Pipette Accuracy Tester Kit for the BH-T/BH series

BH-014

INSTRUCTION MANUAL

A&D Company, Ltd.

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1. INTRODUCTION

The Pipette Accuracy Tester Kit for the BH-T/BH series performs an accuracy test of the volume of a pipette in accordance with ISO 8655.

This manual describes how the Pipette Accuracy Tester Kit works and how to get the most out of it in terms of performance. It includes how to assemble the tester, how to measure and how to use the software, WinCT-Pipette, for pipette accuracy testing.

Read this manual thoroughly before using the tester and keep it at hand for future reference.
For detailed information on handling the balance, refer to the BH-T/BH series instruction manual.

It is available for download from the A&D website (https://www.aandd.jp).

BH-T/BH Series Instruction Manual

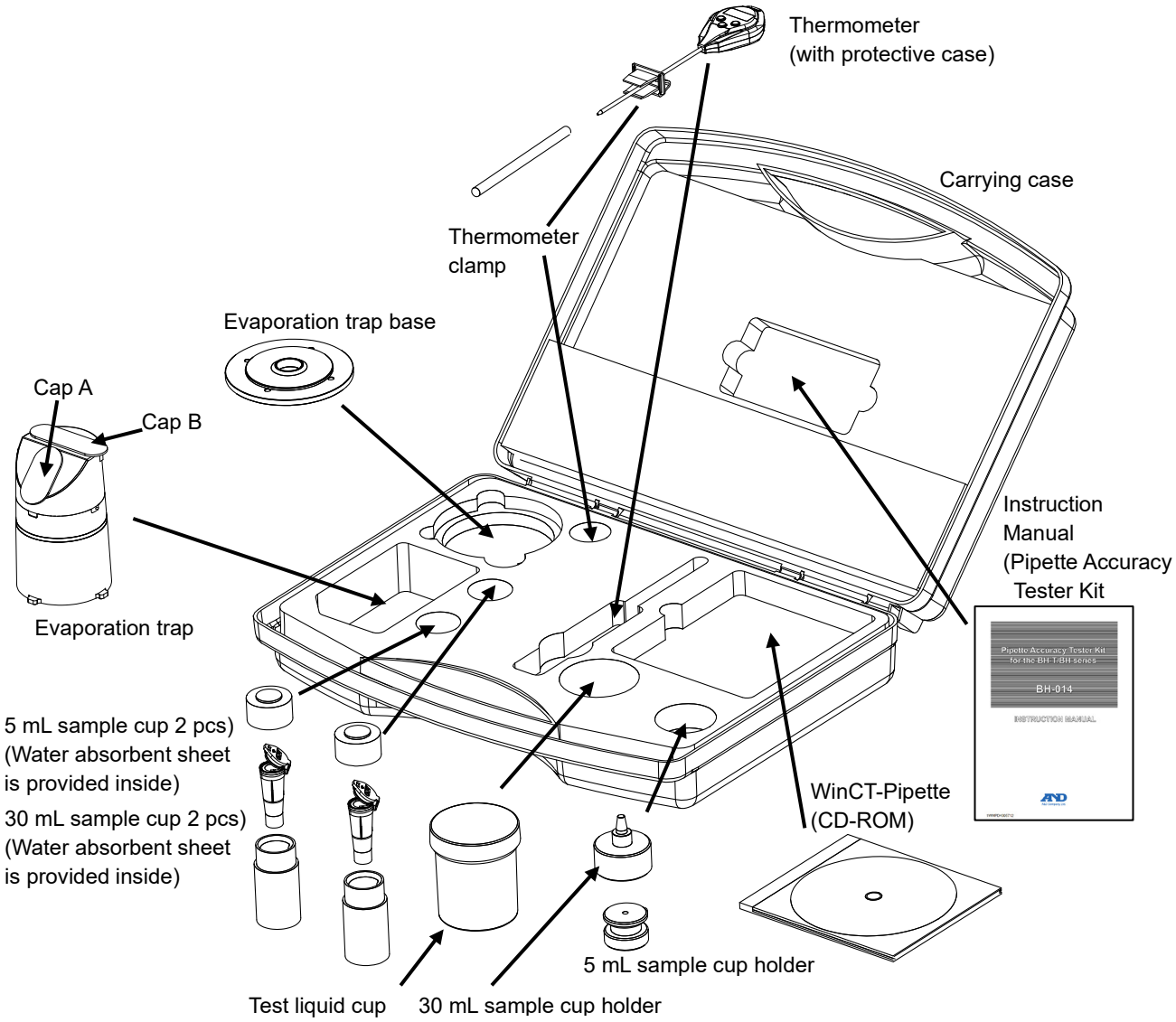
This manual provides detailed information on the functions and operations of the BH-T/BH series, enabling you to fully utilize its features.

Scan the QR code to access the manual.

NOTE **ISO 8655 is the international standard that includes pipette calibration and specifies a test method for accuracy of the pipette volume. For detailed information, visit our web site.**

1-1 Unpacking the Tester

NOTE **The Pipette Accuracy Tester Kit is contained in a carrying case. The case is only for carrying the tester and is not solid enough to endure transportation. So, do not transport the tester using the carrying case. When transporting the tester, be sure to use the original packing material.**
When handling the tester, be careful not to drop it, even if it is placed in the carrying case.



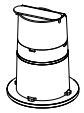
NOTE **The thermometer battery is packed inside the carrying case. For installation instructions, please refer to 'Replacing the battery' in the 'Using the Thermometer' section.**

NOTE **The actual capacity of the 30 mL sample cup is 25 mL.**

1-2 Description of Each Component

- Evaporation trap

  A chamber to prevent the evaporation of the dispensed test liquid (distilled water). (Refer to “1-4 Function of the Evaporation Trap”.)



- Sample cup holder

  30 mL sample cup holder

  To hold the 30 mL sample cup.



  5 mL sample cup holder

  Used in combination with the 30mL sample cup holder to hold the 5 mL sample cup.



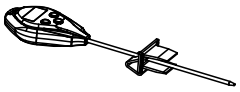
- Sample cup

  A measuring cup to contain the test liquid dispensed from a pipette, with a water-absorbent sheet installed, to prevent water droplets from remaining on the edge of the pipette tip.



- Thermometer (with a clamp)

  Measures the temperature of the test liquid.



- WinCT-Pipette

  Software for pipette accuracy testing to convert the test liquid mass into a volumetric value.



1-3 WinCT-Pipette, Software for Pipette Accuracy Testing

Features

The mass value of the distilled water dispensed from a pipette is transmitted from the balance to a PC. Using the temperature of the test liquid and the barometric pressure that are previously entered, the PC calculates the conversion factor (Z factor) from a mass value to a volumetric value and converts the mass value into a volumetric value automatically, using the Z factor.

- ■The measurement results are compared with the specification previously entered, to perform judgment whether the pipette will pass or fail.
- ■Besides the pipette volume, test numbers, test dates and pipette information (manufacturer, model, serial number) can be recorded as test data. The test data, output to a printer or stored in the PC, allows easy management of pipette accuracy and reduces errors due to data mismanagement.
- ■The specifications of accuracy and repeatability can be entered either as an absolute value (μL) or as a relative value (percentage to the pipette volume).
- ■The mass value data from the balance can be transmitted to the PC either using a COM port or using a USB connection.
- ■For testing various pipettes easily, multiple test conditions (pipette volume, number of measurements and specifications) can be set previously. When multiple operators are set previously, an operator can be selected easily as necessary.

