BeneHeart D3/BeneHeart D2

Defibrillator/Monitor

Operator's Manual

A Specifications

A.1 General Specifications

Type of protection against electrical shock	Class I, equipment energized from an external and internal electrical power source. If you suspect the integrity of the external protective earthing or the protective earthing wire, you should run the equipment on internal electrical power supply (battery).
Degree of protection against electric shock	Type BF defibrillation proof for CO_2 monitoring and external defibrillation.
	Type CF defibrillation proof for ECG, SpO_2, NIBP, internal defibrillation and CPR sensor.
Mode of operation	Continuous
Degree of protection against harmful ingress of solid	IP4X
Degree of protection against harmful ingress of water	IPX4 (when running on battery) IPX1 (when running on AC power supply)
Degree of mobility	Portable

Size	
Width × depth × height, without external paddles	288×203×275 mm

Maximum Weight
6.1 kg, including a battery, external paddles and 3-leadwire.

Display	
Type	TFT Color LCD
Size	7 inch
Resolution	800×480 pixels
Viewed waveforms	Max. 3
Wave viewing time	Max. 16s (ECG)

Equipment connectors	
USB connector	Connects USB flash memory
Multifunctional connector	Connects a cable for analog output or a cable for defibrillator synchronization.
RJ45 connector	Connects standard network cable.

Audio Indicator	
Speaker	Gives alarm tones (45 to 85 dB), key tones, QRS tones; Supports PITCH TONE and multi-level tone modulation; Alarm tones comply with IEC60601-1-8.
Multifunctional connector	
Standard	Meets the requirements of EN60601-1 for short-circuit protection and leakage current
Output impedance	Typically 50Ω
ECG Analog Output (only ECG lead set)	
Bandwidth (-3 dB; reference frequency: 10 Hz)	Diagnostic mode: 0.05 to 150 Hz Monitor mode: 0.5 to 40 Hz Therapy mode: 1 to 20 Hz
Maximum QRS delay	25 ms (in diagnostic mode, and with Notch off)
Sensitivity	1 V/mV ±5%
Pace enhancement	Signal amplitude: V_{oh}≥2.5V Pulse width: 10ms±5% Signal rising and falling time: ≤100μs
Synchronous input	
Input signal range	0 to 5V (TTL level)
Input impedance	≥10 kΩ
Pulse width	>5 ms
Alarm output (Network connector)	
Alarm delay time from the equipment to other remote equipment	The alarm delay time from the equipment to other remote equipment is ≤4 seconds, measured at the equipment signal output connector.

