User’s manual of the IR-thermometer Smart ThermoGraph

Thank you for purchasing the IR-thermometer Smart ThermoGraph with advanced thermomonitoring features.

DESCRIPTION:

The IR-thermometer Smart ThermoGraph is an infrared thermometer and thermograph in one device designed for thermomonitoring of inflammatory sicknesses of organs close to the skin surface. It measures body temperature in a way similar to common IR-thermometer in the mode **Body** and measures surface temperature of skin in the mode **Surface.**

Smart Thermograph is a portable, battery powered device that uses advanced infrared technology for temperature measurement. There are two supported modes allowing you to measure **body** temperature or **surface** temperature. At the second mode IR-thermometer Smart ThermoGraph can be used separately or can be connected to any mobile device such as smartphone or tablet computer supporting Bluetooth 4.0 LE. The use of Smart ThermoGraph mobile applications allows visualization of a surface temperature distribution on any area of your skin surface on the screen of your smartphone or tablet computer.
Please note that in order to achieve consistent results during monitoring session you must follow procedures described in this manual.

The IR-thermometer Smart ThermoGraph has the following features:

- **The IR-thermometer Smart ThermoGraph measures surface temperature of any part of a skin surface.**
- **The IR-thermometer Smart ThermoGraph provides high reproducibility of temperature measurement be the use of a measurement unification feature.**
- **The IR-thermometer Smart ThermoGraph measures body temperature by taking temperature on a forehead.**

Carefully read this manual before using the device. Please, keep this manual for future reference.

Consult a doctor in regards to specific temperature values of your body. Contact a doctor when more detailed information is necessary or if you are experiencing difficulties when using the device.

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1. GENERAL INFORMATION

1.1. IMPORTANT SAFETY INSTRUCTIONS

To assure the correct use of IR-thermometer Smart ThermoGraph, safety measures should always be followed including the instructions listed below.

- Follow the maintenance requirements stipulated in this instruction manual.
- This device may be used for personal home use and for professional purposes.
- This device must only be used for the purposes described in this instruction manual.
- This device must only be used in the surrounding ambient temperature range of between 10°C and 40°C.
- This device must always be kept in a clean, dry area.
- Do not expose this device to electric shocks.
- Do not expose this device to extreme temperature conditions of >50°C or ≤-20°C.
- Do not use this device in relative humidity higher than 85%.
- The protective glass over the lens is the most fragile part of the device.
- Do not expose the device to sunlight or water.
- Never drop the device.
- Should a problem occur with your device, please contact your distributor. Do not attempt to repair this device yourself.

THE MANUFACTURER RESERVES THE RIGHT TO ALTER THE SPECIFICATIONS OF THE PRODUCT WITHOUT PRIOR NOTIFICATION

1.2. PRECAUTIONS BEFORE USE

The Smart ThermoGraph device is pre-set at the factory. It is not necessary to calibrate the device when starting it up.

If you bring the device from outside and there is a significant difference between the outside environment temperature and the room temperature, it is advised to allow the device to acclimatize for 15 to 20 minutes before use in order to obtain reliable and stable results.

