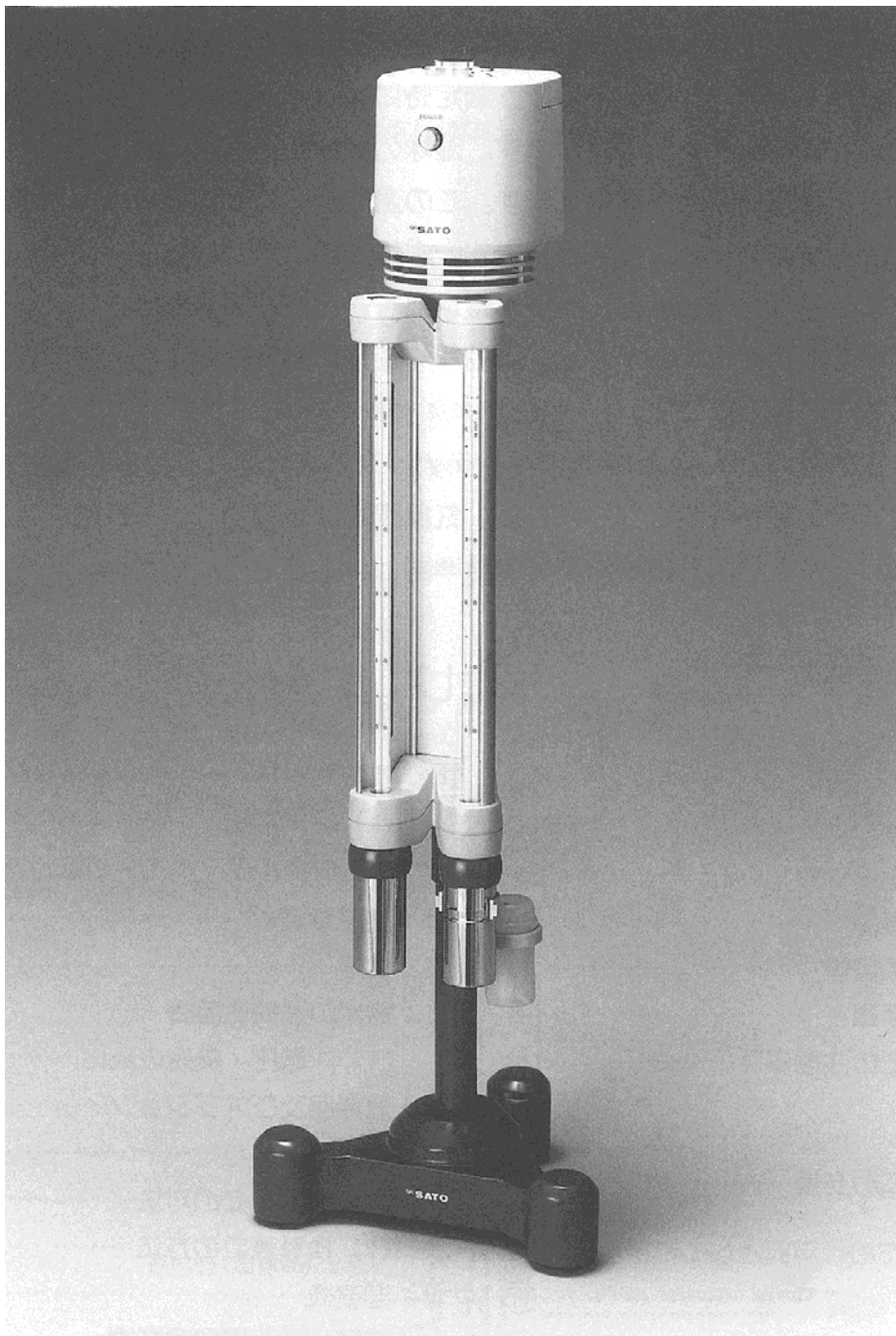


**No. 7450-00 Assmann Type Psychrometer
Model SK-RHG
Instruction Manual**



SATO KEIRYOKI MFG. CO., LTD.

Thank you for purchasing Assmann type psychrometer Model SK-RHG.

Read this manual thoroughly before using the SK-RHG. Keep the manual in a safe place for future references whenever necessary.