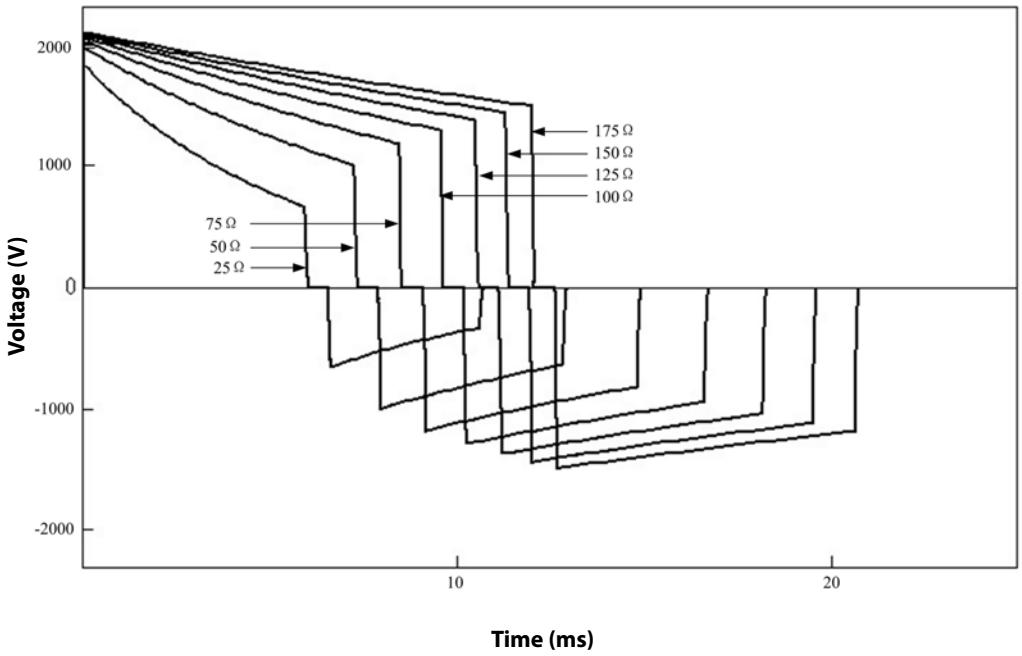
A.2 Defibrillator Specifications

Standards	Meet standards of IEC 60601-2-4
Defibrillation mode	Manual defib, synchronous cardioversion, AED
Defibrillation waveform	Biphasic truncated exponential (BTE) waveform, auto-compensation according to patient impedance
Defibrillation electrodes	External paddles set coming with pediatric paddles included, multifunction electrode pads and internal paddles
Controls and indicators on external paddles	Charge button, Shock buttons, Energy Select buttons and charge done indicator

Range of selected energy	
External defibrillation	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 30, 50, 70, 100, 150, 170, 200, 300 (optional), 360 (optional) J
Internal defibrillation	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 30, 50 J

Patient impedance range	
External defibrillation	25 to 300 Ω
Internal defibrillation	15 to 300 Ω

360 J defibrillation waveform into impedance of 25Ω, 50Ω, 75Ω, 100Ω, 125Ω, 150Ω, 175Ω



Selected energy accuracy								
Impedance / Energy	25Ω	50Ω	75Ω	100Ω	125Ω	150Ω	175Ω	Accuracy
1 J	1	1	1	0.9	0.9	0.9	0.8	±2J
2 J	2	2	2	1.9	1.8	1.7	1.6	±2J
3 J	2.9	3	2.9	2.8	2.7	2.6	2.4	±2J
4 J	3.9	4	3.9	3.7	3.6	3.4	3.2	±2J
5 J	4.9	5	4.9	4.7	4.5	4.3	4.1	±2J
6 J	5.8	6	5.8	5.6	5.3	5.1	4.9	±2J
7 J	6.8	7	6.8	6.6	6.3	6	5.7	±2J
8 J	7.8	8	7.8	7.4	7.1	6.8	6.5	±2J
9 J	8.8	9	8.8	8.4	8	7.7	7.3	±2J
10 J	9.7	10	9.7	9.3	8.9	8.5	8.1	±2J
15 J	15	15	15	14	13	13	12	±15%
20 J	20	20	20	19	18	17	16	±15%
30 J	29	30	29	28	27	25	24	±15%
50 J	49	50	49	47	45	43	41	±15%
70 J	68	70	68	65	62	60	57	±15%
100 J	97	100	97	93	89	85	81	±15%
150 J	146	150	146	140	134	128	122	±15%
170 J	166	170	166	159	151	145	138	±15%
200 J	195	200	195	187	178	170	163	±15%
300 J	292	300	292	280	267	255	244	±15%
360 J	351	360	350	336	321	306	293	±15%

Charge time (Note: at 20 ±5 °C of ambient temperature)												
	Manual Defib						AED					
	Charge time		From initial power on (from cold start) to charge done		From initial power on (from fast startup mode) to charge done		From initiation of rhythm analysis to charge done		From initial power on (from cold start) to charge done		From initial power on to charge done	
	200J	360J	200J	360J	200J	360J	200J	360J	200J	360J	200J	360J
With a new, fully charged battery	<3 s	<7 s	<11 s	<14 s	<6 s	<10 s	<10 s	<12 s	<21 s	<26 s	<13 s	<15 s
With a new, fully charged battery, depleted by 15 360 J discharges	<4 s	<8 s	<12 s	<15 s	<7 s	<11 s	<11 s	<13 s	<23 s	<27 s	<14 s	<16 s
With 90% to 100% rated mains voltage	<4 s	<7 s	<11 s	<14 s	<7 s	<10 s	<11 s	<12 s	<22 s	<24 s	<14 s	<15 s

