

# Fingertip Pulse Oximeter

**MQ3000**

# AIRIAL

## USER MANUAL

Ver1.0C11

### General Description

Oxygen Saturation is a percentage of Oxyhemoglobin (HbO<sub>2</sub>) 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. Therefore, it is very important to know the oxygen saturation.

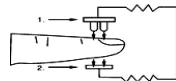
The fingertip pulse oximeter features low power consumption, convenient operation and portability. Place one fingertip into the photoelectric sensor for diagnosis and the pulse rate and oxygen saturation will appear on the display.

### 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<sub>2</sub>) 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.

#### 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<sub>2</sub> measurement. Verify that nothing is hindering the pulse measurement before relying on the SpO<sub>2</sub> 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, including batteries.
- 11 This equipment complies with IEC 60601-1-2:2007 for electromagnetic compatibility. 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 the equipment.

### Inaccurate measurements may be caused by

- 1 Significant levels of dysfunctional hemoglobin (such as carbonyl - 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 user 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 user has hypotension, severe vasoconstriction, severe anemia, or hypothermia;
- 9 The user 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 to carry.
- 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<sub>2</sub>) and pulse rate.

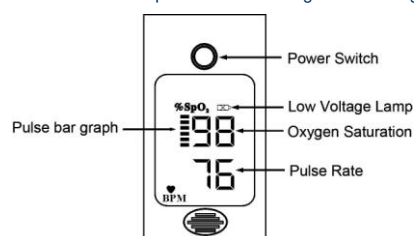
### Operation Instructions

- 1 Install two AAA batteries according to the Battery Installation instructions listed above in the right column.
- 2 Open the clamp as illustrated in the picture below.
- 3 Fully insert one fingertip into the silicone hole of the oximeter before releasing the clamp.
- 4 Press the switch button once on front panel.
- 5 Keep your finger still during measurement.
- 6 Read corresponding data from display screen.



### Front Panel

The pulse bar graph displays corresponds with the user's pulse beat. The height of the bar graph shows the user's pulse strength.



### 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 with the correct 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!

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

### Maintenance and Storage

1. Replace the batteries in a timely manner when low voltage lamp is lighted.
2. Clean surface of the fingertip oximeter before it is used.
3. Remove the batteries if the oximeter is not operated for a long time.
4. It is best to store the product in -20°C~+55°C and ≤93% humidity.
5. Keep in a dry place. Extreme moisture may affect oximeter lifetime and may cause damage.
6. Dispose of battery properly; follow any applicable local battery disposal laws.

The use life of the device is five years when it is used for 15 measurements every day and 10 minutes per one measurement. Stop using and contact local service center if one of the following cases occurs:

- An error in the *Possible Problems and solutions* is displayed on screen.
- The oximeter cannot be powered on in any case and not the reasons of battery.
- There is a crack on the oximeter or damage on the display resulting readings cannot be identified; the spring is invalid; or the key is unresponsive or unavailable.

### Specifications

#### 1. Display Type

LED display

#### 2. SpO<sub>2</sub>

Display range: 0-99%

Measurement range: 70-99%

Accuracy: 70%-99%: ±3%; 0%~69% no definition

Resolution: 1%

#### 3. Pulse Rate

Display range: 0~254BPM

Measure range: 30-235 BPM

Accuracy: 30~99bpm, ±2bpm; 100~235bpm, ±2%

Resolution: 1BPM

#### 4. Probe LED Specifications

	Wavelength	Radiant Power
RED	660±2nm	1.8mW
IR	940±10nm	2.0mW

#### 5. Power Requirements

Two AAA alkaline Batteries

Power consumption: Less than 25mA

Low power indication:

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

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

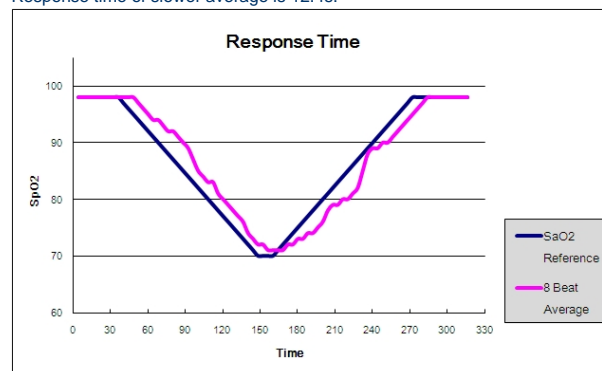
Storage Temperature: -20~+55°C

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 12.4s.



