

**Instruction manual**  
**for**  
**No. 6427-00 Desktop Type pH Meter**  
**Model SK-650PH**

**SATO KEIRYOKI MFG. CO., LTD.**

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URL: <http://www.sksato.co.jp/english/>

## **Introduction**

Thank you for purchasing the desktop type pH meter Model SK-650PH.

- This pH meter is designed to measure hydrogen ion concentration (pH) and temperature (liquid temperature). Do not use this instrument for any other purposes.
- Read this instruction manual thoroughly before use and keep the manual in a safe place for future references.



### **Warnings**

The SK-650PH is not explosion-proof. Never use it for flammable materials.



### **DANGER RISK OF EXPLOSION**

- For any other inquiries, contact the store where you purchased the instrument or our service network.



### **Precautions in use**

For proper use of the SK-650PH, be sure to observe the followings:

- This is a precision instrument. Be careful not to drop or knock it.
- The operating temperature range for this instrument is 5 to 40°C and a relative humidity is less than 95%. Operating this product outside the temperature range may result in unit malfunctions.
- Avoid using this unit in a place exposed to direct sunlight or near a heat source. Otherwise, the case may become deformed or malfunction may be caused.
- If this instrument is left in a car in the hot summer sun, it will become extremely hot and may malfunction. Do not leave the unit in such a place.
- If this unit is used in an environment where electrical noise is generated, the display may become unstable or the measurement error may increase.
- Never disassemble or modify the unit. Doing so may cause malfunctions.
- Do not wash or wipe this unit with alcohol, thinner, or other solvents. If the unit becomes dirty, wipe it with a tightly-wrung towel or the like that has been dipped in warm water with a neutral detergent.
- If the pH standard solution contacts the skin (hand), immediately wash the contaminated skin with running water. If the solution gets into the eyes, immediately rinse with water and consult a doctor.
- Keep the pH standard solution out of reach of children. If accidentally ingested, consult a doctor immediately.

## **Overview**

The SK-650PH pH meter is a desktop type pH meter having a sensitivity display function that can check the deterioration state of sensor. Sensor arm that is convenient to use stirrer is equipped.

## **Features**

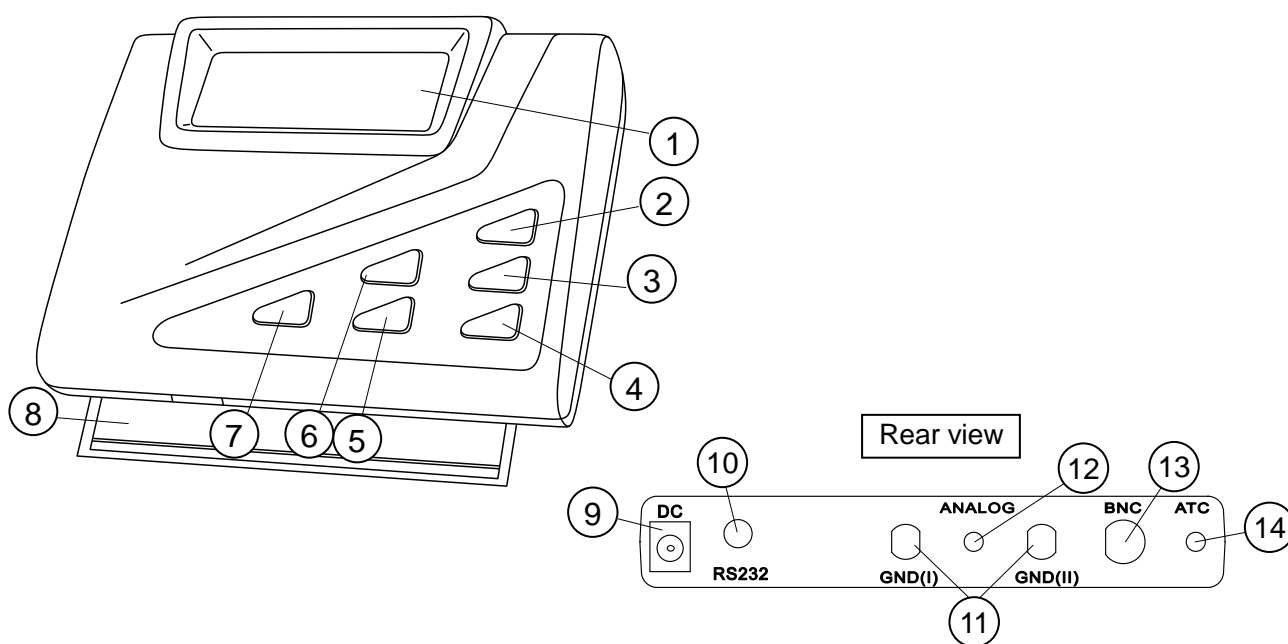
- **Sensitivity display function**  
Sensitivity display function can check the deterioration state of sensor. This is very useful to determine the timing of the maintenance and exchange of sensor.
- **Stability display function**  
Easily find the measuring values are stabilized
- **Auto temperature compensation**  
Automatic temperature compensation can produce more accurate pH measurements.
- **Measured value, date and time are simultaneously displayed**
- **Calibration at one to three levels can be done**  
Selectable calibration point (at 25°C) among 4.01, 6.86 and 9.18 or 10.01
- **Data recording function**  
The recording capacity is max. 99 data
- **Measured value can be transmitted to a computer**  
RS-232C transmission is a standard equipment (RS-232C cable is provided at option)
- **Auto Power-Off**  
The "auto power-off" function turns off the unit 20 minutes after the power is turned on. This conserves battery life if you forget to turn off the unit.
- **Sensor arm is equipped**  
Convenient for the use of stirrer or like
- **Various electrodes are provided**  
Wide applications are available

