NISSEI
MT-500

Issued on May 13. 2021

Non-Contact Thermometer
User manual
English



Thank you for purchasing this product.
Please read the manual thoroughly and use the product correctly.

Operating Principles and Intended Use

The product measures body temperature by measuring the peak wavelength of the infrared rays emitted from the forehead to measure forehead temperature without touching the forehead.
It then calculates body temperature (armpit temperature) using the correction value calculated from the relationship between forehead and body temperature. It converts the amount of infrared radiation detected to body surface temperature. The product can also measure the surface temperature of other objects and room air temperature.

triControl **triControl** technology used in the product provides high accuracy. Three sensors automatically control: the distance to the body (object), the temperature of the ambient to adjust the results and the temperature of the measured body (object).

MT-500 is a clinical thermometer designed for the professional use in medical institutions , and it is intended to be used for patients with all ages except for pre-term infants and small for gestational age (SGA) newborns. The product is also intended to be used during professional transportation of a patient outside the healthcare facility and home healthcare environment.

Safety Precautions

[Usage Conditions]

- **Do not use the product near flammable gas, such as anesthetic gas in hospitals, or in locations with high oxygen concentration such as hyperbaric oxygen chambers or oxygen tents.**
  Otherwise this may cause combustion or ignition.
- **Do not use in combination with the electrical medical equipment below.**
  – MRI (magnetic resonance imaging) equipment
  – Hyperbaric oxygen treatment equipment
  Otherwise this may cause an accident or malfunction.
- **Do not make any diagnoses or treat yourself based on your own measurement results.**
  Measure the temperature under direction from the doctor, receive a professional diagnosis, and follow their directions on taking medicine.
- **Do not use the product near devices that produce electromagnetic waves (microwaves, electromagnetic cookers, etc.) or near devices that generate radio waves (cell phones, PHS, etc.).**
  Otherwise this may cause product malfunction.
- **The correct temperature may not be displayed in the following situations.**
  – When measured in an area near an air conditioner or in windy areas
  – When the forehead is in direct sunlight
  – When the forehead is wet due to sweat or similar
  – When the subject was in a different location with a different temperature just before measuring
  – When the product was in a different location with a different temperature just before measuring
  – When there is hair, foundation, or anything that interrupts measurement between the forehead and the sensor
  – When the forehead was covered with a hat or similar until just before measuring.
- **Do not use outside of the specified operating temperature range.**
  Otherwise the accuracy of the measurement cannot be guaranteed.
- **Take a measurement after leaving the product for about 30 minutes under the ambient temperature for thermal adaptation.**
- **Do not warm the measurement sensor of the product before making a measurement.**
- **Do not use the product at the environment with dust, lint and direct sunlight.**
  Since the product includes precision parts, they may cause the malfunction of the product.

[Measuring]

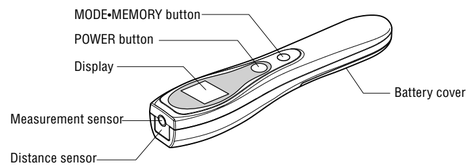
- **Use the forehead to measure body temperature.**
  If used on another body site the measurement will not be accurate.
- **Consult a doctor for taking a measurement on Pre-term infants or small for gestational age (SGA) newborns.**
- **When taking a measurement for an infant, please make sure that he/she is in calm state.**
  Emotional states of infants may affect the measurement results.

