


# Specifications

## Physical specifications

### Protection classifications, Wall system configurations

Characteristic	Specification
Electrical rating	100 – 240 V AC, 50 – 60 Hz, 1.5 – 0.8 A
Duty cycle - monitor	Continuous operation
Duty cycle - physical assessment handles	2 minutes on, 10 minutes off
Type of protection against electric shock	Class I equipment (protectively earthed) with double insulation
Degree of protection against electric shock, for parts applied to patients	Type BF defibrillator proof IEC EN 60601-1
Recovery time following defibrillator discharge	Less than or equal to 10 seconds
Flammable anesthetics	 <b>WARNING</b> Not suitable for use with flammable anesthetics.
Degree of protection provided by the enclosure with respect to harmful ingress of liquids	IPX0 Non-protected according to EN/IEC 60529; Pulse oximeter equipment complies with ISO 9919 Cl. 44.6 Ingress of liquids tests and EN/IEC 60601-1, 60601-2-30, 60601-2-49 Cl. 44.3 Spillage tests
Height	10.56 in. (268.26 mm )
Width	39.92 in. (1014 mm)
Depth	7.51 in. (190.8 mm)
Weight (including battery)	14.1 lb. (6 kg)

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**Protection classifications, Wall system configurations**


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**Graphical display resolution**


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Display area	8 in. (H) x 4 in. (V) (19.5 [H] cm x 11.3 [V] cm)
Pixels	1024 (H) x 600 (V)
Pixel arrangement	RGB (red, green, blue)
Color depth	16 bits per pixel

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**Speaker volume**


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Output sound pressure	57 dB at 1.0 meter
Measured sound range	46 – 66 dB(A)

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**Alarm and pulse tones**


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Pulse frequency ( $f_0$ )	150 – 1000 Hz
Number of harmonic components in the range 300 Hz to 4000 Hz	minimum of 4
Effective pulse duration ( $t_d$ )	high priority: 75 – 200 ms medium and low priority: 125 – 250 ms
Rise time ( $t_r$ )	10 – 20% of $t_d$
Fall time <sup>a</sup> ( $t_f$ )	$t_f \leq t_s - t_r$

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**Note** The relative sound pressure level of the harmonic components should be within 15 dB above or below the amplitude at the pulse frequency.

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<sup>a</sup> Prevents overlap of pulses.

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**Battery specifications**


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Rating	10.8V 1.9 Ah (20Wh)
Composition	Lithium-ion

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**Nurse Call connection specifications**


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Nurse Call	25 V AC or 60 V DC maximum at 1A maximum
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**Handle specifications**


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Handle output	3.00 - 3.90v, .700 - 1.5A
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Leakage current is less than 10 microamps from any exposed metal part.

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**NIBP specifications**


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Cuff pressure range	Meets or exceeds ANSI/AAMI SP10:2002 standards for cuff pressure range
Systolic range	Adult: 30 to 260 mmHg Pediatric: 30 to 260 mmHg Neonate: 20 to 120 mmHg
Diastolic range	Adult: 20 to 220 mmHg Pediatric: 20 to 220 mmHg Neonate: 10 to 110 mmHg
Cuff Inflation Target	Adult: 160 mmHg (StepBP) Pediatric: 120 mmHg (StepBP) Neonate: 90 mmHg (StepBP)
Maximum Target Pressure	Adult: 280 mmHg (StepBP, SureBP) Pediatric: 280 mmHg (StepBP, SureBP) Neonate: 130 mmHg (StepBP)
Blood pressure determination time	Typical: 15 seconds Maximum: 150 seconds
Blood pressure accuracy	Meets or exceeds ANSI/AAMI SP10:2002 standards for noninvasive blood pressure accuracy ( $\pm 5$ mmHg mean error, 8 mmHg standard deviation)
Mean Arterial Pressure (MAP) range The formula used to calculate MAP yields an approximate value.	Adult: 23 to 230 mmHg Pediatric: 23 to 230 mmHg Neonate: 13 to 110 mmHg
Pulse rate range (using blood pressure determination)	Adult: 30 to 200 bpm Pediatric: 30 to 200 bpm Neonate: 35 to 220 bpm
Pulse rate accuracy (using blood pressure determination)	$\pm 5.0\%$ ( $\pm 3$ bpm)
Overpressure cutoff	Adult: 300 mmHg $\pm 15$ mmHg Pediatric: 300 mmHg $\pm 15$ mmHg Neonate: 150 mmHg maximum