## **Before use**


Check that the unit has not damaged during transportation. If damaged, please contact the shop you purchased or our service network.

## Components names and functions


### 1. Main unit





(1) Display: Displays measured values or the status of the unit.  
For details, refer to "LCD"


(2) : Key used to switch between the pH and mV displays. Also used to change the values in the various setting modes.

(3) : Key used to record data on the unit. Also used to change the values in the various setting modes.

(4) : Key used to confirm the values set in the various setting modes. Also used to switch to the MAX/MIN function while the recorded data is displayed.

(5) : Key used to hold the measured values. Also used to retrieve the data recorded on the unit.

(6) : Key used to switch to the calibration mode.  
Also used to return to the measurement mode from the various setting modes.

(7) : Key used to turn on or off the unit. Also used to switch to the various setting modes.

(8) Memo drawer: Can be used to hold memos on measurement information or operation procedures.

(9) DC : Port used to connect the AC adapter.

(10) RS232C : Port used to connect RS-232C cable

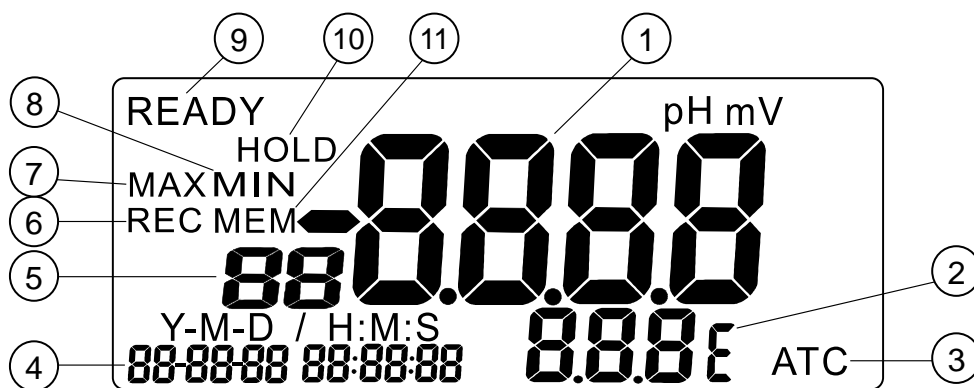
(11) GND ( I ) : Port for earth  
GND ( II )

(12) ANALOG : Port to output electromotive of pH sensor

(13) BNC : Port used to connect pH sensor

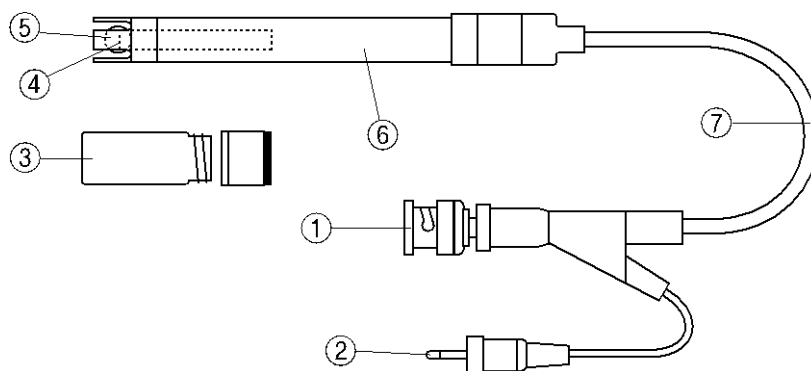
(14) ATC : Port used to connect temperature sensor