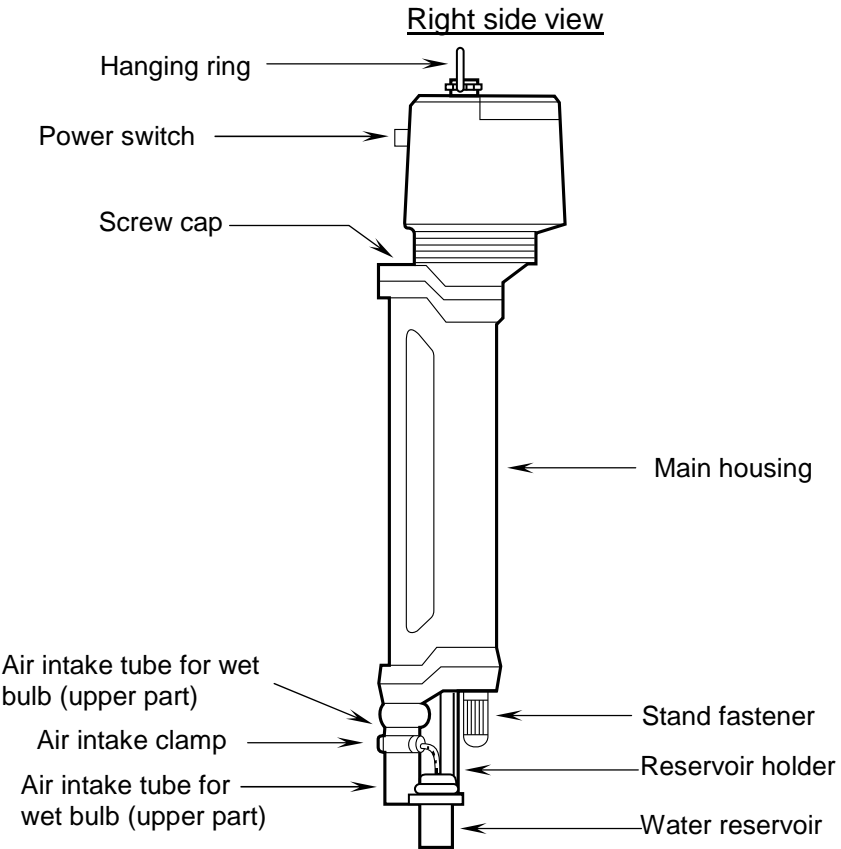
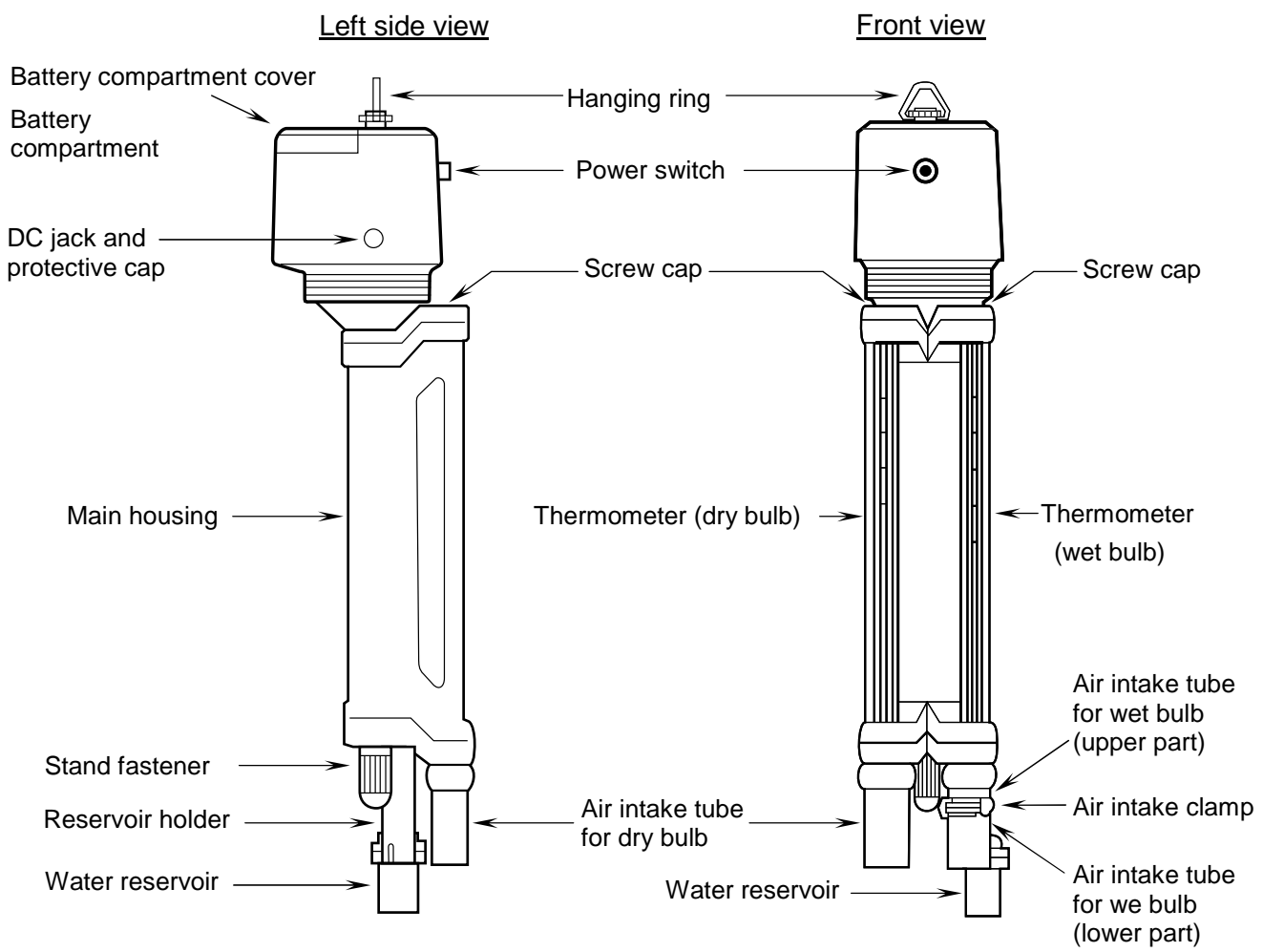
1. Descriptions

The SK-RHG is an aspirated psychrometer that it is said as the most stable measuring method for relative humidity.

Two glass thermometers are equipped in the body. The one whose bulb is covered with a wick is called as wet-bulb thermometer and another one is called dry-bulb thermometer. The temperatures that wet bulb and a dry bulb thermometer measure are different. Based on this difference between them, The Assmann psychrometer detects relative humidity (RH) using Sprung's formula to convert the temperature into a humidity reading.

You can use the Assmann psychrometer in any application where accurate relative humidity measurements are required, not only meteorological observation.

2. Names of Section



3. How to use

3-1 Preparation (Unpacking procedure)

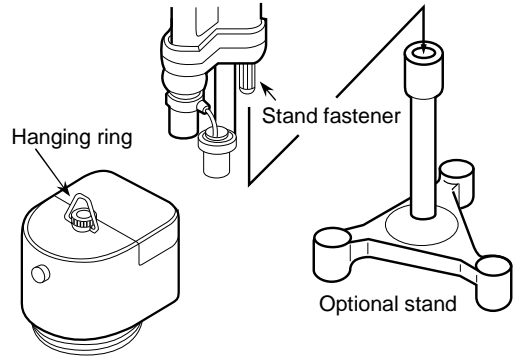
- 1) Open the carrying case
- 2) Check the appearance for the damages or scratches on the main unit and thermometers.
- 3) Check that you have all accessories referring to the manual

* If you find any damage or shortage, contact the dealer or our service network.

