

**BeneVision™**  
See more With ease

**BeneVision™ N22/N19**  
**Patient Monitor**

Change your perspective, again.  
Maximize your confidence.  
Built for a paperless future.



[www.mindray.com](http://www.mindray.com)

P/N: ENG-BeneVision N22/N19-210285x14Px20190129  
©2018 Shenzhen Mindray Bio-Medical Electronics Co., Ltd. All rights reserved.

**mindray**  
healthcare within reach

**mindray**

**BeneVision N22/N19**  
Patient monitor

Always in sight, always in mind





# BeneVision.

## Change your perspective, again.

### BeneVision N22/N19

At Mindray, we believe the best way to predict the future is to create it today. We're thinking how to help you save your time in order to treat more patients effectively. We also focus on clinical safety, and efficiency. Now for the first time in the world, the BeneVision patient monitor ROTATES between landscape and portrait. You have both higher and wider clinical views when patient care demands them.





Design.  
Excellence for visionaries.



Original technology innovations have been combined with thoughtful considerations to improve patient monitoring experience.

During the design process, we strove to make the details “and” instead of “or”, such as the ingenious portrait and landscape display, as well as the single-level menu user interface.



Modular design brings so many options.

- Parameter modularity allows you flexibility in patient care and makes the most of your equipment investment.
- iView module combines a powerful, embedded PC and the patient monitor in the same unit. The innovative design optimizes cooling without the need for a fan.
- Ultra-compact main unit and big screen can be used as a combined unit or separated to make use of the rotating screen feature.



Auto



Built-in



No fan



Seamless






# Innovative.


## Maximize your confidence.

Everyday, Mindray delivers accurate, real-time, physiological measurement data from millions of patients worldwide, which clinicians have come to rely on when making decisions. BeneVision provides the worlds best monitoring technologies for you and promotes new ones continuously.




### Cardiology

ΔST monitoring and ST segment templates.  
Real-time QT/QTc measurement.  
Glasgow 12-lead resting interpretation.




### Hemodynamics and volumetric

Less-invasive PiCCO and ScvO<sub>2</sub> monitoring.  
Non-invasive cardiac output with ICG module.




### Airway gas and lung mechanics

One-slot CO<sub>2</sub>+O<sub>2</sub> module  
Volumetric CO<sub>2</sub> and metabolic measurements  
AION Multi-Gas +SPIRIT respiratory mechanics



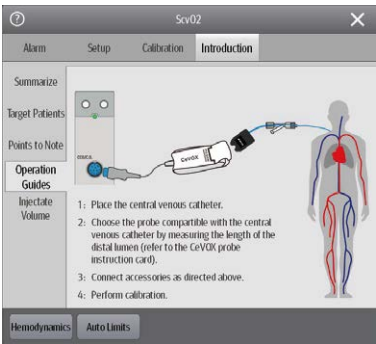
### Tissue perfusion

INVOS rSO<sub>2</sub> provides a noninvasive and continuous reading of changes in regional oxygen saturation of blood in tissue microvascular circulation.

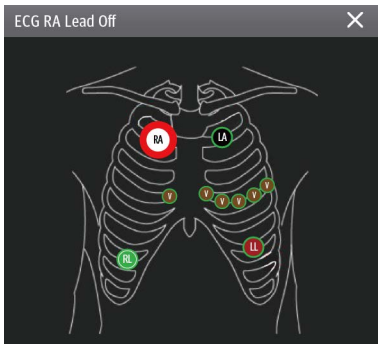


### Neurology

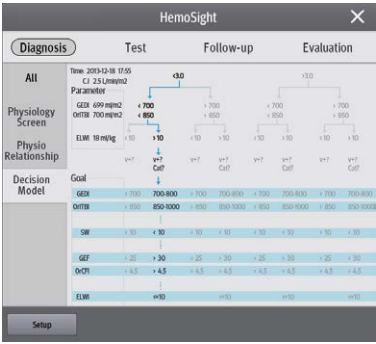
EEG, and BIS/BISx4 monitoring.  
Advanced NMT monitoring technology can detect movement in all directions accurately.



