

Fingertip MD300C1 Pulse Oximeter

USER MANUAL

Ver3.0C1

General Description

Oxygen Saturation is a percentage of Oxyhemoglobin (HbO_2) capacity, compounded with oxygen, by all combinative hemoglobin (Hb) capacity in blood. In other words, it is consistency of Oxyhemoglobin in blood. It is a very important parameter for the Respiratory Circulation System. Many respiratory diseases can result in oxygen saturation being lowered in human blood. Additionally, the following factors can reduce oxygen saturation: Automatic regulation of organ dysfunction caused by Anesthesia, Intensive Postoperative Trauma, injuries caused by some medical examinations. That situation might result in light-headedness, asthenia, and vomiting. Therefore, it is very important to know the oxygen saturation of a patient so that doctors can find problems in a timely manner.

The fingertip pulse oximeter features small size, low power consumption, convenient operation and portability. It is only necessary for a patient to put one of his fingers into the fingertip photoelectric sensor for diagnosis, and a display screen will show oxygen saturation. It has been proven in clinical experiments that it also features high precision and repeatability.

Measurement Principle

Principle of the oximeter is as follows: A mathematical formula is established making use of Lambert Beer Law according to Spectrum Absorption Characteristics of Reductive hemoglobin(RHb) and Oxyhemoglobin (HbO_2) in glow and near-infrared zones. Operation principle of the instrument: Photoelectric Oxyhemoglobin Inspection Technology is adopted in accordance with Capacity Pulse Scanning and Recording Technology, so that two beams of different wavelength of lights (660nm glow and 940nm near infrared light) can be focused onto a human nail tip through a clamping finger-type sensor. A measured signal obtained by a photosensitive element, will be shown on the oximeter's display through process in electronic circuits and microprocessor shown on the oximeter's display through electronic circuits and a microprocessor.

Diagram of Operation Principle

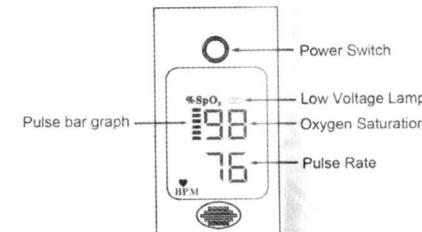
1. Red and Infrared-ray Emission Tube
2. Red and Infrared-ray Receipt Tube



Precautions For Use

- 1 Before use, carefully read the manual.
- 2 Operation of the fingertip pulse oximeter may be affected by the use of an electrosurgical unit (ESU).
- 3 The fingertip pulse oximeter must be able to measure the pulse properly to obtain an accurate SpO_2 measurement. Verify that nothing is hindering the pulse measurement before relying on the SpO_2 measurement.
- 4 Do not use the fingertip pulse oximeter in an MRI or CT environment.
- 5 Do not use the fingertip pulse oximeter in situations where alarms are required. The device has no alarms. It is not for continuous monitoring.
- 6 Do not use the fingertip pulse oximeter in an explosive atmosphere.
- 7 The fingertip pulse oximeter is intended only as an adjunct in patient assessment. It must be used in conjunction with other methods of assessing clinical signs and symptoms.
- 8 Check the pulse oximeter sensor application site every 4 hours to determine the positioning of the sensor and circulation and skin sensitivity of the patient.
- 9 Do not sterilize the device using autoclaving, ethylene oxide sterilizing, or immersing the device in liquid. The device is not intended for sterilization.
- 10 Follow local ordinances and recycling instructions regarding disposal or recycling of the device and device components.

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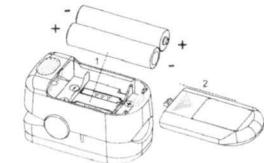


Product Accessories

1. One lanyard.
2. Two AAA batteries
3. One user's manual

Battery Installation

1. Install two AAA batteries into the battery compartment. Match the plus (+) and minus (-) signs in the compartment. If the polarities are not matched, damage may be caused to the oximeter.
2. Slide the battery door cover horizontally along the arrow shown as the picture.

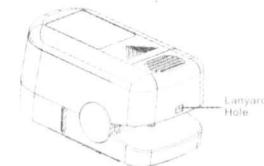


Notes:

- Install the batteries in right polarity. Incorrect placement may cause damage to the bracket.
- Please remove the batteries if the pulse oximeter will not be used for long periods of time.