3-2 Installation of the main unit

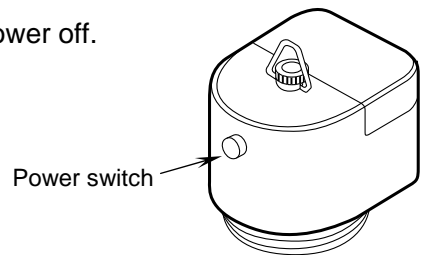
Mount the unit by using either the optional compact stand or the hanging ring on the top.

NB. Do not hold the unit in your hands while measuring.
Doing so may result in inaccurate measurement.
A tripod for hanging the unit is provided at option.



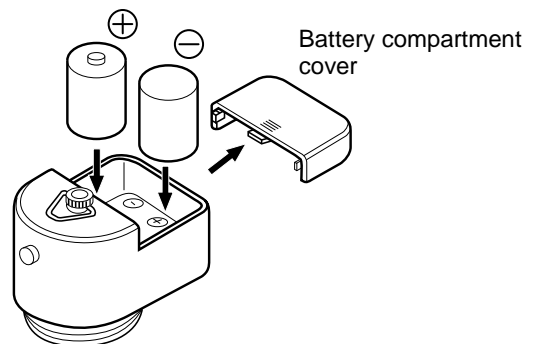
3-3 Operation procedure

- 1) Pressing the power switch to Black (OFF) to turn the power off.
(Black: OFF, Orange: ON)

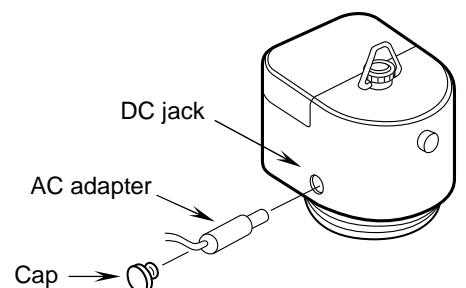


- 2) Loading batteries

Remove the lid of the battery compartment. While confirming each polarity (+) or (-) shown in the battery compartment, load 2 "D" sized batteries to the battery compartment. Then reinstall the battery lid.



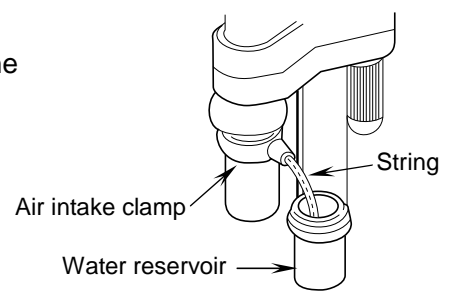
External power supply is also available.
Connect the supplied AC adapter to the DC jack on the left side of the head.



3) Setting the string

Carefully pull the string from the guide and place the string into the water reservoir.

NB. Thoroughly wash your hands or use forceps avoiding to adhering hand stains, salts and acids on the string or wick.

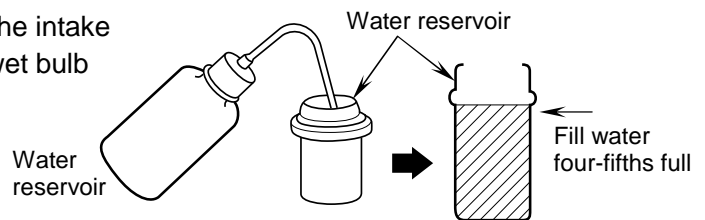


4) Pouring water

Fill the water reservoir to four-fifths with distilled water using the water bottle supplied.

NB. - Ordinary tap water should be avoided because it affects the accuracy of the measurements.

- Be sure that the inside of the air intake tube stays dry. Moisture on the walls of the intake tube will cause lower-than-normal wet bulb temperature.

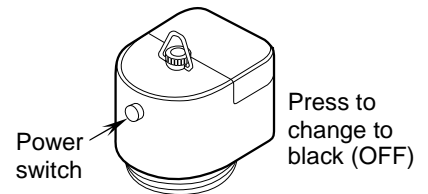


5) Start measurement

Place the power switch in ON position (switch turns to orange).

The ventilation fan will begin to turn.

NB: Warm up the unit for at least five minutes after it is turned on.

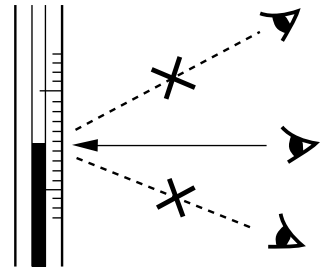


6) Measurement end

Turn off the unit by pressing the power switch (switch turns to black)

Cautions on measurement

- When you read the temperature, your eyes are (at right angle) level to the thermometer and the top of mercury or alcohol level.
- Do not bring your face too close to thermometer since the heat of your breath and body affects readings. Read temperature quickly so as not to get too close to the thermometer.
- Avoiding any possible reading error, read tens place first and then smaller places.
- Wick of the wet bulb will dry out quickly in high temperature/low humidity environment. Make sure to refill water to the water reservoir.
- It takes approx. 2 minutes in mercury-filled thermometer and approx. 5 minutes in alcohol-filled thermometer for the indicated value to stabilize.