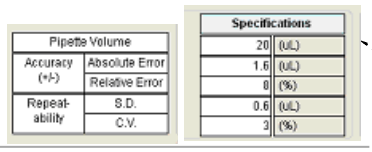
NOTE For detailed information on WinCT-Pipette, refer to "How to use WinCT-Pipette.pdf" in the WinCT-Pipette CD-ROM.

Main Window

When WinCT-Pipette starts up, the window below opens

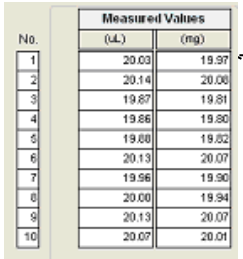
Specifications

Enter the pipette volume, specifications of accuracy and repeatability used for pass/fail judgment.



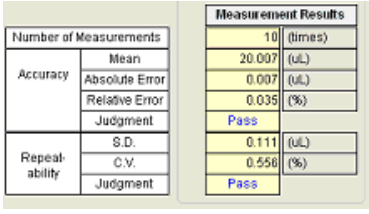
Measured Values

Displays the mass values transmitted from the balance and the volumetric values obtained using the Z factor.

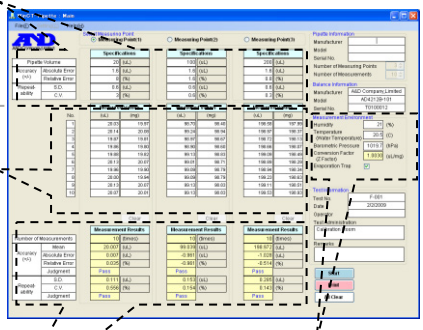


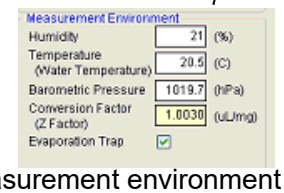
Measurement Results

Displays the measurement results and judgment results.



Main window





Measurement environment

Enter the ambient relative humidity, the distilled water temperature and the barometric pressure.

The Z factor is automatically calculated using the values of the distilled water temperature and the barometric pressure.

1-4 Function of the Evaporation Trap

In the pipette accuracy test using the gravimetric method, to obtain the mass of the test liquid, distilled water is dispensed from the pipette into the sample cup installed on the balance. The obtained value, however, is generally smaller due to evaporation loss of the test liquid. To prevent evaporation of the test liquid, the evaporation trap is used. The ISO 8655 standard recommends that the humidity of the measurement environment be 50%RH or greater.

Water is poured into the groove of the evaporation trap. This helps to maintain the humidity inside the evaporation trap high and reduces evaporation.
Using the evaporation trap reduces the evaporation of the test liquid, compared with when the evaporation trap is not used. Consequently, measurement errors due to evaporation loss of the test liquid are reduced.

Another function of the evaporation trap is one as a breeze break, to prevent drafts in the measurement environment from influencing the weighing operation and enable a stable weighing.

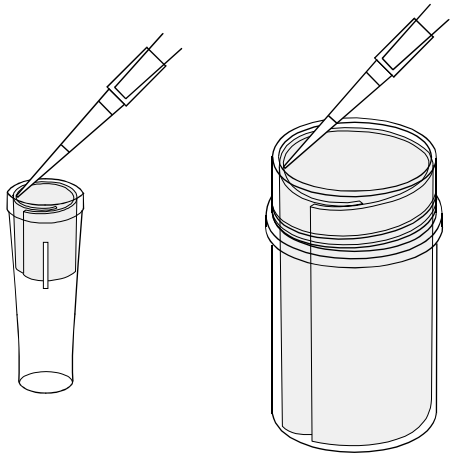
The evaporation trap is designed for an easy dispensing of the test liquid. The upper part has a sloped surface so that the pipette can be inserted from obliquely above.

1-5 Description of the Sample Cup

When dispensing a test liquid from the pipette, to perform an accuracy test of the volume of a pipette, a possible cause of errors is water droplets remaining on the edge of the pipette tip. Using the water-absorbent sheet in the sample cup prevents this and increases the accuracy of a test.

As shown in the illustration below, a water-absorbent sheet is rolled into a cylinder and is placed along the inner wall of the sample cup.
By dispensing the test liquid with the edge of the pipette tip touching the sheet, the sheet will absorb any droplet which may otherwise remain on the edge of the tip. Thus all the test liquid will be dispensed into the sample cup.

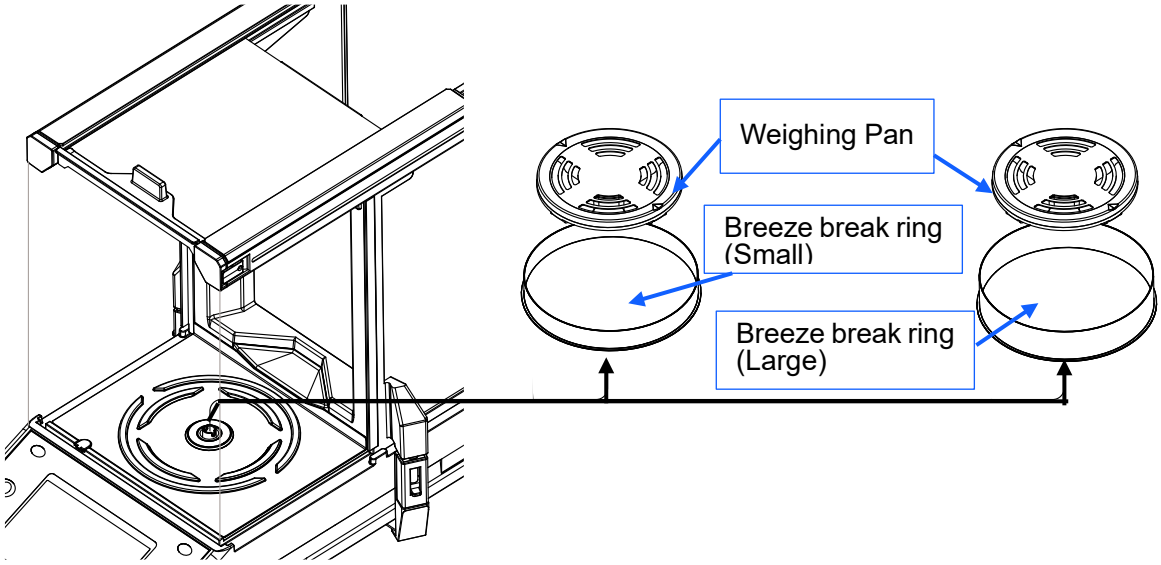
The water-absorbent sheets are made of a RoHS-compliant material for safety.
The sheet, once used, can be cleaned and used repetitively.



2. ASSEMBLING THE TESTER

2-1 Preparing to Assemble the Tester

Remove the weighing pan and so on (refer to the figure below) from the BH-T/BH balance.

