KYOTO ELECTRONICS MANUFACTURING CO., LTD.

WBGT Meter

WBGT-301 / WBGT-302

Operation Manual
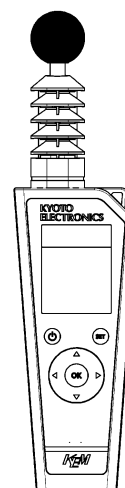
The pictorial illustrations shown in this manual are images.

Contents

Please read this manual thoroughly before using this product for the best performance of it.

1. About WBGT-300 series

- Conform to JIS B 7922:
  Electronic Wet-bulb globe temperature (WBGT) index meter
  - in conformity with Class 1.5.

- Dustproof and water resistant enclosure (JIS C0920)
  Rated equivalent to IP6X for solid matter and IPX5 for water

- Memory capabilities:
  Up to 30,000 measurement data can be stored on the internal memory.
  Measurement data stored on this product can be transferred to a personal computer (PC).

- USB port:
  Measurement data can be summarized and easily transferred to PC. USB power supply enables continuous measurement for a long time without worrying about the battery capacity.

- Notification with alarm sound
  The alarm notifies the danger to the user when WBGT reading reaches a preset threshold value.

- Available for both indoor and outdoor use:
  Ordinary thermometer cannot measure the radiation heat, i.e., solar radiation heat or reflected heat from ground. Thus, under a blazing sun, correct WBGT (Wet-bulb globe temperature) reading cannot be determined by it. Whereas this product can be used indoors, outdoors, or even under a blazing sun because this product is equipped with a globe so that solar radiation or radiation heat, one of the causes of heat-stroke occurrence, can be determined.
  It may fail to measure correctly if the wind speed is less than 0.3 m/s.
  In an enclosed space, such as a closed room, the wind speed will be less than 0.3 m/s, so the WBGT index will be higher than indicated by the measuring instrument. Please open the room so that it can be ventilated.

2. For proper usage

- Read the indicated value in about twenty (20) seconds when turning on the unit which keeps lying under outdoor natural draft for over five minutes.
- Wait 1 to 2 minutes until the reading becomes stable even under outdoor natural draft when this product has just been taken out from the case or it has been moved to somewhere else. Once the reading becomes stable, read the indicated value.
- Under nearly calm indoor conditions, read the indicated value on this product after shaking it some five times and waiting for about 10 seconds. Since heat stays in the temperature/humidity sensor under the environment of strong radiation heat, shake this product well before measurement in order to replace the air inside the temperature/humidity sensor with ambient air.
- Do NOT leave this product under the environment of strong radiation heat at 50° C or over. It may cause a malfunction such as the display disappearing. Shield all parts other than the sensor unit with aluminum foil or the like when measuring under a strong radiant heat environment, and expose only the sensor unit.
- This product should be placed in the shade when not in use.
- If the temperature/humidity sensor unit gets wet, the correct measurement and display of temperature and humidity may not be possible until it dries.
- Dew condensation may occur due to a sudden change in temperature and humidity of the environment especially when taking out this product suddenly from a well air-conditioning room to places such as high temperature/humidity outdoors. When dew condensation occurs, the humidity sensor and the built-in circuit board may be adversely affected. Therefore, please avoid a sudden temperature change.
- Avoid using this product under organic-solvent or hot air atmosphere to prevent malfunction.
- Do NOT use this product under a strong magnetism such as near a dynamic loudspeaker or a motor.
- The temperature/humidity sensor will be gradually degraded under the influence of the water vapor in the atmosphere. Therefore, it is recommended that you have an annual inspection by KEM representative.
  Please contact your KEM representative for inspection.

- Dirt, corrosion and other factors may shorten the product life if it is used in places exposed to sea breezes at the seaside, or in environments where dust or oil mist is generated. Make sure to replace the temperature/humidity sensor periodically or have an inspection regularly by KEM representative.

3. Safety precautions

Please be sure to follow the safety precautions in order to prevent harm to users and others and loss of property:

⚠ Warning	There may be a risk of death or serious injury if precautions are not observed.
⚠ Caution	There may be a risk of injury or material damage if precautions are not observed.
🚫	Description of prohibited item.
❗	Description of strictly observed item.
Request	Description of keeping this product in the best conditions.
Notice	Additional information for users in the usage of this product.

⚠ Warning

● This product is not for medical use. The possible heat stroke has to be cautioned by, other than WBGT index, environmental conditions, individual difference or physical condition and the wear. Heat stroke occurs more likely when the person has the experience of heat stroke in the past or his health condition is not well. An advanced health check by a medical doctor or at an appropriate institution is recommended.
Especially, instructors and managers need to be careful when working in a hot environment.
● Immediately stop using this product if anything abnormal is found. Clearly mark with "Out of Order" in order to prevent accidental use by other users, and keep out of reach of them. Working based on wrong WBGT readings by the faulty meter may result in death or serious injury in the worst case.
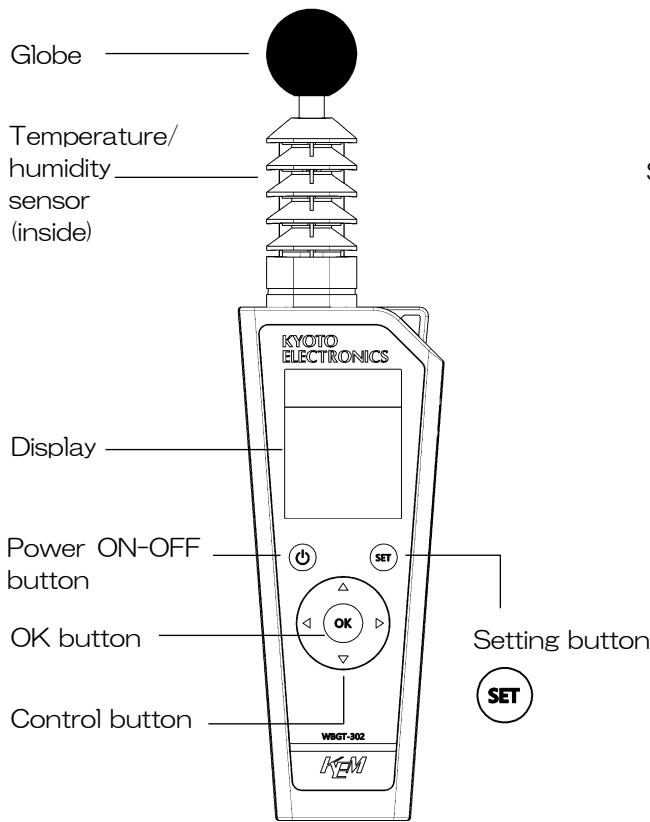
⚠ **Caution**

- This product is made of precision electronic parts. Do not handle roughly, not give strong impact, nor dip the temperature/humidity sensor unit in liquid.
- Do not use or store this product in corrosive or organic gas environment.
- Do not damage the temperature/humidity sensor unit, nor immerse it in liquid. Failure may result in incorrect measurements or malfunction of this product.
- When using a tripod or the like, firmly fix it to something with sufficient strength. Failure may result in falling of the instrument, causing an injury and/or the malfunction of this product.
- Connect the USB cable 2.0(AtoC) after wiping off any dust or waterdrops that may have adhered to the USB port of the main unit. It may cause a malfunction if used with dust or waterdrops adhered.
- Be sure to use this product with batteries in place even when supplying power from an external source. If the USB cable 2.0(AtoC) is come off while supplying power, the power may suddenly turn off and it may cause damage of memories.
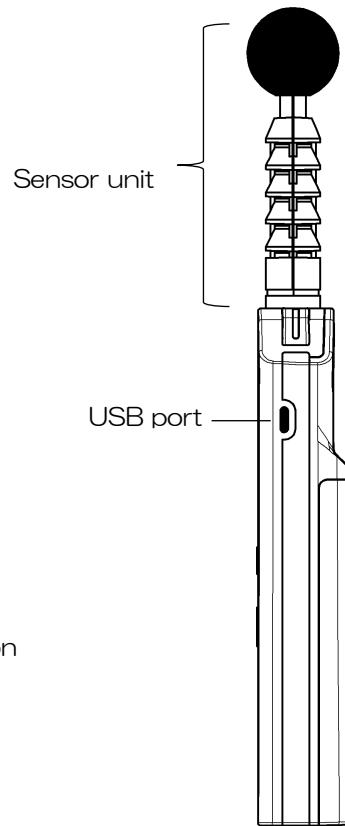
Notice on this Manual
1. Make sure to read "Safety Precautions" in this manual before use for safety handling the instrument.
2. Every effort has been made to ensure that information in this manual is accurate, up-to-date and complete. However, should you find anything unclear, erroneous description, or any omissions in this manual, contact your KEM representative.
3. Reproduction, duplication or translation of this manual in whole or in part is strictly prohibited without permission of KEM.
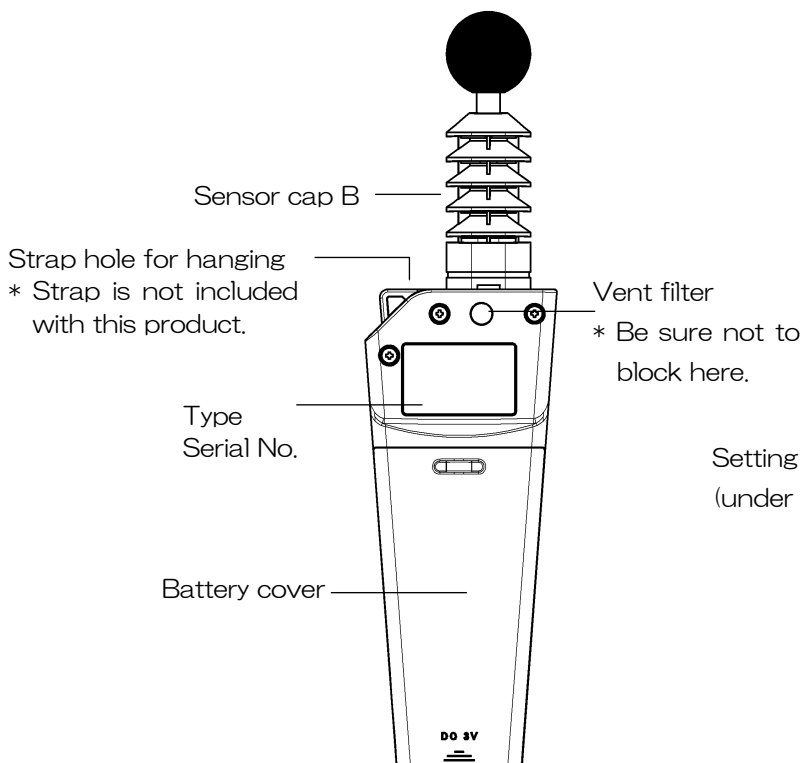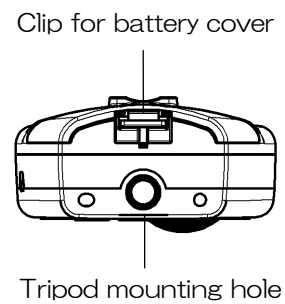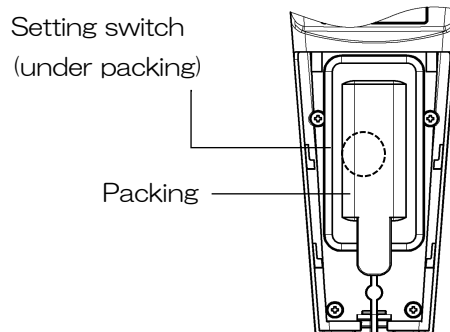
4. Parts configuration and accessories