4. Maintenance

4-1 Replacing the wick

- Maintaining the wet bulb

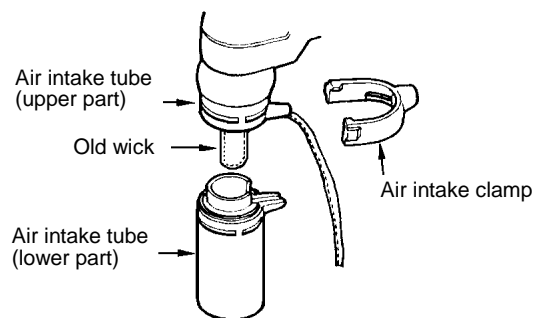
Before using the instrument, make sure the wick is free from dust and dirt. If it is dirty, replace the wick.

NB: * Replace wick and distilled water and clean the water reservoir once every seven days.

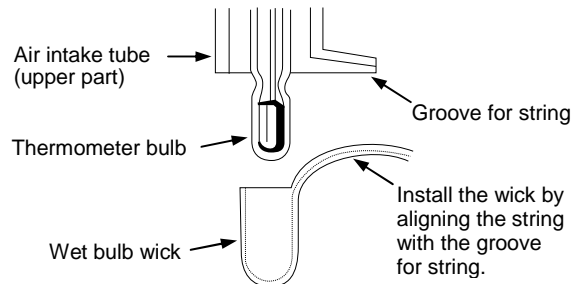
- * Be sure your hands are clean when replacing the wick.

- How to replace the wick

1) Pull horizontally the air intake clamp to remove and pull down the air intake tube.

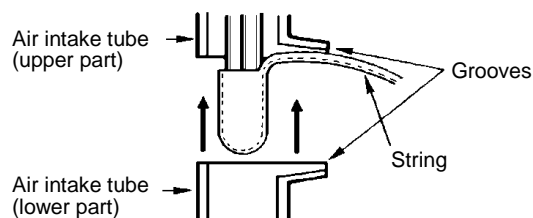


2) Pull down the old wick and clean the bulb of thermometer with clean, dry cloth.

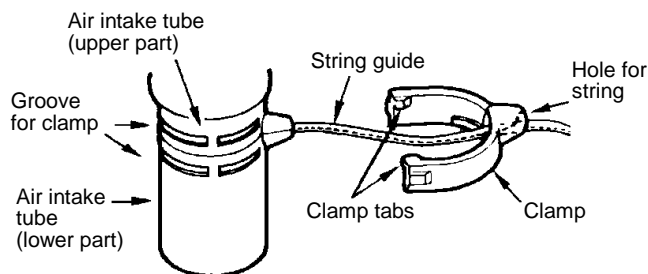


3) Use forceps to attach a wick to the bulb of thermometer

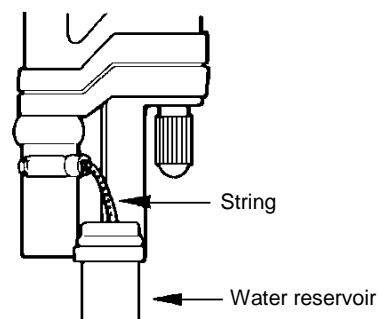
4) Don't let the string get stuck or caught between the housing and air intake tube, between the clamp and air intake tube or in the grooves.



5) Join the upper and lower sections of the air intake tube and lock with the clamp. Carefully connect the clamp tabs with the groove on the upper part of the air intake tube



6) Reattach the water reservoir to the reservoir holder, and place the string into the reservoir.

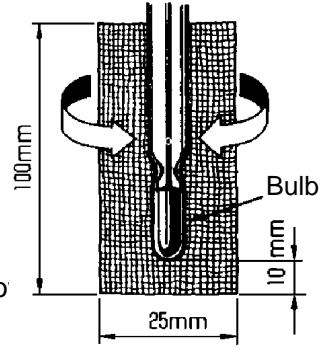


4-2 Using gauze as the wet bulb wick

Using gauze is an alternative to using the standard wicks when more accurate measurement is required at the state of lower than 25%RH.

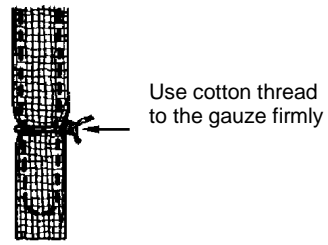
• How to replace gauze

- 1) Remove the old wick as shown in "Replacing the wick".
- 2) Use gauze and a thread made of cotton fiber.
We do not recommend a synthetic fiber. Boil the gauze and cotton thread in soapy water, rinse the materials with distilled water to remove soap residues and oils.

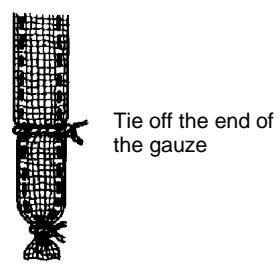


- 3) Cut a piece of gauze large enough to fit around the bulb (100 x 15 mm), and dampen it with distilled water. Extend the gauze about 10mm from the end of the bulb, and wind the gauze around the sensing part without making wrinkles.

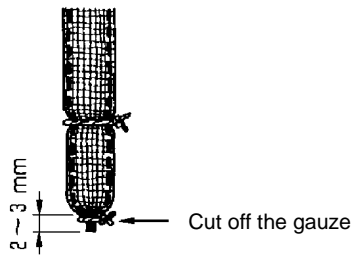
- 4) Use cotton thread to tie the gauze firmly above the bulb



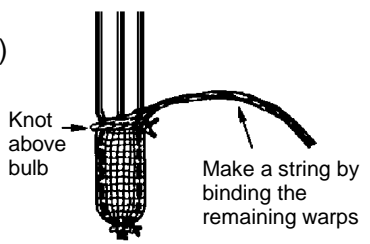
- 5) Tie of the end of the gauze with another piece of tread. The knot should be snug.



- 6) Cut off the gauze about 2 or 3 mm beyond the end of the bulb.