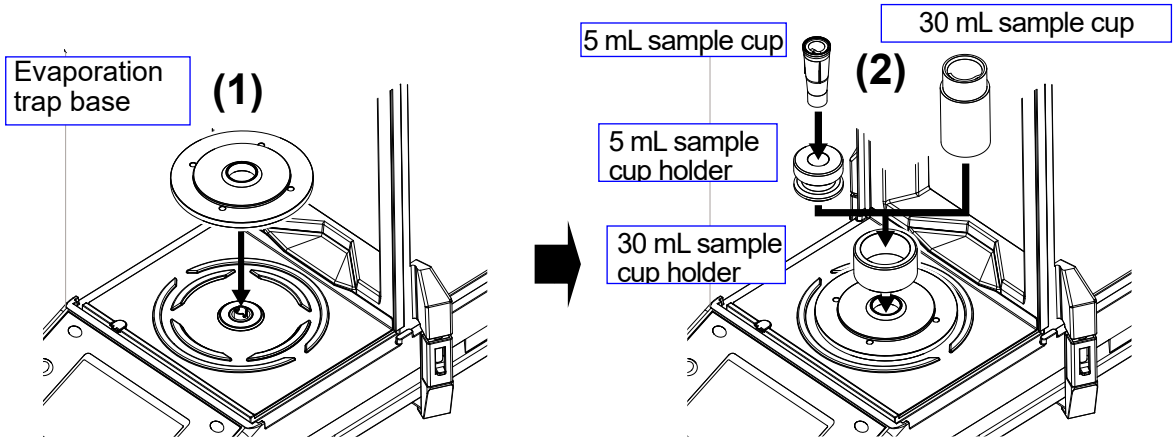


NOTE Breeze break ring (large) is included only with BH-225TE, BH-225DTE, BH-225, and BH-225D.

2-2 Assembling the Tester

1 Install the evaporation trap base on the BH-T/BH balance.
2 Install the 30 mL sample cup holder.
When the 30 mL sample cup is used:
Insert the sample cup into the holder.

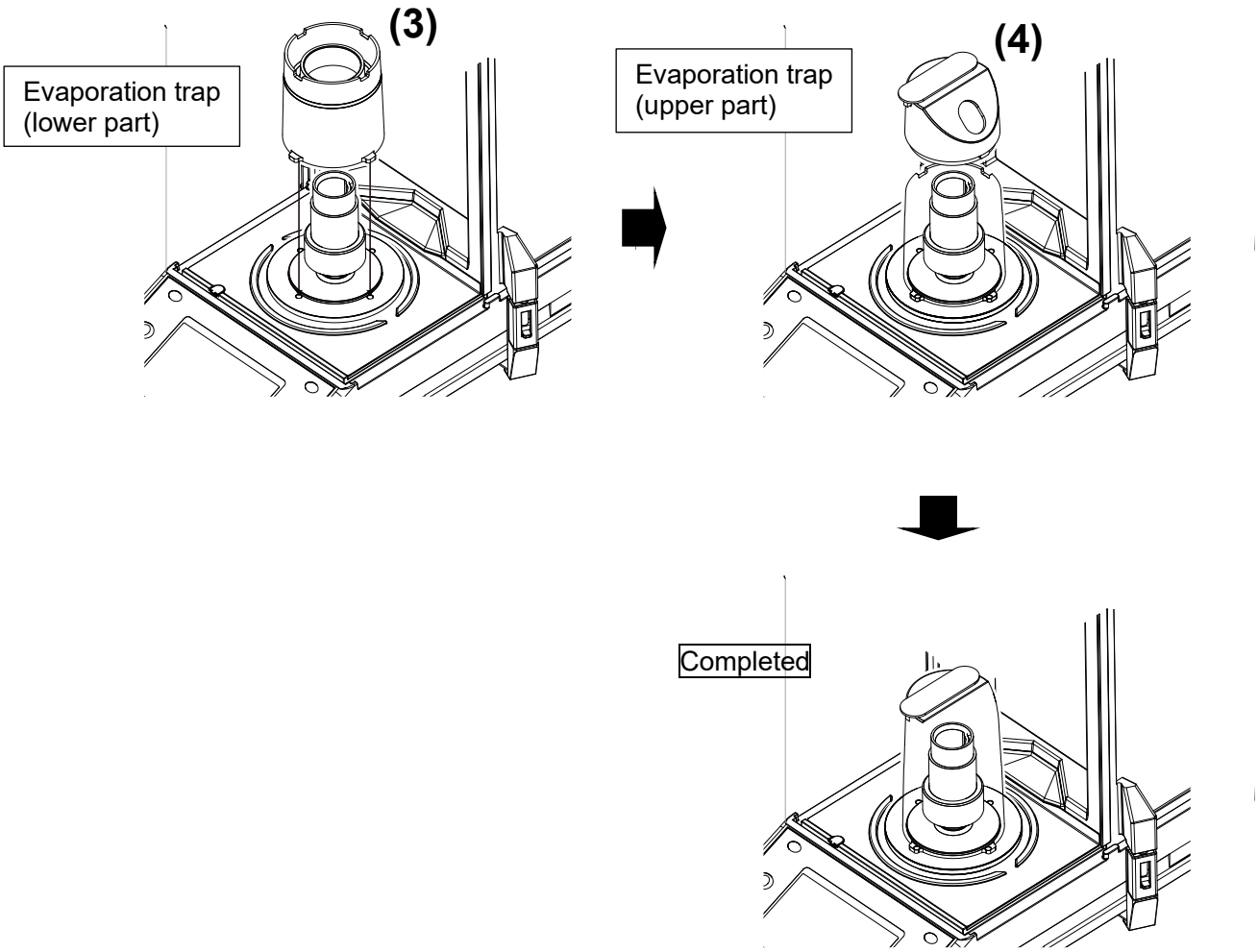
When the 5 mL sample cup is used:
Insert the 5 mL sample cup holder into the 30 mL sample cup holder and then insert the sample cup.



Note Depending on the manufacturing lot of the balance, the fitting strength between the evaporation trap base and the balance may vary.

3 Install the lower part of the evaporation trap on the evaporation trap base.

4 Install the upper part of the evaporation trap on the lower part to complete assembly.



NOTE When the pipette nominal volume is 500 μL or more, the 5 mL sample cup cannot be used to perform the series of ten measurements per volume recommended by ISO 8655.

The actual capacity of the 30 mL sample cup is 25 mL.

3. PRECAUTIONS BEFORE USE

Arrange the following setup conditions to prevent the negative effects of temperature change, vibration, or drafts and ensure stable balance performance.
The BH-T/BH series has a high weighing sensitivity, so it is important to give proper attention to the setup conditions before using these balances.

- ■Install the balance where the measurement environment is appropriate. The best operating temperature is 15°C to 30°C ±0.5°C with a humidity of 50%RH or greater.
- ■Install the balance where it is not exposed to direct sunlight and it is not affected by air from heaters or air conditioners.
- ■Install the balance where it is free of dust.
- ■Install the balance away from equipment which produces magnetic fields.
- ■Install the balance in a stable place avoiding vibration and shock. Corners of rooms (close to pillars or walls) far from a passageway are best, as they are less prone to vibration.
- ■The weighing table should be solid and free from vibration, drafts and as level as possible.
- ■Level the balance by adjusting the leveling feet and confirm it using the bubble spirit level.
- ■Before use, warm up the balance for at least one hour with nothing on the weighing pan.
- ■Adjust the balance before use or after having moved it to another location. For details, refer to “7. ADJUSTING THE BALANCE”.

