

Handheld Thermometer Instruction Manual HR-1500

AE-100290

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Safety information

Caution

To safely operate and service the thermometer and to prevent any product damage and/or maintain the precise temperature measurement results, please carefully follow the instructions below:

- Do not use this product for any purpose other than taking temperature measurements.
- If any abnormalities are found, immediately stop using the product.
- Do not disassemble or modify the product.
- Do not use any power supply other than commercially available dry batteries and/or a dedicated adaptor.
- Insert the batteries in the correct manner (pole+ to pole+).
- Remove the batteries when depleted or when the product is not expected to be used for an extended period of time.
- Do not mix old and new batteries or batteries of different makes or types.

Warning

- Do not throw into an open fire. Do not short circuit, disassemble, or heat.
- Do not recharge the batteries at any time.
- Use specified type batteries.
- To prevent electric shock, do not touch the metal parts or terminals of the sensor cable or analog output cable during measurement.
- To prevent electric shock, if the sensor is still in contact with the voltage application part even when the power is turned off, disconnect the sensor before setting the analog output cable or device.
- ※ When measuring under the influence of high voltage and high frequency, there is a risk of electric shock and measurement failure, so please contact us.

Introduction

Thank you very much for purchasing this Anritsu Meter product.

This instruction manual has been carefully prepared to ensure that the product can be used safely and securely.

Please carefully and thoroughly read this instruction manual, fully understand all the individual functions, and use the product properly.

Should you have any unclear issues or questions while operating the product, please refer to this instruction manual.

Notes

- The contents of this document and/or product specifications are subject to change without prior notice.
- Unauthorized reproduction of any part of this document is strictly prohibited.
- This instruction manual has been prepared with absolute care. Please free feel to contact our company or your retailer should you discover any omissions or mistakes.
- In no event is Anritsu Meter liable to anyone for any indirect, special, or consequential damages as a result of using this product.

Warranty and After-sales Service

● Warranty

This product has been submitted to strict tests and inspections prior to delivery. Anritsu Meter warrants this product to be free from defects in material and workmanship for a period of one (1) year from date of delivery. Should any failures arise due to defects during manufacture or accidents during transportation, please contact our company or your retailer. For any failures during the warranty period which are deemed our responsibility, we will exchange the necessary parts or carry out repairs at no cost.

However, the warranty will be considered to be voided (i.e., the customer pays for repairs) in the following cases:

- Failure due to a fire, earthquake, or any other force majeure.

- Failure due to misuse, abuse, and/or modification. (Please note that if the case of the product is opened or the screws are loosened, such an act will be regarded as a modification.)

Note: Our thermocouple sensors are consumables and are not covered by the warranty.

● **After-sales Service**

- If you think the product is not correctly working, please refer to this instruction manual. Should any issue persist, please contact our company or your retailer.

- Repairs during the warranty period are subject to the content of the warranty sheet. Repairs after the warranty period has elapsed will be carried out only if such repairs recover and maintain the product functions.

- If there is a need to return the product for repair or calibration, please pack it in the original packaging that was used for delivery. If such packaging is not available, please enclose the product with sufficient cushioning material and return the product in a condition where no damage can be caused.

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1. General

This product is a handheld thermometer for high precision, reliability, and usability. It has a high-precision analog technology and a microcomputer to digitally correct measured data, making highly stable and high-precision temperature measuring possible.

By using the memory function, measured data can be stored in the memory and transferred to a PC.

Stored data will not be deleted even if the batteries in the main unit are fully depleted, thereby securely retaining data.

2. Unpacking

2.1. Unpacking

Please check if the following items are present when unpacking. We make sure all items are carefully packed, but should you find any missing or failed items, please contact our company or your retailer.

Item	Q'ty
Main unit	1
Soft case	1
Hand strap	1
USB cable	1
Dedicated software (AMS-300)	1
Alkaline AA battery	4
Instruction manual	1
Test report	1
Warranty sheet	1
User registration sheet	1

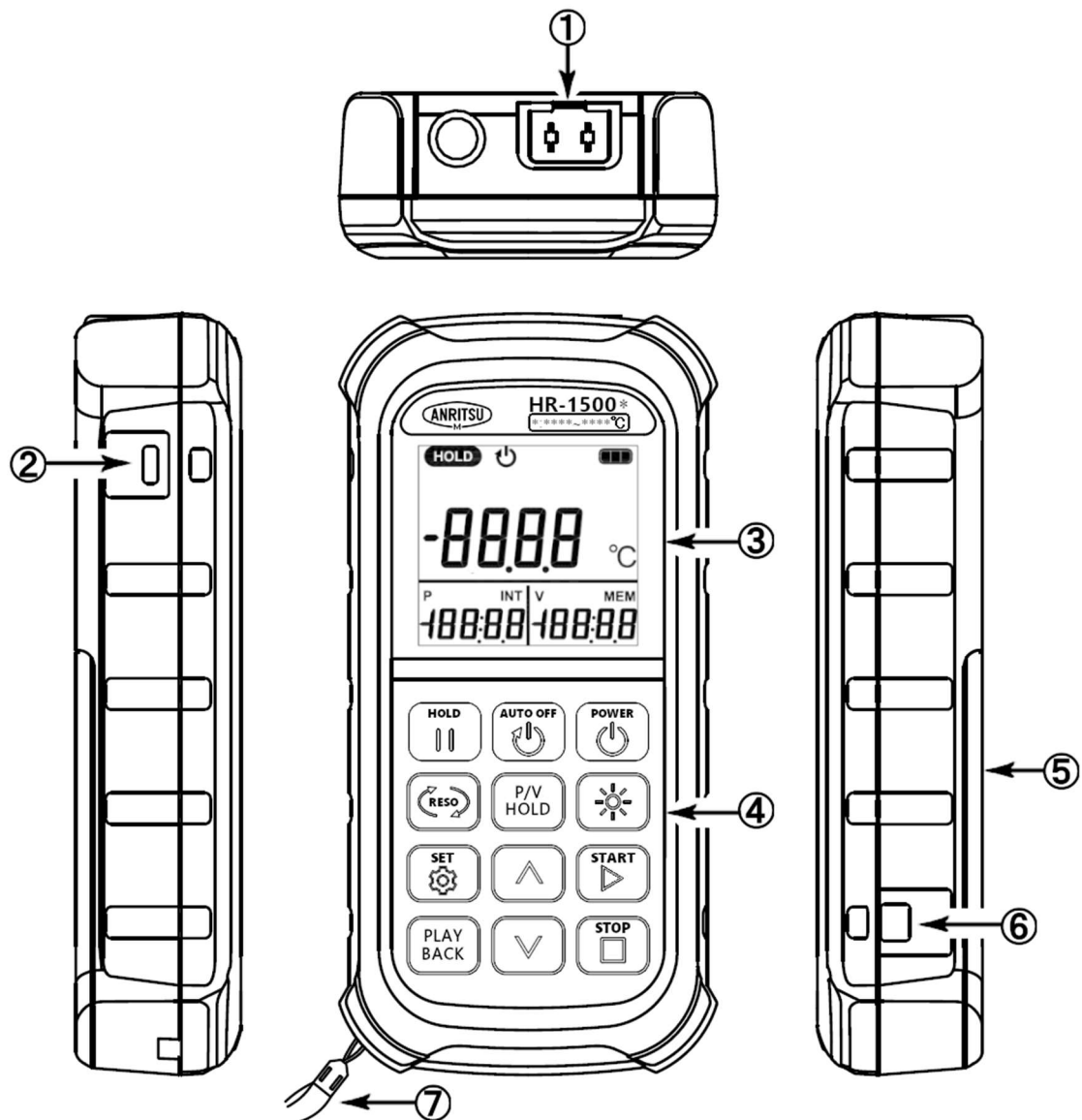
2.2. Repacking

To move this instrument (such as transportation by car), pack it in its original packaging. If such packaging is not available, fully protect the instrument with shock-absorbing material (Styrofoam, etc.). Please note that if packing materials generate dust or moisture, the instrument may become damaged. Please use dry packing materials that do not generate dust.