< Front view >

Globe

Temperature/ humidity sensor (inside)

Display

Power ON-OFF button

OK button

Control button

Setting button

SET

WBGT-302

KYOTO ELECTRONICS

< Side view >

Sensor unit

USB port

< Rear view >

Sensor cap B

Strap hole for hanging
* Strap is not included with this product.

Type
Serial No.

Battery cover

Vent filter
* Be sure not to block here.

DC 3V

< Bottom view >

Clip for battery cover

Tripod mounting hole

< View of battery cover removed >

Setting switch (under packing)

Packing

⟨ Display ⟩

Time display — 88:88

eco 🔋 — Remaining battery life

Icon — 🕐 📥 🔔 ◐ **USB**

WBGT ⛅ ☀ MIN MAX °C

WBGT reading — 88.8

Ta Tg RH

Temperature (Ta)/ Globe temperature (Tg) — 188.8°C 88.8% — Relative humidity (RH)
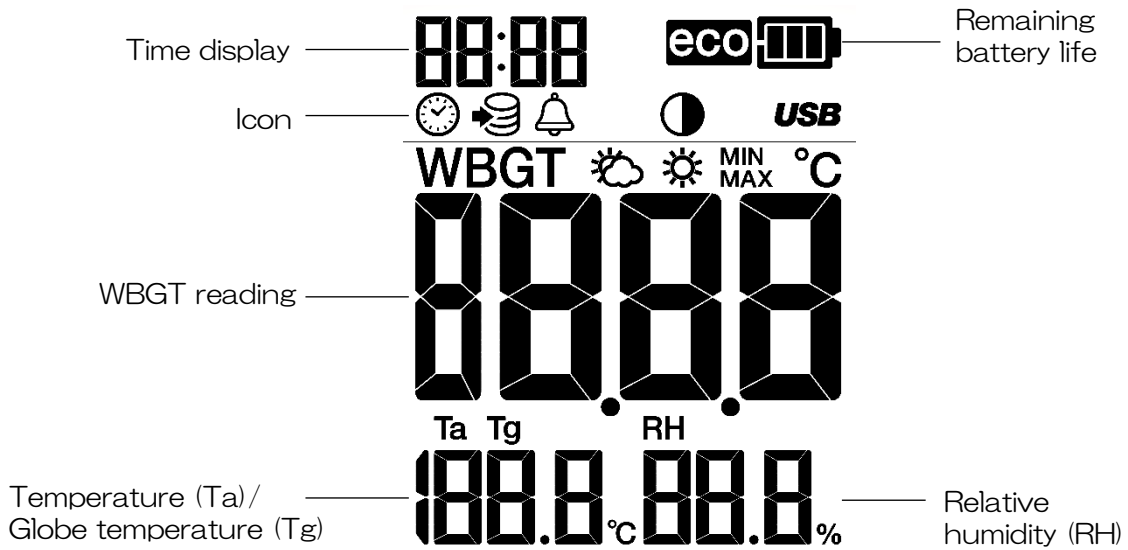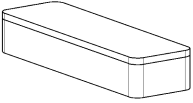
⛅	Measurement mode (without sunlight)
☀	Measurement mode (under sunlight)
MIN	Minimum value
MAX	Maximum value
Ta	Temperature display
Tg	Globe temperature display
🕐	Date/time setting
📥	Memory
🔔	Alarm
◐	Contrast

eco	Eco mode
USB	USB communication mode：lighting RS communication mode：blinking

＊Refer to the section 'Change settings 'in page 16 for more information on the displayed icons

＊ The measured value of WBGT is expressed as WBGT reading in this manual.

Accessories		
WBGT-301／WBGT-302		
□	Operation manual	
□	AA size alkaline battery	Two
□	Carrying case	
□	Index sticker	
□	Inspection Certificate /Warranty	
□	China-RoHS DECLARATION OF CONFORMITY(WBGT-301/WBGT-302)	
□	Contact	

＊In the case that some accessories are short of quantity or damaged, contact your KEM representative.

5. Operation buttons

* Description of buttons:

⏻	Power ON-OFF button: Press and hold this button for more than 3 seconds to turn the power ON or OFF.
SET	Setting/data transmission button: Press and hold this button for 2 seconds to proceed to the parameter settings.
OK	OK button: Confirm values to be set in the parameter settings.
▲	Up arrow button: Allows to change parameter values and switch the display of temperature (Ta) or globe temperature (Tg).
▼	Down arrow button: Allows to change parameter values and switch the display of temperature (Ta) or globe temperature (Tg).
▶	Right arrow button: Allows to change selected items and switch the display of MIN or MAX.
◀	Left arrow button: Allows to change selected items and switch the display of MIN or MAX.

6. Measuring method

About Heat Index (WBGT)

Heat index (WBGT) is the index which focuses on heat balance - the exchange of heat between human body and outside air. This index adopts three factors - humidity that has a large effect on the heat balance of the human body, the surrounding thermal environment such as sunlight and solar radiation, and temperature - that considerably affect the heat balance on human body. This index is used to prevent heat stroke during work or exercises. The calculation of this index is made with dry-bulb temperature, wet-bulb temperature, and globe temperature. The unit is [°C].

Under sunlight

0.7 x wet-bulb temperature + 0.2 x globe temperature + 0.1 x dry-bulb temperature

Without sunlight

0.7 x wet-bulb temperature + 0.3 x globe temperature

This product determines the dry-bulb temperature by temperature sensor, and the wet-bulb temperature by calculating the relative humidity measured by humidity sensor and the dry-bulb temperature. The globe temperature is a value converted from 30mm-diameter globe temperature to the standard 150mm-diameter globe temperature.
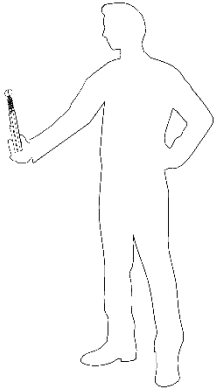
About the measurement position
WBGT reading should be measured at the height of the human abdomen area (1.1 m in the standing position, 0.6 m in the sitting position).

7. How to use

## Measurement in hand

When measuring WBGT with this product in hand, try to keep the main unit away from the operator's body as far as possible.
* When the operator's body is so close to the temperature/humidity sensor unit that the heat of the body may affect the sensor, resulting in incorrect readings.