Caution

Do not install the balance where flammable or corrosive gas is present.

4. ANTI-STATIC TREATMENT

An anti-static treatment has been applied to the evaporation trap. Cleaning it with alcohol will reduce the effect of the treatment.

If the evaporation trap has acquired a static charge, we recommend that you apply an anti-static agent or use the static eliminator AD1683A, which comes standard with BH-T series.

5. INSTALLING WinCT-Pipette

For detailed information on the WinCT-Pipette program, refer to “How to use WinCT-Pipette.pdf” in the WinCT-Pipette CD-ROM.

For installing WinCT-Pipette, refer to “Readme.txt” in the WinCT-Pipette CD-ROM.

System requirements

OS	Windows 10/11

For the latest information, please refer to our website: https://www.aandd.jp.

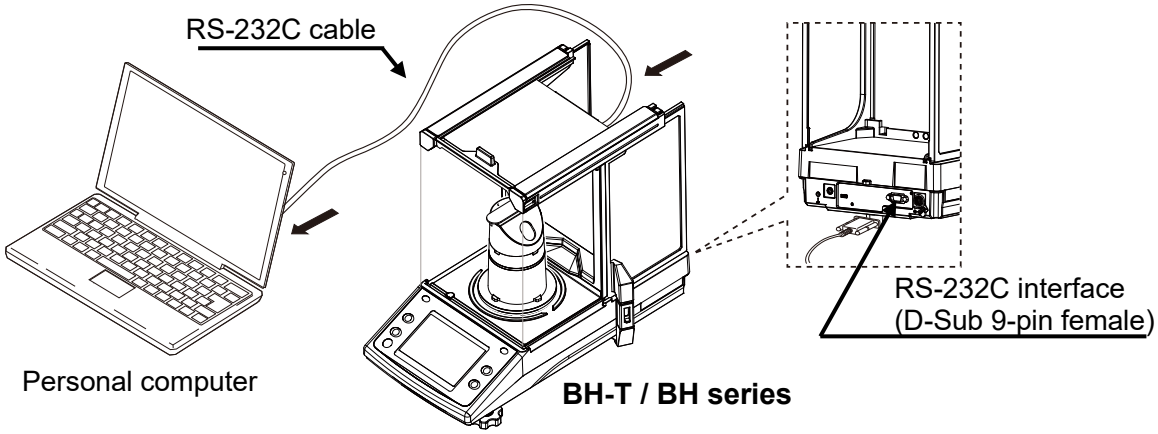
6. CONNECTING A PC TO THE BALANCE

To connect a PC to the balance, use a RS-232C cable or USB cable (either the one included with the BH-T/BH series or your own Type-C cable).

6-1 Connecting a PC

When a PC COM port is used

When using the COM port of a PC to make a connection to the balance, use the accessory RS-232C cable.



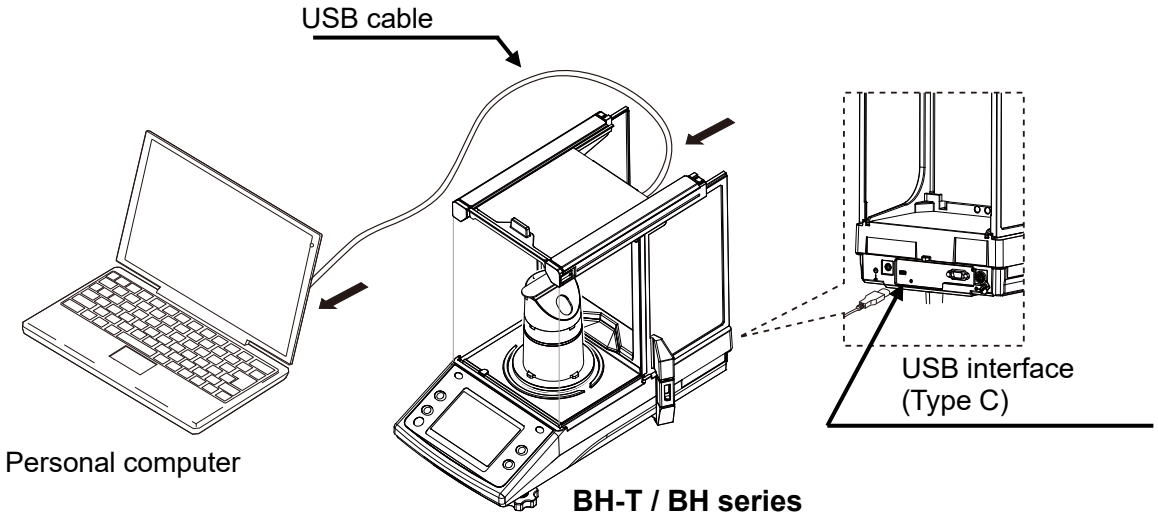
When a PC USB port is used

When connecting to the balance via PC USB port, use a USB cable (either the one included with the BH-T/BH series or your own Type-C cable).

When using WinCT-Pipette or bidirectional communication, please set the USB mode of the balance to 'Virtual COM Mode'.

(The factory default 'Quick USB Mode' at the time of shipment for the BH-T/BH series does not support WinCT-Pipette or bidirectional communication.)

For information and details on how to change the settings, please refer to the 'Virtual COM Mode' section in the BH-T/BH series instruction manual.



6-2 Checking COM Port Numbers

COM port numbers vary depending on the PC used. To check the COM port number, connect the electronic balance to your PC and open Windows 'Device Manager'. Then, refer to the 'Ports (COM & LPT)'. To set the port number in WinCT-Pipette, navigate to ‘Settings’ -> ‘Communication Settings’, and specify the number of the COM port to be used in ‘Port’.

7. ADJUSTING THE BALANCE

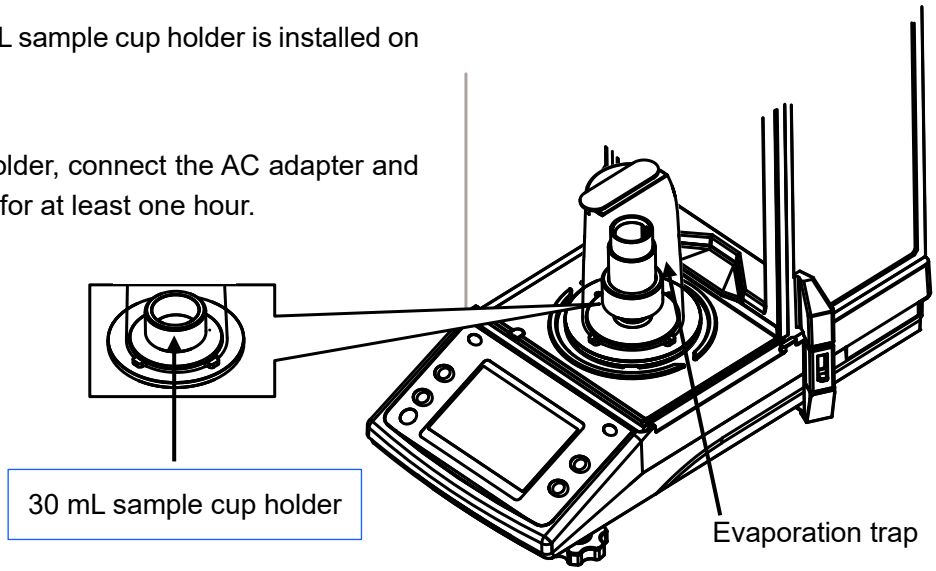
For details on adjustment, read the BH-T / BH series instruction manual in addition to this manual. Before adjustment, refer to "3. PRECAUTIONS BEFORE USE". Because the BH-T/BH series has an especially high weighing sensitivity, make sure that the installation environment is appropriate and the balance is warmed up for the appropriate duration, one hour or more.