3. Name and Explanation of Each Part

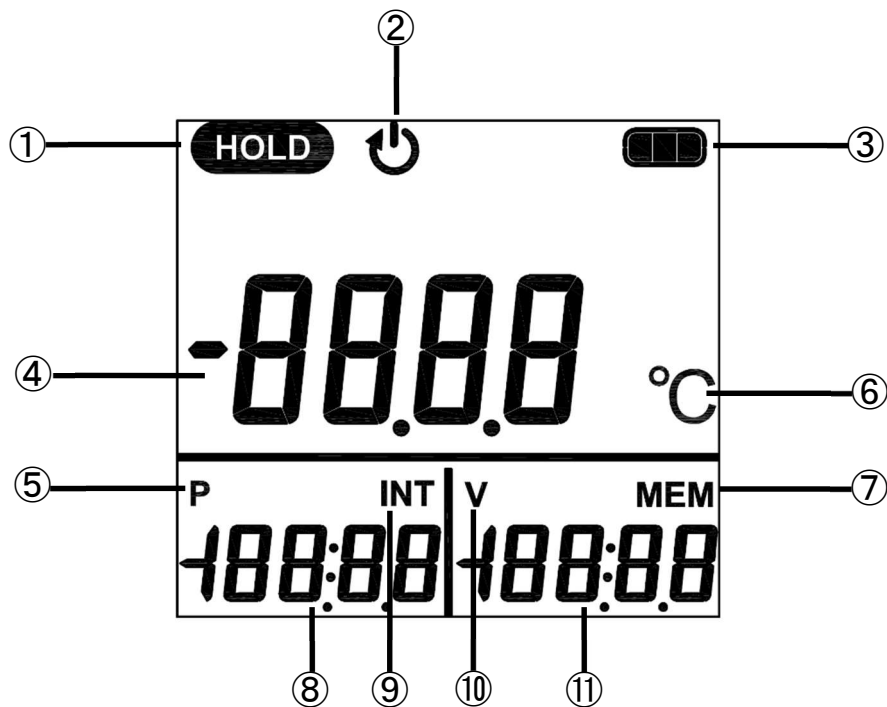
3.1. External View

(HR-1500)



- ① Sensor input connector
- ② USB connector
- ③ LCD display
- ④ Key switch panel
- ⑤ Battery housing
- ⑥ AC adaptor jack
- ⑦ Hand strap

3.2. LCD Display

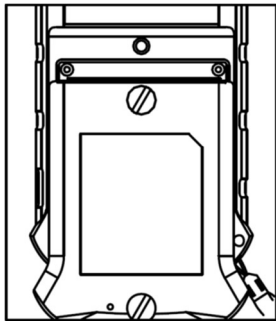


Description		
②	HOLD segment	Lights when using the hold function
③	A-OFF segment	Lights when using the auto-off function
④	Battery segment	Battery level
⑤	Main display	Main display
⑥	P segment	Lights when using the P/V hold function
⑦	°C segment	Temperature symbol
⑧	MEM segment	Lights when using the memory function
⑨	Sub display 1	Sub display
⑩	INT segment	Lights when using the interval function
⑭	V segment	Lights when using the P/V hold function
⑮	Sub display 2	Sub display

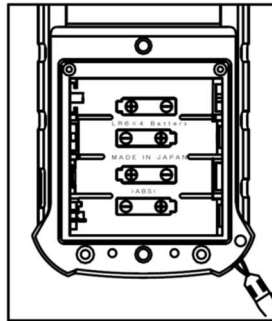
4. Preparations Before Taking Measurements

4.1. How to Install the Batteries

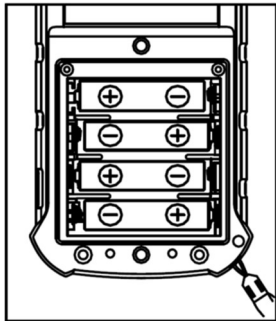
Make sure to turn the power off when replacing batteries.



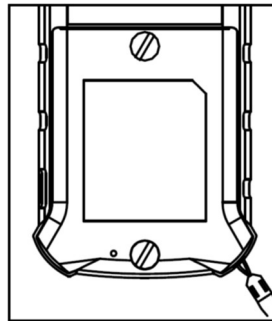
- (1) Remove both screws and open the cover of the battery housing.



- (2) Pay attention to the orientation of the batteries.



- (3) Install the batteries.

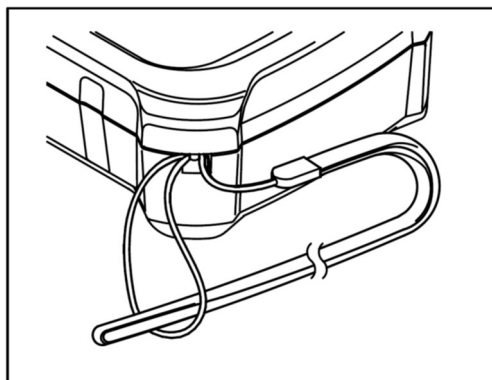


- (4) Reattach the battery housing cover, tighten both screws, and then press the edge of the cover to secure it.

4.2. How to Use the Hand Strap

Place the enclosed hand strap on your wrist to prevent the instrument from dropping.

Loop the thin cord of the strap through the hole and then pull the other end of the hand strap through that loop.

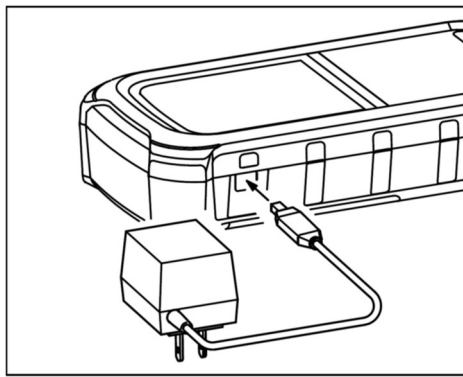


4.3. How to Use the AC Power Supply

- (1) Turn off the power of the instrument and then connect the connection plug of the AC adaptor to the main unit as follows:

Note: The HR-15*0 has a built-in capacitor to maintain the clock settings. To recharge, please keep the batteries in the housing even when the product is being run by the AC adapter.

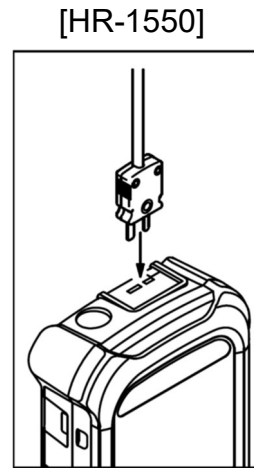
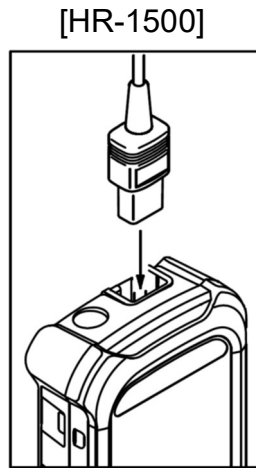
If used without batteries, the clock will be initialized when the product is turned off.