1.3. DESCRIPTION OF THE IR-THERMOMETER SMART THERMOGRAPH

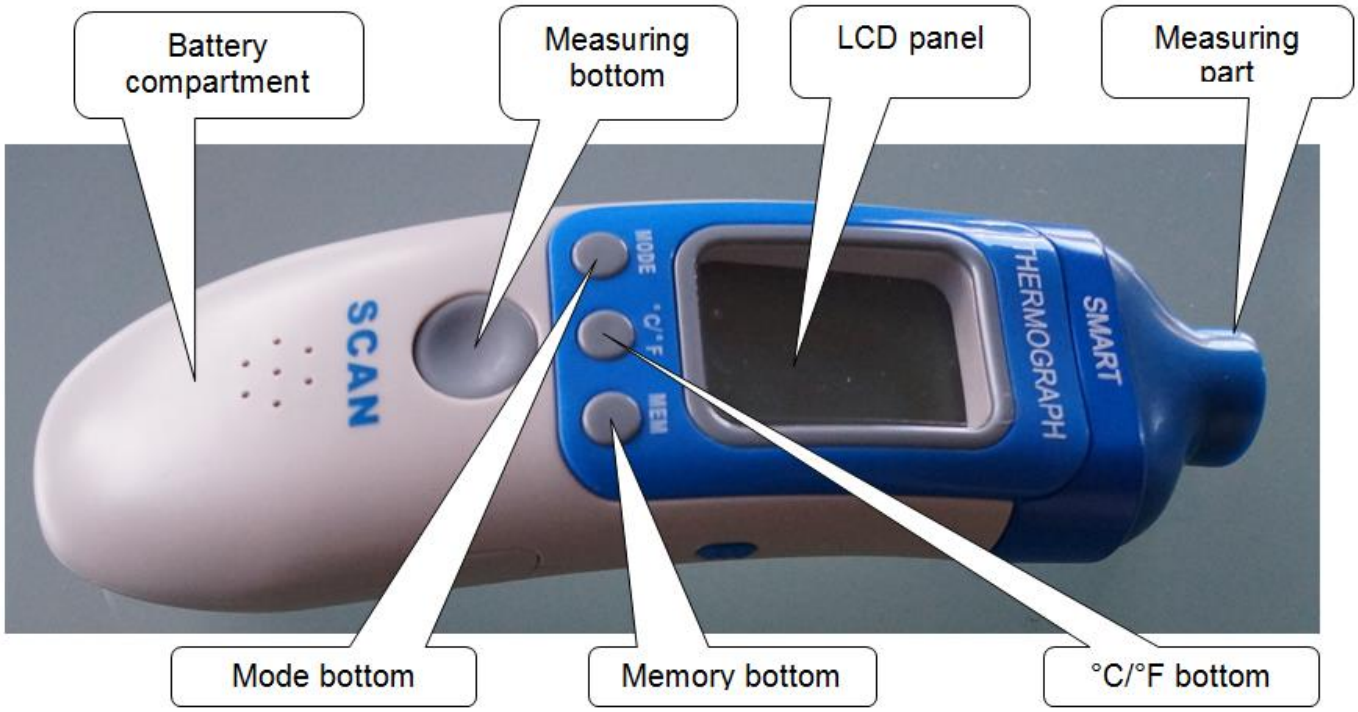


Fig. A1.General view of the IR-thermometer Smart ThermoGraph

Symbol	Reference
	IEC 60417-5333,Type BF applied part
⎓	IEC 60417-5031 Direct current
IP22	IEC 60529 Ingress protection
	WEEE Directive (2002/96/EC)
	Consult operating instructions

1.4. FEATURES

1. Connects to your Smartphone with Smart ThermoGraph application.
2. Reproducibility of measurements.
3. Quick and reliable results due to the advantage infrared detection system.
4. Audible alarm if temperature is exceeded.
5. Memorizes 32 measures.
6. Backlit-lighted LCD digital screen.
7. Data can be displayed in either Celsius or Fahrenheit.
8. Auto power-off 30 seconds (energy saver) after the last measurement.
9. Practical, easy to use.

1.5. INTERFACE

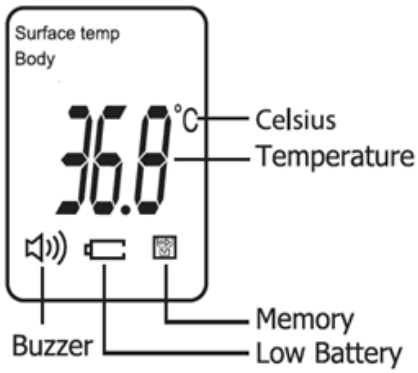


Fig.A2. Interface of IR-thermometer Smart ThermoGraph

1. Setting the Mode:
a. Press the Mode button and the screen will display: Surface Temp…°C
b. Press the button again, the screen will display: Body…°C

The device default is set to SURFACE mode and the BLUETOOTH is switched on by default.