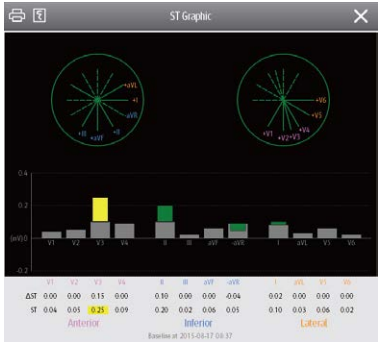
Online Guide



Infographic alarm



HemoSight™  
Help clinicians to make decisions through sets of hemodynamic assistance applications.



ST Graphic™  
Quickly and accurately detect changes in ST values for analysis.



Comparison review  
Events summary and details ease contextual evaluation.





# Mobility. Streamlined.

Since the introduction of the world's first portable cardiac monitor in 1964, Mindray has committed itself to being the pioneer in early patient mobilization for better recovery. BeneVision extends the typical mobile monitoring solution with more wireless roaming, data continuity, and streamlined workflow in every situation. Combined with its patient-worn telemetry monitor, which is also a cableless measurement module, BeneVision ensures a supreme level of mobility and offers more freedom to both patient and caregiver.



BeneVision N22/N19 wirelessly pairs with its TM80 and BP10 patient-worn modules for cableless measurement at the bedside and beyond.



Ambulatory patients monitored around the bedside and beyond.



The Mindray classical transport monitoring solution with BeneVision N1 also works seamlessly with BeneVision for unmatched patient safety.



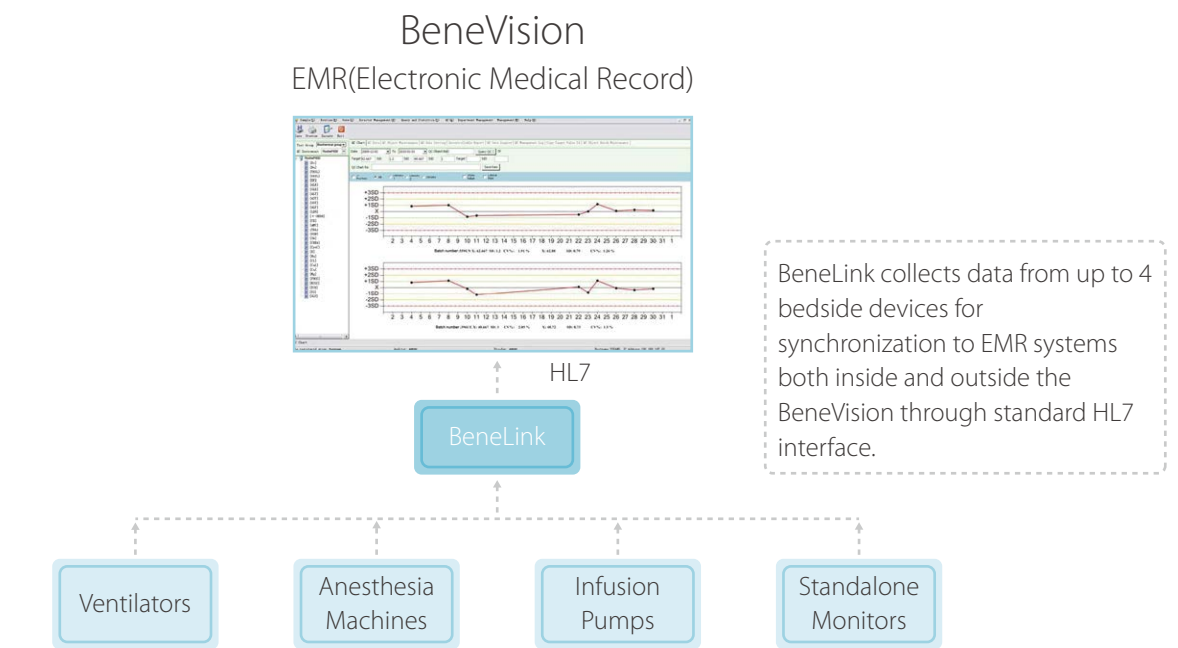
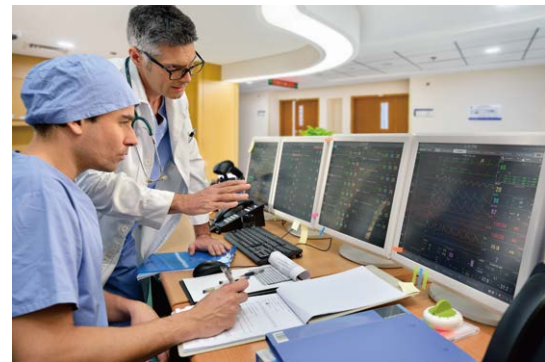