Using the Lanyard

1. Thread thinner end of the lanyard through the loop.
2. Thread thicker end of the lanyard through the threaded end before pulling it tightly.



Warnings!

1. Keep the oximeter away from young children. Small items such as the battery door, battery, and lanyard are choking hazards.
2. Do not hang the lanyard from the device's electrical wire.

Maintenance and Storage

1. Replace the batteries in time when low voltage lamp is lighted.
2. Clean surface of the fingertip oximeter before it is used in diagnosis for patients.
3. Remove the batteries inside the battery cassette if the oximeter is not operated for a long time.
4. It is best to preserve the product in a place where ambient temperatures is $-20^\circ\text{C} \sim +55^\circ\text{C}$ and relative humidity is $\leq 93\%$.
5. It is recommended that the product is kept in a dry environment. A wet ambient might affect its lifetime and even might damage the product.
6. Please follow the law of the local government to deal with used battery.

Cleaning the fingertip pulse oximeter

Please use the medical alcohol to clean the silicone touching the finger inside of oximeter with a soft cloth dampened with 70% isopropyl alcohol, and clean the test finger using alcohol before and after each test.

11 This equipment complies with IEC 60601-1-2:2007 for electromagnetic compatibility for medical electrical equipment and/or systems. However, because of the proliferation of radio-frequency transmitting equipment and other sources of electrical noise in healthcare and other environments, it is possible that high levels of such interference due to close proximity or strength of a source might disrupt the performance of this device.

12 Portable and mobile RF communications equipment can affect medical electrical equipment.

Rx only: "Caution: Federal law (USA) restricts this device to sale by or on the order of a licensed practitioner."

Inaccurate measurements may be caused by

- 1 Significant levels of dysfunctional hemoglobin (such as carboxy - hemoglobin or methemoglobin);
- 2 Intravascular dyes such as indocyanine green or methylene blue;
- 3 High ambient light. Shield the sensor area if necessary;
- 4 Excessive patient movement;
- 5 High-frequency electrosurgical interference and defibrillators;
- 6 Venous pulsations;
- 7 Placement of a sensor on an extremity with a blood pressure cuff, arterial catheter, or intravascular line;
- 8 The patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia;
- 9 The patient is in cardiac arrest or is in shock;
- 10 Fingernail polish or false fingernails;
- 11 Weak pulse quality (low perfusion);
- 12 Low hemoglobin;

Product Properties

- 1 Operation of the product is simple and convenient.
- 2 The product is small in volume, light in weight and convenient in carrying.
- 3 Power consumption of the product is low and the two AAA batteries can be operated continuously for 30 hours.
- 4 A low voltage warning will be indicated when battery voltage is low and normal operation of the oximeter might be influenced.
- 5 The product will automatically power off when there is no signal for longer than 8 seconds.

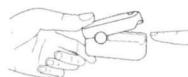
Intended Use

Fingertip pulse oximeter is a portable non-invasive device intended for spot-checking of oxygen saturation of arterial hemoglobin (SpO_2) and pulse rate of adult and pediatric patient at home, and hospital (including clinical use in internist/surgery, Anesthesia, intensive care etc). It is not for continuous monitoring.

The fingertip pulse oximeter requires no routine calibration or maintenance other than replacement of batteries.

Operation Instructions

- 1 Install two AAA batteries into battery cassette before covering its cover.
- 2 Open the clamp as illustrated in the picture below.
- 3 Plug one of fingers into silicone hole of the oximeter (it is best to plug the finger thoroughly) before releasing the clamp.
- 4 Press the switch button once on front panel.
- 5 Keep your finger still during measurement.
- 6 Read correspondent data from display screen.



Front Panel

The pulse bar graph displays corresponding with the patient's pulse beat. The height of the bar graph shows the patient's pulse strength.

Do not pour or spray any liquids onto the oximeter, and do not allow any liquid to enter any openings in the device. Allow the oximeter to dry thoroughly before reuse.