Synchronized discharge delay	
Local synchronized discharge delay	< 60ms (from the peak of R-wave)
Remote synchronized discharge delay	< 25ms (from the rise edge of synchronous signal)

AED	
Shock series	Energy level: 100 to 360J, configurable for adult; 10 to 100J, configurable for pediatric Shocks: 1, 2, 3, configurable; Meeting AHA guidelines 2015 by default.
Shockable rhythm	VF, VT (HR>150bpm and QRS width>120ms)

AED ECG Analysis Performance

Rhythm Class	Performance requirement	Remark
Shockable rhythm Ventricular fibrillation	Sensitivity > 90%	Meets IEC 60601-2-4 and AAMI DF80 requirement and AHA recommendation
Shockable rhythm Ventricular tachycardia	Sensitivity > 75%	Meets IEC 60601-2-4 and AAMI DF80 requirement and AHA recommendation
Non-shockable rhythm Normal sinus rhythm	Specificity > 99%	Meets IEC 60601-2-4 and AAMI DF80 requirement and AHA recommendation
Non-shockable rhythm Asystole	Specificity > 95%	Meets IEC 60601-2-4 and AAMI DF80 requirement and AHA recommendation
Non-shockable rhythm All other non-shockable rhythms	Specificity > 95%	Meets IEC 60601-2-4 and AAMI DF80 requirement and AHA recommendation

A.3 CPR Compression Specifications

Compression depth	Measurement range: 0 to 8 cm Accuracy: ±5 mm or 10%, whichever is greater
Compression rate	Measurement range: 40 to 160 cpm (compressions per minute) Accuracy: ±2 cpm (compression per minute)
Interruption time	0 to 300 s

A.4 Pacer Specifications

Standards	Meet standards of IEC 60601-2-4
Pacing mode	Demand, fixed
Output waveform	Monophasic square wave pulse pulse width 20 ms or 40 ms Accuracy: ±5%
Pacing rate	30ppm to 210ppm Accuracy: ±1.5% Resolution: 5 ppm
Pacing output	0mA to 200mA, Accuracy: ±5% or ±5mA, whichever is greater Resolution: 1mA, 2mA or 5mA
Refractory period	200 to 300 ms (depending on pacing rate)
4:1 pacing	Pacing pulse frequency reduced by factor of 4 when this function is activated.
Output protection	The equipment has no sign of damage after defibrillation-proof test.

A.5 Monitor Specifications

ECG (from ECG lead set)	
Standards	Meet standards of IEC 60601-2-27
Patient connection	3-lead ECG cable, 5-lead ECG cable
ECG inputs	3-lead ECG set: I, II, III 5-lead ECG set: I, II, III, aVR, aVL, aVF, V
Gain	2.5 mm/mV (×0.25), 5 mm/mV (×0.5), 10 mm/mV (×1), 20 mm/mV (×2), 40mm/mV (×4), Auto
Paper speed	6.25mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Bandwidth (-3dB)	Diagnostic mode: 0.05 to 150 Hz Monitor mode: 0.5 to 40 Hz Therapy mode: 1 to 20 Hz
Common mode rejection	Diagnostic mode: >90 dB Monitor mode: >105 dB Therapy mode: >105 dB
Notch filter	50/60Hz, In Monitor, Therapy modes: notch filter turns on automatically In Diagnostic mode: notch filter is turned on manually
ECG signal range	±8mV
Calibration signal	1mV (peak-to-peak value) ±5%
Differential input impedance	≥5 MΩ
Electrode offset potential tolerance	±500mV

