



NVX

DC EEG amplifiers

USER MANUAL

WARNINGS

- ⚠ *Connect the equipment to other devices, particularly PC and computer peripheral hardware, in compliance with the guidelines set out in IEC 60601-1-1. Prevent any possibility of a patient with touching metal computer and peripheral hardware parts, as well as conductive grounded items and elements, radiators etc. 1.5 meters away around a patient. Prevent any possibility of a patient with touching the above components by any body part, as well.*
- ⚠ *Do not use the equipment near to such powerful EM emission-source facilities as arc-welding machines, microwave ovens, X-ray units etc. Do not use portable HF communication appliances, for example – cellular telephones, closer than 30 cm off any equipment part. If the equipment is used within that distance, make sure that all appliances operate properly.*
- ⚠ *Do not use the equipment jointly with defibrillators, MRT, high-frequency electrosurgical appliances, pacemakers and other electrical stimulators.*
- ⚠ *Do not use the equipment in anesthetic agent, air, oxygen, or nitrous oxide combustible mixture atmospheres. Prevent the ingress of any moisture into the equipment.*
- ⚠ *Follow the safety rules described hereunder. Do not ignore any storage, transportation and operation guidelines specified in this manual. Do not strip the equipment. This equipment has no components subject to unauthorized repair.*
- ⚠ *Be careful when using the equipment for a patient. Avoid entangling, tightening, and bending of cables and make sure that no cabling pulls in tight any patient body parts.*
- ⚠ *If the equipment has been kept outside at low ambient temperatures and it is intended for using indoors, bring the equipment to a warm room and wait for at least 4 hours to evacuate any condensate collected inside it.*
- ⚠ *Use special conductive gels for EEG acquisition. Never use gels on injured skin areas. Reusable electrodes may be applied provided that they are thoroughly disinfected in compliance with electrode manufacturer guidelines.*
- ⚠ *Auxiliary probe or probes set which is connected, must comply with the safety standard for electric medical devices IEC60601-1. If are used two probes with separate functions (for example GSR and plethysmograph) or one probe with set of functions then should be use double or reinforced galvanic isolation between this functions parts*
- ⚠ *Do not use this equipment for any purposes other than those duly declared in the user manual. An operator is responsible for application of any devices and software products together with the equipment. In case of doubt about product performance, you can contact a provider.*
- ⚠ *Follow the recommendations from the section WARNINGS in USER MANUAL of the application software, which used with the amplifier.*
- ⚠ *In the event of emergency, perform the procedure as follows: 1) turn off (cut off) computer; 2) disconnect electrodes from a patient; and 3) take measures to remedy a fault.*

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BASIC INFORMATION

NVX is the DC amplifier with 24, 32 or 48 monopolar channels for electrodes and 4 auxiliary bipolar channels for sensors NeoSens. The device is used in training systems, clinical and scientific researches as a part of computer-based research system for short-term registration of the electro-physiological signals, primarily EEG. The amount of channels and presence of auxiliary channels depends of models.

Basically NVX amplifiers is used with *NeoRec application software*. NeoRec is software for the acquisition of EEG and other biomedical signals during the process of scientific or medical research. The program records the signals in various file formats for further analysis and processing by third-party software. For more information, see *NeoRec – User manual*.

Models

1. **NVX24** with EEG DC monopolar channels, 1/1 input/output triggers
2. **NVX36** with 32 EEG DC monopolar channels, 4 DC AUX bipolar channels for probes, 9/1 input/output triggers, OLED display
3. **NVX52** with 48 EEG DC monopolar channels, 4 DC AUX bipolar channels for probes, 9/1 input/output triggers, OLED display.

SPECIFICATION

	model		
	NVX 24	NVX 36	NVX 52
EEG DC monopolar channels	24	32	48
AUX bipolar channels	–	4 galvanic isolated from EEG for probes	
TTL triggers	1 input / 1 output	9 input / 1 output	
Display	–	Graphic OLED	
EEG dynamic range	±400 mV		
EEG channel's input impedance	more 100 MOhm @ DC		
EEG channel's noise	less 0.9 uV p-p @ 0,1..30 Hz		
EEG test signal	200 µV (±1%), 1 Hz		
Electrode impedance measurement range	1 .. 120 kOhm (±10%) @ 30 Hz		
AUX channel's dynamic range	0 .. 4 V		
AUX channel's input impedance	more 100 MOhm @ DC		
AUX channel's noise	less 15 uV p-p @ 0,1..30 Hz		
AUX probe powering	+5 V (±5%). Up to 15 mA per probe with electronic protection		
Digitalization	24 bit, 6th order delta-sigma modulator with 64x oversampling, one converter per each channel		
High-pass response	DC coupled and digital filtration by application software		
Sampling rate	125, 250, 500, 1000, 2000 Hz @ all channels 5000 Hz @ 24 EEG monopolar or bipolar channels 10000 Hz @ 16 EEG monopolar or bipolar channels 50000 Hz @ 4 EEG monopolar or bipolar channels		
Control and powering	from USB +5V, 450 mA max		
Safety	IEC 60601-1, IEC 60601-2-26, class IIa, type BF		
Size	200 x 155 x 40 mm		
Weight	less 650 gr		

