JS-410

Platinum Resistance Thermometer based Psychrometer

Instruction Manual

Nippon Electric Instrument, Inc.

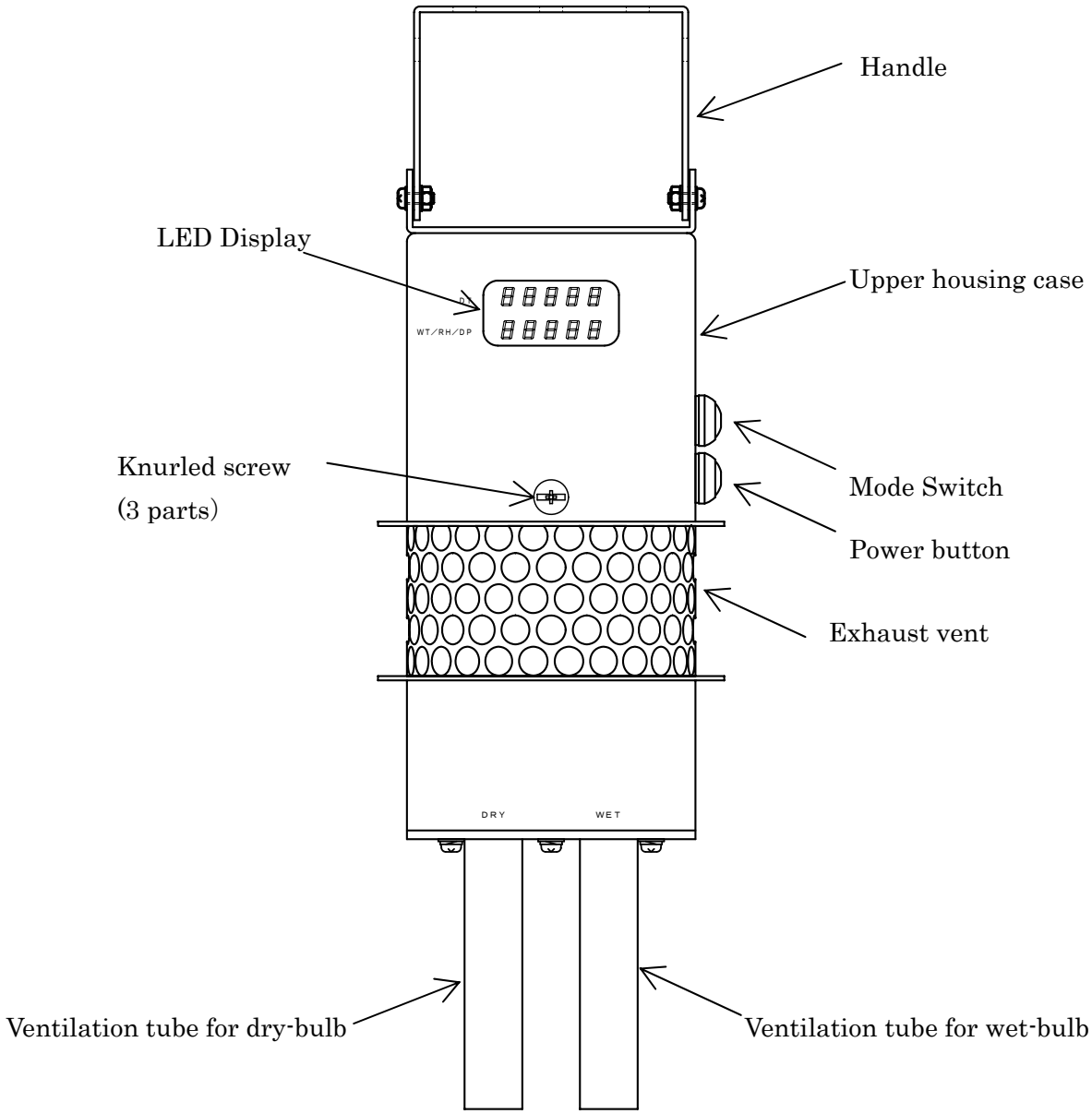
1. General description

JS-410 is an Assmann aspirated psychrometer that incorporates platinum electrical resistance (Pr100) for the temperature sensor featuring digital display that gives highly accurate readings of dry- and wet-bulb temperatures.

2. Features

- Each temperature sensor is calibrated accurately by microcomputer to ensure high-precision measurement.
- In addition to dry- and wet-bulb temperatures, it can display relative temperatures and dew- point temperatures, as well.
- Forced ventilation by sirocco fan keeps the instrument unaffected by any shift in wind direction.
- Measurement data can be stored on a microSD card.
- Stabilized power supply built in the circuit serves to ensure sufficient ventilation and measurement accuracy even low battery voltage conditions.