ESU protection	Cut mode: 300 W Coagulate mode: 100 W Recovery time: ≤10 s In compliance with the requirements in clause 202.6.2.101 of IEC 60601-2-27
Pace Pulse	
Pace pulse markers	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
Pace pulse rejection	When tested in accordance with the 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 Input slew rate: 2.2 V/s ± 15% RTI
HR	
Measurement range	Neonate 15 to 350 bpm Pediatric 15 to 350 bpm Adult 15 to 300 bpm
Accuracy	±1% or ±1bpm, which ever is greater
Resolution	1 bpm
Sensitivity	200 µV (lead II)
Heart rate averaging	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 3) of IEC 60601-2-27, the following method is used: If the last 3 consecutive RR intervals are greater than 1200 ms, the 4 most recent RR intervals are averaged to compute the HR. Otherwise, heart rate is computed by subtracting the maximum and minimum ones from the most recent 12 RR intervals and then averaging them. The HR value displayed on the screen is updated every second.
Response time to heart rate change	Meets the requirements of IEC 60601-2-27: Clause 201.7.9.2.9.101 b) 5). From 80 to 120 bpm: less than 11 s From 80 to 40 bpm: less than 11 s
Time to alarm for tachycardia	Meets the requirements in Clause 201.7.9.2.9.101 b) 6) of IEC 60601-2-27. Waveform 4ah - range: 11 s 4a - range: 11 s 4ad - range: 11 s 4bh - range: 11 s 4b - range: 11 s 4bd - range: 11 s
Arrhythmia Analysis Classifications	Asystole, V-Fib/V-Tach, V-Tac, Vent. Brady, Extreme Tachy, Extreme Brady, PVCs/min, PVC, Couplet, VT>2, Bigeminy, Trigeminy, R on T, Tachy, Brady, Missed Beat, PNP, PNC, Vent. Rhythm, Multif. PVCs, Nonsus. Vtac, Pause, Irr. Rhythm, Afib
Tall T-wave rejection capability	When the test is performed based on Clause 201.12.1.101.17 of IEC 60601-2-27, the heart rate meter will reject all 100 ms QRS complexes with less than 1.2 mV of amplitude, and T waves with T-wave interval of 180 ms and those with Q-T interval of 350 ms.

Lead-off detection current	Measuring electrode: ≤0.1 μA Drive electrode: ≤1 μA
Baseline recovery time	<2.5 s (after defibrillation, in monitor mode and therapy mode)
Response to irregular rhythm	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 4) of IEC 60601-2-27, the heart rate after 20 seconds of stabilization is displayed as follows: Ventricular bigeminy (3a): 80±1 bpm Slow alternating ventricular bigeminy (3b): 60±1 bpm Rapid alternating ventricular bigeminy (3c): 120±1 bpm Bidirectional systoles (3d): 90±2 bpm

ECG (from defibrillation electrodes)	
Patient connection	paddles or multifunction electrode pads
ECG inputs	pads/paddles
Gain	2.5 mm/mV (×0.25), 5 mm/mV (×0.5), 10 mm/mV (×1), 20 mm/mV (×2), 40mm/mV (×4), Auto
Paper speed	6.25mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Bandwidth (-3dB)	Therapy mode: 1 to 20 Hz
Common mode rejection	Therapy mode: >90 dB
Notch filter	50/60Hz In Therapy mode: notch filter turns on automatically
ECG signal range	±8mV
Calibration signal	1mV (peak-to-peak value) ±5%
Differential input impedance	≥5 MΩ
Electrode offset potential tolerance	±1V
Defibrillation protection	Enduring 5000V (360 J) charge without data loss or corruption Baseline recovery time: <2.5 s (after defibrillation) Polarization recovery time: <10 s Defibrillation energy absorption: ≤10% (100Ω load)
ESU protection	Cut mode: 300 W Coagulate mode: 100 W Recovery time: ≤10 s In compliance with the requirements in clause 202.6.2.101 of IEC 60601-2-27
Pace Pulse	
Pace pulse markers	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
Pace pulse rejection	When tested in accordance with the 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
HR	
Measurement range	Pediatric 15 to 350 bpm Adult 15 to 300 bpm
Accuracy	±1% or ±1bpm, which ever is greater
Resolution	1 bpm
Sensitivity	200 μV