[Handling the Product]

- **Check that the product is not dirty or wet.**
  Refer to the instructions on cleaning the product.
- **Remove the battery when not using the product for a long period of time.**
  Leaving the battery in for a long time may cause battery fluid to leak and damage the product.
- **When replacing the battery do not touch the battery or battery terminal and another person at the same time.**
  A conductive connection may be formed.
- **Do not allow children to handle the product alone or leave the product in a place children or pets can reach.**
  Otherwise this may cause injury.
- **Do not drop or apply strong impacts to the product.**
  We recommend taking the product to the store to be inspected if it is dropped from a height of 1 m or more, or is impacted strongly in any other way.
- **Do not disassemble, repair or modify the product.**
  Otherwise this may cause product malfunction.
- **If the product stops functioning properly, stop using it**.
  Ask for it to be inspected or repaired.
- **Stop using the product immediately and contact your dealer or the manufacturer in case any visible damage is found on the product.**
- **Follow the regulations of your local area when disposing of the product or used batteries.**
- **Any serious incident occurred in relation to the product should be reported to the manufacturer and the competent authority in your country/area. If you have no contact information of such authority, please contact the manufacturer or EU authorized representative whose contact information is indicated in this user manual.**

Part Names and Product Components

Check that following items are included.
If any of the parts are missing, contact the store where the product was purchased.



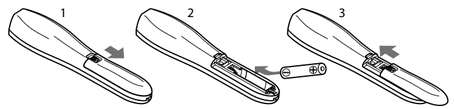
User manual

AAA alkaline battery (LR03)
(for test use)
* The battery included is for test use. It may have a shorter life than commercially sold batteries.

Storage case

Inserting the Battery

1. Push the battery cover on the back of the device in the direction of the arrow to open it.
2. Insert an AAA alkaline battery (LR03) as shown on the device.
   Press the negative end (-) of the battery against the spring when inserting and removing the battery.
3. Insert the battery cover in the direction of the arrow to close it.



- Replace the battery when the battery mark ( ) is displayed. When the mark stops flashing and remains indicated no measurements can be taken.
- Follow the regulations of your local area when disposing of used batteries.
- Check the expiration date of the battery. If an expired battery is used the device may malfunction or break.
- Remove the battery if the device is not used for a long period of time. Otherwise battery fluid may leak and damage the device.
- Do not use a battery other than the one with designated type. The specified performance of the product may not be retained if such battery is used.

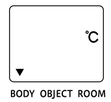
Measuring Body Temperature

1 Press the POWER button to turn the device on.
Full display will appear for one second for functional test of LCD segments.



*The battery mark indication at full display doesn't mean the depletion of battery.

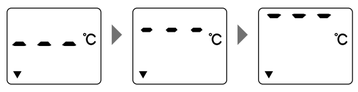
2 Check that it is in body temperature mode.



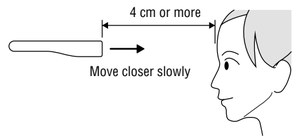
3 Press the POWER button. The device will beep, and the distance sensor will start monitoring the distance.

If the device is too close to the measurement site, a warning beep will sound repeatedly. Move the device away until the beeping stops.

The bars on the screen keep moving while the distance is monitored.



4 Hold the device perpendicular to the forehead, hold it more than 4 cm away, and slowly move it closer. When the forehead and the device are about 4 cm away, a long beep will sound and the measurement result will be displayed.
The measurement results are automatically saved.



*In body temperature mode the measurement result will not be displayed unless the sensor and forehead are about 4 cm of each other.
*To stop the measurement, press POWER button.

5 Press and hold the POWER button for 2 seconds or longer to turn off the device.
If the device remains turned on, the backlight will automatically turn off after 15 seconds, and the device will automatically turn off after 1 minute.

Cautions when measuring body temperature

- Take measurements in an environment with ambient temperature of 10℃ to 40℃.
- Take a measurement after leaving the device for about 30 minutes under the ambient temperature for thermal adaptation.
- The device calculates internal body temperature (armpit temperature) from the forehead and room air temperature. Forehead temperature will be affected in the following situations and it may not be possible to accurately calculate internal body temperature.
  – When measured in an area near an air conditioner or in windy areas
  – When the forehead is in direct sunlight
  – When the forehead is wet due to sweat or similar
  – When the subject was in a different location with a different temperature just before measuring
  – When the device was in a different location with a different temperature just before measuring
  – When there is hair, foundation, or anything that interrupts measurement between the forehead and the sensor
  – When the forehead was covered with a hat or similar just before measuring.
- When measuring, do not put the hand or similar near the forehead. The measurement sensor will measure the temperature of other site than the forehead.
- Slowly move the device closer to the forehead. If it is moved quickly, accurate measurement may not be possible.
- If the device is too close to the measurement part, a warning beep will sound repeatedly. Move the device away until the beeping stops.