Measurement by installing on a wall

30mm

4mm*8mm
Long round hole

Fixing plate
Fixing screw
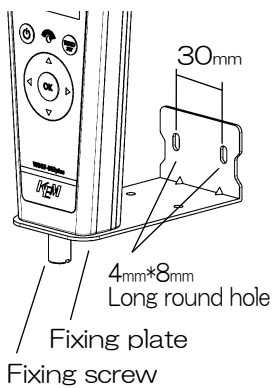
When installing this product on a wall, first secure the fixing plate on the wall with screws, then, install this product on the fixing plate with the fixing screw for mounting a tripod.
* Secure the fixing plate firmly so as not to fall off.
* Screws for mounting the fixing plate are not included.
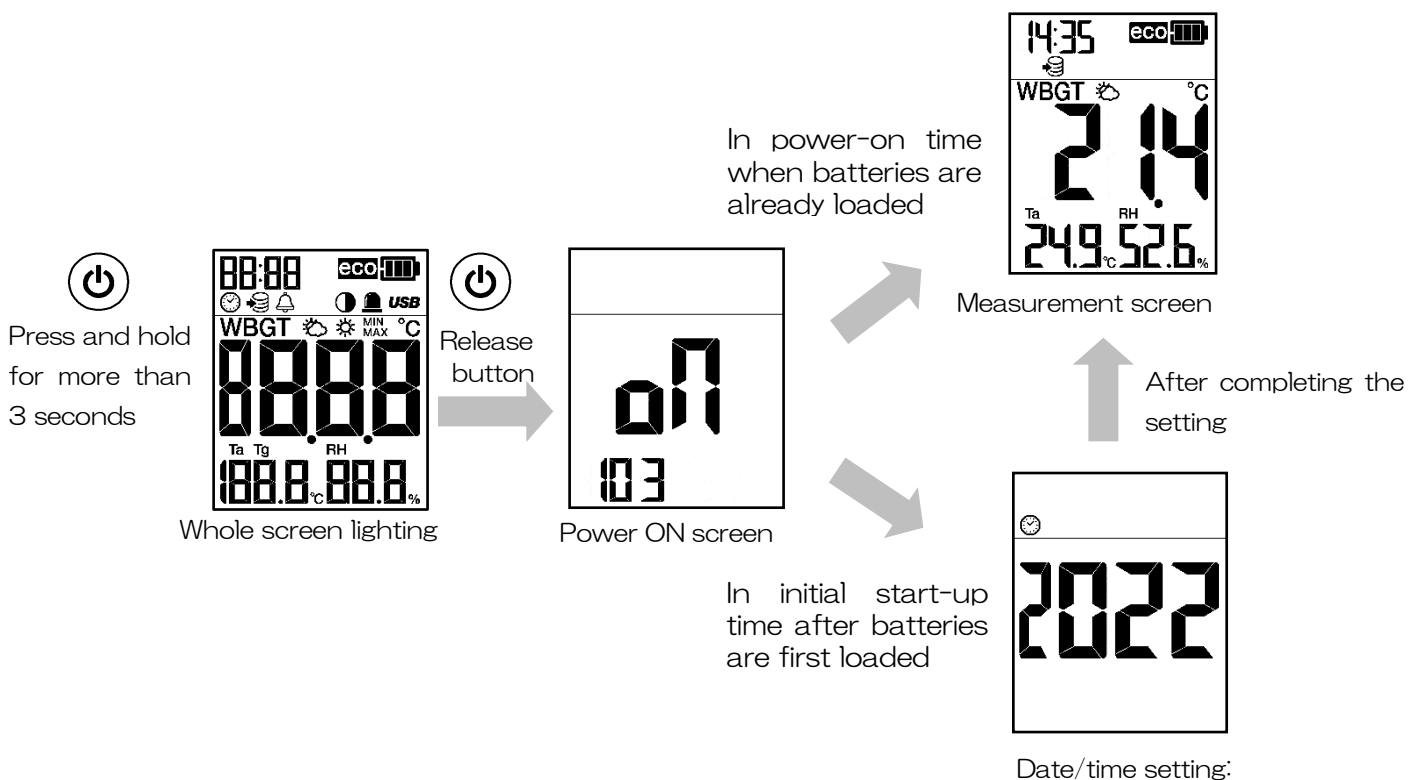
Measurement by mounting on a tripod
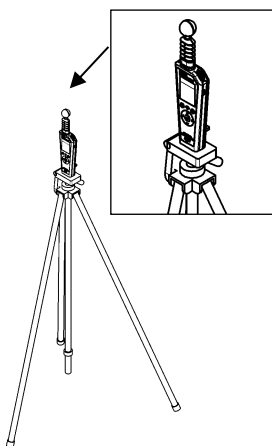
When mounting this product on a tripod, secure the fixing screw for mounting a tripod into the mounting hole at the bottom of this product.
* Be sure to mount this product with the glove upwards.
* A tripod and a screw for mounting a tripod are not included with this product.

8. Measurement

1. Press and hold the power ON-OFF button for more than 3 seconds.
2. Measurement starts immediately after the power is on.
* The screen for Date/time setting is displayed in the initial start-up time after batteries are first loaded.

A measurement is performed once every 1 second and the display will be updated.

In power-on time when batteries are already loaded

Measurement screen

Press and hold for more than 3 seconds

Release button

Whole screen lighting

Power ON screen

After completing the setting

In initial start-up time after batteries are first loaded

Date/time setting:
* For details of Date/time setting, refer to Page 15.

9. Display switching

This function can be used on the measurement screen.
1. Press up/down arrow button to switch the display of temperature (Ta) or globe temperature (Tg).
2. Press left/right arrow button to switch the measured value of minimum (MIN) or maximum (MAX).

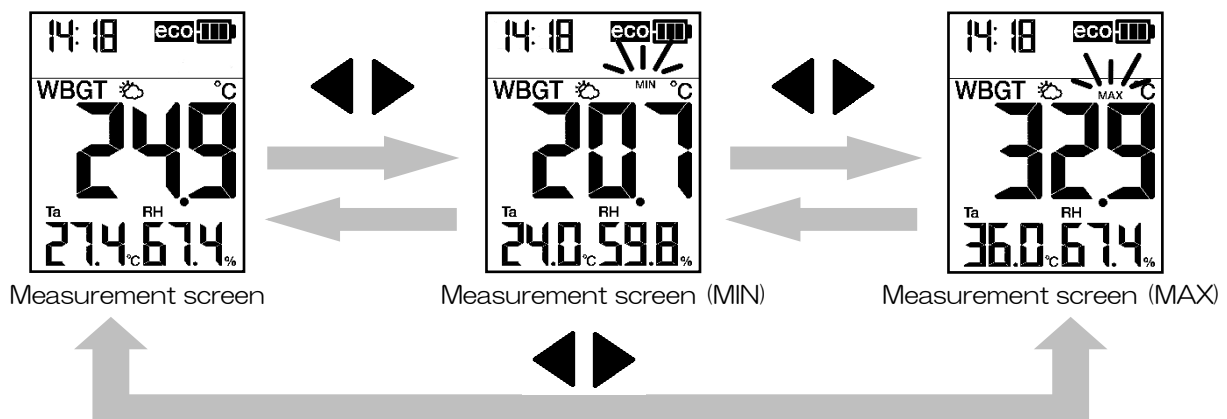## Switching temperature (Ta) or globe temperature (Tg)
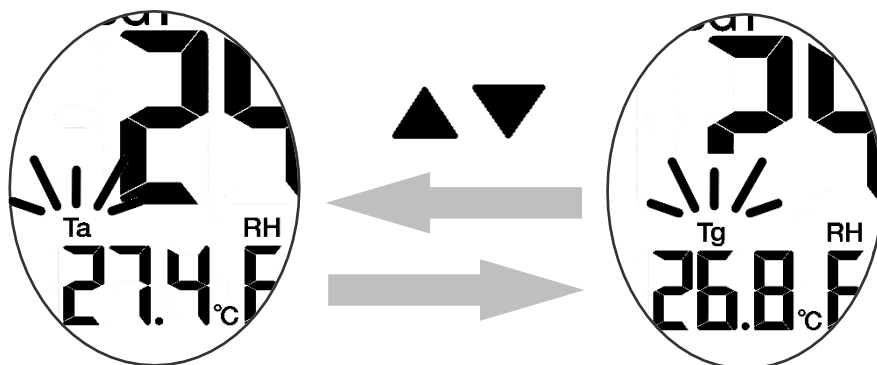
Measurement screen (Ta)   Measurement screen (Tg)

* Possible to switch the screen with either Up or Down arrow button.

Switching minimum value (MIN) or maximum value (MAX)

Measurement screen   Measurement screen (MIN)   Measurement screen (MAX)

* Possible to switch the screen with either Right or Left arrow button.
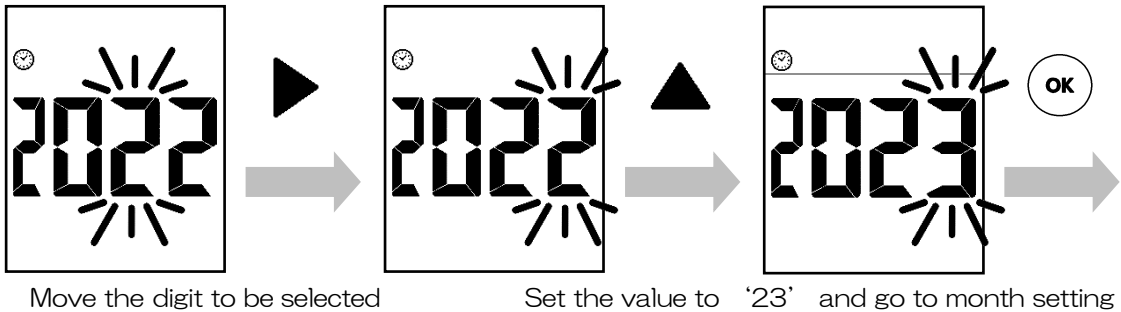
10. Date/time

