# **BeneVision N1**

## **Transport Monitor**

**Physical Specifications** 

Weight 0.95 kg (2.1 lbs)

(Standard parameters with battery)

1.17 kg (2.6 lbs)

(Standard parameters with internal CO2

module and battery)

Size 150×103×81 mm (5.9" x 4" x 3.2")

Display

Type Medical-grade color TFT LCD, capacitive

touch screen, with Corning® Gorilla® Glass,

support multi-touch operation.

Size & Resolution 5.5-inch, 1280 x 720 pixels (WXGA)
Waveforms 5 traces, up to 13 waveforms

External display Medical-grade color TFT LCD, capacitive

touch screen,

19-inch, 1280 x 720 pixels

Up to 8 traces

ECG

Meet standards of IEC 60601-2-27 and IEC 60601-2-25.

Lead Sets Automatic 3/5/6/12 - lead recognition

3-lead: I, II, III

5-lead: I, II, III, aVR, aVL, aVF, V
6-lead: I, II, III, aVR, aVL, aVF, Va, Vb
12-lead: I, II, III, aVR, aVL, aVF, V1 to V6

Sweep Speed 6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s

Gain Selection x 0.125, x 0.25, x 0.5, x 1, x 2, x 4, auto

Waveform format Standard, Cabrera

Input Signal Range ±8 mV (p-p)

Electrode Offset Potential Tolerance  $\pm$  500 mV

Bandwidth

Diagnostic Mode: 0.05 to 150 Hz
Monitor Mode: 0.5 to 40 Hz
Surgical Mode: 1 to 20 Hz
ST Mode: 0.05 to 40 Hz

High Freq Cut-off (for 12-lead ECG analysis):

350 Hz, 150 Hz, 35 Hz, 20 Hz selectable

CMRR

Diagnostic: > 90 dB Monitor, Surgical, ST mode:

> 105 dB (with notch filter on)

Pace detection

Amplitude:  $\pm 2 \text{ mV to} \pm 700 \text{ mV}$ 

Width: 0.1 to 2 ms

Rise time: 10 to 100 µs (without overshoot)

Defibrillator Protection Withstand 5000VAC (360J) defibrillation

Defib. Recovery Time  $\leq 5$  seconds ESU recovery time  $\leq 10$  s

Provides Glasgow resting 12-lead ECG algorithm.

Provides Mindray Multi(4)-lead ECG monitoring analysis algorithm.

**Heart Rate** 

Measurement Range

Adult: 15 to 300 bpm Pediatric/Neonate: 15 to 350 bpm Accuracy  $\pm$  1 bpm or  $\pm$  1%, whichever is greater.

Resolution 1 bpm

**Arrhythmia Analysis** 

Patient Adult/Pediatric/Neonate.

Monitored Arrhythmias Asystole, VFib/VTac, VTac, Vent. Brady, Extreme

Tachy, Extreme Brady, Vrhythm, PVCs/min,
Pauses/min, Couplet, Bigeminy, Trigeminy, R on T,
Run PVCs, PVC, Tachy, Brady, Missed Beats, PNP,
PNC, Multif. PVC, Nonsus. VTac, Pause, Irr.

Rhythm, AFib.

**ST Segment Analysis** 

Patient Adult/Pediatric.

Range - 2.0 to + 2.0 mV (RTI)

Accuracy  $\pm$  0.02 mV or  $\pm$  10%, whichever is greater

(-0.8 to + 0.8 mV)

Resolution 0.01 mV

QT Analysis

Patient Adult/Pediatric/Neonate.

Parameters QT, QTc, ΔQTc

QTc Formula Bazett, Fridericia, Framingham, or Hodges

Range

QT/QTc: 200 to 800 ms QT-HR: Adult: 15 to 150 bpm

Pediatric/Neonate: 15 to 180 bpm

QT Accuracy ± 30 ms

Resolution QT 4 ms; QTc 1 ms

Respiration

Range 0 to 200 bpm
Resolution 1 rpm

Apnea Alarm Time 10, 15, 20, 25, 30, 35, 40 sec

Accuracy

0 - 120 rpm:  $\pm$  1 rpm 121 - 200 rpm:  $\pm$  2 rpm

Lead I, II, or auto (default: lead II)

**Pulse Oximetry** 

Meet standards of ISO 80601-2-61.