2. Press the °C/°F button to switch between Celsius and Fahrenheit
3. Press Mem (Memory) button, which displays the last temperature measured, and allows viewing the last 32 measurements taken.

The surface temperature differs from the internal body temperature.
To obtain the internal temperature, always use the “BODY” mode.
Please make sure to select “SURFACE TEMP” mode for measuring surface temperature.

BATTERIES REPLACEMENT
Replace the batteries when battery replacement indicator ‘Battery’ appears on the display.
1. Open the lid and insert the new batteries. Make sure the battery is put in with the correct polarity and positioning. Incorrect battery replacement could cause damage to the device and compromise the guarantee of your device.

2. Close the lid after replacing the batteries.
Never use rechargeable batteries. Use only batteries for a single usage.
Battery type: 2X1.5V AAA size

1.6. TECHNICAL CHARACTERISTICS

1. Operating temperature range:
   10°C to 40°C (50°F to 104°F) < =85% relative humidity
2. Temperature Measurement Ranges:
   Body mode: 32°C~42.9°C (89.6°F - 109°F).
   Surface mode: 0°C~60°C (32°F - 140°F).
3. Power: DC 3 volt (two AA batteries)
4. Size: 145 mm x 45 mm x 55 mm
5. Weight: 74 g without batteries
6. Display resolution: 0.1°C (0.1°F)
7. Consumption: <=300mW
8. Accuracy:
   32.0°C~35.9°C (89.6°F - 96.6°F) +/- 0.3°C (+/-0.6°F).
   36.0°C~39.0°C (96.8°F - 102.2°F) +/- 0.2°C(+/-0.4°F)
   39.1°C~42.9°C (102.4°F - 109.2°F) +/- 0.3°C(+/-0.6°F)
9. Automatic power off: 30 seconds after reading

IR-thermometer Smart ThermoGraph PRECISION According to ASTM Standard E1965-1998 (2009)
From 34°C to 35.9°C = ± 0.3°C
From 93.2°F to 96.6°F =± 0.6°F
From 36°C to 39°C = ± 0.2°C
From 96.8°F to 102.2°F = ±0.4F
From 39°C to 42.5°C = ± 0.3°C
From 102.2°F to 108.5°F = ± 0.6°F

The IR-thermometer Smart ThermoGraph takes temperature readings below 32°C or above 42.9°C (89.6°F to 109.2°F), but precision is not guaranteed outside of this range.

LONGEVITY USE
IR-thermometer Smart ThermoGraph was conceived for home and professional use, its longevity is guaranteed for 40,000 temperature takings.

1.7. ADVICE

- Do not use other batteries than the stated type batteries, do not recharge non rechargeable batteries, and do not throw in fire.
- Remove the batteries when device is not used for an extended period of time.
- Do not expose the device to sunlight or water.
- An impact will damage the device.

The mode for measuring surface temperature (Surface temp) is set as a default mode, Bluetooth switches on automatically. Body temperature measurement (Body) is switched on by the user with Mode button. This mode is intended for measuring body temperature.

2. BODY TEMPERATURE MEASUREMENTS

2.1. INTRODUCTION

The IR-thermometer Smart ThermoGraph has been developed by using the latest infrared technology. This technology allows taking temporal artery (TA) temperature from the forehead. It has been demonstrated that this method of TA temperature measurement is more precise than the tympanic thermometry and better tolerated than rectal thermometry (Greenes D, Fleisher G. Accuracy of a Noninvasive Temporal Artery Thermometer for Use in Infants. Arch Pediatr Adolesc Med2001; 155:376). Precise, instantaneous IR-thermometer Smart ThermoGraph is, up to now, the most suitable device for safe body temperature measurement. However, as with other types of thermometer, it is essential to use the IR-thermometer Smart ThermoGraph properly in order to obtain reliable and stable results. To achieve the best results, you are advised to read this instruction manual and the safety precautions carefully before use of the device.