7-1 Adjusting Using the Internal Mass (Adjustment of balance)

With the holder installed on the balance, it is possible to adjust the balance with one touch using the internal mass.

1 Confirm that the 30 mL sample cup holder is installed on the balance.

2 With nothing in the holder, connect the AC adapter and warm up the balance for at least one hour.



3 Press the CAL key to display CAL in .

4 The balance performs adjustment using the internal mass. Do not allow vibration or drafts to affect the balance.

5 If GLP output is set, GLP is displayed and the adjustment test report is output to the RS-232C or USB interface, or stored in memory (BH series only). (For details, please refer to the 'GLP Output' and 'Data Memory (BH series only)' sections in the table of contents of the BH-T/BH series instruction manual.)
End is displayed after the adjustment.

6 The balance will automatically return to the weighing mode.

7 A calibration test (CC in) can be used to confirm whether the balance was adjusted correctly. (For details, please refer to the 'Internal Calibration Test' or 'Calibration Test with an internal Weight' sections in the table of contents of the BH-T/BH series instruction manual.)

NOTE When you install the normal weighing pan in place of the holder and -E- is displayed, adjust the balance again with the normal weighing pan installed.

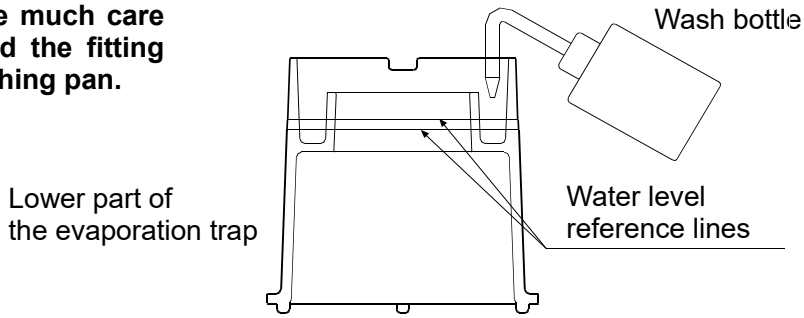
8. PREPARATION BEFORE USE

The measurement environment recommended by ISO 8655 is as follows.
Temperature: Constant between 15°C and 30°C, changes in temperature ±0.5°C.
Humidity: 50%RH or greater

8-1 Filling the Evaporation Trap with Water

Remove the evaporation trap from the balance. Separate the upper and lower parts of the evaporation trap. Pour water into the groove along the circumference of the inner wall of the lower part of the evaporation trap, using a wash bottle or a pipette, up to the center between the two lines on the evaporation trap.

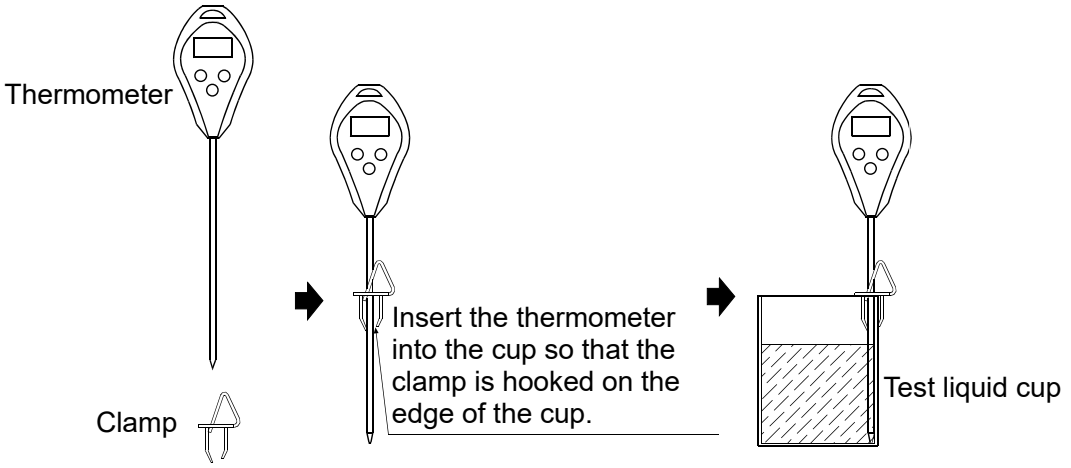
NOTE **When pouring water, use much care not to spill water around the fitting boss of the balance weighing pan.**



Attach the upper part of the evaporation trap to the lower part and place the evaporation trap on the balance or weighing unit.
It takes approximately 15 minutes for the humidity inside the evaporation trap to stabilize to about 85%RH. The time required for the humidity to stabilize varies depending on the measurement environment.

8-2 Preparing the Test Liquid

Pour distilled water into the test liquid cup.
Place the thermometer in the cup, using the clamp as shown below.
Leave as is to allow the temperature of the distilled water to stabilize. ISO 8655 recommends that the test liquid be acclimatized to the measurement environment for two hours or more.

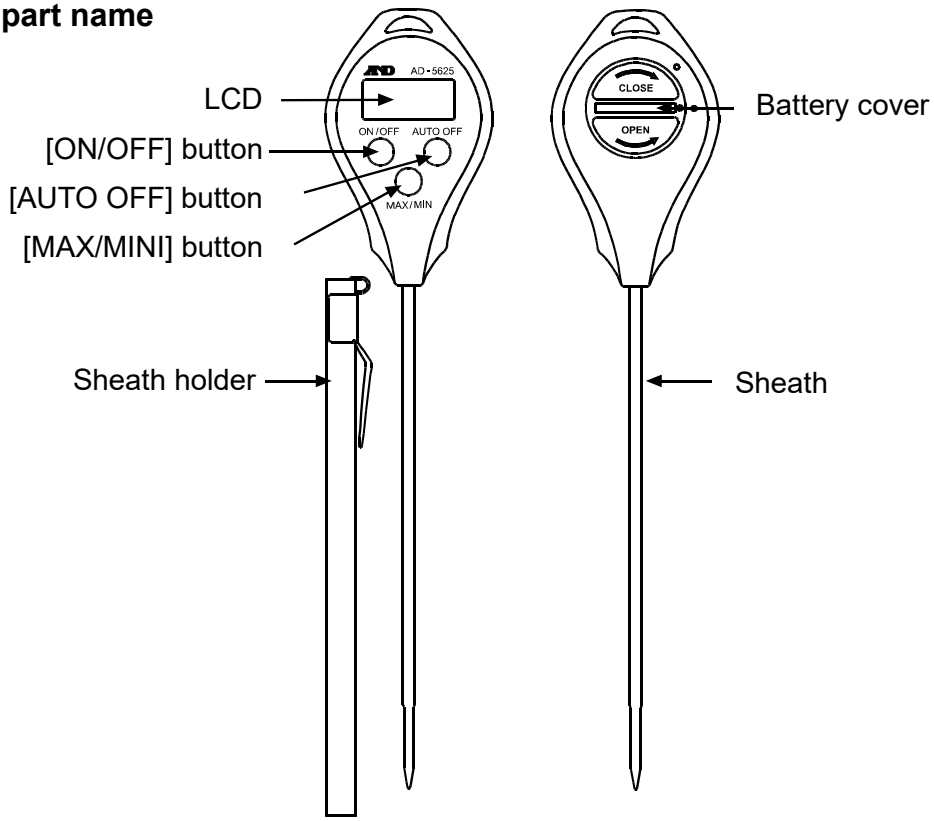


8-3 Preparing the Water-absorbent Sheet

To stabilize the evaporation amount of the dispensed test liquid from the sheet, moisten the sheet in the sample cup with the distilled water (approx. 600 μL for the 5 mL sample cup, approx. 4000 μL for the 30 mL sample cup) before the test.