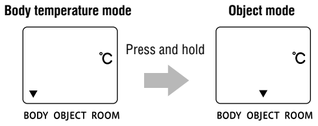
Measuring Object Temperature

1 Press the POWER button to turn the device on.
Full display will appear for one second for functional test of LCD segments.



*The battery mark indication at full display doesn't mean the depletion of battery.

2 Press and hold the MODE-MEMORY button to switch to object mode.



3 Hold the device perpendicular to the measuring surface and press the POWER button when the measurement sensor is around 2 - 3 cm away, facing the object. The device will beep and start measuring.
If the device is too far away it may not measure the temperature accurately.
Take measurements in an environment with ambient temperature of 10℃ to 40℃.

4 A long beep will sound and the measurement result will be displayed.
The measurement results are automatically saved.

5 Press and hold the POWER button for 2 seconds or longer to turn off the device.
If the device remains turned on, the backlight will automatically turn off after 15 seconds, and the device will automatically turn off after 1 minute.

Cautions when measuring object temperature

- Steam or vapor may condensate on the measurement sensor when directly measuring hot liquids, making it impossible to measure accurately.

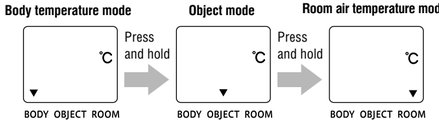
Measuring Room Air Temperature

1 Press the POWER button to turn the device on.
Full display will appear for one second for functional test of LCD segments.



*The battery mark indication at full display doesn't mean the depletion of battery.

2 Press and hold the MODE-MEMORY button to switch to room air temperature mode.



3 The room air temperature is displayed.
Room air temperature measurement results are not saved.

4 Press and hold the POWER button for 2 seconds or longer to turn off the device.
If the device remains turned on, the backlight will automatically turn off after 15 seconds, and the device will automatically turn off after 1 minute.

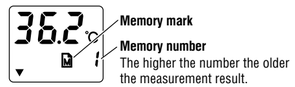
Checking Measurement Results (Memory)

Up to 10 body temperature and 10 object temperature measurement results are saved on the device automatically.
The stored measurement results are cleared when the battery is removed.

- **Checking body temperature measurement results**

1 Press the POWER button to turn the device on.
Full display will appear for one second.

2 Press the MODE·MEMORY button.
The device will indicate the memory display, and the most recent measurement result will be displayed.



3 The next measurement result (in the order from newest to oldest) will be displayed each time the MODE·MEMORY button is pressed.

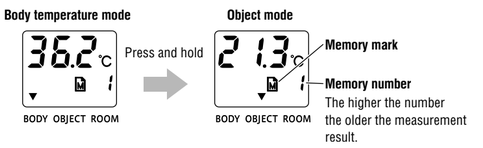
4 Press and hold the POWER button for 2 seconds or longer to turn off the device.
If the device remains turned on, the backlight will automatically turn off after 15 seconds, and the device will automatically turn off after 1 minute.

- **Checking object temperature measurement results**

1 Press the POWER button to turn the device on.

2 Press the MODE·MEMORY button.
The device will indicate the memory display.

3 Press and hold the MODE·MEMORY button to switch to object mode.
The most recent measurement result will be displayed.



4 **The next measurement result (in the order from newest to oldest) will be displayed each time the MODE-MEMORY button is pressed.**

5 **Press and hold the POWER button for 2 seconds or longer to turn off the device.**
If the device remains turned on, the backlight will automatically turn off after 15 seconds, and the device will automatically turn off after 1 minute.

