ePM 10M/12M/15M PATIENT MONITORS

Performance Specifications for Ambulatory Surgery Center and Clinic

Display

Type:	Capacitive touchscreen, supports multi-touch operation.
Size and Resolution:	
ePM 10M:	10.1" – 1280 x 800 pixels
ePM 12M:	12.1" – 1280 x 800 pixels
ePM 15M:	15.6" – 1366 x 768 pixels
Waveforms:	
ePM 10M:	Up to 8 waveforms
ePM 12M:	Up to 10 waveforms
ePM 15M:	Up to 12 waveforms

ECG (3, 5 lead)

Leads:	I, II, III, aVR, aVL, aVF, V
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
Defibrillator Protection:	Withstand 5000 V (360J) voltage in isolation against 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

Heart Rate Meter

Measurement Range:	
Adult:	15 to 300 bpm
Pediatric/Neonate:	15 to 350 bpm
Accuracy:	±1 bpm or ±1%, whichever is greater
Resolution:	1 bpm
Tall T-wave Rejection:	When the test is performed based on Clause 201.12.1.101.17 of ANSI/AAMI/IEC 60601-2-27, the heart rate calculation is not affected for QRS of 1 mV amplitude and 100 ms duration, T-wave duration of 180 ms and amplitude lower than 1.2 mV, and QT interval of 350 ms.

Pace Pulse

Pace:	Pace pulses meeting the following conditions are labelled with a PACE marker:
Amplitude:	±2 to ±700 mV
Width:	0.1 to 2 ms
Rise Time:	10 to 100 µs (without overshoot)
Pace Pulse Rejection:	When tested in accordance with the ANSI/AAMI/ IEC 60601-2-27: 201.12.1.101.13, the heart rate meter rejects all pulses meeting the following conditions.
Amplitude:	±2 to ±700 mV
Width:	0.1 to 2 ms
Rise Time:	10 to 100 µs (without overshoot)

Arrhythmia Analysis

Patient:	Adult/Pediatric
Monitored Arrhythmias:	Asystole, V-Fib/V-Tach, V-Tach, Vent Brady, Extreme Tachy, Extreme Brady, Vent Rhythm, PVCs/min, Pauses/min, Couplet, Bigeminy, Trigeminy, R on T, Run PVCs, PVC, Tachy, Brady, Missed Beats, Pacer Not Pacing, Pacer Not Capture, Multiform PVC, Nonsus V-Tach, Pause, Irr Rhythm, A-Fib



ST Segment Analysis (optional)

Patient:	Adult/Pediatric/Neonate
Range:	-2.0 to +2.0 mV (RTI)
Accuracy:	-0.8 to +0.8 mV: ±0.02 mV or ±10%, whichever is greater Beyond this range: not specified
Resolution:	0.01 mV
ST Adjust Scale:	40 ms after J points, 60 ms after J point (default), 80 ms after J point and 60/80 ms after J point (80 ms when HR 120 bpm or less; 60 ms when HR above 120 bpm)
ISO Adjust Scale:	4-200 ms before R-Wave (default: 80 ms), Step: 4 ms
J Point Adjust Scale:	4-200 ms after R-Wave (default: 48 ms), Step: 4 ms

QT Analysis (optional)

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

Lead:	I or II, auto
RR Range:	0 to 120 rpm (Adult) 0 to 150 rpm (Pediatric/Neonate)
RR Accuracy:	± 2 rpm (7 to 150 rpm) or ± 2 %, whichever is greater 0 to 6 rpm: not specified
RR Resolution:	1 rpm
Sweep Speed:	3 mm/s, 6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Apnea Alarm Delay:	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 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%, Neonate, non-motion) ±3% (70 to 100%, motion) 1 to 69% unspecified
Pulse Rate Range:	25 to 240 bpm
Pulse Rate Accuracy:	±3 bpm (non- motion) ±5 bpm (motion)
Refresh Rate	≤ 1s

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Pulse Oximetry (continued)

With Nellcor SpO_2 (optional)

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

PR

Range:	25 to 350 bpm (from IBP) 30 to 300 bpm (from NIBP)
Accuracy:	±1 bpm or ±1 %, whichever is greater (from IBP)
	± 3 bpm or ±3 %, whichever is greater (from NIBP)

Temperature

Meet standard of ISO 80601-2-56.

Method:	Thermal resistance
Channels:	2 channels
Range:	0 to 50 °C (32 to 122 °F)
Accuracy:	± 0.1 °C or ± 0.2 °F (without probe)
Resolution:	0.1 °C

Non-Invasive Blood Pressure

Meet standards of ISO 80601-2-30.

Method:	Oscillometry	
Operation Mode:	Manual, Auto, STAT, Sequence	
Max Measurement Time:	Adult/Pediatric:	180 s
	Neonate:	90 s
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
Resolution:	1 mmHg	
Assisting Venous Puncture:	Yes	

Invasive Blood Pressure (optional)

Meet standards of IEC 60601-2-34: 2011.