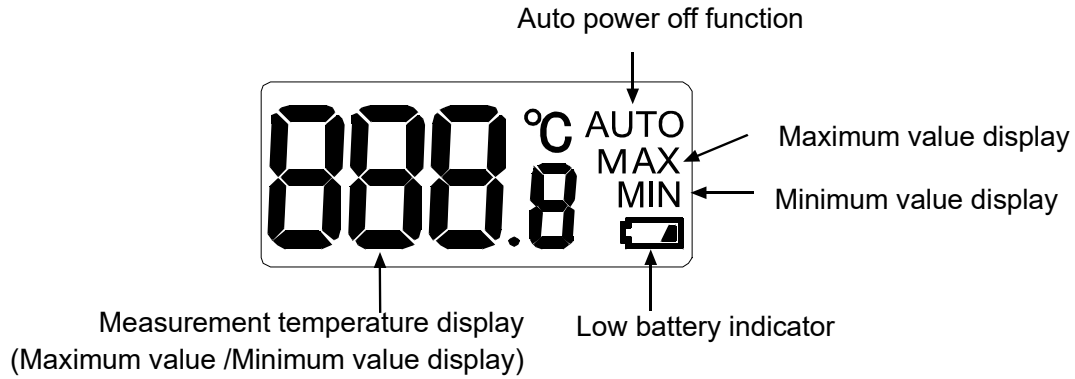
8-4 Using the Thermometer

Each part name



Material: Main body, battery cover: Acrylonitrile-butadiene- styrene (ABS)
Button: Rubber
Display: Polycarbonate (PC)
Sheath: SUS304
Sheath holder: Polycarbonate (PC)
Sheath holder fitting: Iron (Nickel plating)

Display



Error display

Lo	Appears when the measurement temperature is below the lower limit for the display range, or there is an error in the temperature sensor or internal circuit.
Hi	Appears when the measurement temperature exceeds the upper limit for the display range, or there is an error in the temperature sensor or internal circuit.

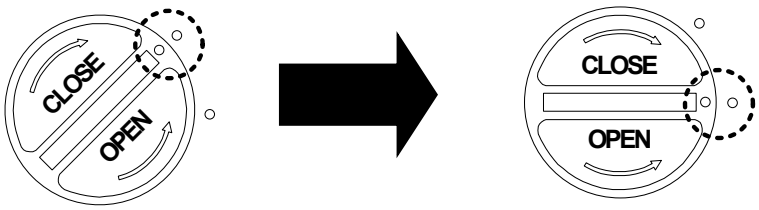
Replacing the battery

The battery is not installed when you purchase the thermometer. Properly install the battery in the thermometer by the following procedure.

Also, when the "" indicator appears at the bottom right in the display, replace the old battery with a new one by the following procedure.

* Purchase the battery at your local convenience store, supermarket, hardware store or electrical store.
* When the main body is damp, wipe the moisture fully and replace the battery.
  The thermometer may be damaged if water gets inside.

1 Turn the battery cover on the rear side of the main body in counterclockwise direction by using a coin, and remove the battery cover.
2 Remove the old battery.
3 Put a new CR2032 coin type lithium battery with the + side facing up.
4 Place the battery cover back on.
  As shown in the figure below, place the battery cover so that the mark on the battery cover is aligned with the upper mark on the main body. Then, turn the battery cover in clockwise direction using a coin until the mark on the battery cover is aligned with the lower mark on the main body.
  The battery cover that is not secured properly may result in water entering inside and damaging the thermometer.



⚠ CAUTION

Precautions on the battery use

- **The provided battery is for monitoring purposes, and its life may therefore be shorter than the battery life specified in this manual.**
- **Remove the battery from the thermometer and keep it elsewhere when you are not using the thermometer for a long period of time,**
- **Use the specified battery (CR2032 coin type lithium battery 1 pc) only.**
- **Be sure to insert the battery with the + side facing up. Reverse polarity may not only cause operation errors but also damage the thermometer.**
- **Do not recharge the battery, short-circuit, disassemble or throw into the fire. It may explode or leak and cause personal injury.**
- **Keep the battery out of the reach of children. If swallowed, consult a physician immediately.**
- **For environmental protection, follow the local regulations to dispose of a used battery.**

Measuring the temperature

1 Press the [ON/OFF] button to turn the power on.
2 Remove the sheath holder when it is attached to the sheath.
3 Measure the temperature by one of the following methods depending on the material to be measured.

When measuring the liquid

Immerse the sensor into the position where you would like to measure the temperature.

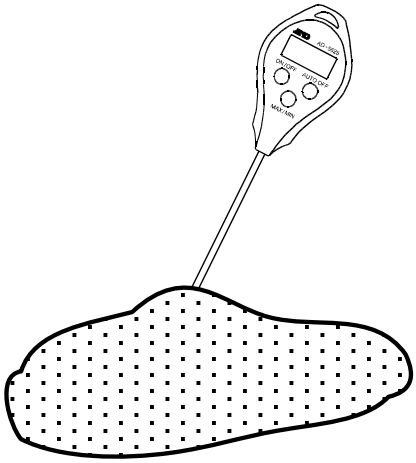
When there is steam arising from the liquid, handle the thermometer so that the display is not exposed to the steam. Otherwise, the steam may damage the thermometer.



When measuring the semisolid material

Stick the sensor to the depth where you would like to measure the temperature in the material.

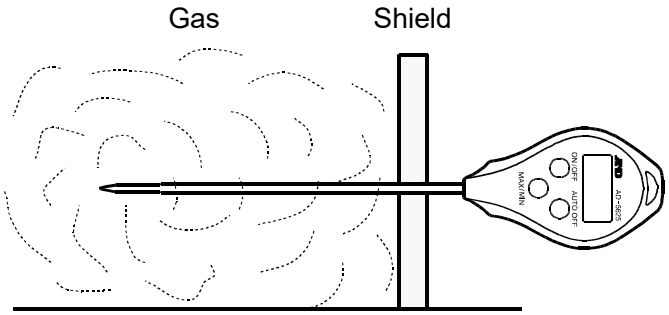
Attempting to forcibly stick the sensor into the material when the measurement material is too solid may damage the sheath. In such case, a device that enables smooth insertion of the sensor is required.



When measuring the gas

Place the sensor in the location where you would like to measure the temperature and wait until the display becomes stable.