2.2. OPERATING PRINCIPLE

All objects, solid, liquid or gas, emit energy by radiation. The intensity of this energy depends on the temperature of the object.
The IR-thermometer Smart ThermoGraph measures human body temperature by the energy the human emits. Therefore, when a user holds the device near the body and activates the radiation sensor, the measurement is taken instantly by detection of infrared heat generated by the arterial blood flow. Therefore, the body heat can be measured without any interference from the heat from the surrounding environment.

2.3. DIFFERENT METHODS OF TEMPERATURE MEASUREMENT

Core temperature

Core temperature is the temperature of brain and internal organs. This is the most precise measurement and involves measuring temperature in the pulmonary artery by means of a catheter equipped with a thermal probe which reads the temperature in situ. The same method is employed for probes measuring the esophageal temperature. However, such invasive temperature measurement methods require specific equipment and expertise.

Rectal thermometry

Rectal temperature adjusts slowly in comparison to the changes of the body's internal temperature. It has been demonstrated that rectal temperature remains raised long after the internal temperature of the patient has started to drop and vice versa.

Oral thermometry

Oral temperature is easily influenced by recent ingestion of food or drinks and by breathing through the mouth. To measure oral temperature, the mouth must remain closed and the tongue lowered for three to four minutes during the measurement, which is a difficult task for young children to accomplish.

Axillary (armpit) temperature

Although it may be easy to measure axillary temperature, it has been proven that it does not provide an accurate measurement of the child's internal temperature. To take this type of temperature, the thermometer must be wedged tightly over the axillary artery. Despite the low sensitivity and relative inaccuracy of axillary temperature in detecting fever, this method is recommended by The American Academy of Pediatrics as a screening test for fever in newborns.

Tympanic thermometry

In order to obtain a precise temperature reading, good command of the measurement technique is required. The thermometer probe must be placed as close as possible to the warmest part of the external ear canal. An incorrectly placed probe could lead to a false temperature reading.

2.4. NORMAL BODY TEMPERATURES ACCORDING TO MEASUREMENT METHOD

MEASUREMENT METHOD	NORMAL TEMP
RECTAL	36.6°C – 38°C
ORAL	35.5°C – 37.5°C
AXILLARY	34.7°C – 37.3°C
AURICULAR	35.8°C – 38°C
TEMPORAL (IR-thermometer Smart ThermoGraph)	35.8°C – 37.8°C

The body temperature varies throughout the day. It can also be influenced by numerous external factors: age, sex, type and thickness of skin.

2.5. ADVANTAGES OF TEMPORAL ARTERY (TA) TEMPERATURE MEASUREMENT

Infrared arterial temperature can be measured by placing the device on the forehead in the temporal artery region. It has been demonstrated that this relatively new method of measuring body temperature is more precise than tympanic thermometry and better tolerated than rectal thermometry.

The IR-thermometer Smart ThermoGraph has been designed to produce an instant forehead temperature reading without any contact with temporal artery. As this artery is quite close to the skin surface and therefore accessible and the blood flow in it is permanent and regular, it allows precise measurement of the body temperature. This artery is linked to the heart by the carotid artery which is directly linked to the aorta. It forms part of the main trunk of the arterial system. The efficiency, speed and comfort of taking body temperature from this area make it ideal compared to the other body temperature measurements methods.

