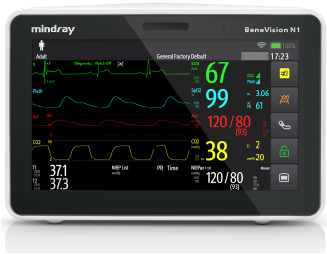
BeneVision N1

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	± 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:	± 2 mV to ± 700 mV
Width:	0.1 to 2 ms
Rise time:	10 to 100 µs (without overshoot)
Defibrillator Protection	Withstand 5000VAC (360J) defibrillation
Defib. Recovery Time	≤ 5 seconds
ESU recovery time	≤ 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	± 1 bpm or ± 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	± 0.02 mV or ± 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:	± 1 rpm
121 - 200 rpm:	± 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:	± 2 % (70 to 100%, Adult/Pediatric:) ± 3 % (70 to 100%, Neonate) Unspecified (0 to 69%)
Masimo:	± 2 % (70 to 100%, Adult/Pediatric, non-motion) ± 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: ± 3 bpm (20 - 300 bpm)
- Nellcor: ± 3 bpm (20 - 250 bpm)
- Masimo: ± 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 ℃ or ℉
Range	0 to 50 ℃ / 32 to 122 ℉
Resolution	0.1 ℃, 0.1℉
Accuracy	± 0.1 ℃ or ± 0.2 ℉ (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 ± 3 mmHg
- Neonate: 147 ± 3 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	± 3 bpm or ± 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	± 1 mmHg or ±2 %, whichever is greater (excluding sensor error)
Sensitivity	5 μV/V/mmHg
Impedance Range	300 to 3000 Ω
PPV Range	0 to 50 %
PAWP	Yes
ICP measurement	Support

Support waveforms overlapping.

Pulse Rate Range	25 to 350 bpm
Pulse Rate Accuracy	±1 bpm or ±1 %, whichever is greater

PiCCO

Parameters	Measurement Range	Coefficient of Variation
CCO	0.25 to 25.0 L/min	≤ 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%
ITBV	50 to 6000 ml	≤ 3%

(Coefficient of variation is measured using synthetic and/or database wave forms (laboratory testing.) Coefficient of variation= SD/mean error.)

TB Range	23 to 43 ℃ / 73.4 to 109.4 ℉
TB, TI Accuracy	± 0.1 ℃ (without sensor)
TB, TI Resolution	0.1 ℃
pArt/pCVP Range	-50 to 300 mmHg
pArt/pCVP Accuracy	± 1 mmHg or ± 2 %, whichever is greater

Internal Sidestream CO_2

Meet standard of ISO 80601-2-55.

Patient	Adult/Pediatric/Neonate.
Measurement Range	0 to 150 mmHg

CO_2 Accuracy
- 0 to 40 mmHg: ± 2mmHg
- 41 to 76 mmHg: ± 5% of reading
- 77 to 99 mmHg: ± 10% of reading
- 100 to 150 mmHg: ± (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: ± 1 rpm
- 61 to 150 rpm: ± 2 rpm

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

Artema Sidestream CO_2

Meet standard of ISO 80601-2-55.

Measurement Range
- $etCO_2$: 0 to 150 mmHg
- O_2 (optional) : 0 to 100 %

CO_2 Accuracy
- 0 to 40 mmHg: ± 2mmHg
- 41 to 76 mmHg: ± 5% of reading
- 77 to 99 mmHg: ± 10% of reading
- 100 to 150 mmHg: ± (3 mmHg+8% of reading)

O_2 Accuracy
- 0 to 25 %: ±1 %
- 25.1 to 80 %: ±2 %
- 80.1 to 100 %±3 %

Resolution
- $etCO_2$: 1 mmHg
- O_2 (optional) : 1 %

Sample Flow Rate
- Adult/Pediatric: 120 ml/min (with or without O_2 monitoring)
- Neonate: 70 ml/min or 90 ml/min, selectable
  90 ml/min (with O_2 monitoring)

Sample Flow Rate Tolerance
±15 ml/min or ±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
- $etCO_2$: ≤ 250 ms @ 70 ml/min (Neonate watertrap)
  ≤ 250 ms @ 90 ml/min (Neonate watertrap)
  ≤ 300 ms @ 120 ml/min (Adult watertrap)
- O_2 (optional) : ≤ 800 ms @ 90 ml/min (Neonate watertrap)
  ≤ 750 ms @ 120 ml/min (Adult watertrap)

Sampling Delay Time
- $etCO_2$: ≤ 5.0 sec @ 70 ml/min (Neonate watertrap)
  ≤ 4.5 sec @ 90 ml/min (Neonate watertrap)
  ≤ 5.0 sec @ 120 ml/min (Adult watertrap)
- O_2 (optional) : ≤ 4.5 sec @ 90 ml/min (Neonate watertrap)
  ≤ 5.0 sec @ 120 ml/min (Adult watertrap)

awRR Range: 0 to 150 rpm

awRR Accuracy
- 0 to 60 rpm: ± 1 rpm
- 61 to 150 rpm: ± 2 rpm

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

Oridion Microstream CO_2

Measurement Range: 0 to 99 mmHg
Resolution: 1 mmHg
Accuracy
- 0 to 38 mmHg: ±2 mmHg
- 39 to 99 mmHg: ±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_2

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
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[1]: 48 hrs
Minitrend[1]: Yes

Alarms

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

Special Functions[1]

Clinical Assistive Application (CAA):
ST Graphic™, BoA Dashboard™, 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 60601-1 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 V/mV, ± 5 %
Pace Enhancement	
Signal Amplitude:	Voh ≥ 2.5 V
Pulse Width:	10 ms ± 5 %
Signal Rising and Falling Time:	≤ 100 µs
IBP Analog Output	
Bandwidth (- 3 dB; reference frequency: 10 Hz)	0 to 40 Hz
Max. Transmission Delay	30 ms
Sensitivity	1 V/100 mmHg, ± 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_2
	1 with internal CO_2
Run Time	
When powered by two new fully-charged batteries at 25 °C±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_2
When powered by one new fully-charged battery at 25 °C±5 °C with 5-lead ECG , SpO2, IBP, CO_2 sampling, and auto NIBP measurements every 15 min, and factory default screen brightness, Wi-Fi enabled.	> 3 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_2 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 °C (-22 to 158 °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 461F.

Type of Protection	Class I
Degree of Protection	ECG/TEMP/SpO_2/IBP/NIBP: CF
	CO_2: BF
Ingress Protection	Main unit: IP44
	Dock/Module rack/AC adapter: IPX1
	Transport Dock: IP22
Drop Protection	1.2m for all 6 faces

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

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