A functional tester cannot be used to assess the accuracy of a pulse oximeter monitor or sensor. The test methods used to establish the SpO_2 accuracy is clinical testing. The measured arterial hemoglobin saturation value (SpO_2) of the sensors is compared to arterial hemoglobin oxygen (SaO_2) value, determined from blood samples with a laboratory CO-oximeter. The accuracy of the sensors in comparison to the CO-oximeter samples measured over the SpO_2 range of 70 ~ 100%. Accuracy data is calculated using the root-mean-squared (Arms value) for all subjects, per ISO 9919:2005, Medical Electrical Equipment - Particular requirements for the basic safety and essential performance of pulse oximeter equipment for medical use.

Specifications

1. Display Type

LED display
Data update time: <2s

2. SpO_2

Display range: 0-99%
Measurement range: 70-99%
Accuracy: 70%-99%: $\pm 3\%$; 0%-69% no definition
Resolution: 1%

3. Pulse Rate

Display range: 0~254BPM
Measure range: 30-235 BPM
Accuracy: 30~99bpm, $\pm 2\text{bpm}$; 100~235bpm, $\pm 2\%$
Resolution: 1BPM

4. LED Wavelengths

Probe LED Specifications

	Wavelength	Radiant Power
RED	$660 \pm 2\text{nm}$	1.8mW
IR	$940 \pm 10\text{nm}$	2.0mW

5. Power Requirements

Two AAA alkaline Batteries
Power consumption: Less than 40mA

Low power indication:

Battery Life: Two AAA 1.5V, 600mAh alkaline batteries could be continuously operated as long as 30 hours.

If it is equipped with a function switch, through which the oximeter can be powered off in case no finger is the oximeter longer than 8 seconds.

6. Outline Dimension

Length: 56mm
Width: 32mm
Height: 30mm
Weight: 50g (including two AAA batteries)

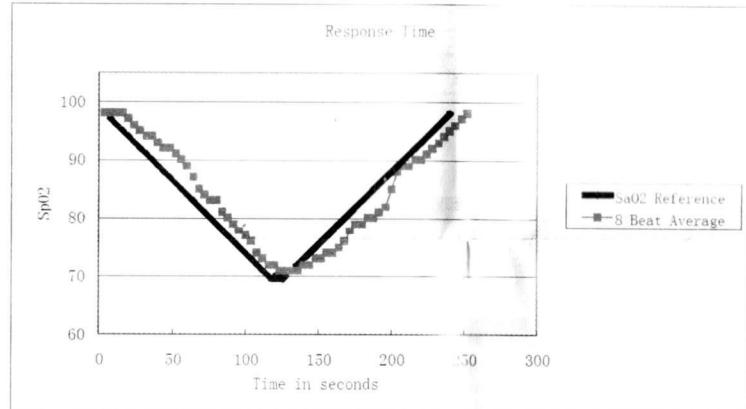
7. Environment Requirements

Operation Temperature: 5~40°C
Storage Temperature: -20~+55°C
Ambient Humidity: 15%~80% in operation
≤93% in storage

8. Equipment Response Time

As shown in the following figure.

Response time of slower average is 9.1s.



Declaration

Guidance and Manufacture's declaration – electromagnetic emissions For all EQUIPMENT and SYSTEMS

Guidance and Manufacture's declaration - electromagnetic emission

Guidance and Manufacture's declaration – electromagnetic environment specified below. The customer or the user of the *Pulse Oximeter (MD300C1)* should assure that it is used in such an environment.

Emission test	Compliance	Electromagnetic Environment – guidance
RF emissions CISPR 11	Group 1	The pulse Oximeter (MD300C1) uses RF energy only for very low and are not likely to cause interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The pulse Oximeter (MD300C1) is suitable for use in all establishment, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not Applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-2	Not Applicable	

Guidance and Manufacture's declaration – electromagnetic immunity- For all EQUIPMENT and SYSTEMS

Guidance and Manufacture's declaration - electromagnetic immunity

Guidance and Manufacture's declaration – electromagnetic environment specified below. The customer or the user of the *Pulse Oximeter (MD300C1)* should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic Environment – guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	+/- 6kV contact +/- 8kV air	+/- 6kV contact +/- 8kV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%.

