Performance Specifications

Display

Type:	Medical-grade color TFT LCD, capacitive touchscreen, 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 (3, 5, 6, 12-lead)

Leads:	I, II, III, aVR, aVL, aVF, V1-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
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
Defibrillator Protection:	Withstand 5000 VAC/50 Hz voltage in isolation against electrosurgical interference and defibrillation
Recovery Time:	≤5 s
CMRR	
Diagnostic:	>90 dB
Monitor, Surgical, ST Mode:	>105 dB (with notch filter on)
ESU Recovery Time:	≤10 s

Pulse Oximetry

With Masimo SET® SpO_2

Range:	1 to 100 %
Resolution:	1 %
Accuracy:	±2 %(70 to 100 %, Adult/Pediatric, non- motion)
	±3 % (70 to 100 %, motion)
	±3 % (70 to 100 %, Neonate, non-motion)
	0 to 69 % unspecified
Dual-SpO_2:	Yes, SpO_2, SpO_2b, ΔSpO_2
Pulse Rate Range:	25 to 240 bpm
Pulse Rate Accuracy:	±3 bpm (non- motion)
	±5 bpm (motion)

With Nellcor SpO_2

Range:	0 to 100 %
Resolution:	1 %
Accuracy:	±2 % (70 to 100 %, Adult/Pediatric)
	±3 % (70 to 100 %, Neonate)
	Unspecified (0 to 69 %)
Dual-SpO_2:	Yes, SpO_2, SpO_2b, ΔSpO_2
Pulse Rate Range:	20 to 300 bpm
Pulse Rate Accuracy:	±3 bpm (20 - 250 bpm)
	Unspecified (251 - 300 bpm)
Refresh Rate:	1 s

Non-Invasive Blood Pressure

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 s
Neonate:	90 s
Assisting Venous Puncture:	Yes
Pulse Rate Range:	30 to 300 bpm
Pulse Rate Accuracy:	±3 bpm or ±3 %, whichever is greater

Temperature

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)

IBP

Number:	Up to 8 channels
Measurement Range:	-50 to 300 mmHg
Resolution:	1 mmHg
Accuracy:	±1 mmHg or ±2 %, whichever is greater (excluding sensor error)
Zero Offset Range:	±200 mmHg
Excitation:	5V DC, ±2 %
Sensitivity:	5 µV/V/mmHg

Performance Specifications

Anesthesia Gases (continued)

Sampling Delay Time: <4 s
Refresh Rate: 1 s
Warm-up Time: 45 s to warm-up status
10 min to ready-to-measure status

Measurement Range

CO_2:	0 to 30 %
N_2O:	0 to 100 %
Des/Sev/Enf/Iso/Hal:	0 to 30 %
O_2:	0 to 100 %
awRR:	2 to 100 rpm

Resolution

CO_2:	0.1 %
N_2O:	1 %
Des/Sev/Enf/Iso/Hal:	0.1 %
O_2:	1 %
awRR:	1 rpm

Full Accuracy

Gases	Range (%REL)	Accuracy (%ABS)
Cc:	0 to 1 %	±0.1 %
	1 to 5 %	±0.2 %
	5 to 7 %	±0.3 %
	7 to 10 %	±0.5 %
	>10 %	Not specified
N_2O:	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 Neonatal DRYLINE II™ watertrap and a Neonatal 2.5m sampling line:

CO_2/N_2O:	≤250 ms
Iso/Hal/Sev/Des:	≤300 ms
Enf:	≤350 ms
O_2:	≤600 ms

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

CO_2/N_2O:	≤250 ms
Iso/Hal/Sev/Des:	≤300 ms
Enf:	≤350 ms
O_2:	≤500 ms

Sampling Delay Time

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

CO_2:	≤4 s
N_2O:	≤4.2 s
O_2:	≤4 s
Enf /Iso/Hal/Sev/Des:	≤4.4 s

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

CO_2:	≤4.2 s
N_2O:	≤4.3 s
O_2:	≤4 s
Enf/Iso/Hal/Sev/Des:	≤4.5 s

Apnea Alarm time: 10, 15, 20, 25, 30, 35, 40 s

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: = 180 s max
Auto-Zeroing Interval: At start-up, and every 12 hrs thereafter
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 Alarm Time: 10, 15, 20, 25, 30, 35, 40 s

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
Blood Temp Range: 23 to 43°C (73.4 to 109.4°F)
Blood Temp Accuracy: ±0.1°C (±0.2°F) (without sensor)
Blood Temp Resolution: 0.1°C (0.2°F)