- (2) Connect the power plug of the AC adaptor to an AC mains (100 VAC).
Note: The AC adaptor is available as an option. Please use one as specified by Anritsu Meter.

4.4. How to Set the Sensor

Set the sensor to the main unit as shown in the illustration below. It is designed so that if the sensor orientation is incorrect, it cannot be fully inserted. If the sensor is forcefully inserted, failure may result. Please check the sensor's orientation before inserting it.



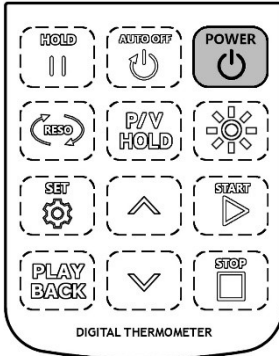
4.5. How to Use the Soft Case

To protect the instrument from dirt or scratches, etc., use the attached soft case.

When using an AC adaptor, alarm output, and/or analog output, open a hole at the relevant position on the soft case by using scissors or a similar object.

5. Operations and Functions

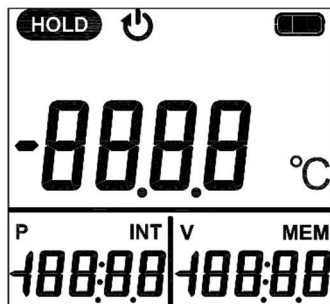
5.1. Power ON/OFF



Pressing the **POWER** key will illuminate all the indicators for about three seconds and start the measurements.

Press the **POWER** key again to turn the instrument off.

All illuminated



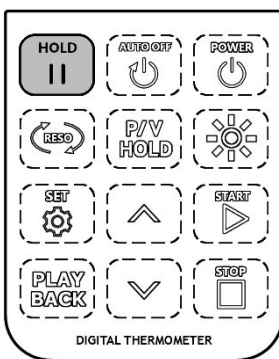
Normal measurement



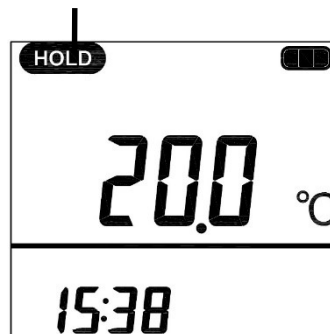
5.2. HOLD Function

Press the **HOLD** key to maintain the indicated values during measurements.

HOLD will illuminate on the screen while HOLD is on. To release the HOLD function, press the **HOLD** key again.

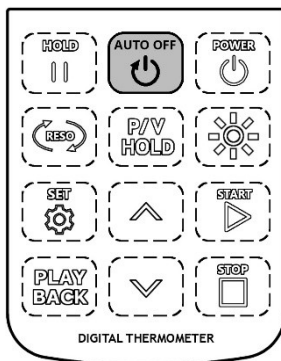


HOLD illuminated

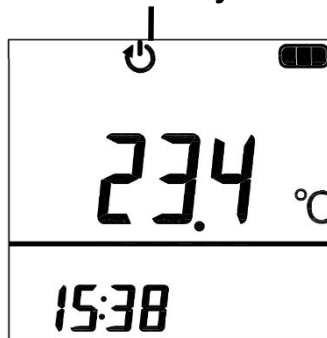


5.3. Automatic Power OFF Function

When the **AUTO OFF** key is pressed, “AUTO OFF” symbol will illuminate on the screen. If no key operation is performed for a certain period of time (about five minutes), the power will automatically be turned off, preventing the unit from remaining turned on. To release the Automatic Power OFF function, press the **AUTO OFF** key again.

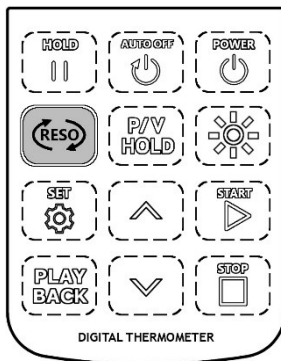


“AUTO OFF” symbol illuminates



- When memory measurements start, the Automatic Power OFF function will be disabled.
- When the product communicates with the PC software (AMS-300), the Automatic Power OFF function will be disabled.

5.4. Resolution Change

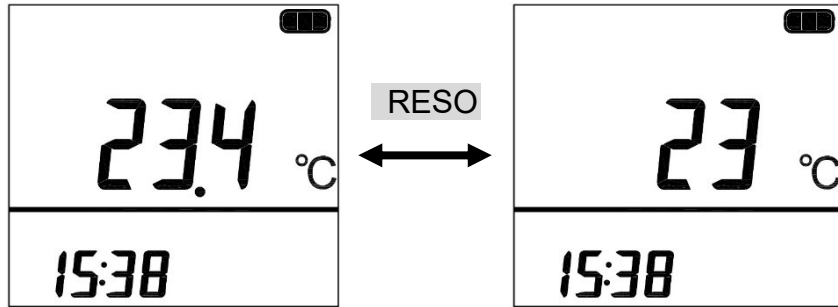


Press the **RESO** key to switch the resolution.

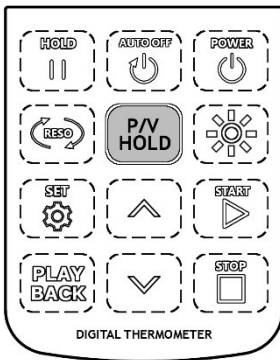
- 0.1°C resolution indication: A range between -104.9 and 504.9°C is displayed with a 0.1°C resolution. If a temperature is out of this range, the instrument will automatically indicate it at a 1°C resolution.
- 1°C resolution indication: The 1°C resolution is applied to all temperatures.

0.1°C resolution indication

1°C resolution indication



5.5. P/V Hold Function [Applicable Models: HR-12*0/HR-13*0]

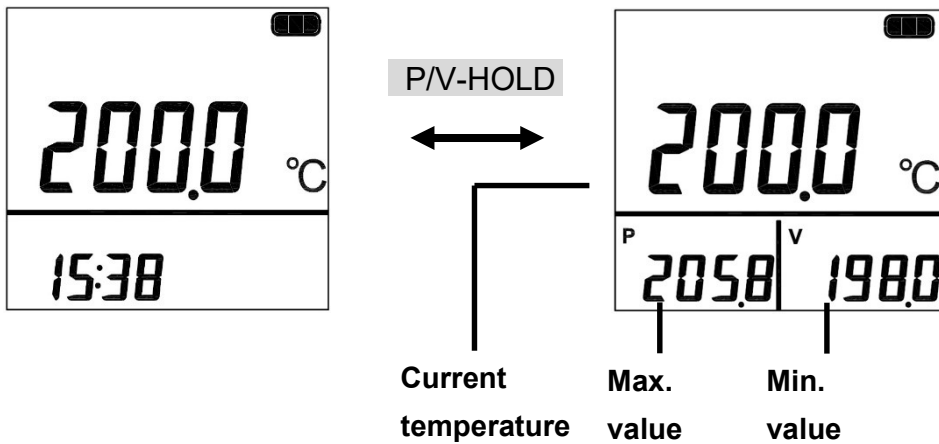


Press the **P/V-HOLD** key to enter the P/V Hold function. The lowest and highest values will be displayed in the sub-screens. Press the **P/V-HOLD** again to return to normal measurements.