Triggers

Parameter	Value
Input digital signals	9, TTL level Uil < 0.8V, Iil > -2.1 mA Uih > 3.5V, Iih > -0.1 mA
Output digital signals	1, TTL level, Control by application software. Uol < 0.4V, Iol < -1,6mA Uoh > 2.8V, Ioh > 0.5mA
Input trigger connector	DSUB-9F for 8 input triggers
Input-output trigger connector	3.5mm stereo plug for 1 input and 1 output triggers
Triggers status	Synchronously with sample data. Tolerance max +0.5 ms. Synchronously for all triggers.

Environmental requirements

Parameter	Range
Working temperature	0°C..+40°C
Storage temperature	-35°C..+65°C
Humidity	30-95% without condensation
Mechanical resistance	according to IEC 60601-1 Ed. 3.0

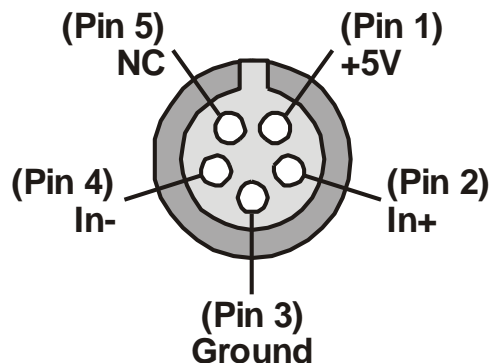
Status Indicator

Parameter	Range
Status indicators and modes	Bi-color indication by 2 LEDs: <ul style="list-style-type: none"> green – no error, active mode (and off in standby) red - error occurred

Auxiliary channel connectors

Probes must have 5 pin male connector (plug) Binder 709/719 series [3] or compatible. For example, Binder 719 cable connector (order number 09-9789-71-05) may be used.

Auxiliary connector of NVX are shown below (front view to NVX panel).

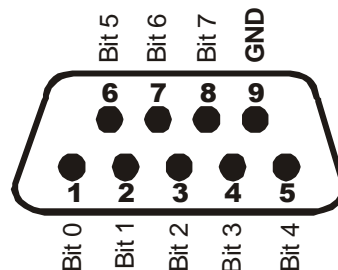


Pin number	Pin functions
1	+5V power for probes
2	Positive terminal of differential input
3	Ground
4	Negative terminal of differential input
5	NC (Not used)

Triggers connectors

Trigger In connector (DB9F) for 8 input trigger lines; table below shows correspondence between pin number and output bit stream;

Pin	Connecting / Input bit
1	bit 0
2	bit 1
3	bit 2
4	bit 3
5	bit 4
6	bit 5
7	bit 6
8	bit 7
9	GROUND



Trigger Out connector (DB9M) for 8 output trigger lines; table below shows correspondence between pin number and output bit stream;

Pin	Connecting / Output bit
1	bit 0
2	bit 1
3	bit 2
4	bit 3
5	bit 4
6	bit 5
7	bit 6
8	bit 7
9	GROUND

EEG active GND connector

EEG active GND connector must have 4-pin connector (plug) Binder 719/709 series [3] or compatible. For example, Binder 719 cable connector (order number 09-9767-70-04) may be used.

EEG channels common connector of NVX24 and NVX36

Number of the EEG channel	Indication (TouchProof connector)	Number of the DSUB-25F contact (compatible with ElectroCap)
1	Fp1	1
2	Fp2	14
3	F7	6
4	F3	2
5	Fz	10
6	F4	15
7	F8	19
8	A1	25
9	T3	7
10	C3	3
11	Cz	22
12	C4	16
13	T4	20
14	A2	13
15	T5	8
16	P3	4
17	Pz	23
18	P4	17
19	T6	21
20	<i>PO3</i>	11
21	<i>PO4</i>	12
22	O1	5
23	OZ	24
24	O2	18
	GND	9
Additional (bipolar) channels (only for NVX36)		
25	Bp1+	
26	Bp1-	
27	Bp2+	
28	Bp2-	
29	Bp3+	
30	Bp3-	
31	Bp4+	
32	Bp4-	
Auxiliary channels (only for NVX36)		
33	Aux 1	
34	Aux 2	
35	Aux 3	
36	Aux 4	

EEG channels common connector of NVX52

Number of the EEG channel	Indication (TouchProof connector)	Number of the 8830E-050-170 contact
1	Fp1	2
2	<i>FpZ</i>	10
3	Fp2	3
4	F7	5
5	F3	6
6	Fz	8
7	F4	9
8	F8	11
9	Ft7	12
10	Fc3	14
11	Fcz	15

