an extended reach while preventing the cable from touching the floor or getting trapped under the wheels of the UB4 cart.

Comfort Probe (RS10)
The Comfort Probe’s ergonomic design makes it very small and comfortable to use. It is intended to be used together with the control panel.

Comfort Probe Plus (WR50)
The Comfort Probe Plus allows for direct control of stimuli parameters as well as of the examination workflow using an integrated wheel and buttons. The following can be adjusted directly from the Comfort Probe Plus: stimulus intensity, start/stop, duration, polarity, and move to next trace.

Probe Heads
The probe heads are available as two (2) large probes (0.8” (2 cm) between prongs) and two (2) small probes (0.4” (1.1 cm) between prongs) both in a straight and an angled (45°) version. The probe heads are rounded to optimize contact while minimizing discomfort. There is also a probe head available with touch proof connectors to be used with external electrodes.
Auditory Stimulator Options (Optional)

Auditory stimulator options and functionality may vary between different test types.

**Stimulus Type**
The stimulus type can be selected between Click, Tone Pip, and Tone Burst.

**Stimulus Intensity**
The stimulus intensity can be set between 0 to 139 dB pSPL or -31 to 109 dB nHL, depending on stimulus type, stimulus frequency, and transducer type. The stimulus increment steps can be selected between 1 to 30 dB. Stimulus intensity can also be set relative to the examined patient’s hearing threshold.

**Stimulus Polarity**
The stimulus polarity can be set to: Condensation, rarefraction, or alternating.

**Click Stimuli**
The Click duration can be set to 0.05, 0.1, 0.2, 0.50, and 1.0 ms.

**Tone Stimuli**
The tone stimuli can be set to either Pip or Burst. The tone frequency can be set to 125, 250, 500, 750, 1K, 1.5K, 2K, 3K, 4K, 6K, 8K (Hz). The tone envelope can be set to Linear, Gaussian, Hanning, or Blackman.

- **Plateau (Pips)**: 0 – 500 cycles in steps of 1 cycle
- **Rise/Fall (Pips)**: 1 – 40 cycles in steps of 1 cycle
- **Plateau (Bursts)**: 4 – 2,000 ms in steps of 1 ms
- **Rise/Fall (Bursts)**: 4 – 100 ms in steps of 1 ms
- **Masking**: White Noise, HP Noise, Notched Noise

**Intensity**
+ 10 dB to – 50 dB relative to stimulus

**Presentation**: Binaural, Ipsilateral, Contralateral

Transducers
Following transducers can be used: 300Ω TDH-39 Headphones (non-shielded or shielded), TIP 300 Insert Phones, Bone Vibrator.

2015 Visual Stimulator (Optional)
The external 2015 visual stimulator is connected to the Nicolet EDX base unit via the Trigger In/Out connectors.

**Pattern**
It is possible to choose pattern stimulus color (foreground and background) and pattern intensity. The pattern type can be selected from check, bars, or gratings.

The pattern can be full-field or partial-field (hemi, quadrants, eighths, and sixteenths) with the possibility to select the partial-field position. The stimulator calculates changes in check size, distance, and visual angle.

**Fixation Target**
It is possible to choose the target size, position, color, and choose between a static or a pulsating target.

**LED Goggles (Optional)**
Optional LED goggles are connected with a single 15 foot (4.6 m) cable to the dedicated LED goggles controller located on the back of the Nicolet EDX base unit.

**LED Stimulus**
The goggles consist of high efficiency red LEDs (635 nm) in 3 x 5 array in each eye piece. The flash rate can be set between 0.1 – 100 per second (Hz) with a duration between 2 – 500 ms.

**Software**
Software options and functionality may vary between different test types.

**Operating System**
The Nicolet EDX ships on Microsoft® Windows® 7 64-bit (also Windows XP® (SP3) compatible).

**Reporting**

**Clinical Tests**
The Nicolet EDX with EMG Software (Version 21 or higher) and is available in English, French, German, Italian, Spanish and Japanese

Choice of EMG software packages includes (but are not limited to): Motor Nerve Conduction (MNC), Sensory Nerve Conduction (SNC), Combined Sensory Index, Combined Motor and Sensory Nerve Conduction, Inching Studies, Reference Help, F-Wave, H-Reflex, Blink Reflex, Repetitive Nerve Stimulation, Needle EMG, Multiple MUAP Analysis, Single Fiber EMG, Macro EMG, Tuns and Amplitude, AEP, SEP, VEP, P300/CNV, IOM, R-R Interval, and Sympathetic Skin Response (SSR/Galvanic Skin Response (GSR)).

