

BeneVision N17/N15/N12

Patient monitor



Physical Specifications

| | |
|--------|---|
| Weight | Standard configuration, excluding modules, recorder, battery and accessories. |
| N17: | 7.3 kg (16.1 lbs) |
| N15: | 5.4 kg (11.9 lbs) |
| N12: | 4.1 kg (9.1 lbs) |
| Size | |
| N17: | 466 x 355 x 210 mm |
| N15: | 396 x 313 x 193 mm |
| N12: | 313 x 290 x 161 mm |

Display

| | |
|------|---|
| Type | Medical-grade color TFT LCD, capacitive touch screen, support multi-touch operation. 178 ° viewing angle |
|------|---|

Screen & Resolution

| | |
|------|-------------------------------------|
| N17: | 18.5-inch, 1920 x 1080 pixels (FHD) |
| N15: | 15.6-inch, 1920 x 1080 pixels (FHD) |
| N12: | 12.1-inch, 1280 x 800 pixels (WXGA) |

Waveforms

| | |
|------|--------------------|
| N17: | Up to 12 waveforms |
| N15: | Up to 10 waveforms |
| N12: | Up to 8 waveforms |

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.

(* These ECG specifications are from MPM Platinum module.)

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, Vrrhythm, 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 °C or °F

Range 0 to 50 °C / 32 to 122 °F

Resolution 0.1 °C, 0.1 °F

Accuracy ± 0.1 °C or ± 0.2 °F (without probe)

Refresh Rate

1 sec

Genius™ 2 Tympanic Thermometer

Measurement Range 33 to 42 °C / 91.4 to 107.6 °F

Calibrated Accuracy ± 0.1 °C (environment temperature 25 °C, target temperature 36.7 to 38.9 °C)

± 0.2 °C (environment temperature 16 °C, target temperature 33 to 42 °C)

Resolution 0.1 °C, 0.1 °F

Response Time < 2 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

| | | |
|----------------------|--------------|-----------------|
| N ₂ O: | 1 % | |
| Des/Sev/Enf/Iso/Hal: | 0.1 % | |
| O ₂ : | 1 % | |
| awRR: | 1 rpm | |
| Full Accuracy | | |
| Gases | Range (%REL) | Accuracy (%ABS) |
| CO ₂ : | 0 to 1 % | ± 0.1 % |
| | 1 to 5 % | ± 0.2 % |
| | 5 to 7 % | ± 0.3 % |
| | 7 to 10 % | ± 0.5 % |
| | > 10 % | Not specified |
| N ₂ O: | 0 to 20 % | ± 2 % |
| | 20 to 100 % | ± 3 % |
| Des: | 0 to 1 % | ± 0.15 % |
| | 1 to 5 % | ± 0.2 % |
| | 5 to 10 % | ± 0.4 % |
| | 10 to 15 % | ± 0.6 % |
| | 15 to 18 % | ± 1 % |
| | > 18 % | Not specified |
| Sev: | 0 to 1 % | ± 0.15 % |
| | 1 to 5 % | ± 0.2 % |
| | 5 to 8 % | ± 0.4 % |
| | > 8 % | Not specified |
| Enf/Iso/Hal: | 0 to 1 % | ± 0.15 % |
| | 1 to 5 % | ± 0.2 % |
| | > 5 % | Not specified |
| O ₂ : | 0 to 25 % | ± 1 % |
| | 25 to 80 % | ± 2 % |
| | 80 to 100 % | ± 3 % |
| awRR: | 2 to 60 rpm | ± 1 rpm |
| | > 60 rpm | Not specified |

Rise Time

Sampling flow 120 ml/min, using the DRYLINE II™ watertrap and a neonatal 2.5m sampling line,

CO₂/ N₂O: ≤ 250 ms

Iso/Hal/Sev/Des: ≤ 300 ms

Enf: ≤ 350 ms

O₂: ≤ 600 ms

Sampling flow 200ml/min, using DRYLINE II™ watertrap and an adult 2.5m sampling line:

CO₂/ N₂O: ≤ 250 ms

Iso/Hal/Sev/Des: ≤ 300 ms

Enf: ≤ 350 ms

O₂: ≤ 500 ms

Sampling Delay Time

Sampling flow 120 ml/min, using the DRYLINE II™ watertrap and a neonatal 2.5m sampling line,

CO₂: ≤ 4 sec

N₂O: ≤ 4.2 sec

O₂: ≤ 4 sec

Enf /Iso/Hal/Sev/Des: ≤ 4.4 sec

Sampling flow 200ml/min, using DRYLINE II™ watertrap and an adult 2.5m sampling line:

CO₂: ≤ 4.2 sec

N₂O: ≤ 4.3 sec

O₂: ≤ 4 sec

Enf/Iso/Hal/Sev/Des: ≤ 4.5 sec

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

Provide MAC value (support calibrated by age).