#### 9. Classification

According to the type of protection against electric shock: INTERNALLY POWERED EQUIPMENT;

According to the degree of protection against electric shock: TYPE BF APPLIED PART;

According to the method(s) of sterilization or disinfection recommended by the manufacturer: Equipment with method(s) of sterilization or disinfection recommended by the manufacturer;

According to the degree of safety of application in the presence of a FLAMMABLE ANAESTHETIC MIXTURE WITH AIR or WITH OXYGEN OR NITROUS OXIDE: EQUIPMENT not suitable for use in the presence of a FLAMMABLE ANAESTHETIC MIXTURE.

According to the degree of protection against ingress of water: IPX1

According to the mode of operation: CONTINUOUS OPERATION



## Declaration


### Guidance and Manufacturer's declaration – electromagnetic emissions- For all EQUIPMENT and SYSTEMS

Guidance and Manufacturer's declaration - electromagnetic emission		
The MQ3000 Pulse Oximeter is intended for use in the electromagnetic environment specified below. The customer or the user of MQ3000 Pulse Oximeter should assure that it is used in such an environment.		
Emission test	Compliance	Electromagnetic Environment – guidance
RF emissions CISPR 11	Group 1	The MQ3000 Pulse Oximeter uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The pulse Oximeter (MQ3000) 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 61000-3-3	Not Applicable	

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

Guidance and Manufacturer's declaration - electromagnetic immunity			
The MQ3000 Pulse Oximeter is intended for use in the electromagnetic environment specified below. The customer or the user of the MQ3000 Pulse Oximeter 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%.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristics of a typical location in a typical commercial environment.

### Guidance and Manufacturer's declaration – electromagnetic immunity- For all EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Guidance and Manufacturer's declaration - electromagnetic immunity			
The MQ3000 Pulse Oximeter is intended for use in the electromagnetic environment specified below. The customer or the user of the MQ3000 Pulse Oximeter 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 (MQ3000), including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = \left[ \frac{3.5}{E_1} \right] \sqrt{P}$ <p>80 MHz to 800 MHz</p> $d = \left[ \frac{7}{E_1} \right] \sqrt{P}$ <p>800 MHz to 2.5 GHz</p> <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). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey<sup>a</sup>, should be less than the compliance level in each frequency range.<sup>b</sup> 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 (MQ3000) should be observed to verify normal operation. If abnormal performance is observed, additional measurements may be necessary, such as reorienting of the relocating the Pulse Oximeter (MQ3000).

b Over the frequency range 150 kHz to 80 MHz, fields 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












Recommended separation distances between portable and mobile RF communications equipment and Pulse Oximeter (MQ3000)		
The <i>Pulse Oximeter (MQ3000)</i> is intended for use in electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the <i>Pulse Oximeter (MQ3000)</i> can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the <i>Pulse Oximeter (MQ3000)</i> 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)	
	80 MHz to 800 MHz	800 MHz to 2.5 GHz
	$d = \left[ \frac{3.5}{E_1} \right] \sqrt{P}$	$d = \left[ \frac{7}{E_1} \right] \sqrt{P}$
0.01	0.1167	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 <sub>2</sub> or PR can not be shown normally	1. Finger is not inserted correctly 2. The user's Oxyhemoglobin value is too low to be measured	1. Retry by inserting the finger 2. Try not to move

SpO <sub>2</sub> or PR is shown unstably	1. Finger might not be inserted deep enough. 2. Finger is trembling or user'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. 3. Current control circuit malfunctions.	1 Please change battery 2 Please contact local customer service center 3 Please contact local customer service center

## Symbol Definitions

Symbol	Definition
	Type BF applied part.
	Attention, consult accompanying documents.
	Protected against dripping water.
% SpO <sub>2</sub>	Oxygen saturation
BPM	Pulse rate (BPM)
	Low power indication
	No SpO <sub>2</sub> Alarm
	Power switch
SN	Serial No.
	Storage temperature and relative humidity
	Manufacturer's information
	Date of Manufacture
	European union approval
	Authorized representative in the European community

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

Manufactured For:



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