Heart rate averaging	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 3) of IEC 60601-2-27, the following method is used: If the last 3 consecutive RR intervals are greater than 1200 ms, the 4 most recent RR intervals are averaged to compute the HR. Otherwise, heart rate is computed by subtracting the maximum and minimum ones from the most recent 12 RR intervals and then averaging them. The HR value displayed on the screen is updated every second.
Response time to heart rate change	Meets the requirements of IEC 60601-2-27: Clause 201.7.9.2.9.101 b) 5). From 80 to 120 bpm: less than 11 s From 80 to 40 bpm: less than 11 s
Time to alarm for tachycardia	Meets the requirements in Clause 201.7.9.2.9.101 b) 6) of IEC 60601-2-27. Waveform 4ah - range: 11 s 4a - range: 11 s 4ad - range: 11 s 4bh - range: 11 s 4b - range: 11 s 4bd - range: 11 s
Arrhythmia Analysis Classifications	Asystole, V-Fib/V-Tach, PNP, PNC
Tall T-wave rejection capability	When the test is performed based on Clause 201.12.1.101.17 of IEC 60601-2-27, the heart rate meter will reject all 100 ms QRS complexes with less than 1.2 mV of amplitude, and T waves with T-wave interval of 180 ms and those with Q-T interval of 350 ms.
Lead-off detection current	<0.1 μA
Baseline recovery time	<2.5 s (after defibrillation, in therapy mode)
Response to irregular rhythm	In compliance with the requirements in Clause 201.7.9.2.9.101 b) 4) of IEC 60601-2-27, the heart rate after 20 seconds of stabilization is displayed as follows: Ventricular bigeminy (3a): 80±1 bpm Slow alternating ventricular bigeminy (3b): 60±1 bpm Rapid alternating ventricular bigeminy (3c): 120±1 bpm Bidirectional systoles (3d): 90±2 bpm

Resp	
Technique	Trans-thoracic impedance
Measurement range	0 to 200 rpm
Resolution	1 rpm
Accuracy	121 to 200 rpm: ±2 rpm 0 to 120 rpm: ±1 rpm
Respiration excitation waveform	<300 μA, sinusoid, 62.8 kHz (±10%)
Minimum respiration impedance threshold	0.3Ω
Bandwidth	0.2 to 2.5 Hz (-3 dB)
Reference impedance range	2200 to 4500Ω, using an ECG cable with 1 kΩ resistor
Apnea alarm time	10 s, 15 s, 20 s, 25 s, 30 s, 35 s, 40 s

Mindray SpO_2 Module	
*Measurement accuracy verification: The SpO_2 accuracy has been verified in human experiments by comparing with arterial blood sample reference measured with a CO-oximeter. Pulse oximeter measurements are statistically distributed and about two-thirds of the measurements are expected to come within the specified accuracy range compared to CO-oximeter measurements.	
Standard	Meet standards of ISO 80601-2-61
Measurement range	0 to 100%
Resolution	1%

Accuracy	70 to 100%: 70 to 100%: 0% to 69%:	±2% (in adult/pediatric mode) ±3% (in neonate mode) Not specified
Refreshing rate	≤2 s	
PR		
Measurement range	20 to 300 bpm	
Resolution	1 bpm	
Accuracy	±3 bpm	
Response time	<20 s (SpO_2 value sudden changes from 70% to 100%) <20 s (PR value sudden changes from 25 to 240 bpm)	

Masimo SpO_2 Module		
Standard	Meet standards of ISO 80601-2-61	
Measurement range	1 to 100%	
Resolution	1%	
Accuracy	70 to 100%: 70 to 100%: 70 to 100%: 1% to 69%:	±2% (measured without motion in adult/ pediatric mode) ±3% (measured without motion in neonate mode) ±3% (measured with motion) Not specified
Refreshing rate	≤2 s	
PR		
Measurement range	25 to 240 bpm	
Accuracy	±3 bpm (measured without motion) ±5 bpm (measured with motion)	
Response time	≤20 s (SpO_2 value sudden changes from 70% to 100%) ≤20 s (PR value sudden changes from 25 to 220 bpm)	

Nellcor SpO_2 Module		
Standard	Meet standards of ISO 80601-2-61	
Measurement range	1 to 100%	
Resolution	1%	
Accuracy	70 to 100%: 70 to 100%: 1% to 69%:	±2% (in adult/pediatric mode) ±3% (in neonate mode) Not specified
Refreshing rate	≤2 s	
PR		
Measurement range	20 to 300 bpm	
Resolution	1 bpm	
Accuracy	±3 bpm (20 to 250 bpm) Not specified (251 to 300 bpm)	