Support two mixed gas identify and monitoring.

RM

| | |
|--------------------------|---|
| Method | Diff-Pressure flow |
| Measurement Range | |
| Flow | Adult/Pediatric: ± (2 to 120) L/min Neonate: ± (0.5 to 30) L/min |
| Paw | -20 to 120 cmH ₂ O |
| MVe/MVi | Adult/Pediatric: 2 to 60 L/min Infant: 0.5 to 15 L/min |
| TVe/TVi | Adult/Pediatric: 100 to 1500 ml Infant: 20 to 500 ml |
| awRR range | 4 to 120 rpm |
| Resolution | |
| Flow | 0.1 L/min |
| Paw | 0.1 cmH ₂ O |
| MVe/MVi | 0.01 L/min (MVe/MVi < 10 L/min) 0.1 L/min (MVe/MVi ≥ 10 L/min) |
| TVe/TVi | 1 ml |
| awRR: | 1 rpm |
| Accuracy | |
| Flow | Adult/Pediatric: ± 1.2 L/min or ± 10% of the reading, whichever is greater. Neonate: ± 0.5 L/min or ± 10%, whichever is greater. |

| | |
|---------|--|
| Paw | ± 3% of reading |
| MVe/MVi | ± 10% of reading |
| TVe/TVi | Adult/Pediatric: ±10% or ±15 ml, whichever is greater. Infant: ±10% or ±6 ml, whichever is greater. |
| awRR: | ±1 rpm (4 to 99 rpm) ±2 rpm (100 to 120 rpm) |

Provide loops display.

Monitoring parameters include PEEP, Pmean, PIP, Pplat, PEF, PIF, MVe, MVi, TVe, TVi, RR, I:E, FEV1.0, Compl, RSBI, NIF, WOB, RAW.

rSO₂

| | |
|-------------------|--|
| Patient | Adult/Pediatric/Neonate. |
| Method | INVOS, NIRS (Near Infrared Spectroscopy) |
| Number | Up to 4 channels |
| Measurement Range | 15 to 95 % |

NMT

Meet the standard of IEC 60601-2-10

Sensor Type Acceleromyography sensor

Stimulation Modes ST, TOF, PTC, DBS3.2, DBS3.3

Stimulation Current Range

0 to 60 mA

Stimulation Current Accuracy

± 5% or ±2 mA, whichever is greater.

Stimulation Pulse Width 100,200 or 300µs, monophasic rectangle pulse

Stimulation Pulse Width Accuracy

± 10 %

Max. Output Voltage 300 V

BISx/BISx4

Meet standard of IEC 60601-2-26.

Method Bispectral Index

Impedance Range 0 to 999 kΩ

EEG Bandwidth 0.25 to 100 Hz

BIS Range 0 to 100 (BIS, BIS L, BIS R)

SQL Range 0 to 100 % (SQL, SQL L, SQL R)

ASYM 0 to 100%

DSA Trend Yes

EEG

Meet standard of IEC 60601-2-26.

EEG Channels Up to 4 channels

Montage Mode Biopolar mode, referential mode

Input Signal Range - 2 mVp-p to + 2mVp-p

Max. Input DC Offset ± 500 mV

CMRR ≥ 100 dB @51 kΩ imbalance and 60 Hz

Noise Level ≤ 0.5 µV rms (1 Hz to 30 Hz)

Differential Input Impedance

> 15 MΩ @10 Hz

Electrode Impedance

Range 0 to 90 kΩ

Accuracy ± 1 kΩ or ± 10%, whichever is greater

Sampling Frequency 1024 Hz

Analog bandwidth 0.5 to 110 Hz

Spectrum analysis SEF, MF, PPF, TF, Delta, Theta, Alpha, and Beda

Trend DSA, CSA

tcGas

Interfaces with TCM CombiM, TCM TOSCA or SenTec SDM monitor.