Module Mindray, Masimo, Nellcor

Range 0 to 100 % Resolution 1%

Accuracy

Mindray/Nellcor:  $\pm$  2 % (70 to 100%, Adult/Pediatric:)

± 3 % (70 to 100%, Neonate) Unspecified (0 to 69%)

Masimo:  $\pm 2\%$  (70 to 100%, Adult/Pediatric, non-motion)

 $\pm$  3 % (70 to 100%, Neonate, non-motion)

± 3 % (70 to 100%, motion) Unspecified (0 to 69%)

Perfusion indicator (PI) Yes, for Mindray/Masimo SpO2

Pitch Tone Yes

Dual-SpO2 Yes, SpO2, SpO2b, ΔSpO2

Pulse Rate Range

Mindray/Nellcor: 20 to 300 bpm Masimo: 25 to 240 bpm

Pulse Rate Accuracy

Mindray:  $\pm 3$  bpm (20 - 300 bpm) Nellcor:  $\pm 3$  bpm (20 - 250 bpm) Masimo:  $\pm 3$  bpm (non-motion)

±5 bpm (motion)

PR Refresh Rate 1 sec

**Temperature** 

Meet standard of ISO 80601-2-56.

Method Thermal resistance
Channels Up to 8 channels
Units of Measure Selectable °C or °F
Range 0 to 50 °C / 32 to 122 °F

Resolution 0.1 °C, 0.1 °F

Accuracy  $\pm 0.1$  °C or  $\pm 0.2$  °F (without probe)

Refresh Rate 1 sec

**Non-Invasive Blood Pressure** 

Meet standards of ISO 80601-2-30.

Method Oscillometry

Modes Manual, Auto, STAT, Sequence

Units of Measure mmHg, kPa (user-selectable)

Resolution 1 mmHg

Systolic range

Adult: 25 to 290 mmHg
Pediatric: 25 to 240 mmHg
Neonate: 25 to 140 mmHg

Diastolic range

Adult: 10 to 250 mmHg
Pediatric: 10 to 200 mmHg
Neonate: 10 to 115 mmHg

Mean range

Adult: 15 to 260 mmHg
Pediatric: 15 to 215 mmHg
Neonate: 15 to 125 mmHg

Accuracy

Max Mean Error: ± 5 mmHg
Max Standard Deviation: 8 mmHg
Cuff Deflation Technique Step bleed

Initial Cuff Inflation

Adult: 80 to 280 mmHg (default: 160 mmHg)
Pediatric: 80 to 210 mmHg (default: 140 mmHg)
Neonate: 60 to 140 mmHg (default: 90 mmHg)

Over Pressure Protection

Adult/ Pediatric:  $297 \pm 3 \text{ mmHg}$ Neonate:  $147 \pm 3 \text{ mmHg}$ 

Max Measurement time

Adult/Pediatric: 180 sec
Neonate: 90 sec
Assisting Venous Puncture Yes

Pulse Rate Range 30 to 300 bpm

Pulse Rate Accuracy  $\pm 3$  bpm or  $\pm 3$  %, whichever is greater

IBP

Meet standard of IEC 60601-2-34.

Number Up to 8 channels

Measurement Range -50 to 360 mmHg

Resolution 1 mmHg

Accuracy  $\pm$  1 mmHg or  $\pm$ 2 %, whichever is greater

(excluding sensor error)

 $\begin{array}{lll} \text{Sensitivity} & 5 \, \mu\text{V/V/mmHg} \\ \text{Impedance Range} & 300 \, \text{to} \, 3000 \, \Omega \\ \text{PPV Range} & 0 \, \text{to} \, 50 \, \% \\ \text{PAWP} & \text{Yes} \\ \text{ICP measurement} & \text{Support} \\ \text{Support waveforms overlapping.} \end{array}$ 

Pulse Rate Range 25 to 350 bpm

Pulse Rate Accuracy  $\pm 1$  bpm or  $\pm 1$  %, whichever is greater

PiCCO

ITBV

**Parameters** Measurement Range Coefficient of Variation 0.25 to 25.0 L/min CCO < 2% C.O. 0.25 to 25.0 L/min ≤ 2% **GEDV** 40 to 4800 ml ≤ 3% SV 1 to 250 ml ≤ 2% **EVLW** 10 to 5000 ml ≤ 6%

(Coefficient of variation is measured using synthetic and/or database wave

≤ 3%

forms (laboratory testing.) Coefficient of variation= SD/mean error.)