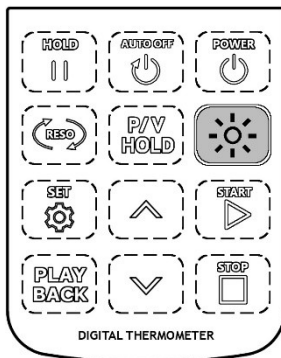
- The P/V Hold function cannot be used simultaneously with the memory function.
- When burnout or out of range are indicated, the P/V Hold function cannot be set up.


Normal measurement


P/V mode



5.6. Turning the Backlight ON/OFF



Press the  key to turn on the backlight so that indications on the screen can be seen in dark places.

Press the  key again to turn off the backlight.

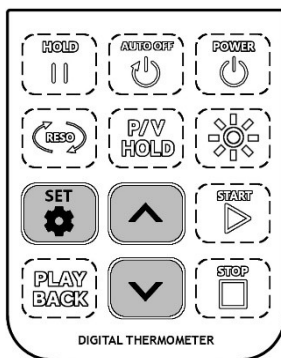
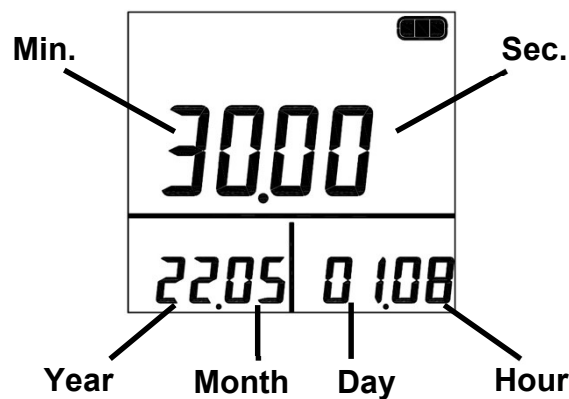
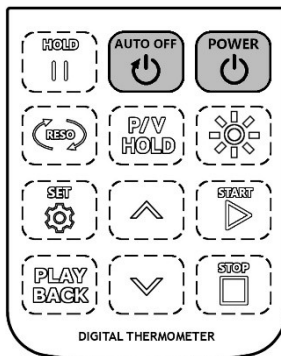
Note: When the backlight is ON, more battery usage will be incurred. Don't forget to turn it off.



6. Time Setting

This product is equipped with a clock function. At the time of purchase or resetting the clock, please follow the steps below:

With the power of the instrument off, press the **AUTO OFF** and the **POWER** key at the same time to turn the instrument on.

The time setting screen will be displayed with the selected value flashing.



Use the  and  keys to increase/decrease the numerical value. To set the value, press the **SET** key.

Press the **SET** key with the minute selected, and the second will be set to "00" to complete time setting.

Notes: To avoid malfunction of the clock function, always use the instrument with batteries.

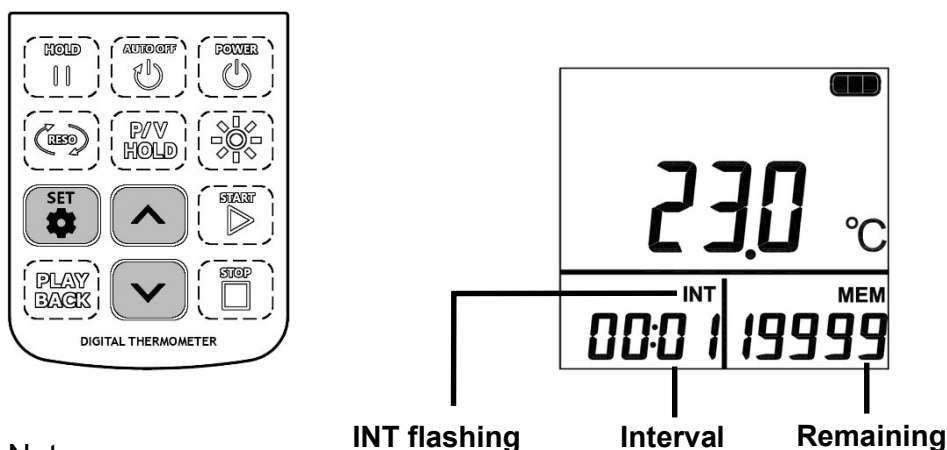
· Time setting can easily be done by using the dedicated software, AMS-350. For details, please refer to the user's manual of AMS-350.

7. Memory Function

7.1. Interval Setting

When the **SET** key is pressed, INT will be displayed and flashing in the left-bottom sub-screen, and the interval will illuminate.

Intervals will be switched in the order of 1 sec. → 5 sec. → 10 sec. → 30 sec. → 1 min. → 5 min. → 10 min. → 30 min. → 60 min. → manual by pressing the **▲** key in the reverse order with the **▼** key. Select the desired interval by pressing the **▲** and **▼** keys.



Notes:

- Max. number of memory data is 19,999.
 - During interval setting, the remaining number of memory available is indicated in the right-bottom sub-screen.
 - Press the **SET** key during the interval setting to return to normal measurements.
 - When the Automatic Power OFF function is enabled, this function will be disabled when memory measurements are started.
 - In the case of manual measurements, the interval indication will be “- - -”.
 - If interval measurements are conducted for a long time, always use the AC adaptor (optional).
- (Even when the AC adaptor is used, always mount batteries so that the clock IC is backed up.)

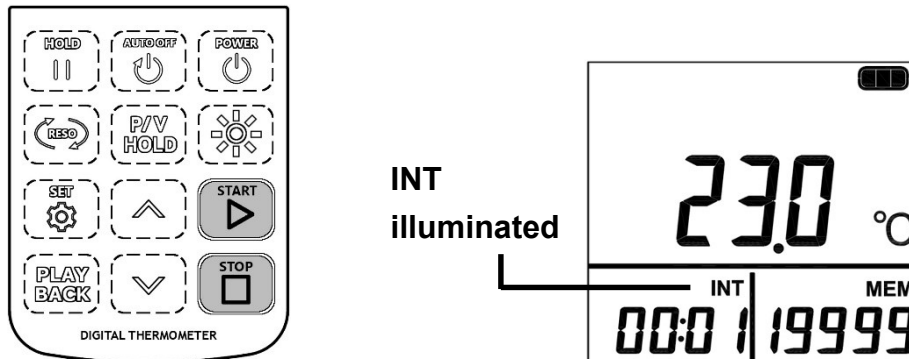
7.2. Starting Memory Measurements

When the **START** key is pressed, INT will illuminate, and memory measurements will start at the displayed interval. To stop memory measurements, press the **STOP** key.

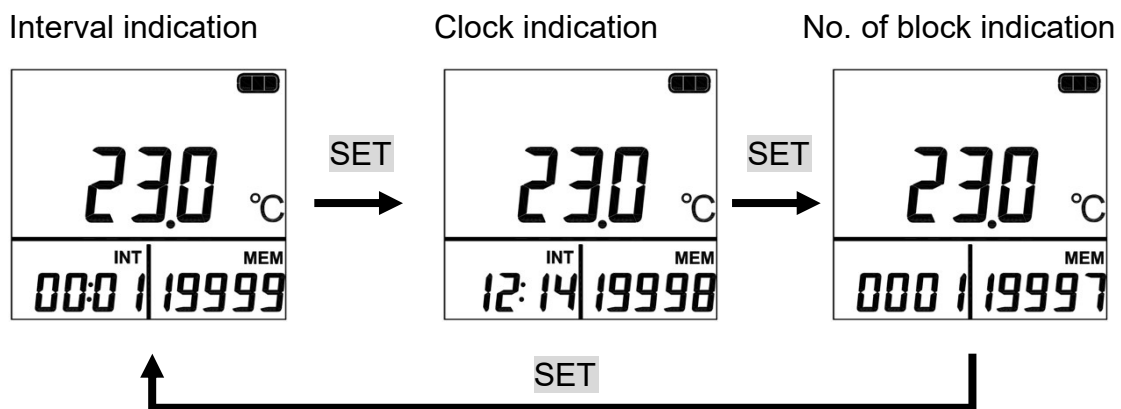
When the **STOP** key is pressed, measured data will be saved as a data block. Saved data blocks can be transferred to PCs, creating a data file for each block. (The maximum number of blocks is 200.)