- 7) Carefully pull out and remove the horizontal threads (woofs) of gauze above the hollow of the bulb, leaving only the vertical strands (warps). Make a string by binding the remaining wraps of gauze.



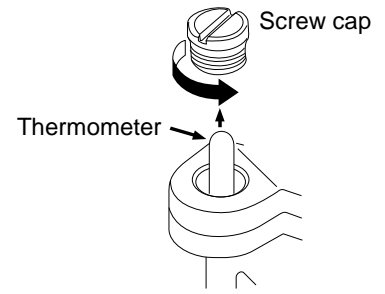
- 8) Follow steps (4) and (5) in "Replacing Wick". Replace the lower part of air intake pipe, clamp, water reservoir, and insert the string into the water reservoir.

4-3 Replacing thermometers

Note: The thermometer with a metal cap that is used with a traditional Assmann psychrometer is not usable. Be sure to use the dedicated thermometers for SK-RHG.

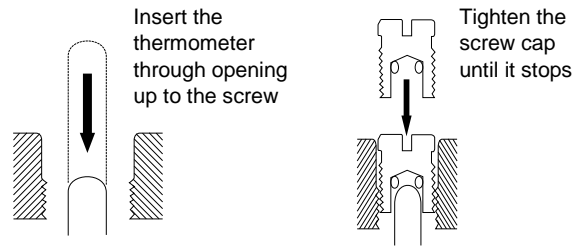
1) Removing the glass thermometers

Turn the screw cap counterclockwise with a screwdriver or coin.
Push the thermometer up through the opening and get it out.



2) Installing the glass thermometers

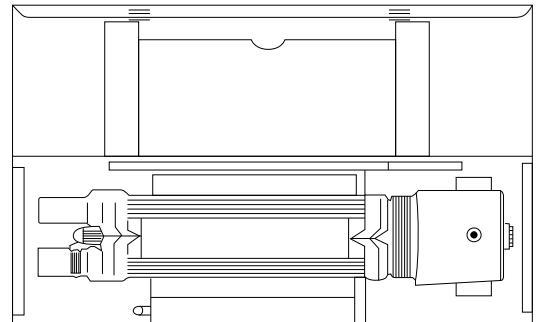
Insert a new glass thermometer down into the opening. Be sure the thermometer is all the way down and positioned correctly.
Tighten the screw cap until it stops.



5. Accessories

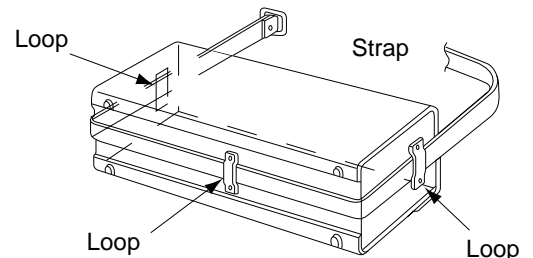
5-1 Storage method

When not using for a long time, store the SK-RHG Assmann psychrometer in the carrying as shown as the right figure. At this time, remove the batteries, the wick (or gauze) and water reservoir

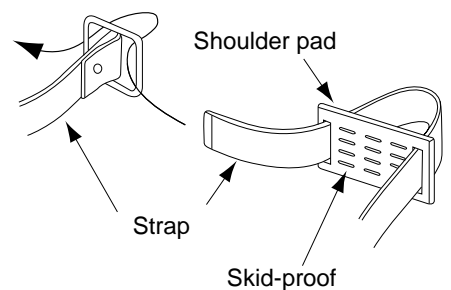


5-2 Setting the strap

(1) Pass the strap through the loops of the carrying case. Be sure to pass it through the bottom loop.

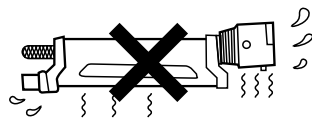


(2) Set the shoulder pad so that the skid-proof side will touch your shoulder.



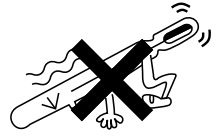
6. Cautions

- Do not throw or drop the SK-RHG since the main parts of SK-RHG is glass thermometers
- The humidity conversion chart for Aspirated psychrometer is cleared by using Sprung's formula. Do not use the chart other than Aspirated psychrometers
- When the wet becomes dirty, replace it immediately for accurate measurement
- Do not store or use the SK-RHG in a place where the environmental temperature exceeds the maximum temperature range of the thermometer.



In such a high temperature state, thermometer may break.

- Always place the SK-RHG so that the bulb of glass thermometer is not higher than horizontal. If so, the thread of mercury or liquid may break.



- Motor life

A small brush motor is used in SK-RHG. Be sure to turn off the power switch except measurement time. Unnecessary continued use accelerates brush attrition and shortens the life of the motor. The motor life is approx. 200 hours.

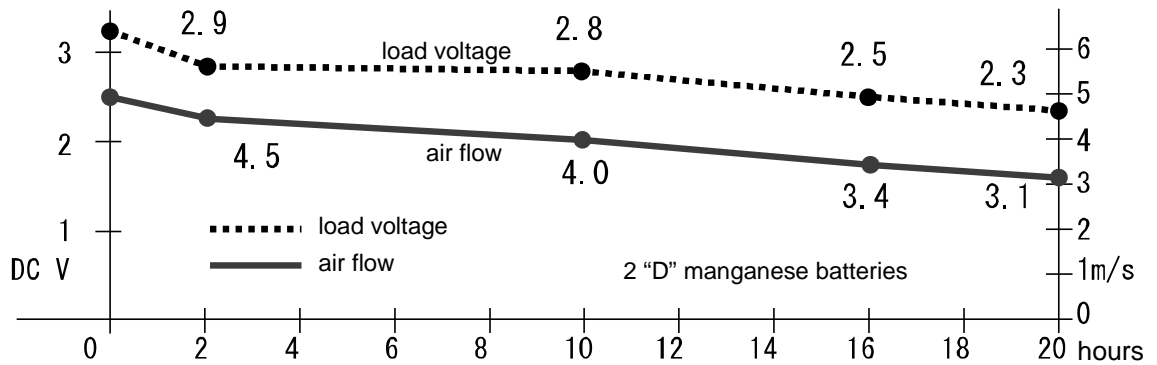
* Brushless motor is available at option.