TB Range 23 to 43 °C / 73.4 to 109.4 °F TB, TI Accuracy  $\pm$  0.1 °C (without sensor)

50 to 6000 ml

TB, TI Resolution 0.1 °C

pArt/pCVP Range -50 to 300 mmHg

pArt/pCVP Accuracy  $\pm$  1 mmHg or  $\pm$  2 %, whichever is greater

Internal Sidestream CO<sub>2</sub>

Meet standard of ISO 80601-2-55.

Patient Adult/Pediatric/Neonate.

Measurement Range 0 to 150 mmHg

CO<sub>2</sub> Accuracy

0 to 40 mmHg: ± 2mmHg 41 to 76 mmHg: ± 5% of reading 77 to 99 mmHg: ± 10% of reading

100 to 150 mmHg:  $\pm$  (3 mmHg+8% of reading)

Sample Flow Rate 50 ml/min

Sample Flow Rate Tolerance

±15 ml/min or ±15 %, whichever is greater.

Sweep speed 3 mm/sec, 6.25 mm/sec, 12.5 mm/sec,

25 mm/sec, 50 mm/sec

awRR range 0 to 150 rpm

awRR accuracy

0 to 60 rpm:  $\pm 1$  rpm 61 to 150 rpm:  $\pm 2$  rpm

Apnea time 10, 15, 20, 25, 30, 35, 40 sec

Artema Sidestream CO<sub>2</sub>

Meet standard of ISO 80601-2-55.

Measurement Range

etCO<sub>2</sub>: 0 to 150 mmHg  $O_2$  (optional) : 0 to 100 %

CO₂ Accuracy

0 to 40 mmHg: ± 2mmHg
41 to 76 mmHg: ± 5% of reading
77 to 99 mmHg: ± 10% of reading

100 to 150 mmHg:  $\pm$  (3 mmHg+8% of reading)

 $O_2$  Accuracy

0 to 25 %: ±1 % 25.1 to 80 %: ±2 % 80.1 to 100 %±3 % Resolution

etCO<sub>2</sub>: 1 mmHg

O<sub>2</sub>(optional): 1%

Sample Flow Rate

Adult/Pediatric: 120 ml/min (with or without O<sub>2</sub> monitoring)

Neonate: 70 ml/min or 90 ml/min, selectable

90 ml/min (with O<sub>2</sub> monitoring)

Sample Flow Rate Tolerance

 $\pm 15$  ml/min or  $\pm 15$  %, whichever is greater.

Warm-up Time 90 sec (maximum), 20 sec (typically)

Measured with a neonatal watertrap and 2.5-meter neonatal sampling line,

or an adult watertrap and a 2.5-meter adult sampling line:

Rise Time

etCO<sub>2</sub>:  $\leq$  250 ms @ 70 ml/min (Neonate watertrap)

≤ 250 ms @ 90 ml/min (Neonate watertrap)
≤ 300 ms @ 120 ml/min (Adult watertrap)
≤ 800 ms @ 90 ml/min (Neonate watertrap)

 $O_2$  (optional) :  $\leq 800$  ms @ 90 ml/min (Neonate watertrap  $\leq 750$  ms @ 120 ml/min (Adult watertrap)

Sampling Delay Time

et $CO_2$ :  $\leq 5.0 \text{ sec } @ 70 \text{ ml/min (Neonate watertrap)}$ 

≤ 4.5 sec @ 90 ml/min (Neonate watertrap) ≤ 5.0 sec @ 120 ml/min (Adult watertrap)

 $O_2$  (optional) :  $\leq 4.5 \text{ sec } @ 90 \text{ ml/min}$  (Neonate watertrap)