## 2. LCD



- (1) Display of pH or mV : Displays pH values or mV values.
- (2) Display of temperature : Displays temperature values or temperature setting values
- (3) ATC : Lights up when the temperature sensor is connected.
- (4) Display of clock : Year, month, date and time are displayed
- (5) Number of stored data : Indicates the numbers of stored data
- (6) REC : Lights up when the stored data are displayed.
- (7) MAX : Lights up when the maximum value is displayed.
- (8) MIN : Lights up when the minimum value is displayed.
- (9) READY : Lights up when the measured value is stable
- (10) HOLD : Lights up when the measured value has been held
- (11) MEM : Lights us when the measured value are being logged.

## 3. Sensor section (PHP-31 sensor probe: option)



- (1) pH sensor connection plug : This product uses the BNC connector
- (2) Temperature sensor connection plug: This product uses the ATC plug
- (3) Glass electrode protection bottle : Contains the phthalate pH standard solution (set at the factory)
- (4) Liquid junction
- (5) Glass electrode
- (6) Electrode holding tube
- (7) Sensor cable

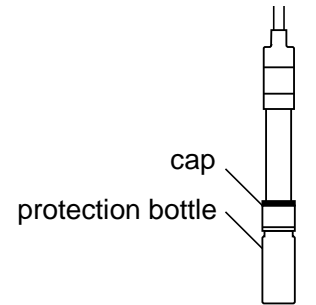
## **Before Measurement**

### **1. Preparation of pH sensor (3 IN 1 Model PHP-31)**

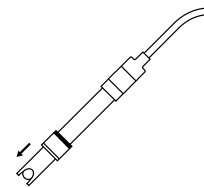
To prevent the glass electrode from becoming dry, the PHP-31 sensor probe is equipped with a glass electrode protection bottle which contains the phthalate pH standard solution. Remove the protection bottle before measuring. Reinstall the protection bottle after measurement.

- Removing the glass electrode protection bottle

- (1) Hold the sensor probe upright so as not to spill the standard solution in the protection bottle. Turn the protection bottle counterclockwise while pressing the cap.

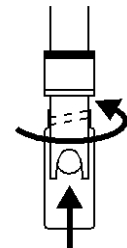


- (2) Slide the cap to take it out from the sensor probe as shown in the figure on the right.



- Installing the glass electrode protection bottle

- (1) Install the protection bottle to the sensor probe in the reverse order of removal.
- (2) Hold the sensor probe upright so as not to spill the standard solution in the protection bottle. Turn the protection bottle clockwise while pressing the cap.
- (3) After installing the protection bottle, push in the sensor probe until its tip hits the bottom of the protection bottle.



Note: \* When installing or removing the glass electrode protection bottle, pay attention not to spill the standard solution in the bottle. If the standard solution comes in contact with the skin (hand), immediately wash the contaminated skin with running water.  
If the solution gets into the eyes, immediately rinse with water and consult a doctor.

\* If the standard solution in the bottle is spilled, replenish the bottle with the phthalate pH standard solution to protect the glass electrode from becoming dry. Adding distilled water, pure water or tap water before storing is recommended.

### **2. Connection**

- Connecting the sensor to the unit

- (1) Connect the pH connector of the sensor to the BNC port on the back of the unit.  
Be sure to insert the connector with its holes aligned with the BNC terminal pins.
- (2) Plug the temperature connector of the sensor into the ATC port on the back of the unit.

- Connecting the AC adapter

Plug the AC adapter into the DC port on the back of the unit.



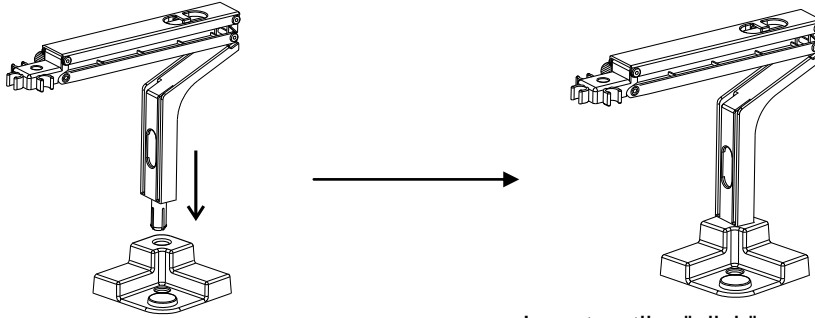
#### **Caution**

- \* Do not connect the AC adaptor with wet hands or in a place exposed to water splashes. Doing so is dangerous, as it could cause electrical shock.
- \* Be sure to use the dedicated AC adapter for the SK-650PH.