1. Put the batteries in, then press and hold the power ON-OFF button for more than 3 seconds.
2. When the power is turned on for the first time after replacing the battery, the screen for setting Date/time will be displayed first after startup. The setting method is described below.
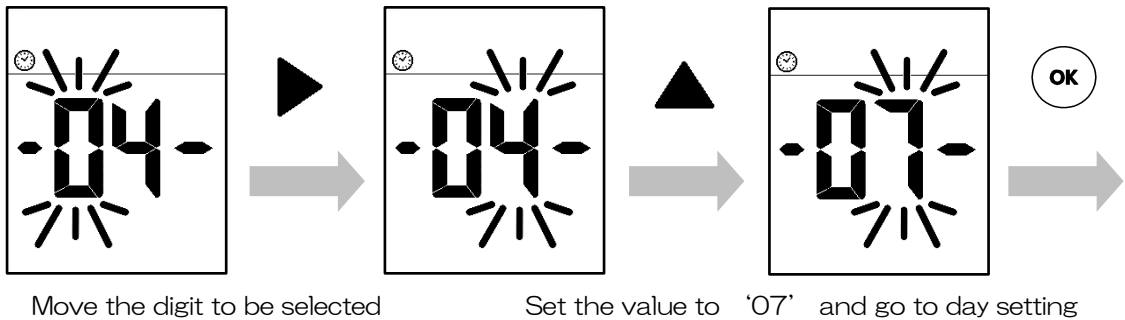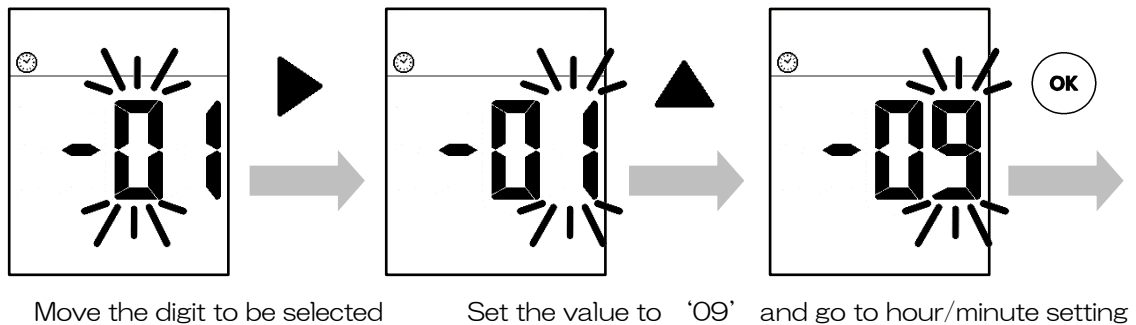
Set date
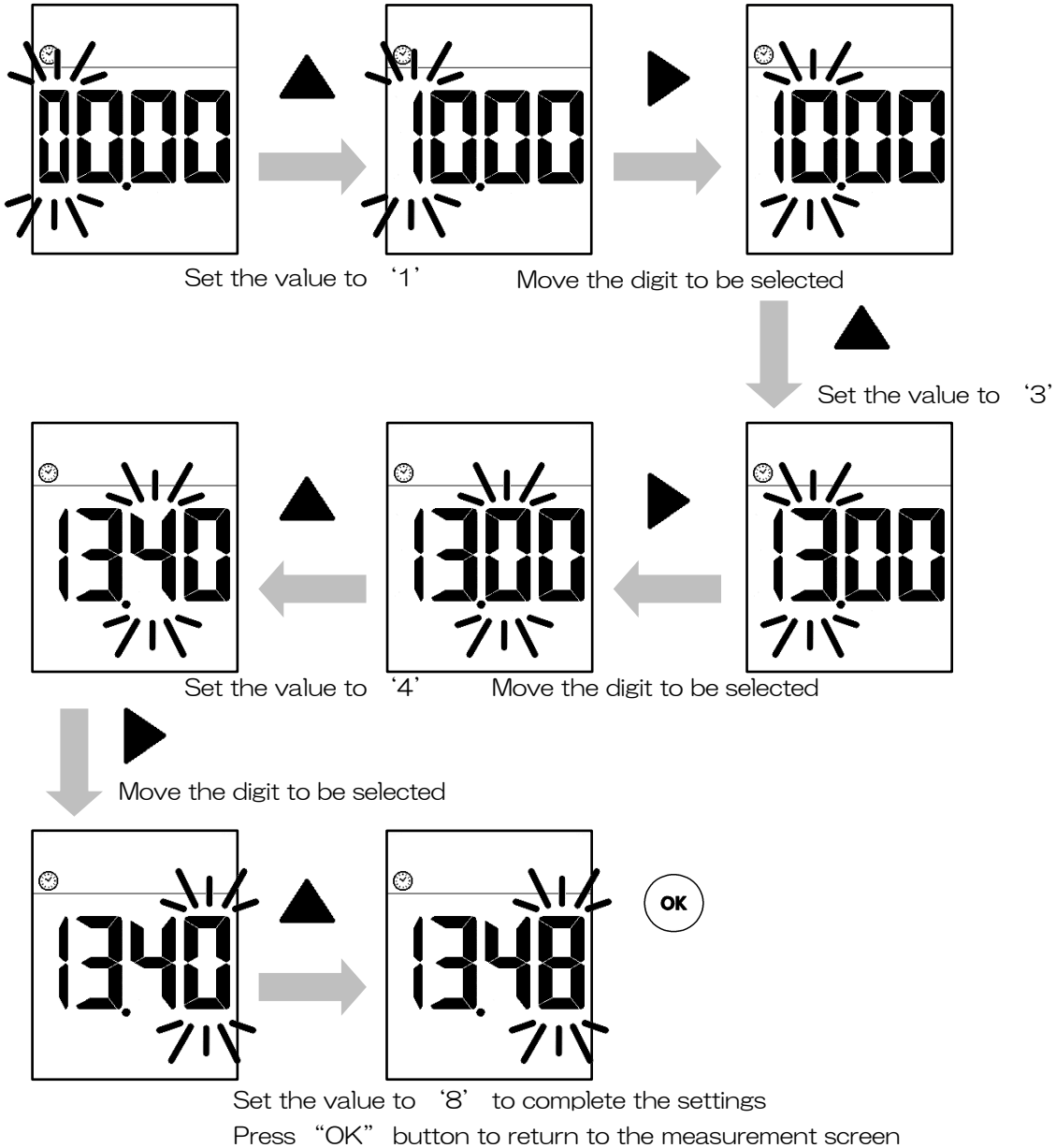
(Example) When setting July 9, 2023:

[Set year]

Move the digit to be selected   Set the value to '23' and go to month setting

[Set month]

Move the digit to be selected   Set the value to '07' and go to day setting

[Set day]

Move the digit to be selected   Set the value to '09' and go to hour/minute setting

Set time

(Example) When setting to 13:48: (24-hour clock)

[Set hour/minute]

Set the value to '1'   Move the digit to be selected

Set the value to '3'

Set the value to '4'   Move the digit to be selected

Move the digit to be selected

Set the value to '8' to complete the settings
Press "OK" button to return to the measurement screen

Notice
Date/time setting need to be set the first time the battery is loaded and the power is turned on. It can be changed later.
In this case, after changing the settings, press "OK" button to return to the setting change screen.

11. Change settings

This product features the following setting items.
The contents of setting items are displayed with icons shown as below.:

Item	Icon	Content
Date/time		Set date and time
Memory		Set memory function for stored data (Also used in connecting with an LED indicator.
Alarm		Set a temperature when the alarm sounds.
Contrast		Set contrast of screen display
eco mode	eco	Set auto power-off
Switch measurement mode		Switch measurement mode (Under sunlight)
		Switch measurement mode (Without sunlight)
USB communication	USB	Switch USB connection method