## Connected. Built for a paperless future.

As a pioneer in clinical informatics with patient monitoring, Mindray integrated the embedded PC (iView) in 2007, which enables a patient monitor to run user APPs for the first time in the world. BeneVision enhances the iView open platform with a more intuitive display, modular design, and powerful performance. Patient monitoring and healthcare applications are combined into one workstation at the point of care.

Mindray provides a flexible solution for monitoring your patient's status anywhere, anytime, even when you are away from the clinical environment. . .Based on layer 3 network structure, the Mindray patient monitoring system has a high network adaptability to integrate seamlessly with your hospital's current network.

With Mindray's central station and eGateway further connecting BeneVision with your clinical world, bedside device data and other clinical system data is shared to enhance your diagnosis and clinical decision making.



iView can run your own clinical Apps (such as PACS, LIS, HIS/CIS, and EMR) on one intuitive view and connects with your hospital network infrastructure directly without any additional server or gateway.

With its 1680 x 1050 pixels 22-inch screen, BeneVision N22 has a perfect split layout in portrait display. No need to worry that the waveforms will be obstructed by the iView application window as you browse the patient's information.



# BeneVision N22/N19

## Patient monitor

### Physical Specifications

<b>Weight</b>	Including main unit with a battery, screen with handle & navigation knob, iView module, and Wi-Fi module.
N22:	11.5 kg (25.4 lbs)
N19:	10.3 kg (22.7 lbs)
<b>Size</b>	Including main unit, screen with handle.
N22:	641 x 383 x 115 mm (portrait) 566 x 458 x 115 mm (landscape)
N19:	584 x 348 x 115 mm (portrait) 509 x 423 x 115 mm (landscape)
Main unit:	268 x 268 x 68 mm
<b>Display</b>	
Type	Medical-grade color TFT LCD, capacitive touch screen, support multi-touch operation. Rotatable screen (Landscape and portrait)
Resolution	1680 x 1050 pixels
Screen	
N22:	22-inch, 178° viewing angle
N19:	19-inch, 170° viewing angle
Waveforms	Up to 16 waveforms (portrait) Up to 13 waveforms (landscape)

### ECG

Meet standards of IEC 60601-2-27 and IEC 60601-2-25.	
<b>Lead Sets</b>	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
<b>Bandwidth</b>	
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
<b>CMRR</b>	
Diagnostic:	> 90 dB
Monitor, Surgical, ST mode:	> 105 dB (with notch filter on)
<b>Pace detection</b>	
Amplitude:	± 2 mV to ± 700 mV
Width:	0.1 to 2 ms
Rise time:	10 to 100 µs (without overshoot)
<b>Defibrillator Protection</b>	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

<b>Measurement Range</b>	
Adult:	15 to 300 bpm
Pediatric/Neonate:	15 to 350 bpm
<b>Accuracy</b>	± 1 bpm or ± 1%, whichever is greater.
<b>Resolution</b>	1 bpm

### Arrhythmia Analysis

<b>Patient</b>	Adult/Pediatric/Neonate.
<b>Monitored Arrhythmias</b>	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. SVT, SVTs/min

### ST Segment Analysis

<b>Patient</b>	Adult/Pediatric.
<b>Range</b>	- 2.0 to + 2.0 mV (RTI)
<b>Accuracy</b>	± 0.02 mV or ± 10%, whichever is greater (- 0.8 to + 0.8 mV)
<b>Resolution</b>	0.01 mV