NIBP	
Standards	Meet standard of ISO 80601-2-30
Technique	Oscillometry
Mode of operation	Manual, Auto and STAT
Auto mode repetition intervals	1, 2, 2.5, 3, 5, 10, 15, 20, 30, 60, 90, 120, 180, 240 or 480 min
STAT mode cycle time	5 min
Static pressure measurement range	0mmHg to 300mmHg

Static pressure measurement accuracy	±3mmHg				
Maximum measurement time	180s for adult and pediatric patients 90s for neonatal patients				
Initial cuff inflation pressure range	Adult: 80 to 280 mmHg Pediatric: 80 to 210 mmHg Neonate: 60 to 140 mmHg				
Measurement range			Adult	Pediatric	Neonate
	Systolic	mmHg	25 to 290	25 to 240	25 to 140
	Diastolic	mmHg	10 to 250	10 to 200	10 to 115
	Mean	mmHg	15 to 260	15 to 215	15 to 125
Software overpressure protection	Adult:	297±3 mmHg			
	Pediatric:	297±3 mmHg			
	Neonate:	147±3 mmHg			
Measurement accuracy	Max mean error: ±5 mmHg Max standard deviation: 8 mmHg				
Resolution	1 mmHg				

*Measurement accuracy verification: In adult and pediatric modes, the blood pressure measurements measured with this device are in compliance with the Standard for Non-invasive sphygmomanometers (ISO 81060-2)in terms of mean error and stardard deviation by comparing with intra-arterial or auscultatory measurements (depending on the configuration) in a typical patient population. For auscultatory reference, the 5th Korotkoff sound was used to determine the diastolic pressure.

In neonatal mode, the blood pressure measurements measured with this device are in compliance with the American National Standard for Non-invasive sphygmomanometers (ISO 81060-2) in terms of mean error and stardard deviation by comparing with intra-arterial measurements (depending on the configuration) in a typical patient population.

CO_2 Module	
Measurement range	0 to 150 mmHg
Accuracy*	Full accuracy mode: 0 to 40 mmHg: ±2 mmHg 41 to 76 mmHg: ±5% of reading 71 to 99 mmHg: ±10% of reading 100 to 150 mmHg: ±3 mmHg+8% of reading ISO accuracy mode: Add ±2mmHg to the full accuracy mode
Sart-up time	20 s (typical), 90 s (maximum)
Accuracy drift	Meets the requirement for measurement accuracy within 6 hours.
Resolution	1mmHg
Sample flowrate	Connecting the Oridion sampling line: 50 ml/min
Sample flowrate tolerance	±15% or ±15 ml/min, whichever is greater.
Rise time	Measured with a Oridion sampling line: ≤250 ms @ 50 ml/min (standard sampling line) or ≤280 ms @ 50 ml/min (extended sampling line)
Response time	Measured with a Oridion sampling line: ≤5 s @ 50 ml/min (standard sampling line) or ≤6.5 s @ 50 ml/min (extended sampling line)
awRR measurement range	0 to 150 rpm
awRR accuracy	<60 rpm: ±1 rpm 60 to 150 rpm: ±2 rpm
awRR resolution	1 rpm

Effect of interference gases on CO_2 measurements		
Gas	**Concentration (%)**	**Quantitive effect***
N_2O	≤60	±1 mmHg
Hal	≤4	
Sev	≤5	
Iso	≤5	
Enf	≤5	
O_2	≤100	
Helium	≤50	
Xenon	≤100	
Des	≤15	±2 mmHg
*: means an extra error should be added in case of gas interference when CO_2 measurements are performed between 0-40mmHg. Inaccuracy specifications are affected by the breath rate and I: E change. The $EtCO_2$ accuracy is within specification for breath rate ≤ 60rpm and I/E ratio ≤1:1, or breath rate ≤30rpm and I/E ratio ≤ 2:1.		