2.6. NORMAL BODY TEMPERATURES ACCORDING TO AGE

AGE	°C (°F)
0-2 years	36.4-38.0 (97.5-100.4)
3-10 years	36.1-37.8 (97.0-100.0)
11-65 years	35.9-37.6 (96.6-99.7)
> 65 years	35.8-37.5 (96.4-99.5)

2.7. PRACTICAL CONSIDERATIONS WHEN TAKING BODY TEMPERATURE

- To ensure precise and accurate temperature measurements and to receive correct information, the user is recommended to practice temperature measurement technique before using this device.
- It is essential to remember that although procedures such as taking a temperature may be simple they must not be trivialized.
- Temperature should be taken in a neutral ambient. The patient must not have undertaken physical activities prior to temperature measurement and the room temperature must be moderate.
- Be aware of physiological variations in body temperature which must be taken into consideration when evaluating measurements' results: body temperature increases by 0.5C° between 6am and 3pm. On average, women have higher body temperature, by around 0.2C°. Their body temperature also varies in accordance with their ovarian cycle. It rises by 0.5C° in the second half of the cycle and at the early stages of pregnancy.

2.8. HOW TO TAKE A BODY TEMPERATURE

Please, observe the following before taking body temperature measurements to ensure stable and reliable results:

- Push hair back from the forehead.
- Wipe away any perspiration from the forehead.

- Remove any secrets (e.g. from nasal specs) from the measuring part IR-thermometer Smart ThermoGraph.
- Allow 1 minute interval between two measurements.

Apply the IR-thermometer Smart ThermoGraph perpendicularly and non-pressing at the FOREHEAD in contact with the right temporal region and press the measurement button. The body temperature is displayed instantly.

Fig. B1. Body temperature measuring.

3. SURFACE TEMPERATURE MEASUREMENTS

3.1. POSSIBILITIES OF SURFACE TEMPERATURE MODE

The IR-thermometer Smart ThermoGraph in Surface temp mode measures infrared (thermal) radiation from any surfaces, including the skin surface. The temperature of skin surface is more variable than the body temperature and is generally lower than the body temperature. The temperature of the nose, ears, hands and feet is the most variable. The temperature of the skin of these body parts especially strongly depends on the ambient temperature. There are no precisely defined normal values of surface temperature and so the IR-thermometer Smart ThermoGraph is not intended for diagnostics of inflammation diseases, it is intended only for thermomonitoring. Temperature distribution on the surface of a healthy person is approximately symmetrical; the temperature decreases from head to fingers and toes, it is very individual and depends on age, gender, dietary habits, physical activity, ambient temperature, etc.

The IR-thermometer Smart ThermoGraph in Surface temp mode allows measurement of the skin surface temperature on any area of body including inflamed areas. Inflammation diseases of the skin and organs located near skin are accompanied by increase of surface temperature in the area corresponding to skin surface. If you regularly measure the surface temperature in one and the same point on an inflamed area, you can monitor temperature changes in this area. When repeating temperature measurements in the same skin point, and when comparing the new temperature value with the previously obtained temperature value, you can accurately assess the dynamics of temperature changes in this point. Repeating measurements of skin surface temperature in the point located on area of inflammation supply you larger amounts of useful information than with observing of only body temperature.

3.2. CONDITIONS FOR MEASUREMENT OF SURFACE TEMPERATURE OF HUMAN SKIN

Before starting each temperature measurement, make sure that the following mandatory conditions for temperature measurement are met:

- Room temperature is from 20 to 26 °C;
- Air conditioner and/or heater are turned off or situated far enough and are not directed at the examined object;

An ambient temperature must be constant during a session of temperature measurements and for different sessions (or change no more than 3-4 ºC between different sessions). If this condition is not observed, the data about the dynamics of temperature in the area of interest are not reliable.

- The examined area of the body has been freed from clothes or bandages for at least 10 minutes before temperature measurement;
- The person under examination is in a comfortable and relaxed position;
- The examined area of the body was not touched with hands during the past 10 minutes before temperature measurement.
- Hair on the examined area should be pushed away in order not to interfere with the measurement process.
- Any perspiration must be absent on the examined area.
- Remove any secrets (e.g. from nasal specs) from the measuring part IR-thermometer Smart ThermoGraph.