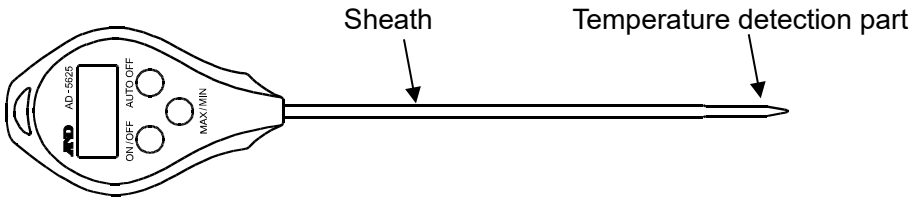
When measuring a high temperature atmosphere such as steam, use a shield to protect the display from high temperature.



⚠ CAUTION

The thermometer detects a temperature at the tip of the sheath.

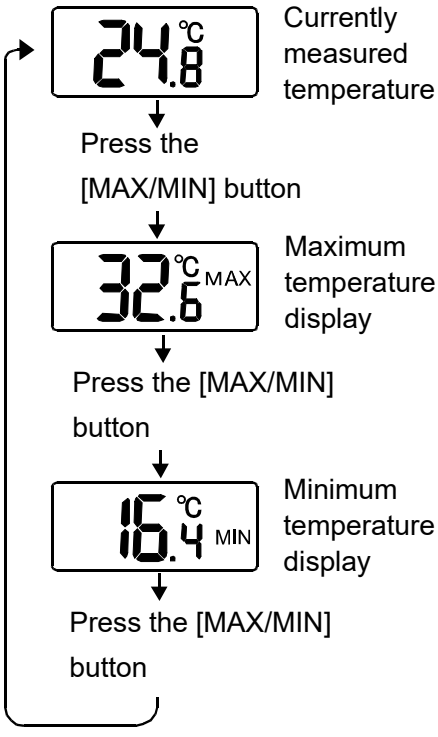
To protect the thermometer from damage, do not expose parts other than the sheath to high or low temperatures of the substances to be measured.



Storing the maximum and minimum temperatures in memory

The thermometer can automatically store the maximum and minimum temperatures measured after the battery is installed in the thermometer (or after the memory is reset).

Press the [MAX/MIN] button to display the maximum or minimum temperature as shown on the right.



The thermometer automatically displays the current measurement temperature if no operation is made for 30 seconds while on the maximum or minimum temperature display.

To check the maximum and minimum temperatures for a new measurement, reset the memory before starting the measurement as described in “Resetting the maximum and minimum temperatures stored in memory” below.

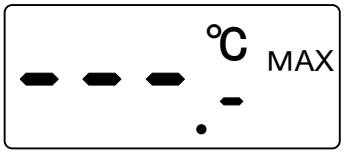
⚠CAUTION

The maximum and minimum temperatures stored in memory are reset automatically when the battery is removed from the thermometer.

Resetting the maximum and minimum temperatures stored in memory

To reset the maximum and minimum temperatures stored in memory, perform the following:

Press the [MAX/MIN] button to display the maximum or minimum temperature. Press the [MAX/MIN] button again and hold it for more than two seconds. The display goes into the bar display, and both the maximum and minimum temperatures stored in memory are reset to store new maximum and minimum temperatures.



About the auto power off function and turning the power off

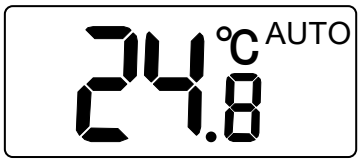
Auto power off function

The thermometer has the auto power off function.

The auto power off function is disabled when the battery is replaced.

To enable the auto power off function, press the [AUTO OFF] button one time. The “AUTO” appears at the upper right in the display to show that the auto power off function is now enabled. With the auto power off function, the thermometer automatically turns the power off when no operation is made for about five minutes. To disable the auto power off function, press the [AUTO OFF] button again.

The “AUTO” at the upper right in the display disappears, and the auto power off function becomes disabled.



Turning the power off

To turn the power off immediately, press the [ON/OFF] button.

How to use the sheath holder

Use the sheath holder to protect the sheath when you carry the thermometer.

Be sure the sheath holder is removed from the sheath when performing measurements.

To prevent the sheath holder from deformation or damage, before using the sheath holder, allow the sheath to return to room temperature after high or low temperature measurements.

Daily Care

Accurate measurements cannot be made if the temperature detection part is dirty. It should be kept clean when performing measurements.

Do not rub the main body to clean. Rinse the dirt off using water.

When the dirt is hard to remove, wipe it off gently using a kitchen sponge, etc., dampened with a neutral detergent.

Do not use abrasives or volatile solvents such as thinner or benzine.

Specifications

Sensor	: Thermistor
Temperature measurement range	: -40.0°C to +260.0°C
Display resolution	: 0.1°C
Measurement accuracy	: ±1.0°C (-9.9 to 59.9°C) ±2.0°C (-19.9 to -10.0°C, 60.0 to 99.9°C) ±3.0°C (-29.9 to -20.0°C, 100.0 to 199.9°C) ±4.0°C (-40.0 to -30.0°C, 200.0 to 260.0°C)
Display refresh rate	: Every second
Waterproof level	: JIS IPX7 (Waterproof for 30 minutes at a water depth of 1 meter, still water at room temperature)
Power supply	: CR2032 x 1 pc
Battery life	: Approx.1 year (When used for one hour per day)
Operating temperature and humidity	: 0 to 40°C, 75%RH or less, No condensation (Excluding the sheath)
Storage temperature and humidity	: 0 to 50°C, 75%RH or less, No condensation
External dimensions of the sheath	: φ2.8 mm (Tip: φ2.2 mm, length 20 mm) Approx. 120 mm long
External dimensions	: 40(W) x 187(H) x 17(D) mm (Excluding the protrusion)
Weight	: Approx. 27 g (Including the battery and sheath holder)
Standard accessories	: Instruction manual, sheath holder, battery (For monitoring purposes)

9. MEASUREMENT

9-1 Measuring Procedure

Using the predetermined pipette volume, perform the measurement the specified times.
ISO 8655 recommends ten measurements for each for the volumes described below.

- At the nominal volume of a fixed volume pipette
- At the following three points of an adjustable volume pipette
  1. 10% of the maximum volume or the lower limit of the adjustable volume range, whichever is greater.
  2. 50% of the maximum volume
  3. 100% of the maximum volume

NOTE Pipette volumes and number of measurements can be changed.

9-2 Judging the Results

WinCT-Pipette converts the mass values into volumetric values, compares these with the predetermined judgment standard and performs judgment whether the pipette will pass or fail.

- Judgment standard
  The averaged value (exceeds / does not exceed) the specified maximum permissible error.
  Repeatability (exceeds / does not exceed) the specified maximum permissible error.

9-3 Example Causes of Measurement Errors

Evaporation of the test liquid

Evaporation of the distilled water dispensed from the pipette into the sample cup can be a cause of measurement error.

To reduce errors caused by evaporation

- Be sure to use the evaporation trap. Using the evaporation trap, evaporation of the test liquid can be reduced to 0.05 mg per minute (0.05 μL per minute).
- Use the display lock function of the BH-T / BH series (software version 1.002 or later). For details, refer to “10-2 Display Lock Function”.

Water temperature and barometric pressure

Correctness of the Z factor, that is used to convert a mass value into a volumetric value, depends on the density by the water temperature.
The barometric pressure, even if changed in the range between 950 hPa and 1050 hPa, influences measurements only by 0.01%.
Water temperature, if changed by 5°C, influences measurements by 0.11%.