### QT Analysis

<b>Patient</b>	Adult/Pediatric/Neonate.
<b>Parameters</b>	QT, QTc, ΔQTc
<b>QTc Formula</b>	Bazett, Fridericia, Framingham, or Hodges
<b>Range</b>	
QT/QTc:	200 to 800 ms
QT-HR:	Adult: 15 to 150 bpm Pediatric/Neonate: 15 to 180 bpm
<b>QT Accuracy</b>	± 30 ms
<b>Resolution</b>	QT 4 ms; QTc 1 ms

### Respiration

<b>Range</b>	0 to 200 bpm
<b>Resolution</b>	1 rpm
<b>Apnea Alarm Time</b>	10, 15, 20, 25, 30, 35, 40 sec
<b>Accuracy</b>	
0 - 120 rpm:	± 1 rpm
121 - 200 rpm:	± 2 rpm
<b>Lead</b>	I, II, or auto (default: lead II)

### Pulse Oximetry

Meet standards of ISO 80601-2-61.	
<b>Module</b>	Mindray, Masimo, Nellcor
<b>Range</b>	0 to 100 %
<b>Resolution</b>	1%
<b>Accuracy</b>	
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%)
<b>Perfusion indicator (PI)</b>	Yes, for Mindray/Masimo SpO <sub>2</sub>
<b>Pitch Tone</b>	Yes
<b>Dual-SpO<sub>2</sub></b>	Yes, SpO <sub>2</sub> , SpO <sub>2</sub> b, ΔSpO <sub>2</sub>
<b>Pulse Rate Range</b>	
Mindray/Nellcor:	20 to 300 bpm
Masimo:	25 to 240 bpm
<b>Pulse Rate Accuracy</b>	
Mindray:	± 3 bpm (20 - 300 bpm)
Nellcor:	± 3 bpm (20 - 250 bpm)
Masimo:	± 3 bpm (non-motion) ± 5 bpm (motion)

### PR Refresh Rate

### Temperature

Meet standard of ISO 80601-2-56.	
<b>Method</b>	Thermal resistance
<b>Channels</b>	Up to 8 channels
<b>Units of Measure</b>	Selectable °C or °F
<b>Range</b>	0 to 50 °C / 32 to 122 °F
<b>Resolution</b>	0.1 °C, 0.1 °F
<b>Accuracy</b>	± 0.1 °C or ± 0.2 °F (without probe)
<b>Refresh Rate</b>	1 sec
<b>Genius™ Tympanic Thermometer</b>	
<b>Measurement Range</b>	33 to 42 °C / 91.4 to 107.6 °F
<b>Calibrated Accuracy</b>	± 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

### Response Time

### Non-Invasive Blood Pressure

Meet standards of ISO 80601-2-30.	
<b>Method</b>	Oscillometry
<b>Modes</b>	Manual, Auto, STAT, Sequence
<b>Units of Measure</b>	mmHg, kPa (user-selectable)
<b>Resolution</b>	1 mmHg
<b>Systolic range</b>	
Adult:	25 to 290 mmHg
Pediatric:	25 to 240 mmHg
Neonate:	25 to 140 mmHg
<b>Diastolic range</b>	
Adult:	10 to 250 mmHg
Pediatric:	10 to 200 mmHg
Neonate:	10 to 115 mmHg
<b>Mean range</b>	



Adult:	15 to 260 mmHg
Pediatric:	15 to 215 mmHg
Neonate:	15 to 125 mmHg
<b>Accuracy</b>	
Max Mean Error:	± 5 mmHg
Max Standard Deviation:	8 mmHg
<b>Cuff Deflation Technique Step bleed</b>	
<b>Initial Cuff Inflation</b>	
Adult:	80 to 280 mmHg (default: 160 mmHg)
Pediatric:	80 to 210 mmHg (default: 140 mmHg)
Neonate:	60 to 140 mmHg (default: 90 mmHg)
<b>Over Pressure Protection</b>	
Adult/ Pediatric:	297 ± 3 mmHg
Neonate:	147 ± 3 mmHg
<b>Max Measurement time</b>	
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