Cleaning

Check that the product is clean after using it. Wipe away dirt on the surface of the product with a cloth soaked in lukewarm or soapy water. Do not use solvents such as benzine, paint thinner or gasoline. Otherwise this may damage the product. In case a risk of cross infection is suspected, use the alcohol cotton and gently wipe the housing of the device for disinfection.
After cleaning the product dry it thoroughly with a soft cloth. If any stain or residue is left at the measurement sensor or distance sensor part, measurement cannot be performed correctly. Do not use a hairdryer or similar.
Use a cotton bud or soft cloth to lightly wipe away dirt inside the measurement sensor.
Do not forcefully rub the inside of the measurement sensor. If the inside of the measurement sensor is scratched correct measurement will not be ensured.

Storing

Do not store the product or leave it for a long period of time in the following locations. Otherwise the product may malfunction or deteriorate.
- Locations exposed to direct sunlight
- Locations with extreme fluctuation of temperature or high temperature and humidity
- Dusty locations
- Cabinets where insecticide is used

Remove the battery if the product is not used for a long period of time. If the battery is left in the product battery fluid may leak and damage the product.

Troubleshooting

Problem	Cause	Solution
HH °C was displayed	The room air temperature is over 40°C	Measure at a room air temperature of 10°C to 40°C.
Even though the room air temperature is at or below 40°C HH °C was displayed	The device was moved from a location with a room air temperature of over 40°C.	The device may not have adjusted to the current room air temperature. Take a measurement after leaving the device for about 30 minutes under the ambient temperature for thermal adaptation.*
LL °C was displayed	The room air temperature is below 10°C.	Measure at a room air temperature of 10°C to 40°C.
Even though the room air temperature is at or above 10°C. LL °C was displayed	The device was moved from a location with a room air temperature below 10°C.	The device may not have adjusted to the current room air temperature. Take a measurement after leaving the device for about 30 minutes under the ambient temperature for thermal adaptation.*
HI °C was displayed	**Body temperature mode** The measured body temperature was over 42.5°C.	Use the device to measure body temperatures between 34.0°C and 42.5°C.
	Object mode The measured temperature was over 100°C.	Use the device to measure temperatures between 0°C and 100.0°C.
Lo °C was displayed	**Body temperature mode** The measured body temperature was below 34.0°C.	Use the device to measure body temperatures between 34.0°C and 42.5°C.
	Object mode The measured temperature was below 0°C.	Use the device to measure temperatures between 0°C and 100.0°C.
was displayed	The battery has run out.	Measurements cannot be taken when the battery mark stops flashing and remains indicated. Replace the battery with a new one.
Nothing is displayed.	The battery is inserted incorrectly.	Insert the battery correctly.
Repeated beeps sound when measuring body temperature.	**Body temperature mode** The device is too close to the measuring site.	Move the device away until the beeps stop.

* Depending on the storage environment of the device, it may take for a while for the adaptation to the ambient temperature where the measurement is performed. If "HH" or "LL" is indicated after leaving the device for about 30 minutes under the ambient temperature, please leave the device under the ambient temperature for a while and take a measurement again.
If measurements cannot be taken normally after using the solutions above or in case of any unexpected events other than the ones described in Troubleshooting, contact the manufacturer, dealer or store where the product was purchased.