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**SureTemp Plus temperature module specifications**


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Temperature range	80°F to 110°F (26.7°C to 43.3°C)
Calibration accuracy	$\pm 0.2^\circ\text{F}$ ( $\pm 0.1^\circ\text{C}$ ) (Direct mode)

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**Braun ThermoScan PRO 4000 thermometer specifications (refer to manufacturer's directions for use for additional information)**

Temperature range	68°F to 108°F (20°C to 42.2°C)
Calibration accuracy	<ul style="list-style-type: none"> <li>±0.4°F (±0.2°C) for temperatures ranging from 95.9°F to 107.6°F (35.5°C to 42°C)</li> <li>±0.5°F (±0.3°C) for temperatures outside of this range</li> </ul>
Display resolution	0.1°F or °C

**SpO2 specifications (refer to sensor manufacturer's directions for use for additional information)**

SpO2 performance measurement range	1 to 100%
<b>Masimo sensor accuracy guide</b>	Accuracy specified when used with Masimo SET pulse oximetry monitors or with licensed Masimo SET pulse oximetry modules using PC series patient cables, during no motion. Numbers present ± 1 standard deviation. Plus or minus one standard deviation represents 68% of the population.
Perfusion	0.02 % to 20 %
Pulse rate	25 to 240 beats per minute (bpm) No motion: ± 3 digits Motion: ± 5 digits
Saturation	70% to 100%
<b>Note</b> Saturation accuracy varies by sensor type.	Adults, Pediatrics (No motion): ± 2 digits Neonates (No motion): ± 3 digits Adults, Pediatrics, Neonates (Motion): ± 3 digits Low Perfusion: 0.02 % to 20 % ± 2 digits
<b>Nellcor sensor accuracy guide</b>	SpO2 measurement accuracy can only be evaluated in vivo by comparing pulse oximeter readings with SaO2 measurements obtained from simultaneously sampled arterial blood made using a laboratory CO-oximeter. SpO2 accuracy was validated through breathe-down-equivalent testing by Covidien using electronic measurements to prove equivalence to the Nellcor N600x predicate device. The Nellcor N600x predicate device was validated by performing human-subject, "breathe-down" clinical trials.
Perfusion	0.03 % to 20 %
Pulse rate	20 to 250 beats per minute (bpm) ± 3 digits
Saturation	70% to 100%
<b>Note</b> Saturation accuracy varies by sensor type.	Adult, Pediatrics: ± 2 digits Neonate: ± 3 digits Low Perfusion: 0.02 % to 20 % ± 2 digits

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**SpO2 specifications (refer to sensor manufacturer's directions for use for additional information)**


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Functional tester



**WARNING** A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor.  
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<sup>1</sup> Some models of commercially available bench top functional testers and patient simulators can be used to verify the proper functionality of Nellcor pulse oximeter sensors, cables and monitors. See the individual testing device's operator's manual for the procedures specific to the model of tester being used.

While such devices may be useful for verifying that the pulse oximeter sensor, cabling, and monitor are functional, they are incapable of providing the data required to properly evaluate the accuracy of a system's SpO2 measurements. Fully evaluating the accuracy of the SpO2 measurements requires, at a minimum, accommodating the wavelength characteristics of the sensor and reproducing the complex optical interaction of the sensor and the patient's tissue. These capabilities are beyond the scope of known bench top testers. SpO2 measurement accuracy can only be evaluated in vivo by comparing pulse oximeter readings with SaO2 measurements obtained from simultaneously sampled arterial blood made using a laboratory CO-oximeter.

Many functional testers and patient simulators have been designed to interface with the pulse oximeter's expected calibration curves and may be suitable for use with Nellcor monitors and/or sensors. Not all such devices, however, are adapted for use with the Nellcor OXIMAX digital calibration system. While this will not affect use of the simulator for verifying system functionality, displayed SpO2 measurement values may differ from the setting of the test device. For a properly functioning monitor, this difference will be reproducible over time and from monitor to monitor within the performance specifications of the test device.