#### Cardiac Output

Method	Thermodilution
Measurement Range	0.1 - 20 L/min
Resolution	0.1 L/min
Accuracy	± 0.1 L/min or ± 5%, whichever is greater
TB Range	23 to 43 °C / 73.4 to 109.4 °F
TB, TI Accuracy	± 0.1 °C (without sensor)
TB, TI Resolution	0.1 °C

#### 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 °C / 73.4 to 109.4 °F
TB, TI Accuracy	± 0.1 °C (without sensor)
TB, TI Resolution	0.1 °C
pArt/pCVP Range	-50 to 300 mmHg
pArt/pCVP Accuracy	± 1 mmHg or ± 2 %, whichever is greater

#### ScvO<sub>2</sub>

Range	0 to 99 %
Accuracy	± 3% (50 to 80 %)

#### ICG

Method	Thoracic electrical bioimpedance (TEB)
HR Range	40 to 200 bpm (ICG), accuracy ± 2 bpm
C.O. Range	1.0 to 15 L/min
SV Range	5 to 250 ml
Provides Monitoring Parameters ACI, VI, PEP, LVET, TFI, TFC, HR, C.O., C.I., SV, SVI, SVR, SVRI, PVR, PVRI, LCWI, LCWI, LVSW, LVSWI, STR, VEPT	

#### Continuous Cardiac Output Interface

Measured Parameter	Consistent with CCO-related parameters outputted by Vigilance II®, Vigileo™, EV1000 or HemoSphere
--------------------	---

#### Artema Sidestream CO<sub>2</sub>

Meet standard of ISO 80601-2-55.

<b>Measurement Range</b>	
etCO <sub>2</sub> :	0 to 150 mmHg
O <sub>2</sub> (optional):	0 to 100 %
<b>CO<sub>2</sub> Accuracy</b>	
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)
<b>O<sub>2</sub> Accuracy</b>	
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

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

#### Warm-up Time

90 sec (maximum), 20 sec (typically)

Measured with a neonatal watertap and 2.5-meter neonatal sampling line, or an adult watertap and a 2.5-meter adult sampling line:

#### Rise Time

etCO <sub>2</sub> :	≤ 250 ms @ 70 ml/min (Neonate watertap)
	≤ 250 ms @ 90 ml/min (Neonate watertap)
	≤ 300 ms @ 120 ml/min (Adult watertap)
O <sub>2</sub> (optional):	≤ 800 ms @ 90 ml/min (Neonate watertap)
	≤ 750 ms @ 120 ml/min (Adult watertap)

#### Sampling Delay Time

etCO <sub>2</sub> :	≤ 5.0 sec @ 70 ml/min (Neonate watertap)
	≤ 4.5 sec @ 90 ml/min (Neonate watertap)
	≤ 5.0 sec @ 120 ml/min (Adult watertap)
O <sub>2</sub> (optional):	≤ 4.5 sec @ 90 ml/min (Neonate watertap)
	≤ 5.0 sec @ 120 ml/min (Adult watertap)
awRR Range	0 to 150 rpm

#### awRR Accuracy

0 to 300 rpm:	± 1 rpm
61 to 150 rpm:	± 2 rpm

#### Apnea Time

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

Provide VCO<sub>2</sub>, VO<sub>2</sub>, MVCO<sub>2</sub>, MVO<sub>2</sub>, EE, RQ parameters, when monitoring with RM module.

#### Oridion Microstream CO<sub>2</sub>

Measurement Range	0 to 99 mmHg
Resolution	1 mmHg
<b>Accuracy</b>	
0 to 38 mmHg:	± 2 mmHg
39 to 99 mmHg:	± 5 % + 0.08 % of the reading – 38 mmHg
Sample Flow Rate	50 <sup>-7.5</sup> <sub>+15</sub> ml/min
Start-up Time	30 sec (typical)
Response Time	2.9 s (typical)
awRR Range	0 to 150 rpm
<b>awRR Accuracy</b>	
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
<b>Accuracy</b>	
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
Provide VCO <sub>2</sub> , MVCO <sub>2</sub> , FeCO <sub>2</sub> , SlopeCO <sub>2</sub> , Vtalv, MValv, Vdaw, Vdaw/Vt, Vdalv, Vdalv/Vt, Vdphy, Vd/Vt, when monitoring with RM module.	