To reduce errors caused by water temperature

- Use the correct Z factor. To obtain the correct Z factor, measure the water temperature using the accessory thermometer and enter the value in WinCT-Pipette.
- For a stable water temperature, allow the temperature of the test liquid to acclimatize to the measurement environment for an appropriate duration of time (ISO 8655 recommends two hours or more) before measurement.

Vibration

Vibration yields unstable measurement values.

To reduce errors caused by vibration

- Install the balance in a stable place avoiding vibration and shock. Use a solid weighing table that is free from vibration.
- If the installation site is the second floor or higher, use the anti-vibration table.

Airflow

Airflow in the measurement environment yields unstable measurement values

To reduce errors caused by airflow

- Install the balance where it is not affected by heaters or air conditioners or where no drafts exist. Because the BH-T/BH series has an especially high weighing sensitivity, use much care in choosing an installation site or cover the weighing unit.

Operator

An operator’s pipetting technique influences measurements.

To reduce errors caused by the pipetting technique

- Learn and use the correct pipetting technique.

10. FUNCTION SETTING OF THE BALANCE

10-1 Auto Print Mode

In the balance function setting, if you set the data output mode to 'Auto Print Mode' and choose 'Zero Point' as the reference, or select ‘Auto Print A Mode (prt 1)‘ via data output (dout), the mass value will be transmitted to WinCT-Pipette automatically once the mass value of the dispensed test liquid becomes stable. (For details, please refer to the 'Auto Print Mode' or 'Data Output Mode' sections in the BH-T/BH series instruction manual.)

10-2 Display Lock Function

To use this function (software version 1.002 or later only), change the application setting to 'Display Lock Function' or set 'Display Lock Function (PLoc)' to 'ON (on)'.

Why use this function

This function is used to compensate time-elapsed errors caused by evaporation. Even when the evaporation trap is used, an evaporation of 0.05 mg per minute (0.05 µL per minute) will occur. This evaporation influences measurements, particularly when the volume of the test liquid is small. For such a situation, the display lock function is useful.

How this function works

After the test liquid is dispensed from the pipette, the measurement starts. When the mass value is stable, data is averaged. After a certain period of time, the averaged value is locked in the display. (For details, please refer to the 'Display Lock Function' or 'Explanation for "Environment, Display"' sections in the BH-T/BH series instruction manual.)

NOTE The RE-ZERO operation unlocks the display.

11. TROUBLESHOOTING

- Displayed values are unstable.

  The BH-T/BH series has a high weighing sensitivity and is influenced by the measurement environment.

  Measures to take

  - Referring to "3. PRECAUTIONS BEFORE USE", check the measurement environment for sources of drafts, vibration and static electricity.
  - The BH-T / BH series is prone to low-frequency vibration such as shaking buildings. Particularly, earthquake, wind and changes in the barometric pressure influence measurements. To avoid vibration, install the balance on the first floor, in the corners of rooms (close to pillars or walls) far from a passageway.
  - We recommend that you use the tabletop breeze break (AD-1672 or AD-1672A) to avoid drafts.
  - We recommend that you use the anti-vibration table (AD-1671) to avoid vibration.
  - We recommend that you use the static eliminator AD1683A, which comes standard with BH-T series, if the cause of the unstable values may be due to static charges.

- Repeatability of the measurement values is low. The measurement values are not correct.

  Measures to take

  - Referring to "3. PRECAUTIONS BEFORE USE", check the measurement environment. Using a weight, measure the balance repeatability and check the balance performance.
  - Referring to "9-3 Example Causes of Measurement Errors", check the measurement environment for causes of errors.

- Balance error displays

  Refer to the BH-T/BH series instruction manual.

- Handling water-absorbent sheets

  When the water-absorbent sheet inside the sample cup has absorbed a large amount of water, the surface area of the water may increase, which in turn may increase the amount of evaporation.

  Replace the sheet with a dry one when appropriate to make accurate measurement possible.

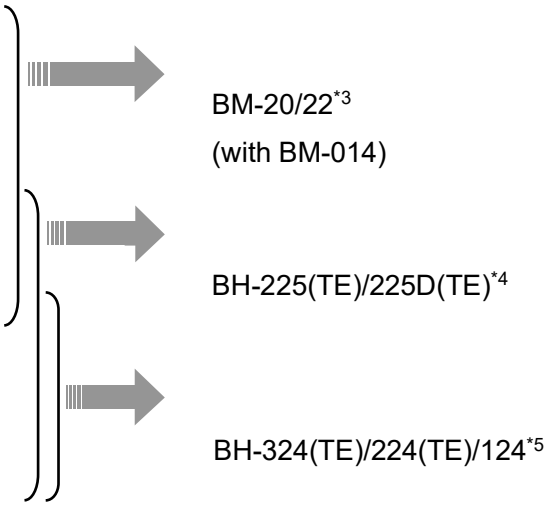
12. OPTIONS

Name and components	Model
5 mL sample cup (with a water-absorbent sheet installed) 5 mL sample cup 5 pcs Lid for 5 mL sample cup 5 pcs Water-absorbent sheet for 5 mL sample cup 5 pcs (The sheet is installed in the cup before shipping.)	AX-PT-01
30 mL sample cup (with a water-absorbent sheet installed) 30 mL sample cup 5 pcs Lid for 30 mL sample cup 5 pcs Water-absorbent sheet for 30 mL sample cup 5 pcs (The sheet is installed in the cup before shipping.)	AX-PT-02
Water-absorbent sheet for the 5 mL sample cup 5 pcs	AX-PT-03
Water-absorbent sheet for the 30 mL sample cup 5 pcs	AX-PT-04

13. APPENDIX

The table below lists the relation between the ISO 8655-2:2022 requirements and the pipette accuracy tester.

Pipette nominal volume *1	ISO 8655-2:2022 requirements				
	Maximum permissible error*2				Balance minimum weighing value
	Accuracy		Repeatability		
(µL)	±%	±µL	%	µL	mg
1	2.5	0.025	2	0.02	0.001
2	2.5	0.05	2	0.04	
5	2.5	0.125	1.5	0.075	
10	1.2	0.12	0.8	0.08	
20	1.0	0.2	0.5	0.1	0.01
50	1.0	0.5	0.5	0.25	
100	0.8	0.8	0.3	0.3	
200	0.8	1.6	0.3	0.6	0.1
500	0.8	4.0	0.3	1.5	0.1
1000	0.8	8.0	0.3	3.0	
2000	0.8	16	0.3	6.0	
5000	0.8	40	0.3	15	
10000	0.6	60	0.3	30	



***1** The maximum volume selectable for adjustable volume pipettes

***2** When set to 100% of nominal volume

***3** The BM-20 / 22 with BM-014 can be used for the pipette volume range from 1 µL to 200 µL.

***4** The BH-225(TE) can be used for the pipette volume range from 20 µL to 10000 µL.

***5** The BH-324(TE) / 224(TE) / 124 can be used for the pipette volume range from 200 µL to 10000 µL.

NOTE **Pipette accuracy testing is performed using a high-resolution valance. Make sure that the measurement environment is free from vibration, drafts and air from air conditioners. For details, refer to "3. PRECAUTIONS BEFORE USE".**

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