Measurement Range

tcpCO₂ 5 to 200 mmHg

tcpO₂ 0 to 800 mmHg

SpO₂ 0 to 100 %

PR 25 to 240 bpm

Power 0 to 1000 mW

Accuracy

tcpCO₂ TOSCA Sensor 92, tc Sensor 54:

Better than 1 mmHg (1 % or 10 % CO₂)

Better than 3 mmHg (33 % CO₂)

tc Sensor 84:

Better than 1 mmHg (1 % or 10 % CO₂)

Better than 5 mmHg (33 % CO₂)

tcpO₂

tc Sensor 84:

Better than 1 mmHg (0 % O₂)

Better than 3 mmHg (21 % O₂)

Better than 5 mmHg (50 % O₂)

Better than 25 mmHg (90 % O₂)

SpO₂

±3 % (70 to 100 %)

PR

±3 bpm

Power

±20 % of reading

iView (for N17 only)

CPU Intel Pentium N4200 2.5GHz

Memory 8 GB

Hard-disk mSATA SSD 128GB

OS

Windows 10

Recorder

Type Thermal array

Speed 25 mm/sec, 50 mm/sec

Trace Up to 3 (paper 50 mm width, 20 m length)
 Supports integrated recorder module.

Alarms
 Audible indicator Yes, 3 different alarm tones, and prompt tone
 Visible indicator Red/yellow/cyan LED, and alarm message
 Provide AlarmSight infographic alarm indicator.

Data Storage
 Trends Data > 120 hrs @ 1 min, 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 48 hrs
 ST review 120 hrs @1 min
 Minitrend Yes

Special Functions
 Clinical Assistive Application (CAA):
 HemoSight™, ST Graphic™, SepsisSight™, BoA Dashboard™, EWS, GCS, 24hrs ECG Summary, Pace View

Support calculations (drug, hemodynamic, Oxygenation, Ventilation, Renal), and Titration table.
 Support wireless connection with BeneVision TM80 and BP10.
 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

MPAN Communications
 Modulation Mode GFSK
 Operating Frequency 2402 to 2480 MHz
 Channel Spacing 2 MHz
 Wireless Baud Rate 1 Mbps
 Output Power ≤ 2.5 mW
 Data Security Private protocol

MPAN is used in device pairing for BeneVision TM80, BP10 NIBP module and BeneVision N series patient monitor.

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: $V_{oh} \geq 2.5 V$
 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 %

Interfacing
 AC Power Connector 1
 RJ45 Network Connector, 100 Base-TX, IEEE 802.3
 N17: 2 (1 for iView)
 N15/N12: 1

USB 2.0 Connector
 N17: 8 (4 for iView)
 N15/N12: 4

Nonstandard USB SMR Connector
 N17/N5: 1 to connect SMR, N1/T1 docking station
 N12: 1 to connect N1/T1 docking station

Standard DVI-D Video Interface Connector
 N17: 2 (1 for iView)
 N15/N12: 1

BNC Connector 1
 Equipotential Grounding Terminal 1

Multifunction Connector for Defib Sync and Analog Output 1 on multi-parameter module

Module Slot
 N17/N15: 6 slots
 N12: 4 slots

Barcode Scanner Support 1D and 2D barcode
 Keyboard & Mouse Support wire and wireless type via USB
 Remote Control Support
 Network Printer Support

Battery
 Type Rechargeable lithium-ion
 Number of Battery 1
 Capacity 4500mAh, 11.1 VDC
 Run Time when powered by a new fully-charged battery at 25 °C±5 °C with 5-lead ECG, SpO2, and auto NIBP measurements every 15 min, and screen brightness set to 1.
 N17/N15: > 2 hrs
 N12: > 4 hrs

Recharge Time 4.5 hrs to 90% when the monitor is off.

Power Requirements
 AC Voltage 100 to 240 VAC (± 10 %)
 Current 2.0 to 0.9 A
 Frequency 50 Hz/60 Hz (± 3 Hz)

Environmental requirements
 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)

Safety
 Type of Protection Class I
 Degree of Protection MPM/IBP/C.O./NMT/EEG module: CF
 ScvO₂/CO₂/AG/BIS/rSO₂ module: BF

Protection Against Ingress of Fluids IPX1

Some of functions marked with an asterisk may not be available. Please contact your local Mindray sales representative for the most current information.

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