3. Part names

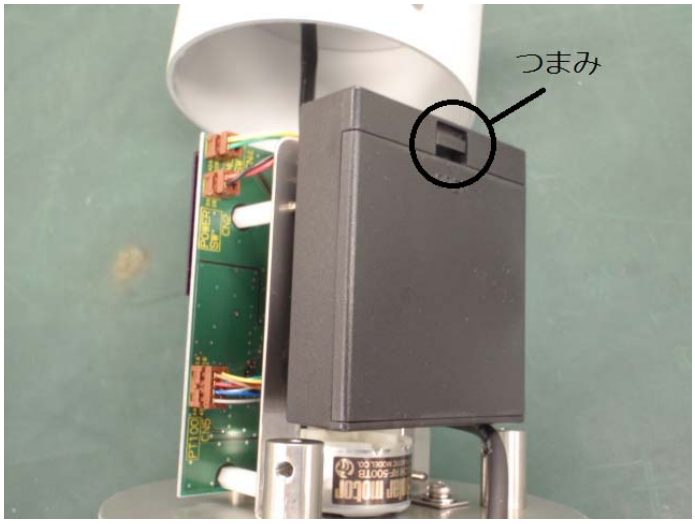


4. How to insert batteries

Batteries are not inserted at the time of shipping. Please take out the batteries from the carrying case and insert them into the battery compartment as described in the following instruction.

Remove 3 knurled screws from the upper housing case.

Remove the upper housing case upwards to access the battery case.
Press down and pull the knob to open the case cover.



Insert 4 AA(4 double A) alkaline batteries. When inserting the batteries, make sure they follow the correct polarities and touch the metal contacts. Avoid reversing the "+" and "–"polarities.

Close the battery cover and then slide back the upper housing case until it locks into place.

5. Observation procedure

Fill out the reservoir with clean water, such as purified water or distilled water.

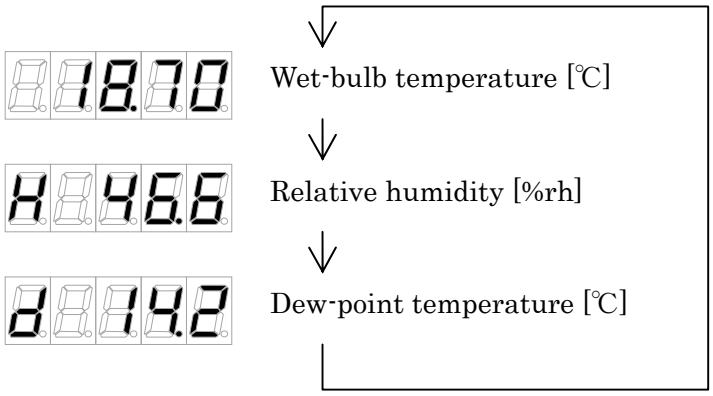
Suck up the water with the included syringe. Insert the tip of the syringe into the wet-bulb vent to moisten the wick that is fitting closely around the sensing element.

Hold down the power button until it turns on.

Dry-bulb temperatures will be shown in the upper column of the display screen, and wet-bulb temperatures in the lower column.

Wait until the dry- and wet- temperatures reach steady readings before measuring them.

By pressing MODE switch, lower line of the display will switch as shown below.



Press the power button again to turn off the power.

5.1. Error display

When the measurement value to be displayed exceeds the threshold of the display range, the display screen will flash while showing the upper or lower limit.

The display range of this instrument is summarized in the table below.

Dry-bulb and wet-bulb temperature	-40～60 ℃
Relative humidity	0～100%RH
Dew-point temperature	-50～60℃

When calculating relative humidity that exceeds 100%rh, the display will show 100.0%rh without flashing.

6. Maintenance

6.1. When the battery voltage drops

When the battery voltage drops, the decimal point will be flashing; however, it does not negatively affect the measurement itself.
When the voltage drops further to the point where correct measurement cannot be performed, the power supply will be turned off automatically.

Battery

JS-410 operates with either standard alkaline batteries, lithium dry batteries, or nickel hydride batteries (rechargeable).

*Alkaline batteries may degrade the performance at low temperatures and shorten battery life.