Continuous Cardiac Output Interface

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

FloTrac™ Specifications

Standard: Meets the requirements of IEC 60601-2-34: 2011

Measured Parameter Display Range Remark

CCO:	1.0 to 20.0 L/min
Reproductibility1:	±6% or 0.1 L/min, whichever is greater
CCI:	0.0 to 20.0 L/min/m2 /
SV:	0 to 300 mL/b /
SVI:	0 to 200 mL/b/m2 /
SVR:	0 to 5000 dyne-s/cm5 /
SVRI:	0 to 9950 dyne-s-m2/cm5 /
SVV:	0 to 99% /
PPV:	0 to 99% /
Blood pressure 2 live pressure:	-34 to 312 mmHg
MAP/DIA/SYS:	0-300 mmHg
Accuracy:	±4% or ±4 mm Hg, whichever is greater, from -30 mmHg to 300 mmHg
PR:	0 to 220 bpm Accuracy 3: Arms ≤3 bpm

1Coefficient of variation: measured using electronically generated data.

2 Parameter specifications compliant with IEC 60601-2-34. Testing performed under laboratory conditions.

3 Accuracy tested under laboratory conditions.

$ScvO_2$

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

rSO_2

Patient:	Weight greated than 2.5 kg
Method:	INVOS, NIRS (Near Infrared Spectroscopy)
Number:	Up to 4 channels
Measurement Range:	15 to 95 %

BIS

Standard:	Meets the standard of IEC 60601-2-26: 2012
Technique:	Bispectral index
Measured Parameters:	EEG
	BIS, BIS L, BIS R: 0 to 100
Calculated Parameters:	SQI, SQI L, SQI R: 0 to 100%
	EMG, EMG L, EMG R: 0 to 100 dB
	SR, SR L, SR R: 0 to 100%
	SEF, SEF L, SEF R: 0.5 to 30.0 Hz
	TP, TP L, TP R: 40 to 100 dB
	BC, BC L, BC R: 0 to 30
	sBIS L, sBIS R: 0 to 10.0
	sEMG L, sEMG R: 0 to 10.0
	ASYM: 0 to 100%
Impedance Range:	0 to 999 kΩ
Sweep Speed:	6.25 mm/s, 12.5 mm/s, 25 mm/s or 50 mm/s, ±10% error
Input Impedance:	>5 MΩ
Noise (RTI):	<0.3 μV (0.25 to 50 Hz)
Input Signal Range:	±1 mV
EEG Bandwidth:	<0.25 to 100 Hz
Patient Leakage Current:	<10 μA

Alarm Limit

BIS High Range:	(low limit + 5) to 100	Step: 5
BIS Low Range:	0 to (high limit - 5)	Step: 5

NMT

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 300 μs, monophasic rectangle pulse
Stimulation Pulse Width Accuracy:	±10 %
Max. Output Voltage:	300 V

EEG

EEG Channels:	Up to 4 channels
Bandwidth:	0.5 to 50 Hz (-3 dB)
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
Accurancy:	±1 kΩ or ±10 %, whichever is greater

Measured Parameters: Measurement Range / Resolution

SEF, MF, PPF:	0.5 to 30 Hz / 0.5 Hz
TP:	40 to 100 dB / 1 dB
SR:	0 to 100% / 1%
Delta, Theta, Alpha, Beta:	0 to 100% / 1%
Alpha/Delta (for EEG-1/ aEEG module):	0 to 99 (invalid if Delta is 0%) / 0.1

iView

CPU:	Intel Pentium N4200 2.5 GHz
Memory:	8 GB
Hard-disk:	mSATA SSD 128 GB
OS:	Windows 10

Recorder

Type:	Thermal array
Speed:	25 mm/s, 50 mm/s
Trace:	Up to 3

Data Storage

Trends Data:	>120 hrs @ 1min, 4 hrs @ 5 s
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:	Up to 48 hrs
OxyCRG:	48 hrs
ST Review:	120 hrs @1 min

Wi-Fi Communications

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

Operating Frequency

IEEE 802.11b/g/n (2.4G):	
FCC:	2.4 to 2.483 GHz

BeneVision N19/N22 PATIENT MONITORS

Physical Specifications

Auxiliary Output (continued)

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 and Mouse:	Support wire and wireless type
Remote Control:	Support
Network Printer:	Support

Battery

Type:	Rechargeable lithium-ion
Number of Battery:	1
Capacity:	5600 mAh, 11.3 VDC
Run Time:	>1 hrs
	When powered by a new fully-charged battery at 25 ºC±5 ºC with 12-lead ECG , Resp, SpO_2, 4-ch IBP, 2-ch Temp, CO_2, C.O. and NIBP measurements every 15 min, WiFi enabled, and screen brightness set to default 5
Recharge Time:	5 hrs to 90 % when the monitor is off