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**SpHb specifications (refer to sensor manufacturer's directions for use for additional information)**


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SpHb saturation range

0 to 25 g/dL

Masimo SpHb sensor accuracy guide

Adults, Pediatrics (no motion): 8 to 17 g/dL  $\pm$  1 g/dL. SpHb accuracy has been validated on healthy adult male and female volunteers and on surgical patients with light to dark skin pigmentation in the range of 8 to 17 g/dL SpHb against a laboratory co-oximeter. This variation equals  $\pm$  1 standard deviation which encompasses 68% of the population. The SpHb accuracy has not been validated with motion or low perfusion.

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## Environmental specifications

Operating temperature

50°F to 104°F (10°C to 40°C)

Storage temperature

-4°F to 122°F (-20°C to 50°C)

Operating altitude

-557 to 10,000 ft. (-170 m to 3,048 m)

Operating humidity

15 to 95% noncondensing

Storage humidity

15% to 95% noncondensing

## Monitor radio

The monitor's radio operates on Welch Allyn FlexNet™ or other 802.11 networks.

<b>Wireless network interface</b>	IEEE 802.11 b/g, 802.11a
<b>Frequency</b>	802.11 b/g: 2.402 GHz to 2.4835 GHz
	802.11a: 5.125 GHz to 5.875 GHz
<b>Channels</b>	Up to 14 in 802.11b/g, up to 24 in 802.11a; country-dependent
<b>Security/encryption/authentication</b>	WPA2/AES (either EAP or PSK authentication)
<b>Antenna</b>	Internal multiband PIFA
<b>Wireless data rates</b>	802.11b: 1Mbps or higher during vitals transmission only
	802.11a/g: 6Mbps or higher during vitals transmission only
	(approximately 2 seconds per reading)
<b>Agency approvals</b>	US: FCC Part 15, Class B; C/UL; CE; 47 CFR Part 2.1093, 15.207, 15.209, 15.247, 15.407; FCC OET Bulletin 65C
	Europe: CE; EN 50371; EN/ETSI 300 328 V1.7.1, 301 489-1 V1.6.1, 301 489-17 V1.2.1, 301 893 V1.4.1
	Canada: RSS-210; RSS-GEN; RSS-102
	Hong Kong: HKTA 1039
<b>Protocols</b>	UDP, DHCP, TCP/IP
<b>Data transfer protocols</b>	UDP/TCP/IP
<b>Modulation</b>	OFDM (802.11a/g), DSSS/CCK (802.11b)
<b>Output power</b>	40mW typical, country-dependent
<b>Ancillary IEEE standards</b>	802.11e, 802.11h, 802.11i, 802.11X

Channel restrictions in the 5-GHz band are determined by country.

Marking by the symbol ( ! ) indicates that usage restrictions apply. To ensure compliance with local regulations, be sure the correct country in which the access point is installed is selected. This product can be used with the following restriction(s):

France - Outdoor use is limited to 10 mW EIRP within the band 2454 to 2483.5 MHz.

**Note** Effective Isotropic Radiated Power (EIRP).

**Note** Some countries restrict the use of 5-GHz bands. The 802.11a radio in the monitor uses only the channels indicated by the access point with which the radio associates. The hospital IT department must configure access points to operate with approved domains.

## Configuration options

The wall system is available in the following configurations.

<b>Model Prefix</b>	<b>Description</b>
84 series	Standard. Includes nurse call, Ethernet, and USB connectivity.
85 series	Wireless. Includes all Standard features plus an internal 802.11 a/b/g radio.

## Patents

The monitor is covered under the following patents:

6,000,846; 6,036,361; 7,255,475; 7,429,245; D480,977; D632,397; and other patents pending.

For SureTemp Plus configured monitors, US patent 6,971,790 applies.

For Nellcor-equipped monitors, the following Nellcor US patents and foreign equivalents apply:

5,485,847; 5,676,141; 5,743,263; 6,035,223; 6,226,539; 6,411,833; 6,463,310; 6,591,123; 6,708,049; 7,016,715; 7,039,538; 7,120,479; 7,120,480; 7,142,142; 7,162,288; 7,190,985; 7,194,293; 7,209,774; 7,212,847; 7,400,919.

For Masimo-equipped monitors, the following Masimo US patents and foreign equivalents apply:

5,758,644; 5,823,950; 6,011,986; 6,157,850; 6,263,222; 6,501,975; 7,469,157; and others listed at [www.masimo.com/patents.htm](http://www.masimo.com/patents.htm).