7. Specifications

Product	Assmann type psychrometer (AC/DC type)	
Model	SK-RHG	
Cat. No.	7450-00	7450-20
Measuring Range	0 to 50.0°C	0 to 50.0°C
Thermometer	Mercury-filled dual tubing (Blue liquid)	Alcohol-filled dual tubing (Red liquid)
Min. graduation	0.2°C	0.2°C
Measurement Accuracy	within ±0.2°C	within ±0.2°C
Speed of airflow	3m/s to 5m/s	
Power Requirements	3VDC (2 "D" manganese batteries) or AC adapter	
Battery life	approx. 20 hours (in continuous use at 3m/s or more)	
Outer Dimensions	80 (W) × 450(H) × 110 (D) mm	
Weight	approx. 0.74kg (excluding the batteries)	
Standard Accessories	Wicks (20 pcs.), Humidity conversion rule, water supply bottle, test result for thermometers, dustproof cover, 2 "D" manganese batteries. carrying case	

8. Changes of voltage of battery and speed of air flow continuous use

- * To obtain accurate readings of humidity (%), operate in 3 to 5m/s of air flow and more than 2.2V load voltage.
- * This product is available to continuously use for 20 hours and when it is used 4 or 5 times per day with 15 min. interval, it is used for approx. two months



9. Consumables and optional accessories

* Thermometers (2 pcs./set with test result, length: 300mm)

No. 7450-50 Mercury-filled thermometer (Range: 0 to 50°C, div. 0.2°C)

No. 7450-60 Mercury-filled thermometer (Range: -30 to 50°C, div. 0.2°C)

No. 7450-67 Alcohol-filled thermometer (Range: 0 to 50°C, div. 0.2°C)

No. 7450-68 Alcohol-filled thermometer (Range: -30 to 50°C, div. 0.5°C)

* Others

No. 7450-30 Compact stand for SK-RHG exclusive use

No. 7450-40 Tripod

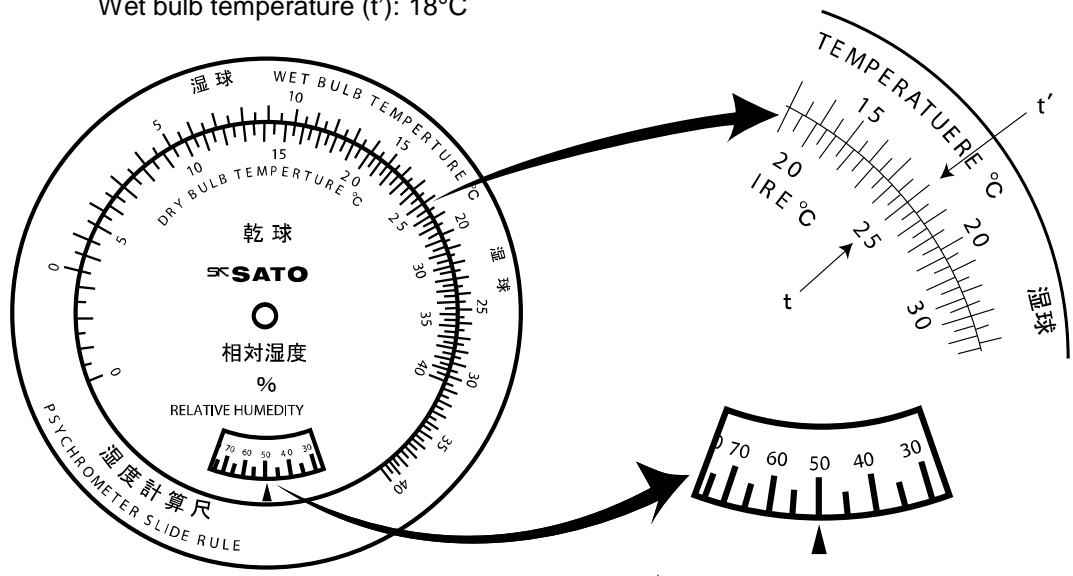
No. 7450-70 Wick for SK-RHG exclusive use (60 pcs. /box)

No. 7450-75 AC adapter in 100 to 240 VAC use

10. How to determine humidity

10-1 Use of humidity conversion rule

Example: Dry bulb temperature (t): 25°C
 Wet bulb temperature (t'): 18°C



The ▲ points 50, which means R. humidity is 50%

10-2 Use of humidity conversion chart

Example: Dry bulb temperature (t): 29°C
 Wet bulb temperature (t'): 27°C

- 1) The temperature difference (t°) between wet bulb (t') and the dry bulb (t) is 2°C
 $t - t' = t^\circ \quad (27^\circ\text{C} - 29^\circ\text{C} = 2^\circ\text{C})$
- 2) Refer to the humidity conversion chart
 - . Read t° cross the top of the chart to "2.0" which is the temperature difference.
 - . Read t' down the side of the chart to "29" which is the dry bulb temperature.
 - . The intersection of the column "2.0" and the row "29" shows "86", which means R. humidity is 86%.