Replacing the battery

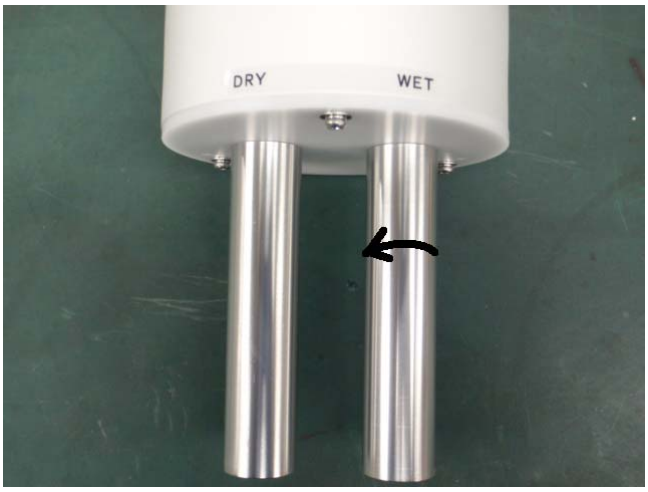
1. Remove 3 knurled screws to uncap the upper housing case.
2. Open the battery case cover to replace batteries.
3. Close the battery case cover and slide back the upper housing case until it locks into place.

Replacing the wet-bulb wick

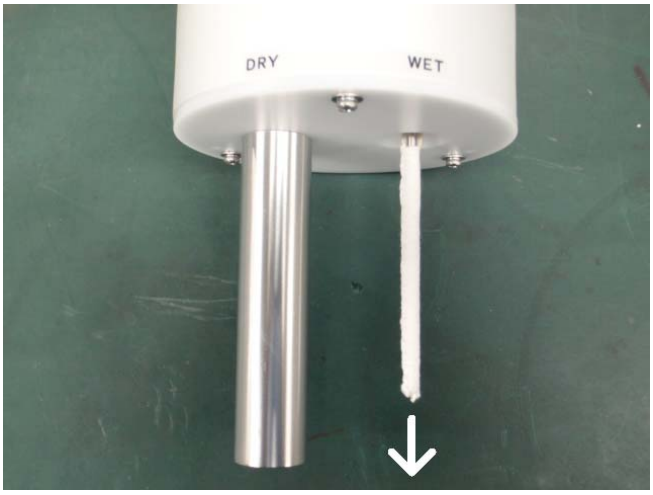
The wet-bulb wick needs to get replaced whenever it becomes dirty.
Please contact us or our distributor to place an order for spare wicks.
（Please refer to 'chapter 9 Specifications' for the model No.）

6.1.1. How to replace the wet-bulb wick

Looking at the ventilation tube covering the wet-bulb from the bottom, turn it counter clockwise until it comes off.



Remove the old wick by pulling it down.



Place a new wick over the sensor and put the ventilation tube back in place.

6.2. Others

- When the ventilation tube becomes dirty, please wipe it with dry cloth, etc.
- If abnormal noise occurs during energization, it could be attributed to motor failure. Please contact us or our distributor immediately.

7. microSD card

Measurement data can be saved on a microSD card.
The following types of card can be used.

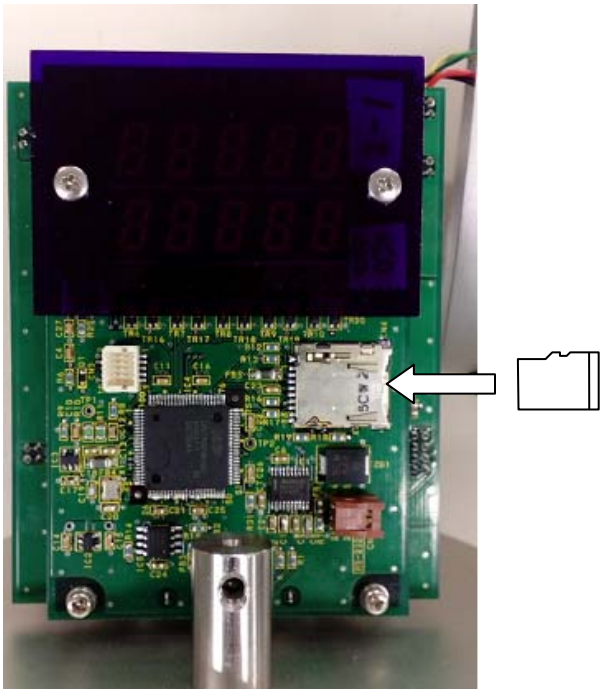
- microSD (2GB or smaller)
- microSDHC (4GB - 32GB)

* microSDXC card (64GB or bigger) cannot be used.

7.1. Inserting and removing the memory card

＊Make sure to turn off power before inserting or removing the microSD card.

Remove 3 knurled screws from the upper housing case to uncap the housing.
Insert the microSD card into the slot as shown in the photo below.



To remove the microSD card, press it inwards to release and partially eject it. Then slide it out of the slot.

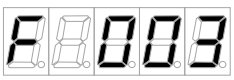
7.2. File name

A file is created with the file name XXX.txt (X is a single digit number from 0 to 9) in the root folder of the microSD card.