Note: For details, please refer to the AMS-350 user's manual.

●Interval measurements



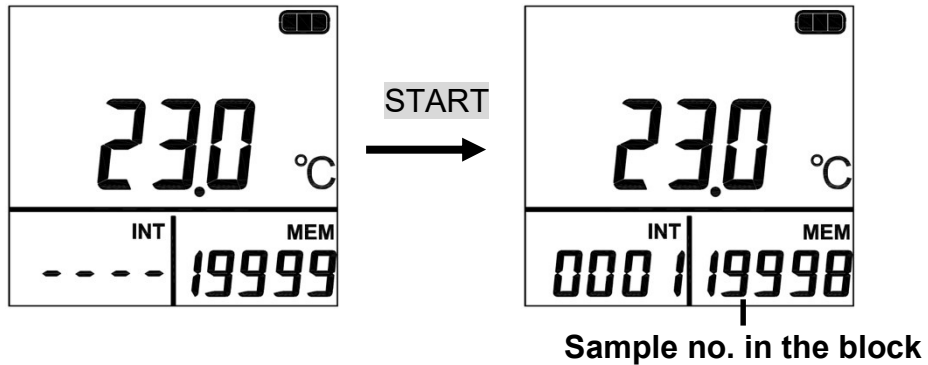
During memory measurements, pressing the **SET** key will switch the down-left sub-screen in the order of interval indication → clock indication → no. of block indication.



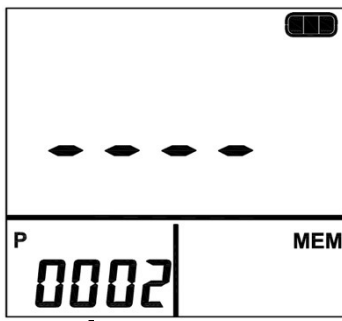
Memory measurements will be terminated when the remaining memory becomes zero (0) or the number of blocks reaches 200.

● **Manual measurements**

For manual measurements, every time the **START** key is pressed, the numerical value of the INT indication will increment, while that of the MEM indication will decrement. Measured temperature indications will be refreshed at an interval of about 200 ms, as is the case with normal measurements.



7.3. Memory Play back Function



Block no. flashing

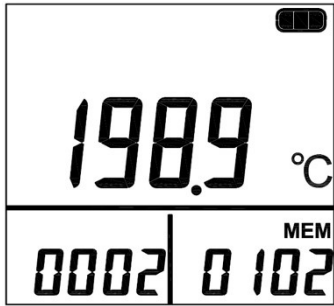
When the **PLAY BACK** key is pressed, indications of the P and the number of measured blocks (bottom-left of the screen) will start to flash. Select the block number to be displayed with the **▲** and **▼** keys and press the **SET** key to confirm the block no. Press the **SET** key again to return to the setting block number to be displayed.



Memory no. flashing

Note: If the number of blocks is just one (1), this value will not change when the **▲** or **▼** keys is pressed.

When the block no. to be displayed is set, MEM and memory no. indication (bottom-right of the screen) will flash, and the temperature of that memory no. will be displayed in the main screen. Select the memory no. to be displayed by using the **▲** and **▼** keys to display the temperature corresponding to the memory no. in the main screen.



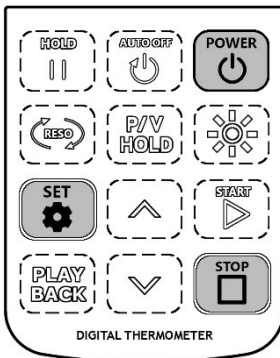
Note: Pressing and holding the **▲** and **▼** keys will increase the refresh rate of the display to x10 and x100.

Press the **PLAY BACK** key again to return to normal measurements (status before the **PLAY BACK** key was pressed.)

7.4. How to clear the Data

With the power of the instrument off, press the **SET** and the **POWER** keys at the same time to turn the instrument on.

The memory clear screen will be displayed. To delete data, press the **SET** key, and if you don't want to clear the data, press the **STOP** key.



Note: Be extra cautious as once deleted, data cannot be recovered.

8. Dedicated Software AMS-350

The HR-15*0 handheld thermometer can communicate with PCs by using the AMS-350 dedicated software.

Please install the AMS-350 software as instructed in the included user's manual.

This software requires the following operating environment:

Supported OS : Microsoft Windows 8.1

Microsoft Windows10


System types : 32 bit/64 bit

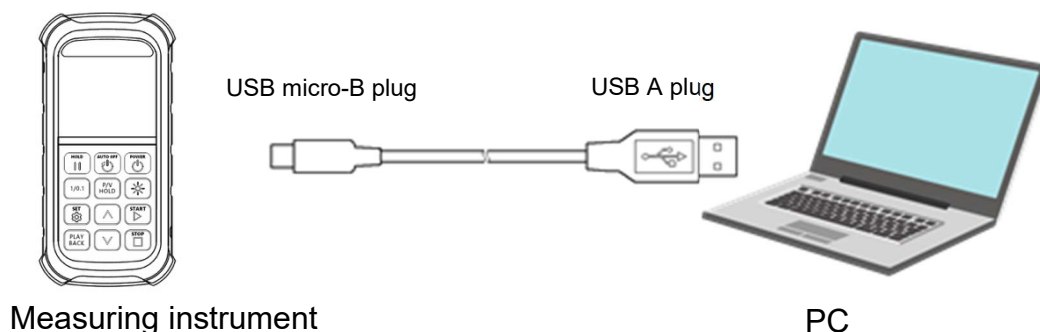
PCs that have sufficient specifications to run the above OS.

Notes

- We cannot guarantee that the software is operable on all PCs with the recommended environment.
- The software can be operated only by users with system administrator privileges (Administrator).
- Macintosh computers are not supported.
- Microsoft® Windows® 8.1 and Windows® 10 are registered trademarks or trademarks of Microsoft Corporation in the U.S.A., Japan, and other countries.

8.1. USB Connection

For the USB communication cable, use one with the USB A plug on the PC side and the USB micro-B plug on the instrument side. Connect the cable to the connector with the USB  mark on the PC.



Note

- For details of communication connectors on the PC, please refer to the PC software instruction manual.
- When not communicating with a PC, always disconnect the instrument from the PC (by removing the communication cable.)
- If a different application is used while the instrument is connected, malfunctions and/or failures may occur.