### 3. Setting up the sensor arm

To use the sensor arm, follow the setup procedure described below.

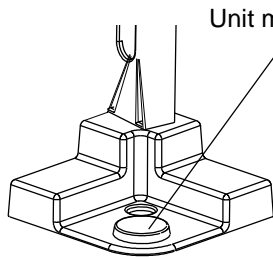
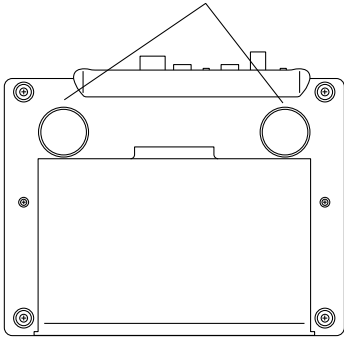
(1) Assemble the sensor arm as shown in the figure below.



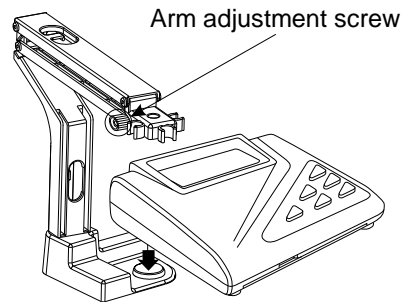
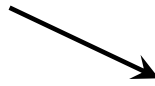
Insert until a "click" sound is heard.

(2) Install the sensor arm on the unit as shown in the figure below.

Sensor arm mounting positions on the unit  
(The sensor arm can be installed on either side.)



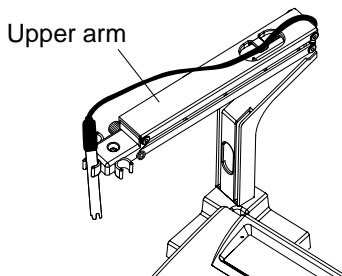
Unit mounting position on the sensor arm



Arm adjustment screw

Install the sensor arm by aligning its mounting position with the unit mounting position as shown in the figure on the right.

(3) Install the sensor on the arm as shown in the figure below.



Upper arm

#### 4. Temperature compensation function

The SK-650PH is equipped with two types of temperature compensation.

##### 1. Automatic temperature compensation (ATC)

: The sample temperature is measured by the temperature sensor included in the pH sensor, and is automatically compensated.

\* Once the temperature connector of the pH sensor is plugged into the unit, the ATC indicator lights up to indicate that the automatic temperature compensation is available.

##### 2. Manual temperature compensation (MTC)

: The temperature of the solution under measurement is manually set for temperature compensation.

##### • How to operate Manual temperature compensation (procedure)

##### (1) Remove the temperature connector of the pH sensor from the unit.

The ATC indicator goes out to indicate that the manual temperature compensation is available.

##### (2) Press and hold the key for at least two seconds in the measurement mode.

The CAL indicator starts flashing to indicate that the manual temperature setting is available.

Default value : 25.0°C

Manual setting range : -5.0 to 80.0°C

##### (3) Press either the or key to set the desired temperature, and then press the key to confirm. The unit returns to the measurement mode and the temperature value that was just set appears.

#### 5. Calibration

For more accurate measurement, calibration of about once a day is recommended.

Prepare the following items for calibrating the SK-650PH

##### . Standard Solutions

Item	Standard Solution	pH value at 25°C
pH 4	phthalate solution	pH 4.01
pH 7	neutral phosphate solution	pH 6.86
pH 9 or pH 10	carbonate solution or borate	pH 9.18 or pH10.1

. Distilled water, pure water or tap water

. Four beakers (each beaker to contain one type of standard solution or water (distilled, pure or tap water))

To ensure accuracy, perform calibration at the same temperature as the material to be measured. The pH standard solution bottle which comes with the instrument can be used as a substitute for a beaker.

##### ● About the calibration point

The calibration point in the SK-650PH can be selected based on the usage of the unit. Conduct the calibration referring to the following information.

. 3-point calibration: Should be used when the pH property of the sample solution is unknown.