12	Fc4	17
13	Ft8	18
14	T3	20
15	C3	21
16	Cz	23
17	C4	24
18	T4	26
19	Tp7	27
20	Cp3	29
21	Cpz	30
22	Cp4	32
23	Tp8	33
24	A1	35
25	T5	36
26	P3	38
27	Pz	39
28	P4	41
29	T6	42
30	A2	44
31	P5	46
32	P6	49
33	Po7	4
34	Po3	7
35	Poz	25
36	Po4	13
37	Po8	16
38	O1	45
39	Oz	47
40	O2	48
	GND	50, 1
Additional (bipolar) channels		
41	Bp1+	19
42	Bp1-	22
43	Bp2+	28
44	Bp2-	31
45	Bp3+	34
46	Bp3-	37
47	Bp4+	40
48	Bp4-	43
Auxiliary channels		
49	Aux 1	
50	Aux 2	
51	Aux 3	
52	Aux 4	

EXTERNAL COMPONENTS

EEG electrodes

Patient is connected to NVX by EEG electrodes block with  mark.

For EEG registration, the EEG electrodes with maximum polarization voltage less than 400mV should be used.

Recommended to use the minimally polarizable sintered Ag/AgCl electrodes, such as MCScap electrodes (www.mks.ru).

Attention: set of electrodes must consist of electrodes of the same type.

USB cable

The following types of USB cables are recommended for use with NVX: DUB-C3AB (3 meters) USB 2.0, 28AWG/1P+22AWG/2C. NVX fixation lock assembly was explicitly design to fit these cables.

Auxiliary probes

External probes can be connected to auxiliary channels. These biomedical probes should convert different physical parameters to voltage, like:

- Bioelectricity (ECG, EMG and etc.),
- Skin impedance (GSR),
- Acceleration (body movement and position, seismocardiogram, balistocardiogram, respiration),
- Pressure and/or force (plethysmogram, respiration),
- Optical density (plethysmogram, respiration),
- Temperature (body temperature, respiration),

These probes may be active (with amplifier or/and signal converter) or passive (sensors only or sensors with voltage dividers).

INSTALLATION AND MAINTENANCE


Computer requirements

Connected computer, as well other periphery devices like printers, must have mark and comply with the safety standard for office machines (DIN VDE 0805 or EN60950 or IEC950 or any).

Computer must conform to minimal requirements: Microsoft Windows 7 32 or 64 bit; processor is not slower than Intel Core i3 1.7 GHz, RAM at least 4 GB, USB 2.0 port.

Installation

It's desirable to install the application software before the first amplifier connection to the computer.

Connect USB cable to  NVX connector and fasten it by fixation lock if it is. Connect USB cable to USB port of computer.

Manual installation of the amplifier driver

The amplifier driver will automatically be installed during the application program installation. Correctly installed driver is displayed in the list of the *Windows Device Manager* as ready to work.

During the first connection of the amplifier to the USB port, operating system will automatically start the installation of the device driver, unless driver has not been installed yet.

There is an opportunity for manual starting the installation procedure, reinstall or update the driver from the *Windows Device Manager*.

During the installation, it is necessary to cancel the automatic driver search on the Internet and specify the path to the amplifier driver. Actual version of the driver may be downloaded from the manufacturer's website.

PRODUCT OFFICIAL INFORMATION

Product name: NVX24, NVX36, NVX52.

UMDNS code: 11467 (*Electroencephalographs*)

Manufacturer: *Medical Computer Systems Ltd.*

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PHONE\FAX: +7 495 913 31 94 \ +7 495 913 31 95.

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Serial numbering

The serial number of NVX: **NVXxx yymmnnnn** (outside serial number) and **yymmnnnn** (inside serial number).

Where:

- **xx** – two digits of amount channels
- **yy** – two digits of year production
- **mm** – two digits of month production
- **nnnn** – four digit of serial number (with beginning zeros if necessary) permanent continues for all models; the start of numbering from 0001.

For example: **NVX24 12010001** is NVX with 24 channels, production of 2012 year, 01 month, serial number is 0001.

Warranty

The manufacturer hereby guarantees that the NVX product will be free from any defects in materials and workmanship (except for consumables) for the period of **two years** from the date of delivery. This warranty does not apply to any damages caused by wrong use, modification, and non-fulfillment of operation requirements. If this product requires repair under our warranty, a customer shall notify the supplier or manufacturer about the defects and send the product thoroughly packed in a shipping container to the supplier or manufacturer for the purpose of inspection and service.

Please, look thoroughly through this manual before its use. The manual contains detailed information and guidelines required for proper and safe operation of this product. Failure to follow these requirements may result in wrong results, damage or injury. The manufacturer disclaims its responsibility for any injuries or losses caused by product misuse.

The manufacturer reserves its right to make changes and amendments in this manual without notice, which improve the performance of this product. If any misprints occur in this document, they will be corrected in further publications.