7.3. Generating filenames

When the power is turned on, the device starts searching for existing files in ascending order and checks if there are any untaken file numbers. Then it takes the lowest number available to create a file and writes to it. For example, if there are four files 000.txt, 001.txt, 003.txt, and 005.txt in the card, it will create 002.txt file to write to.

If the microSD card is full with files from 000.txt to 999.txt, the data will not be saved. Once the file is created, the following display will be shown for 1 second in the upper line on the display screen.



File named 003.txt is created.

7.4. File format

The measured value is saved at every 10 seconds interval.

The file format is as follows.

Item	Number of bytes	Format
Dry-bulb temperature	6	ddD.DD
Delimiter	1	,
Wet-bulb temperature	6	ddD.DD
Delimiter	1	,
Relative humidity	6	dddD.D
Delimiter	1	,
Dew-point temperature	5	ddD.D
End-of-line code	2	<CR><LF>

Symbol table

D	0~9
d	0~9 or space character (20H)
<CR>	Carriage return (13H)
<LF>	Line feed (10H)

Zero suppression is performed on the integer part.

Example:

26.63, 18.70, 46.6, 14.2*<CR><LF>*

7.5. File creation date and time

Since this instrument does not have a built-in watch, the file creation date and time (timestamp) will always be 00:00 on January 1, 2014.

8. Usage note

- Barometric pressure is required to obtain accurate relative humidity and dew-point temperature from dry- and wet-bulb temperature. Since this instrument is not equipped with an atmospheric pressure sensor, a slight error may occur as the result of assuming the pressure value to be 1013.25 hPa in the calculation. For example, when the actual atmospheric pressure is 990 hPa at the dry- and wet-bulb temperature of 20 °C and 15 °C respectively at, the relative humidity will be displayed at 0.7% rh higher than the actual humidity.

- The equation for obtaining relative humidity and dew-point temperature from dry- and wet-bulb temperature differs depending on whether or not the wet-bulb is covered with ice film. When the wet-bulb temperature is below 0 °C, the calculator assumes that the wet-bulb is frozen. In such a case, wait until ice film is formed on the wet-bulb before reading the measurement value.
- When correctly positioned in the right-side-up orientation, this instrument is designed to withstand a light rain shower but it is not completely waterproof.
- When there are a lot of files created on the microSD card, it may take some time to activate the instrument, but it is not malfunction.

9. Specifications

Measurement range	Dry- and wet-bulb temperature	-30~50℃
	Relative humidity	0~100%rh
Resolution capability	Dry- and wet-bulb temperature	0.01℃
	Relative humidity	0.1%rh
	Dew-point temperature	0.1℃
Measurement accuracy	±0.2℃	
Sensor	Pt100 （dry-bulb, wet-bulb） φ3.2mm	
Fan	Sirocco fan	
Ventilation direction	Horizontal omnidirectional（360°）	
Ventilation rate	4~6m/s	
Indicator	7segments LED display - 5 digits x 2 lines	
Display items	Upper line: dry-bulb temperature Lower line: wet-bulb temperature, relative humidity, and dew-point temperature	
Data refresh rate	1 second	
Power supply	AA alkaline battery × 4	
Battery life under normal operation	Approx. 7 hours （with the use of alkaline batteries and continuous operation under normal ambient temperatures）	
Measurement data storage	microSD card (not included with the package)	
Operational temperature range	-30~50℃	
IP code	IPX2 (liquid ingress rating – type II) *1	
Weight	Approx. 1.4 kg (including batteries)	
Accessories	Carrying case Syringe Water reservoir	

	Replacement wick 1 piece Alkaline batteries (included) Instruction manual
Accessories (optional items)	M04-1894 wick (10pieces/pack) M04-1895 syringe

*1. An acceptance criterion is defined as “not to be broken down.”

10. Psychrometric formulae

Vapor pressure is derived from dry- and wet-bulb temperatures using the SPRUNG formulae described in “JIS (Japanese Industrial Standard) Z8806:2001 Humidity - Measurement methods” (from hereafter referred to as just JIS)

The following values are taken from JIS and used as the psychrometer coefficient A in the SPRUNG equation.

When the wet-bulb is not frozen : 0.000 662 K^{-1}
When the wet-bulb is frozen: 0.000 583 K^{-1}

The wet-bulb can be assumed frozen when the wet-bulb temperature is below 0 ℃.

The atmospheric pressure is assumed to be 1013.25 hPa in the calculation.
Saturated water vapor pressure with respect to water or ice is derived from SONNTAG formula described in JIS.
The dew-point temperature is always obtained from the saturated vapor pressure of water. (It is not frost-point temperature.)

11. Exhibit list

Appearance diagram (External view) M01-7223z1