It is recommended to conduct temperature measurements at the same time of the day, preferably, in the morning before meals. Any procedures, manipulations and influences that may affect the temperature distribution in the area of interest are not recommended before examination, or the required time should pass after such procedures, manipulations and effects:

- at least an hour must pass after hygiene procedures, application of creams, shaving the area of interest, prolonged pressure or other mechanical influences in the interest area (for example, do not measure the temperature on the back, if the person was lying on it for the long period of time before the temperature measurement);

- at least 24 hours must pass after massage, physiotherapy, depilation and peeling in the interest area;
- at least two weeks must pass after skin traumatizing influences, for example, tattooing or piercing procedures in the interest area.

However if you want to monitor the effect of some concrete procedure, including any of above mentioned, you can measure the surface temperature before and after this procedure.

3.3. THE TECHNIQUE FOR SURFACE TEMPERATURE MEASUREMENT

1. Choose “Surface temp” mode on your IR-thermometer Smart ThermoGraph. The appropriate inscription should be on the screen.
2. Place the IR-thermometer Smart ThermoGraph to the point on skin surface in the interest area. If you measure temperature on any injured area of skin, the measurements must be done distantly at the distance about 3-5 cm.
3. Place the measuring part of the IR-thermometer Smart ThermoGraph perpendicular **(**maximally close to the angle 90 degree) to skin surface in the point to be measured with approximately the same degree of pressure that you use when working with a touchscreen.

Fig.C1. The correct position of the IR-thermometer Smart ThermoGraph during temperature measurement.

Note: contact measuring of surface temperature of open wound is prohibited. Only non-contact measuring at some fixed distance near 3-5 cm above wound surface can be allowed.
Measurement accuracy can be assured when the method used to measure the temperature is correct. For this purpose the IR-thermometer Smart ThermoGraph must be placed correctly during temperature measurement (the position must be maximally close to perpendicular relatively to the surface of skin), and the correct temperature value will be reached.
It is important to hold the device comfortably in hand during measurement. Therefore, for self-examination of a number of areas of interest (for example, your knee), it is recommended to turn IR-thermometer Smart ThermoGraph for 180 degrees along a longitudinal axis, by turning the measuring part to you:

, 180-degree turn

Fig.C2. Variants of positioning of the thermograph.

If it is difficult for you to measure skin surface temperature on some part of your body you could ask the assistance of somebody.

4. Press the «Scan» button, after that, for 1 second, the display of the IR-thermometer Smart ThermoGraph will show the temperature value of the surface temperature of the skin area to which the device's measuring part is placed against.

In order to obtain accurate temperature values it is necessary to learn how to use IR-thermometer Smart ThermoGraph properly. Select any point on the body surface in the area of interest and measure the temperature at least three times. Temperature is measured correctly when three consecutive temperature measurements at one point do not vary by more than 0.2°C.

Once you have achieved this result, you have the sufficient skills for correct temperature measurement.

3.4. SPECIAL APPLICATIONS OF SURFACE TEMPERATURE MODE WITH THE SMART THERMOGRAPH APP

Regular measurements of the surface temperature at one point only in an inflamed area are the simplest variant of thermal monitoring (thermomonitoring) and it gives a useful information. However regular measurements of several adjacent points provide much more valuable information. For fast and simple processing of such measurements you could download free Smart ThermoGraph software. Smart ThermoGraph software provides visualization of temperature values distribution (thermogram) on surfaces of any part of a human skin for more advanced thermomonitoring. Measuring skin surface temperatures in several adjacent points, including points on the inflamed area and obtaining temperature distribution (thermogram) on it in dynamics allows you to carry out thermomonitoring by using larger amounts of valuable information compared to thermomonitoring of only one point´s temperature.