. 2-point calibration:

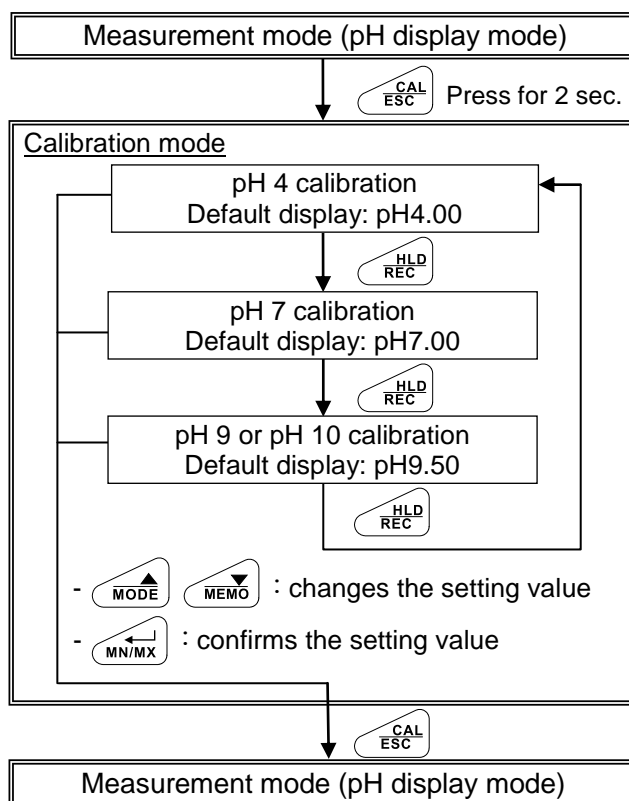
When the pH property (acidic or alkaline) of the sample is predetermined, use the following two points: For acidic samples: pH 4 and pH 7

For alkaline samples: pH 7 and, pH 9 or pH10

. 1-point calibration: Use a pH standard solution close to the expected value of the sample solution.



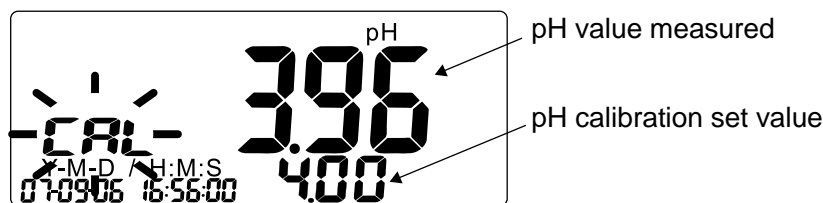
● How to calibrate the SK-650PH



- (1) Press the key to turn on the unit, and then press the key to change to the pH display mode.
- (2) Remove the glass electrode protection bottle, and then thoroughly wash the glass electrode with water (distilled, pure or tap water). After washing, use clean filter paper, cotton swabs or tissue paper to absorb the water on the glass electrode.

Note: When washing the glass electrode, be careful not to rub it. Doing so could generate static electricity resulting in unstable pH readings.

- (3) Press and hold the key for at least two seconds to cause the CAL indicator to flash and to proceed to the calibration mode.



- (4) Press the key to select the calibration point.
- (5) Immerse the glass electrode into the selected pH standard solution until the liquid junction is submerged, and wait until the pH reading becomes stable.

When the stability indication function is on, the READY indicator lights up once the pH reading becomes stable. For details on the stability indication function, refer to "Stability indication function"

- (6) Press either the or key to set the pH calibration value to the value of the standard solution, and then press the key to confirm.

\* To ensure accuracy, perform calibration at the same temperature as the material to be measured.




- Setting range of calibration

Value	Default	Setting range
pH4	pH4.00	pH3.00 to 5.00
pH7	pH7.00	pH6.00 to 8.00
pH9 or pH10	pH9.50	pH8.50 to 10.5


- Relations of pH and Temperature

Standard	Solution	Liquid Temp.	pH	Liquid Temp.	pH	Liquid Temp.	pH
pH4	Phthalate solution	0°C	4.00	20°C	4.00	40°C	4.04
		5°C	4.00	25°C	4.01	45°C	4.05
		10°C	4.00	30°C	4.02	50°C	4.06
		15°C	4.00	35°C	4.02	-	-
pH7	Natural phosphate solution	0°C	6.98	20°C	6.88	40°C	6.84
		5°C	6.95	25°C	6.86	45°C	6.83
		10°C	6.92	30°C	6.85	50°C	6.83
		15°C	6.90	35°C	6.84	-	-
pH9	Borate solution	0°C	9.46	20°C	9.22	40°C	9.07
		5°C	9.40	25°C	9.18	45°C	9.04
		10°C	9.33	30°C	9.14	50°C	9.01
		15°C	9.28	35°C	9.10	-	-
pH10	Carbonate solution	0°C	10.32	20°C	10.06	40°C	9.89
		5°C	10.24	25°C	10.01	45°C	9.86
		10°C	10.18	30°C	9.97	50°C	9.83
		15°C	10.12	35°C	9.92	-	-

JIS Z 8802-1984 (2006)

- (7) Wash the glass electrode with water (distilled, pure or tap water).
- (8) To continue performing calibration with another point, press the  key to select the calibration point, and then follow the steps from (5) above.
- (9) Upon completion of calibration, press the  key to end the calibration mode. The unit returns to the measurement mode.
- (10) Press the  key to turn off the unit.  
Note that the calibration set value is retained even if the AC adapter is pulled out.