Product Specifications

Model		Non-Contact Thermometer MT-500
Sensor		Thermopile
Measuring body site		Forehead
Measurement range	Body temperature	+34.0 to +42.5°C
	Object temperature	0 to +100.0°C
	Room air temperature=	10.0 to +40.0°C
Measuring accuracy	Body temperature*	Within ±0.2°C for temperatures between +36.0 and +39.0°C Within ±0.3°C for other temperatures
	Object temperature	Within ±2.0°C for temperatures between +10.0 and +40.0°C Within ±2.0°C or ±4% (whichever is highest) for other temperatures
	Room air temperature	Within ±2.0°C
Operating conditions		+10.0 to +40.0°C, 15 to 90% RH (no condensation)
Storage temperature/humidity		-20.0 to +50.0°C, 95% RH or below (no condensation)
Smallest display unit		0.1°C
Power supply		1 x AAA alkaline battery (LR03)
Electrical rating		1.5 VDC, 0.09 W
No. of measurements with a new battery		Approx. 4,000 (under NISSEI measurement conditions)
Product dimensions		34.4 mm (L) x 161.0 mm (W) x 25.2 mm (H)
Product weight		Approx. 50 g (excluding accessories)
Memory		Body temperature: 10 measurement results Object temperature: 10 measurement results
Electric shock protection		Internal power supply, Type BF applied part
Protection against harmful ingress of water and particles		IP22: Protected against solid foreign particles with a diameter of more than 12.5 mm, and dripping water when tilted up to 15 degrees.
Classification of safety level when used in air/flammable anesthetic gas, oxygen, nitrous oxide/flammable anesthetic gas.		Not suitable for use in these environments
Classification by operation mode		Continuous operation equipment
Expected service life		3 years (based on manufacturer's verification)
Key to symbols		Type BF applied part
		Read the attached documentation
		Keep dry
		The used electrical and electronic products are not household waste. Follow your national/local recycling rules to dispose of them properly. In the EU countries, please refer to waste management symbol(s) marked on the package or the instrument.

CE marking is declared by conformity to Medical Devices Directive 93/42/EEC including amendments by 2007/47/EC and EMC Directive 2014/30/EU.
These specifications are subject to change without notice.
* When measuring a blackbody furnace.
This product is intended for use in the environment with one atmospheric pressure.

Technical description

MT-500 complies with the EMD, electromagnetic disturbance, standard, IEC60601-1-2:2014. Please refer to the following tables for specific information regarding the compliance to the standard.

- MT-500, as a medical electrical equipment, needs special precautions regarding EMD and needs to be installed and put into service according to the information provided below.
- The device is not intended for use in environments where the intensity of electromagnetic disturbance is high, such as near active HF surgical equipment and MRI (magnetic resonance imaging) equipment etc.
- Use of the device adjacent to or stacked with other equipment must be avoided because it could result in improper operation.
- Use of accessories other than those specified or provided by the manufacturer could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30cm to any part of the device. Otherwise, degradation of the performance of this equipment could result.

Electromagnetic emissions

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	MT-500 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	
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Not applicable	

Electromagnetic immunity
ENCLOSURE PORT

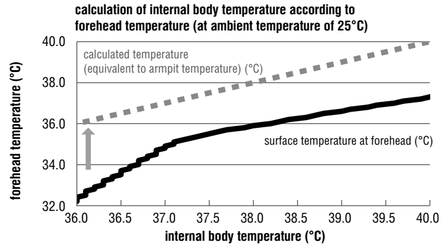
Phenomenon	Basic EMC standard or test method	IMMUNITY TEST LEVELS
ELECTROSTATIC DISCHARGE	IEC 61000-4-2	± 8 kV contact ± 2 kV, ± 4 kV, ± 8 kV, ± 15 kV air
Radiated RF EM fields	IEC 61000-4-3	20 V/m 80 MHz – 2,7 GHz 80 % AM at 1 kHz
RATED power frequency magnetic fields	IEC 61000-4-8	30 A/m 50 Hz or 60 Hz

Test specifications for ENCLOSURE PORT IMMUNITY to RF wireless communications equipment