Technique:	Direct invasive measurement
Measurement Range:	-50 to 300 mmHg
Resolution:	1 mmHg
Accuracy:	±2% or ±1 mmHg, whichever is greater (excluding sensor error)
Refreshing Rate:	≤ 1 s
Recovery Time:	<10 s (after defibrillation)

Sidestream CO_2 (optional)

Measurement Range:	
$etCO_2$:	0 to 150 mmHg
CO2 Accuracy:	
0 to 40 mmHg:	±2 mmHg
41 to 76 mmHg:	±5% of reading
77 to 150 mmHg:	±10% of reading
Resolution:	
$etCO_2$:	1 mmHg
Sample Flow Rate:	
Adult/Pediatric:	120 ml/min
Neonate:	70 ml/min or 90 ml/min
Sample Flow Rate Tolerance:	±15 ml/min or ±15%, whichever is greater
Warm-up Time:	90 s (maximum), 20 s (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/Pediatric watertrap)
Response Time:	
$etCO_2$:	≤5.0 s @ 70 ml/min (Neonate watertrap)
	≤4.5 s @ 90 ml/min (Neonate watertrap)
	≤5.0 s @ 120 ml/min (Adult/Pediatric watertrap)
awRR Range:	0 to 150 rpm
awRR Accuracy:	
0 to 60 rpm:	±1 rpm
61 to 150 rpm:	±2 rpm
Apnea Alarm Delay:	10, 15, 20, 25, 30, 35, 40 s

Oridion Microstream CO_2 (optional)

Measurement Range:	0 to 99 mmHg
Resolution:	1 mmHg
Accuracy:	
0 to 38 mmHg:	±2 mmHg
39 to 99 mmHg:	±5% of the reading (0.08% increased in error for every 1 mmHg if the reading is more than 38 mmHg)
Sample Flow Rate:	50 -7.5 +15 ml/min
Start-up Time:	30 s (typical), 180 s (max)
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
Alarm:	10, 15, 20, 25, 30, 35, 40 s

Anesthesia Gases (ePM 12M and ePM 15M only)

Sampling Rate

Adult/Pediatric:	200 ml/min
Neonate:	120 ml/min
Sampling Rate Tolerance:	±10 ml/min or ±10%, whichever is greater
Delay Time:	<4 s
Warm-up Time:	45 s to iso accuracy mode
	10 min to full accuracy mode

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

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Anesthesia Gases (continued)

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)
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_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 the 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 the 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 Delay:	10, 15, 20, 25, 30, 35, 40 s

Data Review Storage

Trends Data:	Up to 120 hours @ 1 min
Events:	Up to 1000 events, including parameter alarms, arrhythmia events, technical alarms
NIBP:	Up to 1000 sets
Full Disclosure:	48 hours for all parameter waveforms
OxyCRG:	400 OxyCRG events
ST Review:	Up to 120 hours @ 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):
	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, 20 MHz @ 5 GHz
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:	< 20 dBm (CE requirement: detection mode - RMS) < 30 dBm (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:	AES

Interfacing

Main Unit:	AC power connector (1)
	VGA port (1)
	USB 2.0 connector (2)
	Analog output/nurse call/defib. sync/serial port (1) Integrated module rack (1), for 2 slots
Barcode Scanner:	Supports 1D & 2D barcode
Thermal Recorder:	3 traces (paper 50 mm width, 20 m length)
Network Printer:	Support

Power Requirements

Line Voltage:	100 to 240 VAC (±10 %)
Maximum Current:	2.0 A
Frequency:	50/60 Hz (±3 Hz)
Battery:	Rechargeable lithium-ion battery, 4500mAh
	≥4 hours run time
Recharge Time (power off):	5 hours to 90%

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ePM 10M/12M/15M PATIENT MONITORS

Performance Specifications for Ambulatory Surgery Center and Clinic

Physical Specifications

Weight:

ePM 10M:	8.8 lbs (4.0 Kg)
ePM 12M:	10.6 lbs (4.8 Kg)
ePM 15M:	13.7 lbs (6.2 Kg)

(Standard configuration, excluding modules, recorder, battery and accessories.)

Size:

ePM 10M:	10.6" x 9.9" x 6.3" 26.9 cm x 25.2 cm x 15.9 cm
ePM 12M:	12.2" x 11.4" x 6.7" 31.0 cm x 28.9 cm x 16.9 cm
ePM 15M:	15.5" x 12.4" x 6.8" 39.4 cm × 31.6 cm × 17.4 cm

Environmental Requirements

Temperature

Operating:	0 to 40 °C (without AG and CO_2 module)
	10 to 40 °C (with AG and CO_2 module)
Storage:	-20 to 60 °C

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, without AG and CO_2 module)
Storage:	120 to 805.5 mmHg (16.0 to 107.4 kPa, without AG and CO_2 module)

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