≤ 5.0 sec @ 120 ml/min (Adult watertrap)

awRR Range 0 to 150 rpm

awRR Accuracy

0 to 60 rpm:  $\pm$  1 rpm 61 to 150 rpm:  $\pm$  2 rpm

Apnea Time 10, 15, 20, 25, 30, 35, 40 sec

Oridion Microstream CO<sub>2</sub>

Measurement Range 0 to 99 mmHg
Resolution 1 mmHg

Accuracy

0 to 38 mmHg: ±2 mmHg

39 to 99 mmHg:  $\pm 5 \% + 0.08 \%$  of the reading – 38 mmHg

Sample Flow Rate  $50^{-7.5}_{+15}$  ml/min Start-up Time 30 sec (typical) Response Time 2.9 s (typical) awRR Range 0 to 150 rpm

awRR Accuracy

0 to 70 rpm: ±1 rpm 71 to 120 rpm: ±2 rpm 121 to 150 rpm: ±3 rpm

Apnea time 10, 15, 20, 25, 30, 35, 40 sec

Capnostat Mainstream CO<sub>2</sub>

Measurement Range 0 to 150 mmHg

Resolution 1 mmHg

Accuracy

0 to 40 mmHg: ± 2mmHg 41 to 70 mmHg: ± 5% of reading 71 to 100 mmHg: ± 8% of reading 101 to 150 mmHg: ± 10% of reading

 Rise time
 < 60 msec</td>

 awRR Range
 0 to 150 rpm

 awRR Accuracy
 ±1 rpm

**Data Storage** 

Trends Data > 120 hrs @ 1min, 4 hrs @ 5 sec.

Events 1000 events, including parameter alarms,

arrhythmia events, technical alarms, and so on.

NIBP 1000 sets

Interpretation of resting 12-lead ECG results 20 sets

Full disclosure 48 hours for all parameters and waveforms

(8G storage card)

48 hours at maximum. The specific storage time depends on the waveforms stored and the number of stored waveforms. (2G storage card)

OxyCRG<sup>1</sup> 48 hrs Minitrend<sup>1</sup> Yes

**Alarms** 

Audible indicator Yes, 3 different alarm tones, and prompt tone
Visible indicator Red/yellow/cyan LED, and alarm message

Special Functions<sup>1</sup>

Clinical Assistive Application (CAA):

ST Graphic<sup>™</sup>, BoA Dashboard<sup>™</sup>, EWS, GCS

Support calculations (drug, hemodynamic, Oxygenation, Ventilation, Renal),

and Titration table.

Support nView remote display tool

**Wi-Fi Communications** 

Protocol IEEE 802.11a/b/g/n Modulation Mode DSSS and OFDM

**Operating Frequency** 

IEEE 802.11b/g/n (2.4G):

ETSI/FCC/KC: 2.4 to 2.483 GHz MIC: 2.4 to 2.495 GHz

IEEE 802.11a/n (5G):

ETSI: 5.15 to 5.35 GHz, 5.47 to 5.725 GHz
FCC: 5.15 to 5.35 GHz, 5.725 to 5.82 GHz

MIC: 5.15 to 5.35 GHz

KC: 5.15 to 5.35 GHz, 5.47 to 5.725 GHz,

5.725 to 5.82 GHz

Channel Spacing 5 MHz @ 2.4 GHz (802.11 b/g/n)

20 MHz @ 5 GHz (802.11 a/n)

Wireless Baud Rate IEEE 802.11a: 6 to 54 Mbps

IEEE 802.11b: 1 to 11 Mbps
IEEE 802.11g: 6 to 54 Mbps
IEEE 802.11n: 6.5 to 72.2 Mbps

Output Power < 20dBm (CE requirement: detection

mode-RMS)

< 30dBm (FCC requirement, detection

mode- peak power)

Operating Mode Infrastructure

Data Security WPA-PSK, WPA2-PSK, WPA-Enterprise,

WPA2-Enterprise (EAP-FAST, EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, PEAP-TLS, LEAP)

Encryption: TKIP and AES

Output

**Auxiliary Output** 

Standard Meets the requirements of ANSI/AAMI/IEC

 $60601\mbox{-}1$  for short-circuit protection and leakage

current

ECG Analog Output

Bandwidth (- 3 dB; reference frequency: 10 Hz)

Diagnostic Mode: 0.05 to 150 Hz

Monitor Mode: 0.5 to 40 Hz

Surgical Mode: 1 to 20 Hz ST Mode: 0.05 to 40 Hz

QRS Delay ≤ 25 ms (in diagnostic mode, and non-paced)