Test frequency (MHz)	Band (MHz)	Service	Modulation	IMMUNITY TEST LEVEL (V/m)
385	380 –390	TETRA 400	Pulse modulation 18 Hz	27
450	430 – 470	GMRS 460, FRS 460	FM ± 5 kHz deviation 1 kHz sine	28
710 745 780	704 – 787	LTE Band 13, 17	Pulse modulation 217 Hz	9
810 870 930	800 – 960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse modulation 18 Hz	28
1720 1845 1970	1700 – 1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse modulation 217 Hz	28
2450	2400 – 2570	Bluetooth, WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse modulation 217 Hz	28
5240 5500 5785	5100 – 5800	WLAN 802.11 a/n	Pulse modulation 217 Hz	9

Adjustment of temperature

MT-500 is an adjusted mode clinical thermometer which calculates internal body temperature (armpit temperature) with its special algorithm according to the skin surface temperature at forehead and the ambient temperature. Following graph shows the example of the calculation at ambient temperature of 25°C.
The black line in the graph below shows the correlation between the measured surface temperature at forehead and internal body temperature. The grey dotted line shows the calculated temperature based on the surface temperature at forehead.



Clinical accuracy verification

Clinical accuracy of MT-500 was verified by comparison with reference clinical thermometer in the market as stipulated in ISO 80601-2-56, the international standard of clinical thermometers for body temperature measurement. The clinical verification was conducted for 119 subjects covering the age distribution from newborns to adults.
Since the calculated internal body temperature by the measurement at forehead may vary due to the influences of various factors such as sweating, wind or skin conditions at/before measurement etc., it is important for users of clinical thermometers to be aware of the possible bias with the body temperature measurements of other methods. Following results were obtained from the clinical verification and they would be useful indications for possible variation of measurement values to be considered for the use of MT-500.

Age group	Clinical bias*1	Limits of agreement*2
0 up to 3 months*3	-0.08	+0.425 / -0.578
3 months up to 1 year*3	-0.01	+0.332 / -0.359
older than 1 year and younger than 5 years	-0.07	+0.726 / -0.871
older than 5 years	-0.20	+0.652 / -1.043

*1 mean difference of measurement values against the reference clinical thermometer.
*2 the statistical range within which the greatest differences against reference clinical thermometer supposedly lie.
*3 pre-term infants or small for gestational age (SGA) newborns are not included in the subjects. Please consult a doctor for taking a measurement on such patient.

At the clinical verification, the consistency of the repeated measurements amongst all age distribution was also checked as clinical repeatability. It is calculated as the difference of values within three consecutive measurements. MT-500 achieved the clinical repeatability of 0.085°C which confirms its considerable stability at repeated measurements.

Warranty and service

NISSEI warrants the product for 2 years from the date of purchase for functionality and accuracy without charge for inspection, adjustment, repair and labour. Evidence of date of purchase is required for warranty. However, this warranty does not cover defects resulting from, damage caused by wear or misuse, damage caused by unauthorised repair or modification or damage caused by natural disaster, violent action or war. Purchaser shall bear transport or shipping related costs. NISSEI is not liable for any consequential damages caused by MT-500, direct or indirect, economically or biologically.
For the proper and safe operation of the device, the regular maintenance is recommended. If the maintenance or calibration is necessary, please contact the manufacturer or dealer.

✉ **Quality claims are recieved at the following address:**

EU: Little Doctor Europe Sp. z o.o.
57G Zawila Street, 30-390, Krakow, Poland
Service phone: +48 12 2684748, 2684749
www.nissei.pl

NISSEI CE 0123

Manufacturer: **NIHON SEIMITSU SOKKI CO., LTD.**
2508-13 Nakago Shibukawa Gunma 377-0293 Japan
website: www.nissei-kk.co.jp/english

EC-Representative: **MDSS GmbH**
Schiffgraben 41, 30175 Hannover, Germany

Warranty card

MT-500 (Model MT-500) | (Date of sale)
(Serial number)
(Buyer's name)
(Seller's signature) | (Seal (stamp) of the selling company)

To be filled out by the representative of the authorized service center

Date	*Notes on servicing*