Recommended separation distances between

portable and mobile RF communications equipment and Pulse Oximeter (MD300C1)

The *Pulse Oximeter (MD300C1)* is intended for use in electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the *Pulse Oximeter (MD300C1)* can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the *Pulse Oximeter (MD300C1)* as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	Separation distance according to frequency of transmitter (m)	800 MHz to 2.5 GHz
0.01	$d = \left[\frac{3.5}{E_i} \right] \sqrt{P}$	0.2334
0.1	0.3689	0.7378
1	1.1667	2.3334
10	3.6893	7.3786
100	11.6667	23.3334

For transmitters rated at a maximum output power not listed above, the recommended separation distance in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Possible Problems and Solutions

Problems	Possible reason	Solution
SpO ₂ or PR can not be shown normally	1. Finger is not inserted correctly 2. Patient's Oxyhemoglobin value is too low to be measured	1. Retry by inserting the finger 2. Try some more times. If you can make sure no problem is existing in the product, please go to a hospital timely for exact diagnosis.
SpO ₂ or PR is shown unstably	1. Finger might not be inserted deep enough. 2. Finger is trembling or patient's body is in movement status.	1. Retry by inserting the finger 2. Try not to move
The oximeter can not be powered on	1. Power of batteries might be inadequate or not be there at all 2. Batteries might be installed incorrectly 3. The oximeter might be damaged	1. Please replace batteries 2. Please reinstall the batteries 3. Please contact with local customer service centre
Indication lamps are suddenly off	1. The product is automatically powered off when no signal is detected longer than 8 seconds 2. Power quantity of the batteries is started being inadequate	1. Normal 2. Replace the batteries
"Error3" or "Error4" is displayed on screen	1. Low power 2. Receiving tube being shielded or damaged together with broken connector. 3. Mechanical Misplace for receive-emission tube 4. Amp circuit malfunctions.	1. Change batteries 2. Please contact local customer service center 3. Please contact local customer service center 4. Please contact local customer service center
Error 6	Err 6 means the screen is failure	Change the screen
"Error7" is displayed on screen	1. Low power 2. Emission tube damaged.	1. Please change battery 2. Please contact local customer service center

Power frequency (50-60 Hz) magnetic field IEC 61000-4-8			Power frequency magnetic fields should be at levels characteristics of a typical location in a typical commercial or hospital environment.
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**Guidance and Manufacturer's declaration – electromagnetic immunity-
For all EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING**

Guidance and Manufacturer's declaration - electromagnetic immunity

Guidance and Manufacturer's declaration – electromagnetic environment specified below. The customer or the user of the Pulse Oximeter (MD300C1) should assure that it is used in such an environment.

Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic Environment – guidance
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	<p>Portable and mobile RF communications equipment should be used no closer to any part of the Pulse Oximeter (MD300C1), including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = \left[\frac{3.5}{E_i} \right] \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = \left[\frac{7}{E_i} \right] \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$ <p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey^a, should be less than the compliance level in each frequency range.^b</p> <p>Interference may occur in the vicinity of equipment marked with following symbol:</p> 

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection structures, objects and people.

a Field strengths from fixed transmitters, such as base station for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Pulse Oximeter (MD300C1) should be observed to verify normal operation. If abnormal performance is observed, additional measurements may be necessary, such as reorienting or the relocating the Pulse Oximeter (MD300C1).

b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m

Recommended separation distances between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEMS - For all EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

5. Current control circuit malfunctions:

5. Please contact local customer service center

Symbol Definitions

Symbol	Definition
	Type BF applied part.
	Attention, consult accompanying documents.
	Protected against dripping water.
	Oxygen saturation
	Pulse rate (BPM)
	Low power indication
	No SpO2 Alarm
	Power switch
	Serial No.
	Storage temperature and relative humidity
	Manufacturer's information
	Date of Manufacture
	European union approval
	Authorized representative in the European community

Applicable Models

MD300C1 MD300C1-E MD300C10 MD300C12 MD300C12-P MD300C13 MD300C14 MD300C15 MD300C16
MD300C17 MD300C19 MD300C1A MD300C1B MD300C1C MD300C1D MD300C1E MD300C1F MD300C1G
MD300C1H MD300C1I

Note: The illustrations used in this manual may differ slightly from the appearance of the actual product.

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