Sensitivity  $1 \text{ V/mV}, \pm 5 \%$ 

Pace Enhancement

Signal Amplitude:  $Voh \ge 2.5 \text{ V}$ Pulse Width:  $10 \text{ ms} \pm 5 \%$ Signal Rising and Falling Time:  $\le 100 \text{ }\mu\text{s}$ 

**IBP Analog Output** 

Bandwidth (- 3 dB; reference frequency: 10 Hz)

0 to 40 Hz

Max. Transmission Delay 30 ms

Sensitivity 1 V/100 mmHg,  $\pm$  5 % (\* These output signals are from MP1 connector of N1.)

### Interfacing

Main Unit

DC power input 1

Multifunction Connector for Defib Sync and Analog Output

1

Multi-pin connector 1

Dock

AC power connector 1

RJ45 Network Connector, 100 Base-TX, IEEE 802.3

1

VGA connector 1 USB 2.0 connector 2 Host monitor connector 1

Modular Rack Slot

N1: 2 slots Extended module: 1 slot

Barcode Scanner Support 1D and 2D barcode via dock
Keyboard & Mouse Support wire and wireless type via dock

Network Printer Support

**Battery** 

Type Rechargeable lithium-ion
Capacity 2500mAh, 7.56 VDC
Number of Battery 2 without internal CO<sub>2</sub>
1 with internal CO<sub>2</sub>

Run Time

When powered by two new fully-charged batteries at 25 °C $\pm$ 5 °C with 5-lead ECG , SpO2, and auto NIBP measurements every 15 min, and factory default screen brightness, Wi-Fi disabled.

> 8 hrs without internal CO<sub>2</sub>

When powered by one new fully-charged battery at 25 °C±5 °C with 5-lead ECG , SpO2, IBP, CO2 sampling, and auto NIBP measurements every 15 min, and factory default screen

brightness, Wi-Fi enabled.

 $> 3 \text{ hrs with internal CO}_2$  Recharge Time When the monitor is off, 6 hours to 90% Without internal CO $_2$  module

3 hours to 90% With internal CO<sub>2</sub> module

#### **Power Requirements**

N1 Main Unit

Input 12VDC (±10 %), 2A

AC adapter/Transport dock

Input: 100 to 240 VAC (-15%, +10 %), 50/60 Hz

Output: 12VDC (±10 %), 2.5A

**Docking Station** 

Input 100 to 240 VAC (±10 %), 50/60 Hz

Input Current 0.65A to 0.35A

#### **Environmental requirements**

For Main unit/Transport dock/AC adapter

Temperature Operating: 0 to 40 °C (32 to 104 °F)

Storage: -30 to 70  $^{\circ}$ C (-22 to 158  $^{\circ}$ F )

Humidity Operating: 5 to 95 % (non condensing)

Storage: 5 to 95 % (non condensing)

Barometric Operating: 427.5 to 805.5 mmHg (57.0 to

107.4 kPa)

Storage: 120 to 805.5 mmHg (16.0 to 107.4 kPa) (without CO2), 375 to 805.5 mmHg

(50.0 to 107.4 kPa) (with CO2)

For Module rack/Dock/Other extended modules

Temperature Operating: 0 to 40 °C (32 to 104 °F)

Storage: -20 to 60 °C (-4 to 140 °F)

Humidity Operating: 15 to 95 % (non condensing)

Storage: 10 to 95 % (non condensing)

Barometric Operating: 427.5 to 805.5 mmHg (57.0 to

107.4 kPa)

Storage: 120 to 805.5 mmHg (16.0 to 107.4

kPa)

#### Reliability

The monitor can also be used during patient transport with road, rotary and fixed-wing ambulance. Comply with standards of EN 1789, EN13718-1, IEC 60601-1-12, RTCA DO-160G, MIL-STD-810G, and MIL STD 461E.

Type of Protection Class

Degree of Protection ECG/TEMP/SpO<sub>2</sub>/IBP/NIBP: CF

CO<sub>2</sub>: BF

Ingress Protection Main unit: IP44

Dock/Module rack/AC adapter: IPX1

Transport Dock: IP22

Drop Protection 1.2m for all 6 faces

1. The functions are available for independent external display only.

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