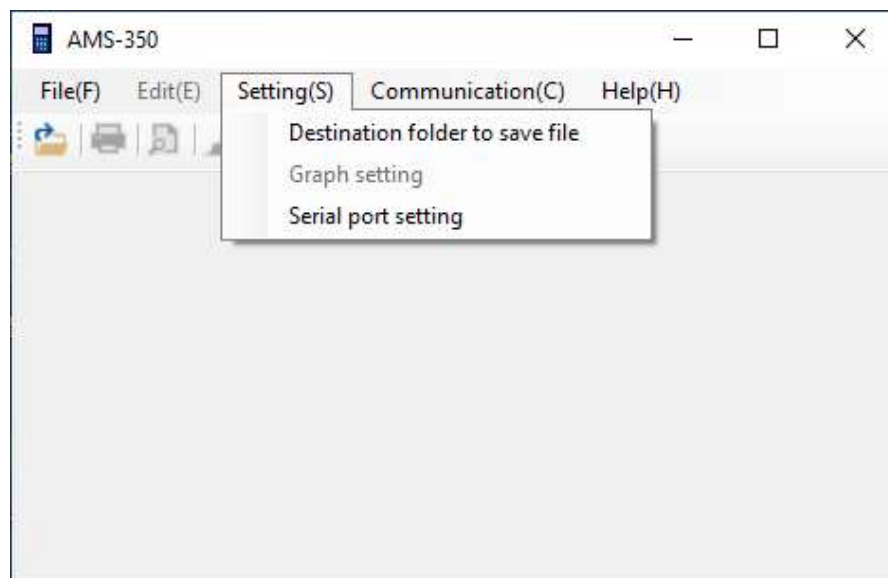
8.2. How to Transfer Data in the Measuring Instrument

Data saved in the instrument is transferred to a PC to create files.

Confirm that the instrument is properly connected to the PC and then turn on the power of the instrument.

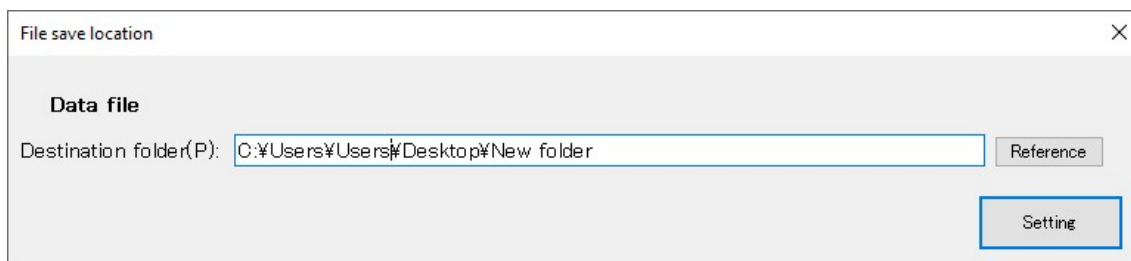
Launch the dedicated PC software, AMS-350.

From the [Setting (S)] menu, set the [Destination folder to save file] and [Serial port setting].



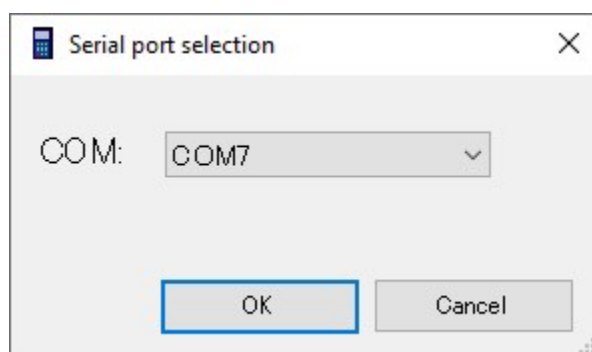
Set the destination to save data to be transferred.

Create a folder in an easy-to-find location on the PC and designate it as the destination.



Every time AMS-350 starts, set the serial port.

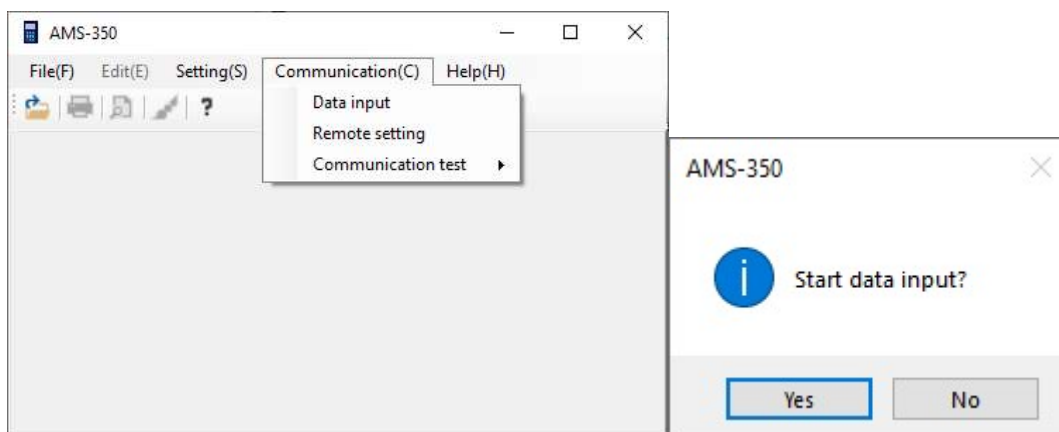
To find the COM value, please refer to the AMS-350 user's manual.



From the [Communication (C)] menu, select [Data input].

The "Do you want to start data input?" screen will be displayed.

Select [Yes] to start data input.



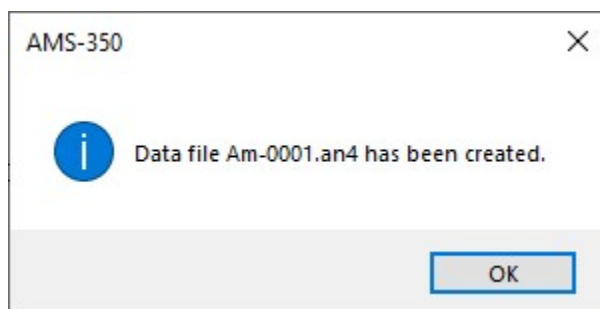
During communication, the transfer bar will be displayed to confirm the data transfer status. Press [Interrupt] to interrupt the communication without creating a file.



Do not operate any keys of the instrument during communication. Abnormal termination or a malfunction may result.

Note: After inputting data, the data on the instrument will be maintained. If any communication error occurs, please input the data again.

When all the data input is completed, a newly created data file will be displayed.



For further details, please refer to the user's manual of dedicated software, AMS-350.

The filename is [Am-****.an4].

The number from 0001 to 9999 will be sequentially given to [****] for each directory.

Deleting any file will not affect other file numbers.

For example, if files up to #9999 are saved on the HD, the file #9999 will remain even if files #0001 to #9998 are all deleted.

In this case, as the file with the largest number (9999) is saved, no more data can be saved in this folder. If you want to save new data in this folder, change the filenames.

Ex: "Am-9999.an4" is renamed as "Am-0001.an4".