## **Measuring the pH**

- (1) Press the  key to turn on the unit. All indicators on the LCD light up for about one second to indicate that the unit is in the measurement mode.
- (2) Immerse the electrode into the material to be measured until the liquid junction is submerged.  
Note: When moving the sensor arm, prevent it from tipping over by holding the arm with your hand.
- (3) Make sure that the reading is stable (READY is lit), and then read the values.

\* About the stability indication function:

With the SK-650PH, the READY indicator lights up to indicate that the reading has become stable.


For details, refer to "Stability indication function".


Depending on the material to be measured, there may be instances when the reading cannot be stabilized. In that case, use the HOLD function to read the values.

\* About the display of the electromotive force:

With the SK-650PH, the pH and mV (electromotive force) display modes can be switched.

Choose either mode as necessary.

Press the  key in the measurement mode to switch between the pH and mV display modes.

- (4) Upon completion of measurement, press the  key to turn off the unit. Thoroughly wash the glass electrode with water (distilled, pure or tap water) and store it.




## Precautions

- The glass electrode could be damaged or its service life could be shortened if it is used for liquids such as organic solvents, oils, adhesives, strong acids (pH 0 to 2), strong alkalis (pH 12 to 14) and surface-active agents.
- The pH reading may become unstable when pure water is measured.
- When the pH of a food or drink is to be measured, take a sample (sufficient quantity so that the liquid junction of the sensor can be submerged) in a separate container for measurement. Do not ingest the sample after measurement.
- The sensor section is made of glass and must be handled with extreme care. If it is damaged, be careful not to be injured by broken glass.


## 1. Hold function

Use the HOLD function when the temperature of the sample being measured fluctuates a lot.

- Operation procedure

(1) Press the  key in the measurement mode.

The HOLD indicator lights up to indicate that the measured values are held.

(2) To cancel, press the  key again.


The HOLD indicator goes out and the unit returns to the measurement mode.

## 2. Data recording function

With the SK-650PH, the measured values are recorded and then retrieved to be displayed.

The recorded data can also be transmitted to a computer via the RS-232C output port.

- How to record the measured values


(1) Press the  key in the measurement mode. The data number and measured values start flashing to indicate that data recording is in progress.

(2) Upon completion of data recording, the unit automatically returns to the measurement mode.



Recorded item and maximum number of data items available for recording

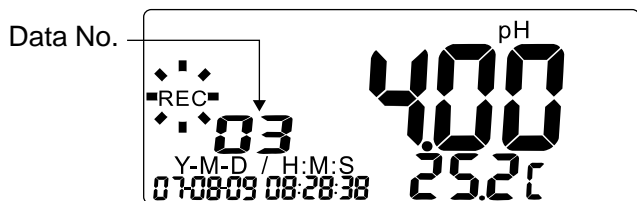
Display mode	Recording item	Number of data
pH	Data No., pH, Temperature, time	99
mV	Data No., mV Temperature, time	99

\* Note that the recorded data items are retained even if the AC adapter is pulled out.

Note: Once the number of recorded data items reaches 99 in each display mode, recording becomes impossible even when the  key is pressed. To continue recording, first delete the existing data and then restart the recording operation.

● How to retrieve the recorded data


- (1) Press the  key in the measurement mode to select either the pH display mode or the mV display mode.
- (2) Press and hold the  key for at least two seconds.  
The REC indicator starts flashing to indicate that the unit is displaying the recorded data.



. Displaying the recorded data:

Press either the  or  key to select the desired data number to be displayed.

[Displaying the maximum/minimum value]

Press the  key to display the maximum value (MAX) or the minimum value (MIN) of the recorded data.








- (3) Press the  key to return to the measurement mode.

● How to delete the recorded data





To delete the recorded data, refer to "Deleting the recorded data".

**Various settings**

The following settings and operations are available in the setting mode.