A.6 Power Supply Specifications

Fuse	Time-lag, 250V, T3.15A
AC power	
Line voltage	100 to 240 VAC (±10%)
Maximum Current	1.8A
Frequency	50/60Hz (±3Hz)
DC Power (with an external DC/AC adapter)	
Input voltage	12VDC
Power consumption	150W

Battery		
Battery type	Smart lithium ion battery, rechargeable and free of maintenance, one battery can be installed, two types of batteries can be configured Battery LI24I005A: 15.1V, 5600mAh Battery LI24I001A: 14.8V, 3000mAh	
Battery LI24I005A charge time	Charged by the equipment connected to the AC power	Less than 3 hours to 90% and less than 4 hours to 100% with equipment power off;
		Less than 5 hours to 90% and less than 6 hours to 100% with equipment power on.
	Charged by the charger station	Less than 5 hours to 90% and less than 6 hours to 100%.
Battery LI24I001A charge time	Charged by the equipment connected to the AC power	Less than 2 hours to 90% and less than 3 hours to 100% with equipment power off;
		Less than 3.5 hours to 90% and less than 4.5 hours to 100% with equipment power on.
	Charged by the charger station	Less than 2.5 hours to 90% and less than 3 hours to 100%.

Battery LI24I005A run time	Operating mode	One new fully charged battery	Testing condition
	Monitoring	≥6 h	The equipment is configured with a 5-lead ECG, Resp, SpO_2, CO_2 and NIBP measurements set at an interval of 15 minutes. WI-Fi is disabled. The screen brightness is set to the factory default without recording.
	Defibrillation	≥200 discharges	360J discharges at intervals of one minute, without recording
	Pacing	≥4.5 h	50 Ω load impedance, pacing rate: 80ppm, pacing output 60mA, without recording
Battery LI24I001A run time	Operating mode	One new fully charged battery	Testing condition
	Monitoring	≥2.5 h	The equipment is configured with a 5-lead ECG, Resp, SpO_2, CO_2 and NIBP measurements set at an interval of 15 minutes. WI-Fi is disabled. The screen brightness is set to the factory default without recording.
	Defibrillation	≥100 discharges	360J discharges at intervals of one minute, without recording
	Pacing	≥2 h	50 Ω load impedance, pacing rate: 80ppm, pacing output 60mA, without recording
Battery fuel gauge	5 LEDs indicating the current battery charge level		
Shutdown delay	At least 20 minutes of monitoring and six 360J discharges (after the low battery alarm occurs)		

Note: The specifications above base on a new battery, and at 20°C±5 °C of ambient temperature.

A.7 Recorder Specifications

Method	High-resolution thermal dot array
Number of waveforms	Max. 3
Paper speed	6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s
Paper width	50 mm
Grid lines	The operator can choose to print grid lines or not
Auto record	Charge events, shock events, marked events, auto test report, parameter alarms, ARR alarms, if configured on

A.8 Alarm Specifications

Alarm Levels	High, medium, low level alarms, complying with IEC60601-1-8
Alarm Categories	Physiological alarms, technical alarms; Latched alarms and unlatched alarms.
Alarm lamp	Independent alarm LED
Parameter alarm setting	Alarm properties of all available parameters can be set simultaneously in the Para. Alarm menu
Auto alarm limits	Parameter alarm limits can be automatically adjusted according to currently measured vital signs

A.9 Data Management Specifications

Data Storage	1G Bytes
Marking Events	16 types of events, user customized
Event recording	Up to 1000 events for each patient.
Waveform storage	Up to 24 hours of consecutive ECG waveform
Voice recording	Max. 180 minutes in total; max. 60 minutes for each patient
Tabular Trends	Max. 72 hours of all measured parameters; resolution:1 min
Data Export	Data can be export to a PC through a USB flash memory
Patient archives	Up to 100