Additional Clinical Tests
Tests available outside the U.S. include Tremor.

**Waveform Acquisition and Display**
Parallel processing allows simultaneous waveform acquisition, display, plotting and real-time signal analysis. The data and results can be displayed in many different ways according to the clinical need or user preference. Data can be repositioned, superimposed, or shown in a rastered mode. The same data can be simultaneously displayed with different filters, sensitivity, and timebase for optimal review of results. Data can be displayed as free run or triggered with a delay ranging from -9.9 to +9.9 divisions.

**Data Storage and Analysis**
Extensive data storage is implemented and available to maximize the extraction of clinical information from the recorded data. Free run EMG data and sound can be recorded for up to 960 seconds for 2 channels or 360 seconds for 8 channels. Stored data can be reanalyzed, digitally filtered, smoothed, inverted, summed, replayed, displayed as trends, in plots, frequency analysis, etc. The data are stored in the standard WAV format making it simple to export to other research or analysis programs.

**Averager Capabilities**
Averaging functionality is frequently necessary when recording small signals buried in large background activity. The Nicolet EDX offers a number of averaging techniques to optimize the averaging results such as mean, exponential, median, rectified, and weighted mean. The Artifact Reject function will automatically exclude artifacts that exceed a user definable amplitude threshold but it is also possible to manually include or exclude data on a trace per trace basis.

The averager display sensitivity can be set from 0.01 µV/division to 10 mV/division in 22 steps.

**Roll Back, Roll Forward and Replication**
The Roll Back and Roll Forward features will automatically store previous responses ensuring that the best response is available, eliminating unnecessary stimulations. Up to four replications are available allowing the user to quickly verify a small response with an easy way of selecting what result to report.

**Signal Enhancer**
The Signal Enhancer highlights clinically relevant data to simplify analysis and measurements. In SNC, it reduces stimulus artifacts to yield a better baseline. In F-waves it will hide the M-portion during the time of the F-response making it easier to identify the response and place markers. This feature can be turned on or off by the user.

**Clinical Workflow**
The Nicolet EDX is optimized to support different types of clinical workflow. Multiple exams can be organized into test folders to facilitate simple and consistent examination even with complex diagnostic procedures or research setups.

**Reporting**
On-line result views give a compact clinical overview with links back to the raw data. The report can highlight results that are outside of reference values and generate a summary of findings. Reports are very flexible and can be setup by the user according to specific needs utilizing Microsoft Word® 2013 (also Microsoft Word® 2010 compatible).

**Image and Video Capturing**
The integrated Producer functionality makes it easy to capture the screen both as a picture or as a movie that can be incorporated into reports, training material, publications, presentations, and much more.

**Patient Administration**
The Nicolet EDX has an integrated database with user defined patient demographics and visit information. Optional NicVue software is available to manage multi-modality patient data and hospital information system integration (optional NicVue Connect module).

**Networking**
The Nicolet EDX supports full networking functionality with multiple acquisition stations storing to a central server. The data are available for review from any acquisition or review station. Optional Synergy Server software must be purchased.

**Hardware Diagnostic Tool**
Diagnostic software is available that validates the integrity of the system and reports detailed system information regarding amplifier, base unit firmware, etc. to simplify and speed up service.
Component Dimensions and Weight
Approximate dimensions and weights.