#### Anesthesia Gases

Meet standard of ISO 80601-2-55.

#### Sampling Rate

Adult/pediatric:	200 ml/min
Neonate:	120 ml/min

Sampling Rate Tolerance ± 10 ml/min or ± 10%, whichever is greater.

#### Sampling Delay Time

< 4 sec

#### Refresh Rate

1 sec

#### Warm-up Time

45 sec to warm-up status  
10 min to ready-to-measure status

#### Measurement Range

CO <sub>2</sub> :	0 to 30 %
N <sub>2</sub> O:	0 to 100 %
Des/Sev/Enf/Iso/Hal:	0 to 30 %
O <sub>2</sub> :	0 to 100 %
awRR:	2 to 100 rpm

#### Resolution

CO <sub>2</sub> :	0.1 %
N <sub>2</sub> O:	1 %
Des/Sev/Enf/Iso/Hal:	0.1 %
O <sub>2</sub> :	1 %



awRR:	1 rpm	
Full Accuracy		
Gases	Range (%REL)	Accuracy (%ABS)
CO <sub>2</sub> :	0 to 1 %	± 0.1 %
	1 to 5 %	± 0.2 %
	5 to 7 %	± 0.3 %
	7 to 10 %	± 0.5 %
	> 10 %	Not specified
N <sub>2</sub> 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 %
Sev:	> 18 %	Not specified
	0 to 1 %	± 0.15 %
	1 to 5 %	± 0.2 %
	5 to 8 %	± 0.4 %
Enf/Iso/Hal:	> 8 %	Not specified
	0 to 1 %	± 0.15 %
	1 to 5 %	± 0.2 %
O <sub>2</sub> :	> 5 %	Not specified
	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,

CO<sub>2</sub>/ N<sub>2</sub>O: ≤ 250 ms

Iso/Hal/Sev/Des: ≤ 300 ms

Enf: ≤ 350 ms

O<sub>2</sub>: ≤ 600 ms

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

CO<sub>2</sub>/ N<sub>2</sub>O: ≤ 250 ms

Iso/Hal/Sev/Des: ≤ 300 ms

Enf: ≤ 350 ms

O<sub>2</sub>: ≤ 500 ms

#### Sampling Delay Time

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

CO<sub>2</sub>: ≤ 4 sec

N<sub>2</sub>O: ≤ 4.2 sec

O<sub>2</sub>: ≤ 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:

CO<sub>2</sub>: ≤ 4.2 sec

N<sub>2</sub>O: ≤ 4.3 sec

O<sub>2</sub>: ≤ 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: $\pm$ (2 to 120) L/min Neonate: $\pm$ (0.5 to 30) L/min	
Paw	-20 to 120 cmH <sub>2</sub> 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 <sub>2</sub> O	
MVe/MVi	0.01 L/min (MVe/MVi < 10 L/min) 0.1 L/min (MVe/MVi $\geq$ 10 L/min)	
TVe/TVi	1 ml	
awRR:	1 rpm	
Accuracy		
Flow	Adult/Pediatric: $\pm$ 1.2 L/min or $\pm$ 10% of the reading, whichever is greater. Neonate: $\pm$ 0.5 L/min or $\pm$ 10%, whichever is greater.	
Paw	$\pm$ 3% of reading	
MVe/MVi	$\pm$ 10% of reading	
TVe/TVi	Adult/Pediatric: $\pm$ 10% or $\pm$ 15 ml, whichever is greater.	

awRR:	Infant: ±10% or ±6 ml, whichever is greater.
	±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.