By using Smart ThermoGraph software you can conduct correct thermomonitoring of any zones of skin surface. The thermomonitoring of area of interests by Smart ThermoGraph software allows you to estimate the dynamics of thermal signs of inflammation. Also, you can correctly estimate the effects of various influences on the surface temperature. By using Smart ThermoGraph software, you can obtain visual and digital information from individual responses from different influences on the skin surface temperature. In any case, the IR-thermometer Smart ThermoGraph with the software Smart ThermoGraph are not intended for diagnosis. The IR-thermometer Smart ThermoGraph with the software Smart ThermoGraph are intended for thermomonitoring of the skin surface area.

Based on the results of surface temperature measurements in several adjacent points, Smart ThermoGraph software plots a thermogram (temperature distribution on the area of interest) overlaid on the photo of that area on screen of your smart phone or tab. The first

thermogram and temperature values are prerequisite for further thermomonitoring. In the thermogram, the zones with relatively high temperature for the given area of interest are shown in red and orange colors, the zones with relatively low temperature for the given area of interest are shown in blue and purple colors, and the zones with relatively intermediate values of temperature for the area of interest are shown in green and yellow. Based on measurement results, the Smart ThermoGraph software automatically generates digital result that includes the maximum temperature and the average temperature for the area of interest. Starting from the second examination session of the same area, the Smart ThermoGraph software automatically shows the comparison of the results of these temperature values with the results from the previous session of thermomonitoring.

The inscription of the decrease of a maximum temperature with simultaneous decrease of an average temperature is displayed by green letters. The inscription of the increase of a maximum temperature with simultaneous increase of an average temperature is displayed by red letters. When maximum temperature and average temperature behave differently or without change, the inscription is displayed by yellow letters.

For more information you can download free app “Smart ThermoGraph” and read the “Help” for the app.

4. TROUBLESHOOTING

If you experience problems while using your device, please refer to this guide to help resolving the problem. If the problem persists, please contact our customer service.

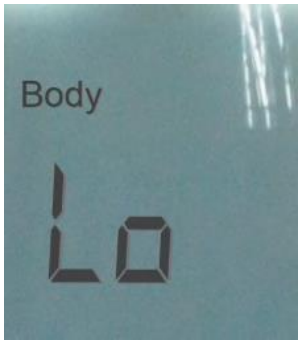
THE SCREEN DISPLAYS TEMPERATURE HIGHER THAN 42.9°C (109.2°F):
The temperature is in Fahrenheit. Change the measurement to Celsius by pressing the Celsius/Fahrenheit button.

THE SCREEN DISPLAYS TEMPERATURE LOWER THAN 32°C (89.6°F):
To take the surface temperature, press the “Mode” button and set to the Body reading mode. If the device is in Surface Temp Mode and the temperature value is 32°C (89.6°F), the thermograph shows the external temperature of your body, not the internal.

THE SCREEN DISPLAYS THE MESSAGE HI

When using the IR-thermometer Smart ThermoGraph, the message “HI” can appear on the screen. In this case, the measured temperature above the measurement range is registered, or the measured temperature is above 42.9 °C(109.2°F) in the Body Mode.

THE SCREEN DISPLAYS THE MESSAGE LO



When using the IR-thermometer Smart ThermoGraph, the message “Lo” can appear on the screen. In this case, the temperature taken is under the measuring range, or is less than 32°C (89.6°F) in the Body Mode.

The Lo message can be displayed for various reasons. Please, take a look at the list of the main issues.

Reasons for LO message display	Advice
Temperature reading hampered by hair or perspiration.	Make sure there is no obstruction or dampness prior to taking temperature.
Temperature hampered by an air draft or dramatic change in ambient temperature.	Make sure there is no air blowing in the area of use; this could affect the infrared reading.
Temperature readings are too close together, and the thermometer did not have time to reboot.	Pause for 15 seconds minimum between readings; a one-minute pause is recommended.

5. ACCESSORIES SUPPLIED

- User Manual in English
- Protective storage bag
- 2 pcs batteries supplied (AAA)