No.	Character	Descriptions
P1.0		Transmits the recorded data to PC
P2.0		Deletes the recorded data
P3.0		Displays the sensitivity of pH sensor
P6.0		Switches ON/Off of stability display function
P7.0		Switches the temperature unit (°C/°F)
P8.0		Clock setting
P9.0		Reset the unit

● Operation in the setting mode

- (1) Press and hold the  key for at least two seconds in the measurement mode.  
The "P1.0" indicator lights up in the temperature display section to indicate that the unit is in the setting mode.
- (2) Press either the  or  key to select the desired item to be set.
- (3) To end the setting mode and return to the measurement mode, press the  key.

### 1. Transmitting the recorded data (P1.0)

The data recorded on the unit can be transmitted to a computer.  
For details about setting the parameters or connecting to the RS-232C, refer to "Realtime communications".

- (1) Press the  key in the measurement mode to select either the pH display mode or the mV display mode.
- (2) Select "P1.0" in the setting mode.
- (3) Press the  key. The OUT indicator starts flashing to indicate that the transmission operation of the recorded data in the display mode is in progress.

\* Example of the communication protocol

Ex. Data No. : 1  
pH : pH12.00  
Temperature : 25.0°C  
Time : at 12:30:30 on January 1, 2015

Communication protocol






\$pH:TpHE1

P12:00 : T25.0C #1 @2015-1-1 12:30:30 dc cr lf

pH value	Temp.	data No.	year, month, day	time	checksum

### 2. Deleting the recorded data (P2.0)

Data recorded on the unit can be deleted. Data deletion should be performed in each display mode selected.

- (1) Press the  key in the measurement mode to select either the pH display mode or the mV display mode.
- (2) Select "P2.0" in the setting mode, and then press the  key.  
As the default value, the NO indicator starts flashing.
- (3) Press either the  or  key to select YES or NO, and then press the  key to confirm.  
YES : Deleting data.  
NO : Not deleting data.
- (4) Upon confirming, the unit returns to "P2.0".

### 3. Sensitivity display function (P3.0)

Based on the data obtained in calibration, the sensitivity of the electrode and asymmetric potential difference are displayed. Use this data as a guide for when to service or replace the electrode.

\* What is sensitivity?


When using a pH glass electrode, potential difference develops due to the pH of the sample being measured. By comparing this potential difference with the theoretical value, the sensitivity is obtained and the deviation from the theoretical value is expressed in percentage (%). If the value "100.00" is displayed, it means that the "sensitivity is 100%", being equal to the theoretical value. The sensitivity of the electrode is degraded by dirt or wear, resulting in errors.

\* What is asymmetric potential difference?

Inside the electrode, the inner solution of pH 7 is charged. The potential difference is theoretically "0" when the solution of pH 7 is measured. In reality, however, certain potential difference is produced due to the distortion of the sensor or the condition of the glass membrane. This difference is referred to as "asymmetric potential difference". If the electrode or inside solution is degraded by dirt, drying or wear, the asymmetric potential difference becomes large, resulting in large errors.

Asymmetric potential difference is expressed in millivolts (mV). The display "-10.0" refers to "asymmetric potential difference of -10.0 mV".

(1) Select "P3.0" in the setting mode.

(2) Every time the  key is pressed, the sensitivity value or the asymmetric potential difference appears as follows:

P3.2: Indicates the sensitivity between pH 4 and 7.

P3.2: Indicates the sensitivity between pH 7 and 9/10.

P3.5: Indicates the asymmetric potential difference.

The unit determines that the sensor is worn when the sensitivity is 75% or less/115% or more, or the asymmetric potential difference is  $\pm 60$  mV or more. (Error code: E13)

(3) Press the  key to return to "P3.0".


#### 4. Stability display function (P6.0)


When the measured values meet the conditions below, the READY indicator lights up to indicate that the measured values have become stable.

Conditions for stable display

Mode	Conditions
pH display mode	valuation during 10 sec. is within $\pm 0.05$ pH and $\pm 0.5^\circ\text{C}$
mV display mode	valuation during 10 sec. is within $\pm 2$ mV and $\pm 0.5^\circ\text{C}$


(1) Select "P6.0" in the setting mode.

(2) Press the  key to cause the YES indicator to flash.

(3) Press the  key to turn on or off the stability display function.

YES : Stability display is on.


NO : Stability display is off.


(4) Press the  key to confirm and return to "P6.0".


#### 5. Setting the temperature unit (P7.0)

The unit of temperature can be switched between Celsius ( $^\circ\text{C}$ ) and Fahrenheit ( $^\circ\text{F}$ ).

(1) Select "P7.0" in the setting mode.





(2) Press the  key to cause the C ( $^\circ\text{C}$ ) or F ( $^\circ\text{F}$ ) indicator to flash.

(3) Press the  key to select the unit to be used.