When changing the settings, press and hold (SET) button for 2 seconds. Further, when returning to the measurement screen from the screen of changing settings, press (SET) button. Pressing (SET) button while an icon is blinking will make transition to the advanced settings screen of the item. When the settings of an item are completed, the screen will return to that of changing settings.
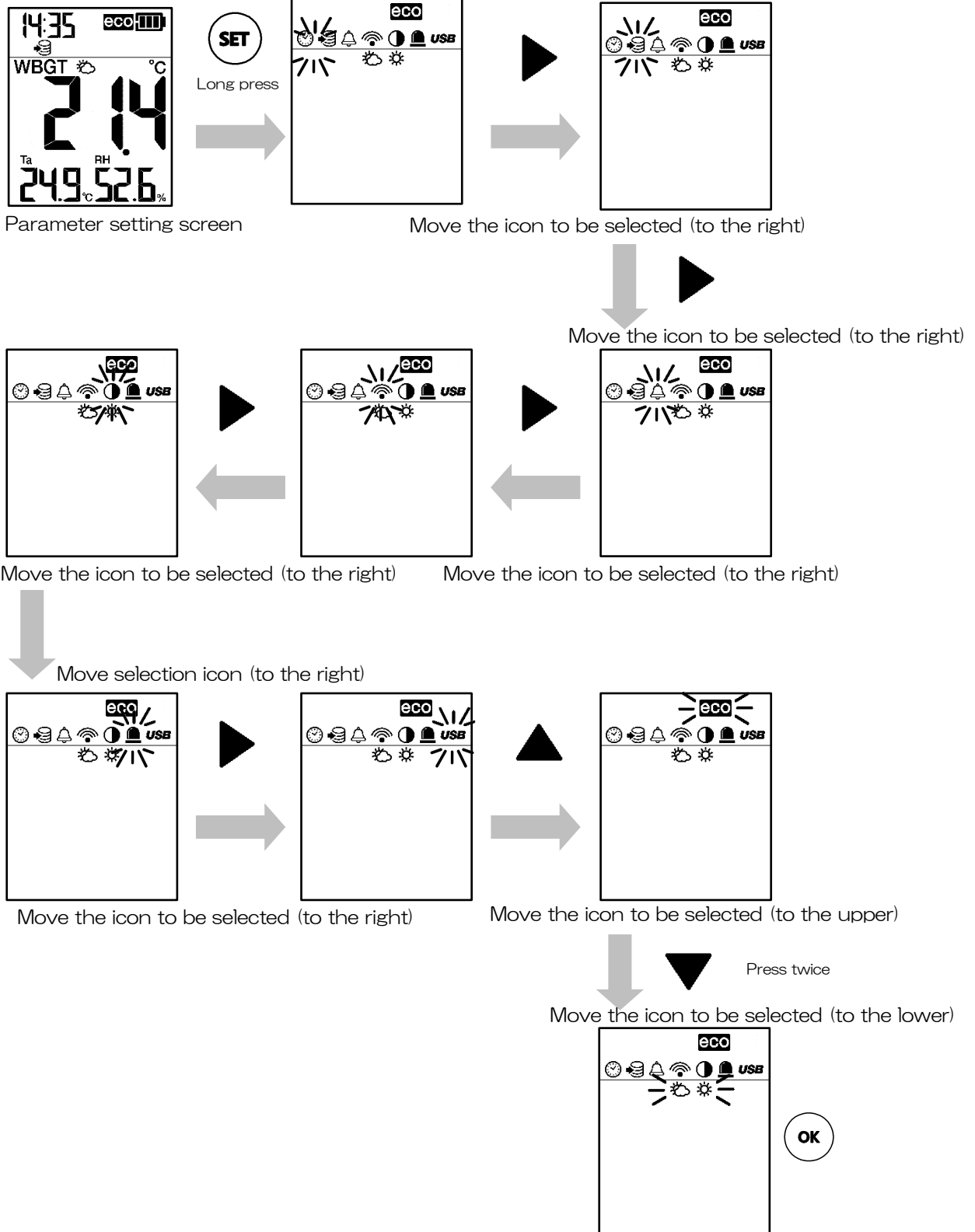
For the information on button controlling or scrolling, refer to page 17.

* For setting the date and time, please refer to "Set date" on page 15.

* Refer to page 20-23 for more details on other setting.

How to select setting items

Select an item to be set.

Parameter setting screen

SET
Long press

Move the icon to be selected (to the right)

Move the icon to be selected (to the right)

Move the icon to be selected (to the right)　　Move the icon to be selected (to the right)

Move selection icon (to the right)

Move the icon to be selected (to the right)　　Move the icon to be selected (to the upper)

Press twice

Move the icon to be selected (to the lower)

OK

Press 'OK' button to proceed to the advanced settings

＊When returning to the measurement screen, press (SET) button.

12. Memory

The memory function features recording measurement data.
Up to 30,000 measurement data can be stored in the memory.
The settable memory interval is from 1 min to 999 min.
(Default: OFF)

Select the memory icon from the screen of changing settings.

Select ON/OFF   When 'ON' is selected, go to interval in memory setting.
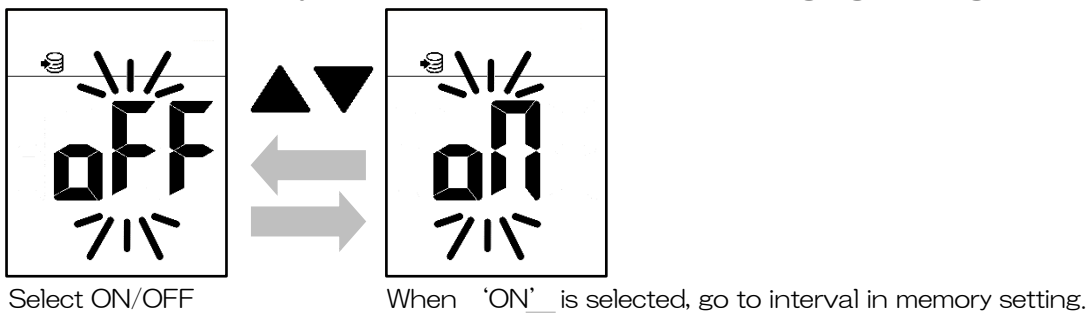
Recording interval in memory
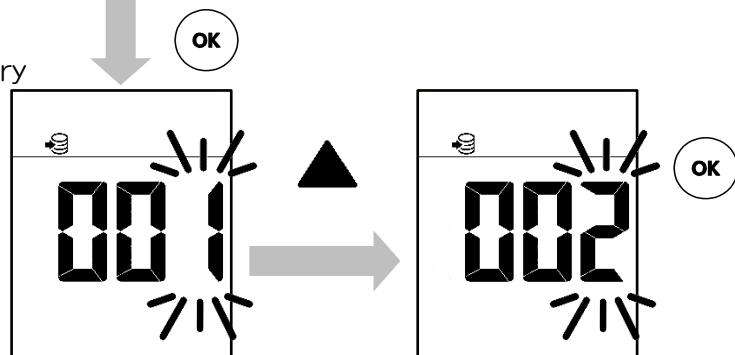
Proceed to the selecting digit and set the recording interval in the memory.
Press "OK" button to complete the setting and start recording the
measurement data.
(When set to OFF in the ON/OFF selection, recording is stopped.)

＊Data can be stored at the preset memory interval even if the power
 is turned off.

Notice

About the contents of the memory of the WBGT main unit
  Csv files will be created in the WBGT folder.
  File name: WBGT_ Serial No._Date of file creation
  Example: WBGT_32602009_210716
 	
SETTING
LOG   WBGT_32602009_210716.csv
WBGT   WBGT_32602009_210921.csv
 	
5,000 data will be stored in one csv file.
In addition, the following items will be recorded for each case.
Measurement date and time/measurement mode (without sunlight : 0, under sunlight: 1) /WBGT/Ta/RH/Tg
 	
DATE   IN/OUT WBGT   Ta   RH   Tg
2021/7/16 1:13   0   20.2   25.3   40.2   26.5
 	
The oldest file (batch of 5,000 data) will be deleted when the number of files exceeds 7 (35,000 data). Therefore transfer the data in an appropriate time.
The stored data can be checked and transferred by connecting the unit to a PC. Please set the communication mode to USB communication mode.

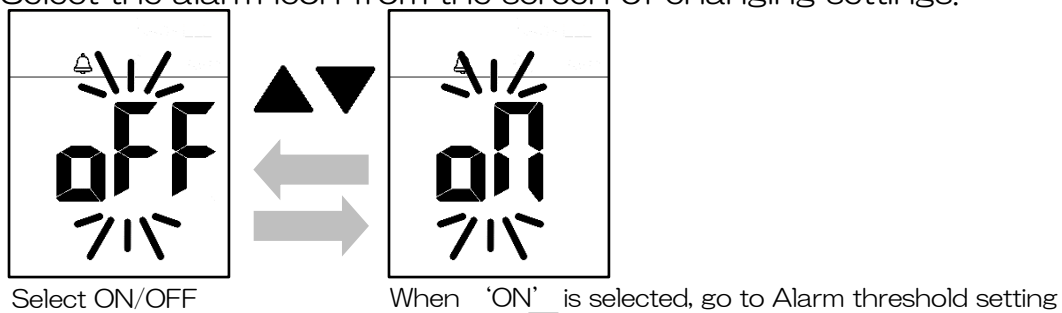|	
❗	Be sure to turn OFF the memory function before removing batteries. Otherwise (remove them when the function is ON), the measurement data file can be damaged
❗	When the remaining battery level becomes lower, the memory function will not work. Therefore, periodically replace butteries.
❗	The memory icon blinks when the available data storage capacity is low. Be sure to transfer or delete data as early as possible.
❗	When the memory function is turned on, the eco mode is forced to turn off.

13. Alarm

This function features to inform with an alarm sound when the measured data exceeds the preset WBGT reading. The alarm function is effective only for WBGT reading.
Configurable range of alarm: 15.0°C to 40.0°C （Default: 28.0°C）

The setting needs to be set to OFF in the screen of changing settings to stop the alarm sound. The alarm sound will stop when the measurement data is below the preset threshold.

Select the alarm icon from the screen of changing settings.

Select ON/OFF   When 'ON' is selected, go to Alarm threshold setting

Alarm threshold

Set alarm threshold and press "OK" button to complete the settings.
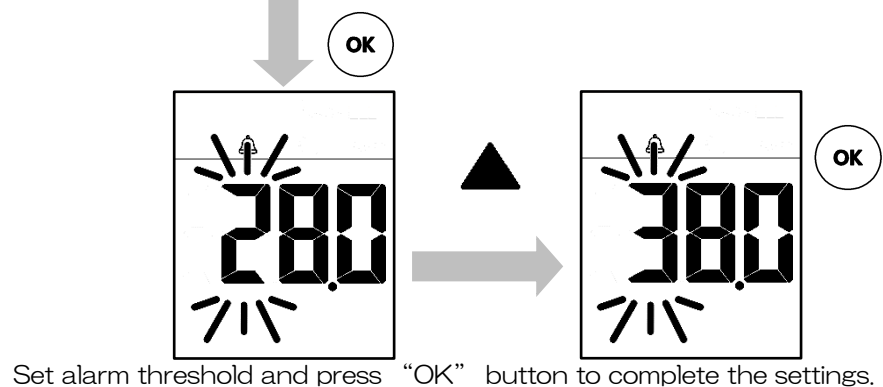
Notice	
❗	Keeping the alarm sounding results in shortening the battery life.
⚠ Warning	Regularly check the reading on the display when using this product in the environment where the alarm sound is hard to hear in such an occasion that there is a sound source around or this product is located far away from the operator.