#### rSO<sub>2</sub>

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)

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

ASYM 0 to 100%

DSA Trend Yes

#### EEG/aEEG

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 (0.5 Hz to 70 Hz)

Differential Input Impedance

> 15 MΩ @10 Hz

Electrode Impedance

Range 1 to 90 kΩ

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

Sampling Frequency

EBN EEG: 1024 Hz

Mindray EEG: 256Hz

Analog bandwidth

EBN EEG: 0.5 to 110 Hz

Mindray EEG/aEEG: 0.1 to 110 Hz

Spectrum analysis

SEF, MF, PPF, TP, SR, EMG, Delta, Theta, Alpha, Beta

Trend

DSA, CSA

#### ANI

Patient Adult, Pediatric (over 12 years old)

Measurement Range ANIi: 12 to100

ANIm: 12 to 100

Energy: 0.00 to 65.54

#### tcGas

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

Measurement Range

tcpCO<sub>2</sub> 5 to 200 mmHg

tcpO<sub>2</sub> 0 to 800 mmHg

SpO<sub>2</sub> 0 to 100 %

PR 25 to 240 bpm

Power 0 to 1000 mW

Accuracy

tcpCO<sub>2</sub> TOSCA Sensor 92, tc Sensor 54:

Better than 1 mmHg (1 % or 10 % CO<sub>2</sub>)

Better than 3 mmHg (33 % CO<sub>2</sub>)

tc Sensor 84:

Better than 1 mmHg (1 % or 10 % CO<sub>2</sub>)

Better than 5 mmHg (33 % CO<sub>2</sub>)

tcpO<sub>2</sub>

tc Sensor 84:

Better than 1 mmHg (0 % O<sub>2</sub>)

Better than 3 mmHg (21 % O<sub>2</sub>)

Better than 5 mmHg (50 % O<sub>2</sub>)

Better than 25 mmHg (90 % O<sub>2</sub>)

±3 % (70 to 100 %)

±3 bpm

±20 % of reading

#### iView

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 two-slots recorder module.

## Alarms

Audible indicator	Yes, 4 different alarm tones, and prompt tone
Visible indicator	Red/yellow/cyan LED, and alarm message
Provide AlarmSight infographic alarm indicator.	
Support iAlarm features (alarm limits recommendations, etc.)	
Support iStatus combined alarms	

## 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
Minirend	Yes

## Special Functions

Clinical Assistive Application (CAA):	HemoSight™, ST Graphic™, SepsisSight™, BoA Dashboard™, EWS, GCS, ECG 24h Summary, Pace View, AF Summary, NeuroSight
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

## 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 %

## Interfacing

Main Unit	
	1 AC Power Connector
	2 RJ45 Network Connector, 100 Base-TX, IEEE 802.3
	6 USB 2.0 Connector
	3 Nonstandard USB SMR Connector
	1 VP Connector, VP1 for the secondary display
	1 BNC Connector
	1 Equipotential Grounding Terminal
Modular iView	
	1 VP Connector, VP2
	4 USB 2.0 Connector
	1 RJ45 Network Connector, 100 Base-TX, IEEE 802.3
Multifunction Connector for Defib Sync and Analog Output	
	1 on multi-parameter module
Barcode Scanner	Support 1D and 2D barcode
Keyboard & Mouse	Support wire and wireless type
Remote Control	Support
Network Printer	Support

## Battery

Type	Rechargeable lithium-ion
Number of Battery	1
Capacity	5600mAh
Run Time	> 1 hrs
	when powered by a new fully-charged battery at 25 °C±5 °C with 12-lead ECG , Resp, SpO2, 4-ch IBP, 2-ch Temp, CO2, C.O. and NIBP measurements every 15 min, WiFi enabled, and screen brightness set to default 5, 5 hrs to 90% when the monitor is off.
Recharge Time	

## Power Requirements

AC Voltage	100 to 240 VAC (±10 %)
Current	2.8 to 1.6 A
Frequency	50 Hz/60 Hz (±3 Hz)

## Environmental

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/(a)EEG/PiCCO/ANI module: CF
	ScvO2/CO2/AG/ICG/BIS/RM/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.

**www.mindray.com**

P/N:ENG- BeneVision N22/N19 Datasheet-210285x4P-20211225

©2021 Shenzhen Mindray Bio-Medical Electronics Co.,Ltd. All rights reserved.

**mindray**  
healthcare within reach