t' \ t°		Temperature difference between the dry bulb (t) and the Wet bulb (t')																			
		0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.5	4.0	4.5	5.0
50	100	99																			
49	100	99	98	97	96	95	94														
48	100	99	98	97	96	95	93	92	91	90	89	88									
47	100	99	98	97	96	94	93	92	91	90	89	88	87	86	85	84					
46	100	99	98	97	96	94	93	92	91	90	89	88	87	86	85	84	82	80			
45	100	99	98	97	95	94	93	92	91	90	89	88	87	86	85	84	82	79	77	75	
29	100	98	97	96	94	93	91	90	89	88	86	85	84	82	81	80	77	74	72	69	
28	100	98	97	96	94	93	91	90	89	87	86	85	83	82	81	80	77	74	71	68	
27	100	98	97	95	94	93	91	90	98	97	86	84	83	82	81	79	76	73	71	68	
26	100	98	97	95	94	92	91	90	88	87	85	84	83	81	80	79	76	73	70	67	
25	100	98	97	95	94	92	91	89	88	86	85	84	82	81	80	78	75	72	69	67	

■ Chart 1 If wet bulb is ice-free at 1013 hPa

t °C	Temperature difference between the dry bulb (t) and the Wet bulb (t')																																							
	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0
50	100	99	98	97	96	95	94	92	91	90	89	88	87	86	85	84	82	80	77	75	73	71	68	66	64	62	60	58	56	54	53	51	49	47	45	44	42	41	39	37
49	100	99	98	97	96	95	93	92	91	90	89	88	87	86	85	84	82	79	77	75	72	70	68	66	64	62	60	58	56	54	52	50	48	47	45	43	42	40	38	37
48	100	99	98	97	96	94	93	92	91	90	89	88	87	86	85	84	82	79	77	74	72	70	68	65	63	61	59	57	55	53	51	50	48	46	44	43	41	39	38	36
47	100	99	98	97	96	94	93	92	91	90	89	88	87	86	85	84	81	79	76	74	72	69	67	65	63	61	59	57	55	53	51	49	47	45	44	42	40	39	37	35
46	100	99	98	97	95	94	93	92	91	90	89	88	87	86	85	84	81	79	76	74	71	69	67	65	62	60	58	56	54	52	50	48	47	45	43	41	40	38	36	35
45	100	99	98	97	95	94	93	92	91	90	89	88	87	86	85	83	81	78	76	73	71	69	66	64	62	60	58	56	54	52	50	48	46	44	42	41	39	37	35	34
44	100	99	98	96	95	94	93	92	91	90	89	88	86	85	84	83	81	78	76	73	71	68	66	64	62	60	57	55	53	51	49	47	45	43	42	40	38	36	35	33
43	100	99	98	96	95	94	93	92	91	90	88	87	86	85	84	83	80	78	75	73	70	68	66	63	61	59	57	55	52	50	48	46	45	43	41	39	37	35	34	32
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41	100	99	98	96	95	94	93	92	90	89	88	87	86	85	84	83	80	77	75	72	70	67	65	62	60	58	56	53	51	49	47	45	43	41	39	37	36	34	32	30
40	100	99	98	96	95	94	93	92	90	89	88	87	86	85	83	82	80	77	74	72	69	67	64	62	59	57	55	53	51	48	46	44	42	40	38	37	35	33	31	29
39	100	99	97	96	95	94	93	91	90	89	88	87	86	84	83	82	79	77	74	71	69	66	64	61	59	57	54	52	50	48	46	44	41	39	38	36	34	32	30	28
38	100	99	97	96	95	94	92	91	90	89	88	86	85	84	83	82	79	76	74	71	68	66	63	61	58	56	54	51	49	47	45	43	41	39	37	35	33	31	29	27
37	100	99	97	96	95	94	92	91	90	89	87	86	85	84	83	82	79	76	73	70	68	65	63	60	58	55	53	51	48	46	44	42	40	38	36	34	32	30	28	26
36	100	99	97	96	95	94	92	91	90	89	87	86	85	84	82	81	78	76	73	70	67	65	62	60	57	55	52	50	48	45	43	41	39	37	35	33	31	29	27	25
35	100	99	97	96	95	93	92	91	90	88	87	86	85	83	82	81	78	75	72	69	67	64	61	59	56	54	51	49	47	44	42	40	38	36	34	32	29	28	26	24
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33	100	99	97	96	95	93	92	91	89	88	87	85	84	83	82	80	77	74	71	68	66	63	60	57	55	52	50	47	45	43	40	38	36	33	31	29	27	25	23	21
32	100	99	97	96	94	93	92	90	89	88	86	85	84	83	81	80	77	74	71	68	65	62	59	57	54	51	49	46	44	41	39	37	34	32	30	28	26	24	22	20
31	100	99	97	96	94	93	92	90	89	88	86	85	84	82	81	80	76	73	70	67	64	62	59	56	53	51	48	45	43	40	38	36	33	31	29	27	24	22	20	18
30	100	99	97	96	94	93	91	90	89	87	86	85	83	82	81	79	76	73	70	67	64	62	58	55	52	50	47	44	42	39	37	34	32	30	27	25	23	21	19	16
29	100	99	97	96	94	93	91	90	88	87	86	84	83	82	80	79	76	72	69	66	63	60	57	54	51	49	46	43	41	38	36	33	31	28	26	24	21	19	17	15
28	100	98	97	95	94	93	91	90	88	87	85	84	83	81	80	78	75	72	69	65	62	59	56	53	50	48	45	42	39	37	34	32	29	27	24	22	20	17	15	13
27	100	98	97	95	94	92	91	89	88	87	85	84	82	81	79	78	75	71	68	65	62	58	55	52	49	47	44	41	38	36	33	30	28	25	23	20	18	16	13	11
26	100	98	97	95	94	92	91	89	88	86	85	83	82	80	79	78	74	71	67	64	61	58	54	51	48	45	43	40	37	34	31	29	26	24	21	19	16	14	11	
25	100	98	97	95	94	92	91	89	87	86	84	83	81	80	79	77	74	70	67	63	60	57	53	50	47	44	41	38	35	33	30	27	24	22	19	17	14	12		
24	100	98	97	95	93	92	90	89	87	86	84	83	81	80	78	77	73	69	66	62	59	56	52	49	46	43	40	37	34	31	28	25	23	20	17	15	12	10		
23	100	98	97	95	93	92	90	88	87	85	84	82	81	79	78	76	72	69	65	62	58	55	51	48	45	42	38	35	32	29	27	24	21	18	15	13	10			
22	100	98	97	95	93	92	90	88	87	85	83	82	80	79	77	75	72	68	64	61	57	54	50	47	43	40	37	34	31	28	25	22	19	16	13	10				
21	100	98	96	95	93	91	90	88	86	85	83	81	80	78	76	75	71	67	63	60	56	52	49	45	42	39	35	32	29	26	23	20	17	14	11					
20	100	98	96	95	93	91	89	88	86	84	83	81	79	78	76	74	70	66	62	59	55	51	48	44	40	37	34	30	27	24	21	18	14	11						
19	100	98	96	94	93	91	89	87	86	84	82	80	79	77	75	74	69	65	61	57	54	50	46	42	39	35	32	28	25	22	18	15	12	10						
18	100	98	96	94	92	91	89	87	85	83	82	80	78	76	75	73	69	64	60	56	52	48	45	41	37	33	30	26	23	19	16	13	10							
17	100	98	96	94	92	90	88	87	85	83	81	79	77	76	74	72	68	63	59	55	51	47	43	39	35	32	28	24	21	17	14	11								
16	100	98	96	94	92	90	88	86	84	82	81	79	77	75	73	71	67	62	58	54	50	45	41	37	33	29	26	22	18	15	11									
15	100	98	96	94	92	90	88	86	84	82	80	78	76	74	72	70	66	61	57	52	48	44	40	35	31	27	23	19	16	12										
14	100	98	96	94	92	89	87	85	83	81	79	77	75	73	71	70	65	60	55	51	46	42	38	33	29	25	21	17	13											
13	100	98	96	93	91	89	87	85	83	81	79	77	75	73	71	69	64	59	54	49	45	40	36	31	27	22	18	14	10											
12	100	98	95	93	91	89	87	84	82	80	78	76	74	72	70	68	62	57	52	48	43	38	33	29	24	20	15	11												
11	100	98	95	93	91	88	86	84	82	79	77	75	73	71	69	66	61	56	51	46	41	36	31	26	22	17	12													
10	100	98	95	93	90	88	86	83	81	79	76	74	72	70	67	65	60	54	49	44	39	33	28	23	19	14														
9	100	97	95	93	90	88	85	83	80	78	76	73	71	69	66	64	58	53	47	42	36	31	26	21	16	10														
8	100	97	95	92	90	87	85	82	80	77	75	72	70	67	65	63	57	51	45	39	34	28	23	17	12															
7	100	97	95	92	89	87	84	81	79	76	74	71	69	66	64	61	55	49	43	37	31	25	20	14																
6	100	97	94	92	89	86	83	81	78	75	73	70	67	65	62	60	53	47	41	34	28	22	16	11																
5	100																																							