A.10 Wi-Fi Specifications

Wi-Fi Technical Specifications		
Protocol	IEEE 802.11a/b/g/n	
Modulation mode	DSSS and OFDM	
Operating frequency	IEEE 802.11b/g/n (at 2.4G)	IEEE 802.11a/n (at 5G)
	ETSI: 2.4 GHz to 2.483 GHz FCC: 2.4 GHz to 2.483 GHz MIC: 2.4 GHz to 2.495GHz KC: 2.4 GHz to 2.483 GHz	ETSI: 5.15 GHz to 5.35 GHz, 5.47 GHz to 5.725 GHz FCC: 5.15 GHz to 5.35 GHz, 5.725 GHz to 5.82 GHz MIC: 5.15GHz to 5.35 GHz KC: 5.15 GHz to 5.35 GHz, 5.47 GHz to 5.725 GHz,5.725 GHz to 5.82 GHz
Channel spacing	IEEE 802.11b/g: 5 MHz IEEE 802.11n (at 2.4G): 5 MHz IEEE802.11a; 20 MHz IEEE802.11n (at 5G): 20 MHz	
Wireless baud rate	IEEE 802.11b: 1 Mbps to 11 Mbps IEEE 802.11g: 6 Mbps to 54 Mbps IEEE 802.11n: 6.5 Mbps to 72.2 Mbps IEEE 802.11a: 6 Mbps to 54 Mbps	
Output power	<20dBm (CE requirement: detection mode- RMS) <30dBm (FCC requirement: detection mode- peak power)	
Operating mode	Infrastructure	
Data security	Standards: WPA-PSK, WPA2-PSK Encryption: TKIP, AES	

System capacity and resistance to wireless interference	When the following conditions exist simultaneously, ■ Number of the equipments supported by a single AP: ≤ 4 ■ Each equipment can communicate with the CMS. ■ The weakest AP signal strength detected at the equipment's position cannot be less than -65 dBm. ■ When the distance between the interfering devices and the monitor is greater than 20 cm, and a co-channel interference Wi-Fi network (at least -85 dBm weaker than the monitor's network) and an adjacent-channel Wi-Fi network (at least -50 dBb weaker than the monitor's network) also synchronously exist. Note: The interfering devices do not include Wi-Fi devices. They include but are not limited to: ◆ 2.4 G wireless devices (excluding Wi-Fi devices) ◆ Cellular mobile communication networks ◆ Microwave ovens ◆ Interphones ◆ Cordless phones ◆ ESU equipment The total delay of data transmission from the monitors to the Central Station: ≤ 4 seconds.
Wi-Fi network stability	When the following conditions exist simultaneously, ■ Number of the equipments supported by a single AP: ≤ 4 ■ Each equipment can communicate with the CMS. ■ The weakest AP signal strength detected at the equipment's position cannot be less than -65 dBm. The time percentage of any equipment failing to transmit data to the CMS does not exceed 0.1% over a 24-hour period.
Distinct vision distance	The distinct vision distance between the equipment and the AP is greater than or equal to 50 meters.

A.11 Environmental Specifications

WARNING

- **The equipment may not meet the performance specifications if stored or used outside the specified temperature and humidity ranges.**

Operating environment	
Operating temperature	0 to 45°C (at least 60 minutes of working time when the temperature reduces from room temperature to – 20°C) (5 to 40°C for CO_2 module)
Operating humidity	10 to 95%, non-condensation
Operating altitude	-381mmHg to + 4575mmHg (106.2kPa to 57kPa) 430mmHg to + 790 mmHg for CO_2 module (57.3kPa to 105.3kPa)

Storage environment	
Storage temperature	-30 to 70°C (-20 to 60°C for CO_2 module)
Storage humidity	10 to 95%, non-condensation
Storage altitude	-381mmHg to +4575 mmHg (106.2kPa to 57kPa) 430mmHg to + 790 mmHg for CO_2 module (57.3kPa to 105.3kPa)

Shock
Complies with requirements of 21.102, ISO9919: Peak acceleration: 1000m/s^2 (102g) Duration: 6ms Pulse shape: half-sine Number of shocks: 3 shocks per direction per axis (18 total)

Vibration
Complies with requirements of 21.102, ISO9919.

Bump
Complies with the requirements of 6.3.4.2, EN1789. Peak acceleration: 15g Duration: 6ms Number of impacts: 1000 Impact direction: vertical impacts are applied when the equipment under test is placed at normal operating position.

Free fall
Complies with the requirements of 6.3.4.3, EN1789. Drop height: 0.75 m Number of drops: once for each of the six surfaces