**Nicolet EDX base unit**
- 14" L x 13.5" W x 3.4" H (35.6 x 34.3 x 8.6 cm), 8 lbs (3.5 kg).

**2 Channel Amplifier**
- 6.5" L x 6" W x 1" H (16.5 x 15.2 x 2.5 cm), 1 lb (0.5 kg).

**2+6 Channel Amplifier**
- 10.3" L x 8" W x 1.5" H (26 x 20.3 x 4 cm), 1.6 lb (0.7 kg).

**Synergy Control Panel**
- 8" L x 5" W x 2" H (20 x 13 x 5 cm), 1.25 lbs (0.6 kg).

**Viking Control Panel**
- 17" L x 8.5" W x 2" H (43 x 21.6 x 5 cm), 2.95 lbs (1.34 kg).

**Comfort Probe (RS10)**
- 7" L x 1.5" W x 1.25" H (18 x 4 x 3.2 cm), 0.25 lbs (0.11 kg).

**Comfort Probe Plus (WR50)**
- 6.8" L x 1.5" W x 1.25" H (17 x 4 x 3.2 cm), 0.25 lbs (0.11 kg).

**Clinical Head Box (HB-6 or HB7)**
- 6" L x 4.25" W x 0.9" H (15 x 11 x 2.3 cm), 0.6 lbs (0.3 kg).

**Laptop System (Base Unit, 2 channel amplifier, laptop computer, and cables)**
- 16 lbs (7.3 kg)

**Desktop System (Base Unit, 2+6 channel amplifier, desktop computer, isolation transformer, 19" monitor, laser printer, and cart)**
- 21" L x 32" W x 45" H, (53 x 81 x 114 cm), 190 lbs. (90 kg).

Power Requirements

**Power Source**
The power consumption varies between 140 - 600 W depending on computer, monitor, printer, and system configuration.

**Power Consumption**
- Operating (in use): Temperature: 19 to 24°C (66 to 75°F), Humidity: 20-80%, non-condensing.
- Non-operating (in storage): Temperature: -20 to 50°C (-4 to 122°F), Humidity: 10 to 90% non-condensing.

Environmental Limits

**Operating (in use)**
- Temperature: 19 to 24°C (66 to 75°F), Relative Humidity: 20-80%, non-condensing.
- Altitude: 0 to 15,000 ft (0-4.57 km).

**Non-operating (in storage)**
- Temperature: -20 to 50°C (-4 to 122°F), Relative Humidity: 10 to 90%, non-condensing.
- Altitude: 0 to 15,000 ft (0-4.57 km).

**Quality Standards**
Manufactured, designed, developed and marketed under ISO 13485 certified quality system.

Compliance/Regulatory Standards
Designed, tested, manufactured and certified to meet the following domestic (USA), Canadian, European and International Standards:

**Medical Electrical Safety Standard (USA)**
- UL 60601-1
- CAN/CSA-C22.2 no. 601.1-M90

**Medical Electrical Safety Standard (International and Europe)**
- EN/IEC 60601-1
- EN 60601-1-2
- EN 60601-2-26
- IEC 60601-2-40

**European Community (CE Mark)**
- Medical Device Directive (MDD) product certified to comply to EC Directive 93/42/EEC.

**Medical Device Directive (MDD)**
- Clinical Head Box (HB-6 or HB7)
- Comfort Probe Plus (WR50)
- Comfort Probe (RS10)
- 2+6 Channel Amplifier
- 2 Channel Amplifier
- Nicolet EDX base unit
- Retractable height-adjusted keyboard tray
- Tilt adjustment of ± 15 degrees
- Range of 6.25" (16 cm);

Electrical Stimulus Pods (Viking only)
The Electrical Stimulus Pod 1 can be connected to any of the two Electrical Stimulator (IES-1 or IES-2) switched output connectors located on the front of the EDX Base Unit. The Pod 1 can switch the electrical stimuli delivered by the IES-1 or IES-2 between 6 separate connector pairs and 1 low level (LL) connector pair limited to a maximal output of 5 mA. The Pod 1 contains also a 7 pin DIN connector providing a way to connect a stimulator probe to the Pod. The second Electrical Stimulus Pod 2 can be connected to the Pod 1 in a daisy chain fashion adding an additional 6 separate connector pairs totalling 12 high level and 1 low level output pairs for each of the two Electrical Stimulators.

Electrical Stimulus Pods

![Electrical Stimulus Pods](image)

Specifications subject to change without notice.

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