■ Chart 2 If wet bulb is ice at 1013 hPa

t °	Temperature difference between the dry bulb (t) and the Wet bulb (t')																			
	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.5	4.0	4.5	5.0
5																				36
4																		46	39	33
3																57	50	43	36	29
2										70	67	64	61	58	55	52	47	40	33	26
1					84	81	77	74	71	68	64	61	58	55	52	44	36	29	22	
0	100	96	93	89	86	82	79	76	72	69	65	62	59	55	52	49	41	33	25	17
-1	99	95	92	88	84	81	77	74	70	66	63	60	56	53	49	46	37	29	21	13
-2	98	94	90	87	83	79	75	72	68	64	60	57	53	50	46	43	34	25	17	
-3	97	93	89	85	81	77	73	69	66	62	58	54	50	47	43	39	30	21	12	
-4	96	92	88	84	79	75	71	67	63	59	55	51	47	43	39	35	26	16		
-5	95	91	86	82	78	73	69	65	61	56	52	48	44	40	36	31	21	11		
-6	94	90	85	80	76	71	67	62	58	53	49	45	40	36	32	27	17			
-7	93	89	84	79	74	69	65	60	55	50	46	41	37	32	27	23	12			
-8	92	87	82	77	72	67	62	57	52	47	42	37	33	28	23	18				
-9	92	86	81	75	70	65	59	54	49	44	39	33	28	23	18	13				
-10	91	85	79	74	68	62	57	51	46	40	35	29	24	18	13					
-11	90	84	78	72	66	60	54	48	42	36	30	25	19	13						
-12	89	83	76	70	63	57	51	44	38	32	26	20	13							
-13	88	81	74	68	61	54	47	41	34	28	21	14								
-14	87	80	73	65	58	51	44	37	30	23	16									
-15	86	79	71	63	56	48	40	33	25	17	10									
-16	86	77	69	61	53	44	36	28	20	12										
-17	85	76	67	58	49	41	32	23	14											
-18	84	74	65	55	46	37	27	18												
-19	83	73	63	52	42	32	22	12												
-20	82	71	60	49	38	28	17													
-21	81	70	58	46	34	23	11													
-22	81	68	55	42	30	17														
-23	80	66	52	39	25	11														
-24	79	64	49	34	20															
-25	78	62	46	30	14															
-26	77	60	42	25																
-27	77	58	39	20																
-28	76	55	34	14																
-29	75	53	30																	
-30	74	50	25																	

Psychrometer formula : Sprung' formula
 Psychrometer coefficient : 0.000 583K³
 Saturated vapor pressure against water : Sonntag's formula

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