14. Other settings

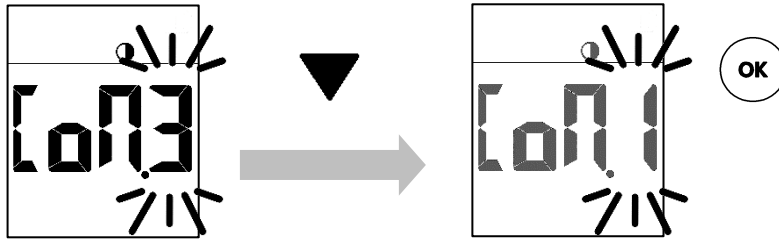This function is to change the contrast of the screen. Use this when having difficulty seeing the screen. Select the contrast icon from the screen of changing settings. The contrast can be set on a scale of 1 to 5.

Screen contrast changes as setting is changed.

Setting of eco mode

The power is automatically turned off if this product is left unoperated for 20 minutes when this function is turned on. Turn off this setting by selecting the 'eco icon' from the screen of changing settings to display the screen all the time.
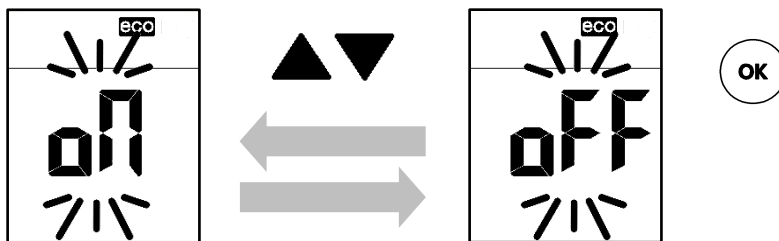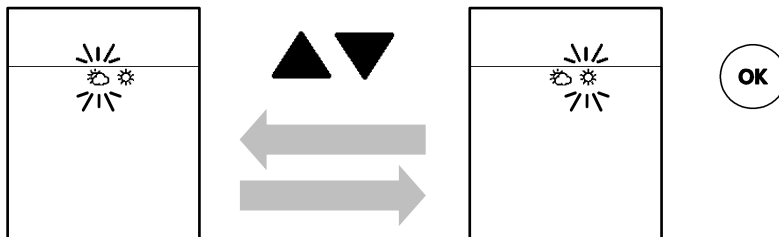
Default: 'ON'   Change setting with up/down arrow button.

Setting of switching measurement mode

Switch the setting of 'Under sunlight' / 'Without sunlight', depending on measurement environment. To do this, select the icon for switching measurement environment.

Switch the setting by selecting an icon.

15. USB communication

This function features the settings of USB communication. This icon lights up when the connection mode is set to USB connection, and blinks when RS connection is set.
Refer to page 18 for more information on connection modes.
Change the settings according to the device to be connected to this product.
(Default : USB communication mode.)
USB2.0 cable (A to C) is necessary to use this function.
Refer to page 34 for the purchase of the USB2.0 cable (A to C).

Set USB communication

Select the USB icon from the screen of changing settings.
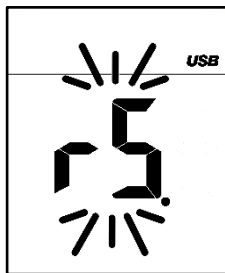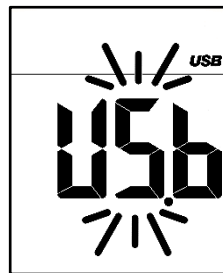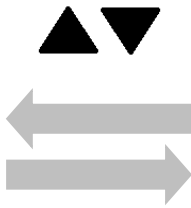
RS mode setting   USB mode setting

Press "OK" button to complete the settings.

Request
ⓘ When disconnecting the cable for connection from the main unit, please follow the general safe disconnection procedure for hardware on the PC. Otherwise, the measurement data or the memory may be corrupted.

.

16. Replace batteries

The icon for remaining battery life is displayed in the upper right corner of the display. Replace batteries according to the display described below:

Display	Remaining battery life description
	Battery fully charged.
	Battery partially discharged.
	Battery becoming low.
Blinking	Replace batteries.
Blinking	USB power feeding

The Low battery screen will display as shown below if the remaining battery life is too low to operate this product properly. All operations and measurements will stop when the Low battery screen is displayed. Replace the battery as early as possible when the battery life is low.
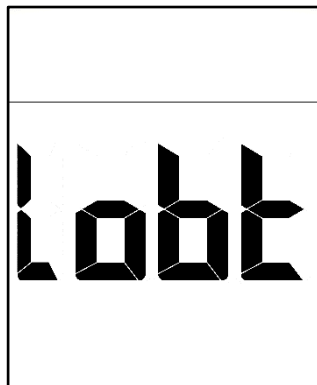
1. Press down the ※ part and slide the battery cover (②) to remove it while pulling up the battery cover clip on the back of this product (①).

clip
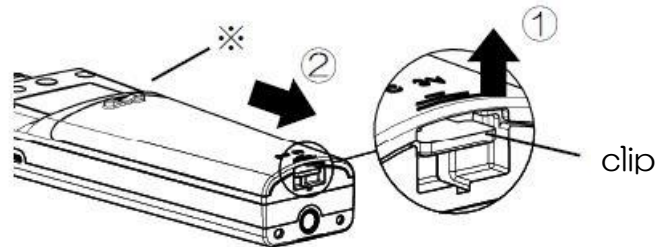
2. Remove the packing after wiping the inside of it off if it is wet.
3. Remove the wrapper of fresh batteries (size AA, 2 pieces), then put them in the battery box as shown in the figure below.
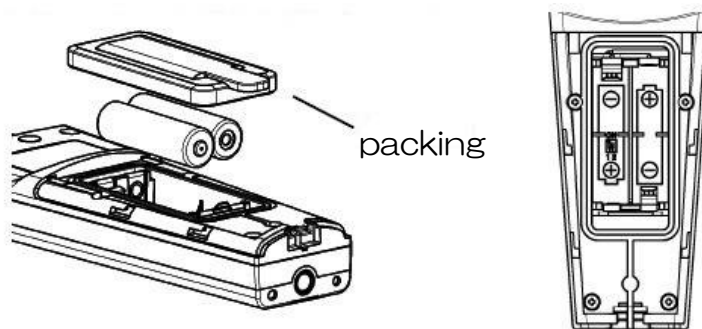
packing

4. After completing to put the batteries, put the packing and the battery cover in the reverse order of removal.
   Push the packing all the way into the groove of the main unit so that it does not come off the main unit.

Request	
⚠ Warning	Be sure to use alkaline batteries since rechargeable batteries may not work properly to display the remaining battery life.
❗	Do not measure while the display of remaining battery life is blinking. Replace the batteries as soon as the icon of remaining battery life blinks. In addition, the battery life may be shortened depending on the usage environment and settings.

	Water resistance is compromised when the instrument's packing is damaged, leading to possible malfunction. Please replace the packing if it gets damaged (refer to page 34).

17. Storage, maintenance, and handling

* Handling and storage

🚫	●Never disassemble this product. ●Do not give a shock or vibration to the instrument. 　☞ There may cause a risk of malfunction.
❗	●Do not use or store this product in a corrosive gas environment. 　☞ There may cause a risk of malfunction. ●Store indoors with less fluctuation in temperature and humidity 　☞ This product may malfunction if stored below zero degrees or in a high humidity place. ●Remove the batteries from the instrument for storage. 　☞ Possible leakage of the battery may cause a risk of malfunction.

* Maintenance

❗	●Do not use water, boiling water, or organic solvents such as alcohols. 　☞ Failure may result in malfunctioning of this product or breakage/discoloration of the parts. 　☞ Use a clean cloth to wipe off dirt on this product. ●If the temperature/humidity sensor unit gets wet, blow away waterdrops with a blower or the like to dry. If it is hard to dry the temperature/humidity sensor, remove the globe and the sensor cap B to dry it. (Refer to page 29 for how to remove.)

⚠ Caution: Dustproofing and Water Resistance Performance

This product is designed to meet "JIS IP65" for performance in blocking solids and resisting water from infiltrating its electrical enclosure, though this performance does not come guaranteed. The ability of the enclosure to resist foreign matter may be compromised if not used in accordance with our recommendations. Failure to operate the instrument as recommended may lead to incorrect results and/or permanent damage, so please be mindful of the following cautionary points:

- Never use this product with the battery cover and the packing removed.
- Be sure to close the battery cover and the packing firmly.
- Never splash hot water or steam over 40° C on this product. Never immerse this product in water.
- If the temperature/humidity sensor unit gets wet with water, it may not be possible to measure and display the temperature and humidity correctly until it gets dry.
- Never open or close the battery cover and the packing, or replace the globe or the temperature/humidity sensor unit in a sandy or dusty place.
- Never use this product while being supplied with external power in the rain.