Physical BeneVision N19

Main Unit and Primary Display Installed Together with Handle

Dimension (horizontal):	16.6" (H) x 20.0" (W) x 4.5" (D) 42.3 cm (H) x 50.9 cm (W) x 11.5 cm (D)
Dimension (vertical):	23.0" (H) x 13.7" (W) x 4.5" (D) 58.4 cm (H) x 34.8 cm (W) x 11.5 cm (D)
Weight:	22.7 lb (10.3 kg) including battery, iView module, WiFi module, display with handle and navigation knob

Display, 19"

Dimension:	13.7" (H) x 20.0" (W) x 1.9" (D) 34.8 cm (H) x 50.9 cm (W) x 4.8 cm (D)
Weight:	13.7 lb (6.2 kg) excluding handle

Main Unit

Dimension:	10.5" (H) x 10.5" (W) x 2.7" (D) 26.8 cm (H) x 26.8 cm (W) x 6.8 cm (D)
Weight:	7.5 lb (3.4 kg) including battery

Physical BeneVision N22

Main Unit and Primary Display Installed Together

Dimension (horizontal):	18.0" (H) x 22.3" (W) x 4.5" (D) 45.8 cm (H) x 56.6 cm (W) x 11.5 cm (D)
Dimension (vertical):	25.2" (H) x 15.0" (W) x 4.5" (D) 64.1 cm (H) x 38.3 cm (W) x 11.5 cm (D)
Weight:	25.3 lb (11.5 kg) including battery, iView module, WiFi module, display with handle and navigation knob

Display, 22"

Dimension:	15.1" (H) x 22.3" (W) x 1.9" (D) 38.3 cm (H) x 56.6 cm (W) x 4.8 cm (D)
Weight:	16.3 lb (7.4 kg) excluding handle

Main Unit

Dimension:	10.5" (H) x 10.5" (W) x 2.7" (D) 26.8 cm (H) x 26.8 cm (W) x 6.8 cm (D)
Weight:	7.5 lb (3.4 kg) including battery

Environmental

Operating Temperature:

0°C to 40°C	Main unit, MPM module, individual module of SpO_2, TEMP, IBP, CO, CCO/SvO_2, NMT, EEG, and BeneLink, recorder
0°C to 40°C	Microstream CO_2 module
5°C to 40°C	Sidestream CO_2 module
10°C to 40°C	AG module, $ScvO_2$ module
16°C to 32°C	rSO_2 module
10°C to 32.5°C	FloTrac module

Storage Temperature:

-20°C to 60°C	Main unit, MPM module, individual module of SpO_2, TEMP, IBP, CO, CCO/SvO_2, $ScvO_2$, NMT, AG, Microstream/Sidestream CO_2, EEG, and BeneLink, recorder
-20°C to 70°C	rSO_2 module
-18°C to 45°C	FloTrac module

Operating Humidity:

15 to 95 % (non condensing):	Main unit, MPM module, individual module of SpO_2, TEMP, IBP, CO, CCO/SvO_2, NMT, AG, Microstream/Sidestream CO_2, EEG, and BeneLink, recorder
15 to 75 % (non condensing):	$ScvO_2$ module
20 to 80 % (non condensing):	rSO_2 module
20 to 90 % (non condensing):	FloTrac module

Storage Humidity:

10 to 95 % (non condensing):	Main unit, MPM module, individual module of SpO_2, TEMP, IBP, CO, CCO/SvO_2, $ScvO_2$, NMT, AG, Microstream/Sidestream CO_2, EEG, and BeneLink, recorder
10 to 90 % (non condensing):	$ScvO_2$ module
20 to 90 % (non condensing):	FloTrac module

Operating Atmospheric Pressure:

427.5 to 805.5 mmHg	Main unit, MPM module, individual module of SpO_2, TEMP, IBP, CO, CCO/SvO_2, $ScvO_2$, NMT, EEG, and BeneLink, recorder
430 to 790 mmHg	Microstream/Sidestream CO_2 module
525 to 805.5 mmHg	AG module, and rSO_2 module
522.8 to 759.8 mmHg	FloTrac module

Safety

Type of Protection:	Class I
Degree of Protection:	MPM/IBP/C.O./NMT/EEG module: CF
	$ScvO_2$/CO_2/AG/rSO_2 module: BF
Protection Against Ingress of Fluids:	IPX1

Power Requirements

AC Voltage:	100 to 240 VAC (±10 %)
Current:	2.8 to1.6 A
Frequency:	50 Hz/60 Hz (±3 Hz)
Fuse:	Time-lag 250 V T4A

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