9. Retention of Setup Data

Some settings will be released when the batteries are exchanged or when the instrument is turned off. Please check the details in the following table:

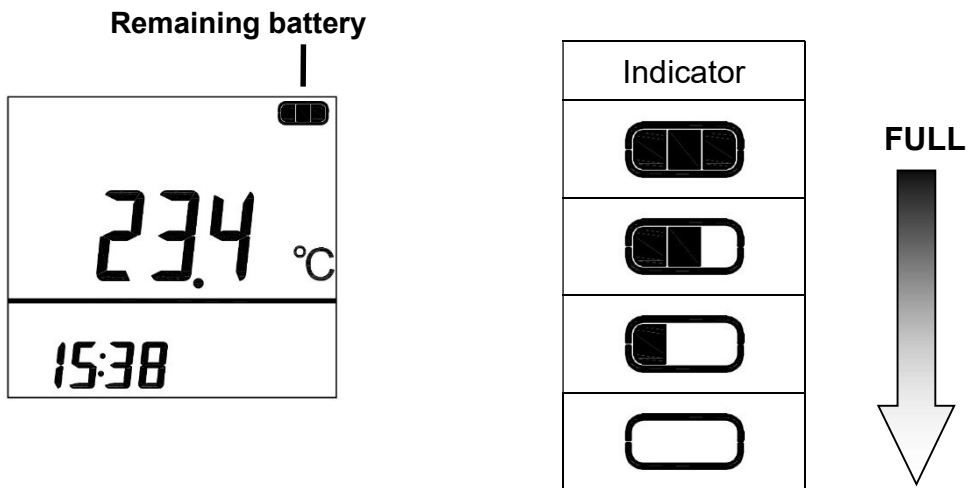
Function	
HOLD	Released
Automatic power OFF	Retained
P/V hold	Released
Resolution/Analog output rate	Retained
Backlight	Released
Alarm setting	Retained
Alarm output buzzer ON/OFF	Released
Calibration setting	Retained
Calibration ON/OFF	Retained
Analog output ON/OFF	Retained


Notes: Be sure to insert the battery to keep the time setting.

10. Checking the Remaining Battery

Remaining battery is displayed in the top right corner of the indication.

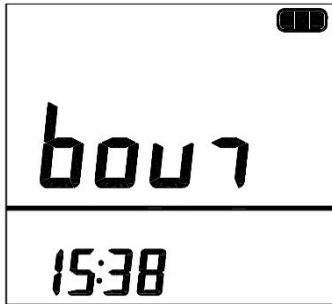
As properties vary, depending on batteries, use this value only as a reference.



When the indication of the indicator becomes , replace the batteries with new ones.

11. Error Messages

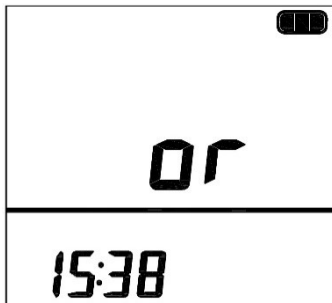
11.1. Indication of a Broken Wire of the Sensor



If the sensor has a broken wire or is disconnected, the burnout (broken wire) indication is displayed.

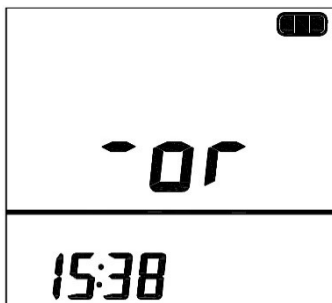
If this indication is displayed, replace the sensor with a new one or connect the sensor.

11.2. Overrange Indication



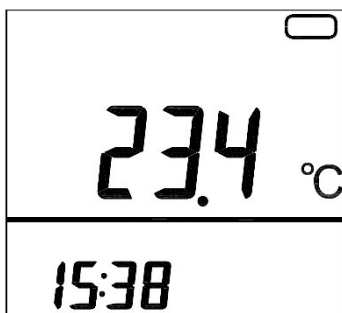
When the temperature in measurement exceeds the measurable range, the overrange indication is displayed.


If the wire of the sensor is about to become broken, this overrange indication may be shown. If it is clear that the temperature in measurement is within the measurable range, check the sensor.



Even if the overrange indication is shown, it will not damage the instrument. However, the sensor may be consumed, so relocate it to a place where the temperature is at a heat-resistant temperature or a lower temperature.

11.3. Battery Voltage Drop Indication



When batteries are depleted and the battery indication on the screen becomes , replace the batteries with new ones.

12. Maintenance

12.1. Storage

When storing the instrument, avoid the following places:

- In direct sunlight
- Subject to heavy vibrations
- High humidity (85%RH or more)
- High temperature atmosphere (50°C or higher)
- Filled with dust, waste, corrosive gas, and/or salt
- High electromagnetic field

To store the instrument for a long time, it is recommended to remove the batteries and store the unit in the original packaging at time of delivery.

12.2. When the Case of the Instrument Gets Dirty

When the case of the instrument gets dirty, please wipe it with a slightly damp cloth. Do not use alcohol, thinner, benzine, or other chemicals. Otherwise, the case or keyboard may become discolored or deformed.

13. Troubleshooting: Before Contacting Support

If you find any abnormalities or become unable to operate the instrument, first check for the following items. If you still cannot solve the issue, please contact your retailer or our company.

(1) The instrument does not operate when power is turned on:

- Is the orientation of the batteries in the correct manner?

Reset the batteries.

- Have the batteries been depleted?

Install new batteries.

(2) The indicated values of temperature are unstable:

- Is the wire of the sensor almost broken or is the sensor deformed?

Do an appearance check of the sensor.

- Is the sensor connector inserted fully?

Re-insert the connector.

- Is the sensor sufficiently making contact with the object of measurements?

Change how to set the sensor.

- Is the measurement environment in a high electromagnetic field (such as a large motor)?

- Relocate the instrument or use the shield.

(3) If measurement errors are too large:

- Are the thermocouple types of the sensor and the instrument the same?

Replace the sensor.

- Is the head of the sensor deformed?

Replace it with a new one.

(4) Keys are not responding:

- Is there any burn out (broken wire) indication shown?

Set the sensor.

- Are any functions running?

Terminate various functions and retry to operate the keys.

(5) If memory measurements cannot start:

- Is there a remaining memory block? Is the number of blocks exceeding 200?

After exporting the necessary measured data, clear the data.

Please refer to "7.4 How to Clear the Data".

14. HR Series Specifications

ASP specifications (common)

Model (HR-)		1100, 1200, 1300, 1301, 1400, 1500	
Operation switches		Membrane keyboard (with clicking function)	
Input connector		ASP connector (thermocouple homogeneous metals)	
Input		Thermocouple Type E or K	
No. of input		One	
Signal source resistance		1 k Ω or less	
Measurement range	1°C resolution	E	-200 to 800°C
		K	-200 to 1370°C
	0.1°C resolution	E	-104.9 to 504.9°C
		K	-104.9 to 504.9°C
Measurement accuracy	1°C resolution	Less than 0°C	$\pm (0.5\% \times \text{indicated value} + 1^\circ\text{C})$
		0°C or more	$\pm (0.1\% \times \text{indicated value} + 1^\circ\text{C})$
	0.1°C resolution	Less than 0.0°C	$\pm (0.15\% \times \text{indicated value} + 0.2^\circ\text{C})$
		0.0°C or more	$\pm (0.05\% \times \text{indicated value} + 0.2^\circ\text{C})$
Accuracy of reference junction compensation		$\pm 0.2^\circ\text{C}$ (at $25^\circ\text{C} \pm 10^\circ\text{C}$)	
Temperature coefficient (Only when exceeding $25^\circ\text{C} \pm 10^\circ\text{C}$)		$\pm 0.02 \times \Delta t^\circ\text{C}$ (Exceeded temperature Δt is multiplied by the coefficient and then added to the indication tolerance (measurement accuracy + accuracy of the reference junction compensation)) Ex. @ 50°C or 0°C environment: $\pm 0.3^\circ\text{C}$ added	
Operational conditions		0 to 50°C , within 0 to 80% RH (no condensation)	
Storage conditions		-20 to 50°C , within 0 to 85% RH (no condensation)	
Sampling frequency		About 200 ms	
Linearizer method		Digital linearizer method (compliant with JIS C 1602-2015)	
Dimensions		82.1 × 166 × 36 (W × H × D) (Excluding connector extrusion)	
Weight		About 350 g (including batteries)	
Analog output		See specifications (analog output)	
Alarm output		See specifications (alarm output)	