[Removal of globe and sensor cap B]

Globe

Serial No.

Back side
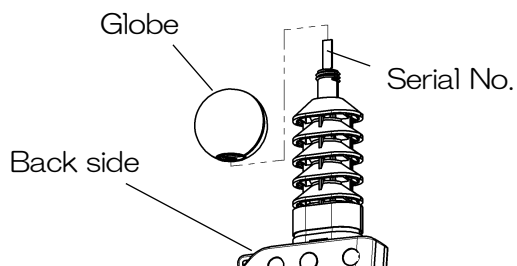
1. Hold the globe and the main unit, and turn the globe counterclockwise to remove it.
   Be careful not to drop the globe when removing it.
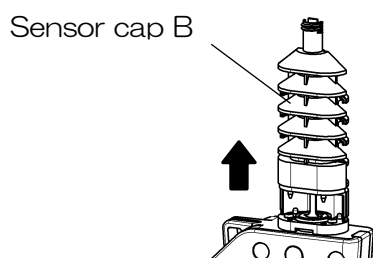
Sensor cap B

2. Slide the sensor cap B on the <u>back of the main unit</u> slightly upward and remove it.

Sensor element (opposite side)

Temperature/humidity sensor unit

Screw
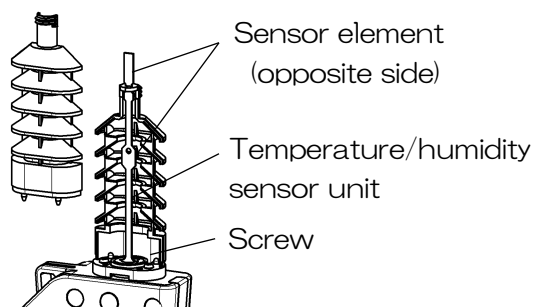
3. Install the sensor cap B and the globe in the reverse order of removal after drying the temperature/humidity sensor unit (especially the sensor element) with a blower.
   Make sure that the globe packing fit in the recess of the sensor cap.
   Turn the globe to the position where it stops and install it.

※ Do not remove the screws.
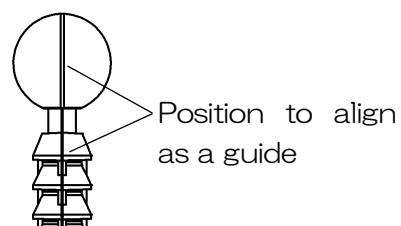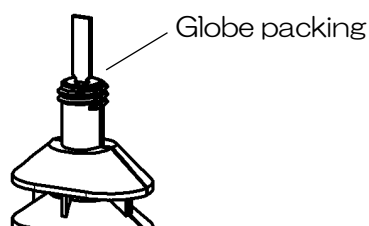
Globe packing

Position to align as a guide

Request
Correct measurements may not be possible if the sensor element is touched. Be sure to install the sensor without touching it.
The sensor cap may be broken if the globe is turned too hard when installing it. Be sure to Install the sensor cap at the position where the screw stops and the connections between the sensor cap and the globe are aligned as a guide. (Refer to above figures)
Make sure not to pull the temperature/humidity sensor unit out during maintenance.

18. Part replacement

The globe and the temperature/humidity sensor unit of this p
roduct can be replaced. Be careful not to allow dust or wate
rdrops to enter the inside of the main unit when replacing.

How to replace the globe
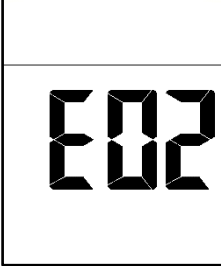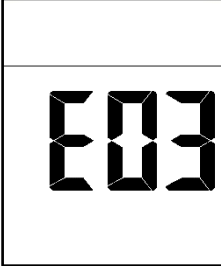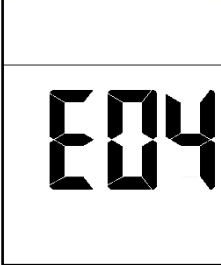
A correct measurement cannot be performed if the globe of this
product is dented or damaged. Replace the globe if it is damaged.
Refer to page 34 for the purchase of the globe.
And refer to the manual included with the Replacement globe for
more details on how to replace it.
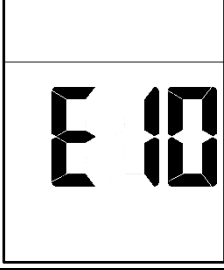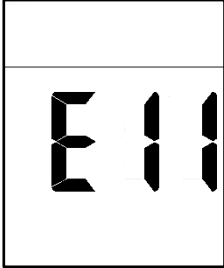
How to replace the temperature/humidity sensor
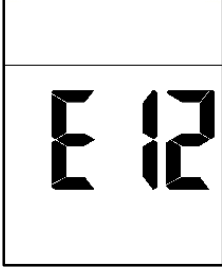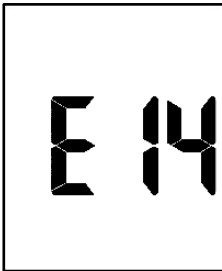
Replace the temperature/humidity sensor unit if it is damaged,
such as when a malfunction of the temperature/humidity sensor
occurs or a correct measurement value is not displayed.
Refer to page 34 for the purchase of the temperature/
humidity sensor.
And refer to the manual included with the Replacement
temperature/humidity sensor for more details on how to replace it.

Request
Correct measurements may not be possible if the sensor element is touched. Be sure to install the sensor without touching it.
Be sure to remove batteries before replacing the temperature/humidity sensor unit.
The shaft may be broken if the globe is turned too hard when installing it. Be sure to Install the globe at the position where the screw stops and the connections between the sensor cap and the globe are aligned as a guide. (Refer to page 29.)
Pickup inspection is necessary when a calibration certificate is required. Please contact your KEM representative.
⚠ **Warning** If the temperature/humidity sensor is not installed correctly, JIS IP65 equivalent dustproofing and water resistance performance cannot be attained.
⚠ **Warning** The temperature/humidity sensor may be damaged if an error occurs after replacing the temperature/humidity sensor unit. Please contact your KEM representative.

19. Troubleshooting

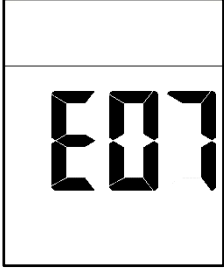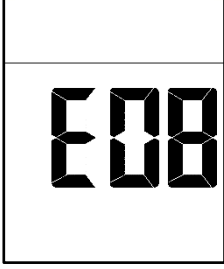| Display	Description and Countermeasure
EO2	Connection error was detected in the temperature/humidity sensor unit. ☞ Make sure that the temperature/humidity sensor unit is connected all the way in. Note that the batteries should be removed at this time. ☞ Wait at least 15 seconds before installing the batteries after removing them. If the error message is still displayed after the power is turned on again, contact your KEM representative.
EO3 **EO4**	Communication error was detected in the temperature/humidity sensor unit. ☞ Make sure that dust and waterdrops are not attached to the temperature/humidity sensor unit. (Refer to page 27, 29) ☞ Wait at least 15 seconds before installing the batteries after removing them. If the error message is still displayed after the power is turned on again, contact your KEM representative.
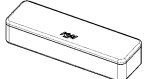
Display	Description and Countermeasure
EO7	Final system error was detected. ☞ Replace the batteries with new ones. ☞ Connect to the PC in order to format the internal memory of this product even if the error is still displayed after replacing the batteries. When performing formatting, switch the connection mode of the main unit to USB connection mode with the setting switch and set USB communication setting to USB communication mode before connecting to PC. (Refer to page 23 for details of connection mode and USB communication settings.). ＊ Be sure to store the necessary data on PC in advance since the data of internal memory will be deleted when formatting. ☞ Once the formatting is completed, wait at least 15 seconds before installing the batteries after removing them. If the error message is still displayed after the power is turned on again, contact your KEM representative.
EO8	Error of measurement value was detected. ☞ There is an error in the sensor measurement value. Check if the globe is not overheated, or if dust or waterdrops are attached to the temperature/humidity sensor unit. (Refer to page 27, 29) ☞ If the error message is still displayed even after wiping dust and waterdrops off, remove the batteries and install them after at least 15 seconds. If the error message is still displayed even after the power is turned on again, contact your KEM representative.
E 10	Failure in reading the setup file. ☞ There is a problem with the setup file. Use the setup file created by the setup tool on our website ″KEM IoT SERVICE″ without any changes. ☞ If the error message is still displayed even after using the above setup file, contact your KEM representative.
E 11	Failure in reading the sensor calibration data. ☞ The temperature/humidity sensor unit may be damaged. Remove the batteries, and install the temperature/humidity sensor unit once again. Wait at least 15 seconds before installing the batteries after removing them. If the error message is still displayed

Display	Description and Countermeasure
after the power is turned on again, contact your KEM representative.	

Display	Description and Countermeasure
E 12	The sensor calibration data has not been input to the temperature/humidity sensor. ☞ If the error message is displayed when replacing the temperature/humidity sensor unit, contact your KEM representative. Please inform us the serial No. of the temperature/humidity sensor. The serial No. can be found by removing the globe. (Refer to page 29)
E 14	Measurement values and settings could not be stored due to extremely low battery voltage. ☞ Replace the batteries with new ones. Parameter changes and measurement values cannot be stored if this error is displayed. If the error message is still displayed even after replacing the batteries, contact your KEM representative.
Nothing displayed after installing batteries	Check the polarity of batteries (the direction of '+' and '-'). (Refer to page 25)
	Batteries are running low. Replace them with new ones immediately. (Refer to page 24, 25)
Temperature (Ta) or relative humidity is too high/low	There may cause malfunctions when using or storing this product in the environment of strong smell such as highly-concentrated volatile organic compound, acid, alkaline agent, corrosive gas, reducing gas, silicone or spray. Contact your KEM representative.
Battery life is too short	Battery life may become shorter depending on the user's operating conditions. This instrument features an external power supply through USB port. Therefore, you can use the instrument while supplying power, or should review the memory interval.
hl or **Lo** is displayed on the display screen	**hl** or **Lo** indicates that the reading is out of measuring range. Change the measuring environment in this case.

20. Optional/Consumable parts

Optional parts			
Part No.	Part name	Note	Sketch
12-08175	Wall Mounting Bracket	Fixing plate Fixing Screw 1/4-20UNC	
20-12864	Fixing Screw 1/4-20UNC		
64-01783-01	USB2.0 Cable (A to C)[1] 1.0m		
64-01783-02	USB2.0 Cable (A to C)[1] 2.0m		
12-08547	Splash-resistant cover		

*1 Used for USB connection.

Consumables		
Part No.	Part name	Sketch
20-05996	Rubber Chip	
20-13243	Packing	
20-13246	Sensor Cap B	
20-13248	Globe Packing	
20-13256	Battery Cover	
20-13313	Carrying Case	
12-08394	Replacement Globe	
12-08395	Replacement Temperature/humidity Sensor	
63-01227	Vent Filter	

* For the purchase of the above parts, contact your KEM representative.

21. Heat stroke index

The index sticker for each product is included in the package of this product.

Please affix the sticker on the battery cover on the back of the main unit, as needed.

Guidebook for the Prevention of Heatstroke During Sports Activities (WBGT-301)		
Heat Index (WBGT)	Guides to how much exercise can be safely performed	
≥ 31°C	Exercise prohibited	At a WBGT of 31°C or above Exercise is prohibited except for special cases. Especially for children, it should be stopped.
28°C - 31°C	Severe Warning (heavy exercise is prohibited)	At a WBGT of above 28°C the danger of heat stroke is high, so events that require heavy exercise or events where the body temperature will rise, like endurance races should be avoided. When such events are held, rest periods should be often provided, and replenishment of water and salt conducted aggressively. People who are weak or not used to the heat should stop the exercise.
25°C - 28°C	Warning (rests should be provided often)	At a WBGT of above 25°C the danger of heat stroke increases, so rest periods should be often provided, and replenishment of water and salt conducted. Rest periods should be provided every 30 minutes for events requiring heavy exercise.
21°C - 25°C	Caution (Frequent rehydration necessary)	At a WBGT of above 21°C the fatal accidents may be caused by heat stroke, so caution is advised, and replenishment of water and salt should be promoted during exercise.
<21°C	Almost safe (Adequate rehydration necessary)	At a WBGT of below 21°C normally the danger of heat stroke is small, but appropriate replenishment of water and salt is necessary. Heat stroke can occur even under these conditions in events such as citizen marathons, so caution is advised.

Reference: Japan Sports Association, "Guidebook for the Prevention of Heatstroke During Sports Activities"

WBGT Criteria According To Physical Work Load (WBGT-302)			
Category	Example of physical work load (metabolite rate level)	WBGT criteria	
		Heat Acclimated	Heat Unacclimated
0 Rest	Complete rest, Comfortable sitting position	33°C	32°C
1 Low metabolic rate	Light handwork (writing, typing, drawing, sewing, bookkeeping); Hand and arm movements (small bench tool, inspection, assembly or sorting light materials); Arm and leg movements (driving under normal conditions, operating a foot switch or a pedal). Standing ; Drilling (a small part); Milling machine (a small part); Coiling; Winding small armatures; Machines operated by small power; Walking on flat ground less than 2.5 km/h.	30°C	29°C
2 Moderate metabolic rate	Head and arm movements on a continuous basis (nailing, raising ground level); Arm and leg movements (Off-road driving of a truck, a tractor and a construction vehicle); Arm and body movements (working with air hammer, assembling a tractor, plastering, intermittent moderate lifting work, weeding, digging up glasses, Harvesting fruits and vegetables); Pushing/pulling a cart and a handcart with light load; Walking on flat ground at 2.5 to 5.5 km/h; Forging	28°C	26°C
3 Heavy metabolic rate	Heavy arm and body movements ; Carry heavy materials ; Shoveling; Operations with a hammer; Sawing; Planing or chiseling hard wood; Mowing; Digging; Walking on flat ground at 5.5 to 7 to km/h. Pushing/pulling a cart and a handcart with heavy load; scraping castings; stacking concrete blocks.	26°C	23°C
4 Very heavy metabolic rate	Intense activities at the maximum speed; Axing; shoveling very hard; Climbing a stairway, Running on flat ground, Walking on flat ground at more than 7km/h.	25°C	20°C

* A heat acclimated person is defined as "a person who had an exposure to high temperature work conditions (or similar or more extreme conditions) for at least one week before the assessment period and for a similar full work period.

Reference: Health, Labour and Welfare Ministry, "Outline of Basic Measures for Preventing Heatstroke in the Workplace" Table 1-1
(Based on JIS Z 8504 Annex A "Reference Values for WBGT Heat Stress Index" by replacing metabolic levels with examples.)

22. Specifications

JIS accuracy classification	Class 1.5※1
Water resistance	Equivalent to IP65※2
Use	WBGT measurement under heat surroundings
Measuring objects	WBGT, Temperature, Relative humidity, Globe temperature
Measuring range (Display resolution)	WBGT: 　0.0°C to 50.0°C（in 0.1°C） Temperature: 　0.0°C to 50.0°C（in 0.1°C） Relative humidity: 　10.0% to 90.0%RH（in 0.1%） Globe temperature: WBGT-301：0.0°C to 60.0°C（in 0.1°C） WBGT-302：0.0°C to 80.0°C（in 0.1°C）
Accuracy ※1 (Under natural draft) (0.3 to 3m/sec)	WBGT　　　　　：±1.5°C（15°C to 40°C） Temperature　　：±0.6°C（20°C to 50°C） Relative humidity　：±3.0%（30% to 90%RH） Globe temperature：±0.6°C（20°C to 60°C）
Storage temperature	0°C to 50°C (indoor)
Storage environment	Dustless and organic-gasless indoor with less fluctuation in temperature and humidity
External output	USB Type-C
Communication Specifications *3	USB connection (USB communication /RS communication) /UART connection
Power source	Two AA alkaline batteries
Dimension	69(W) × 36(D) × 272(L) mm
Weight	Approx. 230 g (including two AA alkaline batteries)

*1 Sensor accuracy: Based on the JIS B 7922 stipulation.

　The precision classification of 'Class 1.5' is provided on the performance

　in shipping inspection.

*2 This product is equivalent to IP65 based on the performance at the time of

　shipment. Damage caused by liquids is not guaranteed.

*3 Please use the specified cable for connection to the main unit.

The specifications of this product or the contents of this manual are subject to change without notice.

23. Warranty and after-sale services

- **Warranty Period**

   One (1) year from the date of receipt of this product.

- **Warranty Details, After-sales Service**

   This product passed the strict inspections of KEM and, except for consumables, KEM warrants this product, under normal use, for one (1) year from the date of receipt of this product or the date of installation by KEM service personnel or by authorized personnel. (In principle parts and consumables will be supplied for at least seven (7) years after discontinuation of this product.)

   Should an initial failure occur during the warranty period, KEM will decide whether to replace this product or to correct defects.

   Note that secondhand or pre-owned products are not covered by warranty.

   For more information, see 'Quality Assurance' on our website (http://www.kyoto-kem.com).

- **Exclusion**

   Warranty shall be void where:

   - Malfunction is caused by usage environment, usage method, maintenance, or storage method that departs from the description in this operation manual;
   - Breakage and/or malfunction is caused by careless handling such as, but not limited to, exposing to or submerging in water, or dropping down;
   - Breakage and/or malfunction is caused by excessive force applied to plastics and the like;
   - Malfunction is caused by any device, part and/or chemical other than those supplied by KEM;
   - Overuse has led to fatigue or wear of parts;
   - Leakage of batteries;
   - This product has been moved or transported to another place once accepted and installed;
   - Breakage and/or malfunction is caused by conditions beyond control of KEM including, but not limited to Acts of God such as fire, earthquake, lightning strike, flood, etc.;

   KEM is also unable to offer warranty and related services of repairs and maintenance checks of any kind once specifications, capability, features and/or functions of this product as well as its parts are changed, altered or remodeled by unauthorized personnel.

- Disclaimer

  KEM is not held liable, during or after the warranty period, regardless of whether loss or damage is caused by any event beyond control of KEM, or it is the user's opportunity loss and/or lost earnings caused by failure or malfunction of KEM products, or with or without predictability of KEM, for loss or damage resulting from a particular reason, secondary loss or damage, accident compensation, damage to products other than those supplied by KEM, and any other incidental compensation.

  KEM is also not held liable for physical and/or economic loss or damage resulting from the use of KEM products, or loss of stored data during repair or servicing of such product.

*Please refer to the attached list of offices for contact information.