Power supply	See specifications (power supply)
Accessories	See specifications (accessories)
Conformity standards (CE)	EMC: EN61326-1: 2013 EN 61326-2-1: 2013 class A Table2 (Industrial) RoHS: IEC EN 63000:2018

ANP specifications (common)

Model (HR-)		1150, 1250, 1350, 1351, 1450, 1550	
Operation switches		Membrane keyboard (with clicking function)	
Input connector		ANP connector (thermocouple homogeneous metals)	
Input		Thermocouple Type E or K	
No. of input		One	
Signal source resistance		1 k Ω or less	
Measurement range	1 $^{\circ}$ C resolution	E	-200 to 800 $^{\circ}$ C
		K	-200 to 1370 $^{\circ}$ C
	0.1 $^{\circ}$ C resolution	E	-104.9 to 504.9 $^{\circ}$ C
		K	-104.9 to 504.9 $^{\circ}$ C
Measurement accuracy	1 $^{\circ}$ C resolution	Less than 0 $^{\circ}$ C	$\pm (0.5\% \times \text{indicated value} + 1^{\circ}\text{C})$
		0 $^{\circ}$ C or more	$\pm (0.1\% \times \text{indicated value} + 1^{\circ}\text{C})$
	0.1 $^{\circ}$ C resolution	Less than 0.0 $^{\circ}$ C	$\pm (0.15\% \times \text{indicated value} + 0.2^{\circ}\text{C})$
		0.0 $^{\circ}$ C or more	$\pm (0.05\% \times \text{indicated value} + 0.2^{\circ}\text{C})$
Accuracy of reference junction compensation		$\pm 0.2^{\circ}\text{C}$ (at 25 $^{\circ}\text{C} \pm 10^{\circ}\text{C}$)	
Temperature coefficient (Only when exceeding 25 $^{\circ}\text{C} \pm 10^{\circ}\text{C}$)		$\pm 0.03 \times \Delta t^{\circ}\text{C}$ (Exceeded temperature Δt is multiplied by the coefficient and then added to the indication tolerance (measurement accuracy + accuracy of the reference junction compensation) Ex. @50 $^{\circ}\text{C}$ or 0 $^{\circ}\text{C}$ environment: $\pm 0.5^{\circ}\text{C}$ added	
Operational conditions		0 to 50 $^{\circ}\text{C}$, within 0 to 80% RH (no condensation)	
Storage conditions		-20 to 50 $^{\circ}\text{C}$, within 0 to 85% RH (no condensation)	
Sampling frequency		About 200 ms	
Linearizer method		Digital linearizer method (compliant with JIS C 1602-2015)	
Dimensions		82.1 \times 166 \times 36 (W \times H \times D) (Excluding connector extrusion)	
Weight		About 350 g (including batteries)	
Analog output		See specifications (analog output)	
Alarm output		See specifications (alarm output)	
Power supply		See specifications (power supply)	

Accessories	See specifications (accessories)
Conformity standards (CE)	EMC: EN61326-1: 2013 EN 61326-2-1: 2013 class A Table2 (Industrial) RoHS: IEC EN 63000: 2018

* About the tolerance

The indication tolerance on the main unit of the thermometer is calculated as “measurement accuracy + accuracy of reference junction compensation”. However, this product is manufactured by customizing the reference junction compensation section for individual products. For this reason, the acceptance-rejection criterion at the time of shipment does not take the accuracy of the reference junction compensation into account and makes judgment for the measurement accuracy only. (This will narrow tolerance.)

For actual use, please calculate the indication tolerance with the formula: measurement accuracy + accuracy of reference junction compensation.

If the value exceeds $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$, the formula will be: measurement accuracy + accuracy of reference junction compensation + temperature coefficient.

Specifications (analog output) HR-13*1

Output rate (to be switched by indication resolution)	1 mV/°C (1°C resolution)	10 mV/°C (0.1°C resolution)
Output range	Full range @1°C resolution measurements	Full range @0.1°C resolution measurements
Analog output conversion accuracy (under the 25°C±10°C environment)	Add equivalent to ±1°C (1 mV) to measurement accuracy	Add equivalent to ±0.1°C (1 mV) to measurement accuracy
Temperature coefficient (When exceeding 25°C±10°C, exceeded temperature Δt°C is multiplied by the coefficient and then added to the analog output conversion accuracy)	± (0.1 mV/°C × Δt°C) Ex. @50°C or 0°C environment: ± 1.5 mV (equivalent to 2°C)	± (0.1 mV/°C × Δt°C) Ex. @50°C or 0°C environment: ± 1.5 mV (equivalent to 0.2°C)
When the sensor disconnected	About -2.3 V	
Out of measurement range (+)	About 5.1 V	
Out of measurement range (-)	About -2.2 V	
Insulation	Insulation resistance	100 MΩ/500 VDC (Between sensor input and analog output)
	Rated working voltage	300Vp-p (Between sensor input and analog output)
Cable		ANGHA-1.5

Warning

- To prevent electric shock, if the sensor is still in contact with the voltage application part even when the power is off, disconnect the sensor before setting the analog output cable and equipment.
- Do not touch the metal part or terminal part of the sensor cable or analog output cable during measurement.

* When measuring under the influence of high voltage and high frequency, there is a risk of electric shock and measurement failure, so please contact us.

* The sensor input and analog output are isolated, but they are connected by a capacitor to reduce output noise.

(Leakage current 0.5mA or less in AC500V withstand voltage test)

* About analog output

The indicated value is D/A-converted and outputted. The timing of an update is about 200 mS, and the output resolution is in the order of 1 mV.

* When not used, turn the analog output off (see instruction manual.)

Specifications (alarm output) HR-13*0 and HR-13*1

	Below lower limit	Within upper/lower limits	Above upper limit
ALM1 Upper limit	Open	Open	Close
ALM2 Lower limit	Close	Open	Open
Cable	ALMHA-1.5		

* The alarm output uses a photo MOS relay.

ON resistance (internal protection resistance 400Ω, photo MOS relay ON resistance 50Ω) Drive voltage MAX.25V

Specifications (power supply)

Model (HR-)	11*0	12*0	13*0	13*1	14*0	15*0
Batteries	4 x Alkaline AA battery (LR6)					
Battery life (continuous operation time)	About 900h	About 900h	About 600h	About 400h	About 300h	About 550h
Analog output (continuous output)	900h	900h	600h	About 20h	300h	550h
AC adaptor (optional) support			•	•		•

* When the AC adaptor is connected, the AC adaptor has priority as the power supply.

* When the AC adaptor is connected, the power can be turned on without pressing the POWER key. Therefore, the AC adaptor can be used as an external switch.

* The HR-15*0 has a built-in capacitor to maintain the clock settings. To recharge, please keep the batteries in the housing even when the product is being run by the AC adaptor.

* Lithium batteries are not used.

* AC adaptor (optional)

Type name: AD-100-500-HR-R (100 VAC input); AD-220-500-HR-R (220 VAC input)

Specifications (accessories)

Common	Instruction manual
	Test report
	Warranty sheet
	Soft case
	Hand strap
	4 x Alkaline AA battery (LR6)
HR-13*1	Analog output cable (ANGHA-1.5)
HR-13*0, 13*1	Alarm output cable (ALMHA-1.5)
HR-15*0	Communication cable (AM-USB2)
	Dedicated software (AMS-300)