(4) Press the  key to confirm and return to "P7.0".

## 6. Setting the clock (P8.0)

Set the clock on the unit.




- (1) Select "P8.0" in the setting mode.
- (2) Press the  key to cause the numbers of the year ("Y") to start flashing.  
For years, only the lower two digits are used.
- (3) Press either the  or  key to change the value, and then press the  key to confirm and cause the numbers of the month ("M") to start flashing.
- (4) Set the date ("D"), hour ("H"), minutes ("M") and seconds ("S") in the same way as for the year described above.
- (5) Upon completion of setting the seconds ("S"), the unit returns to "P8.0".

## 7. Resetting (P9.0)

The calibration values and various settings stored in the unit can be reset.

The table below shows the items that can be reset using this function.

Item	Descriptions
Calibration data	Reset
Stability display function	Reset (ON)
Temperature unit	Reset (°C)
MTC setting function	Reset (25.0°C)
Clock function	Not be reset
Recorded data	Not be reset

- (1) Select "P9.0" in the setting mode.
- (2) Press the  key to cause the NO indicator to flash.
- (3) Press the  key to switch to YES, and then press the  key.  
Upon resetting, the unit returns to "P9.0".

Note: To delete the recorded data, refer to "Deleting the recorded data"

## Realtime communications

The unit outputs the measured data in real time while in the measurement mode.

By connecting the unit to a computer, the measured values (pH, mV, temperature or time) can be imported into the computer for analyzing or saving.

In the realtime communications, the unit outputs data on pH, mV, temperature or time in any display mode. The temperature is output using the previously set unit (°C or °F).


Note: The SK-650PH does not come with the communications or analysis software. It is recommended that you prepare your own software.

The unit does not output data while it is calibrating, displaying recorded data or in the setting mode.

### ● Connecting the cable

To connect the unit to a computer, an RS-232C connection cable must be used.

\* The RS-232C connection cable is optional. To purchase the cable, contact either the shop you purchased unit or our Service Network.

- (1) While the unit is off, connect the RS-232C connection cable to the RS-232C port on the back of the unit.
- (2) Insert the 9-pin connector of the RS-232C connection cable into the serial port (9 pin) on the computer.
- (3) Press the  key to turn on the unit. The unit outputs the measurement data in the measurement mode.

- Communication conditions

Communication standard of computer

Communication speed : 9600bps  
 Data bit : 8  
 Stop bit : 1  
 Parity check : non

- Example of the communication protocol

Ex. pH : pH12.00  
 mV : -129.9mV  
 Temperature : 25.0°C  
 Time : at 12:30:30 on January 1, 2015

Communication protocol

\$pH:mV:TpHE1

P12:00 : m-129.9mV : T25.0C @2015-1-1 12:30:30 dc cr lf

|                      |                      |                      |                      |  
 pH value          mV value          Temp.          year, month, day time          checksum

### Analog output

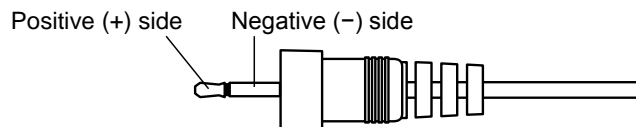
The unit outputs the electromotive force of the pH sensor in real time while in the measurement mode. By connecting the unit to your device, the appropriate analysis will be performed.


Note: The unit does not output the electromotive force while it is calibrating, displaying recorded data or in the setting mode.

- Connecting the cable

A 2.5-mm monaural plug is necessary for connection. Prepare the following items.

Dimensions: 2.5 (Dia.) × 11 (L) mm  
 Wiring: See the figure on the right.



- (1) While the unit is off, insert the plug into the ANALOG port on the back of the unit.
- (2) Press the  key to turn on the unit. The sensor electromotive force is output in the measurement mode.



## **About the glass electrode**

### **(1) Storage**

If left unused for a long time, the glass electrode becomes too dry to measure the pH accurately. The pH electrode works best and shows accurate readings when used with moderate moisture. When using the instrument for the first time after purchasing or a long storage period, we recommend placing the glass electrode in water (distilled, pure or tap water) or the pH standard solution for at least 12 hours and performing calibration before measuring. For everyday storage, fit the glass electrode protection bottle to the sensor probe. The glass electrode protection bottle is filled with the phthalate standard solution (pH 4) at the factory.

### **(2) Inspection and calibration**

For an accurate pH measurement, perform calibration using the pH standard solution. If there is a deviation from the expected value, adjust it before performing a pH measurement.

Note that there are cases where the pH value of the standard solution has changed from its original value. This can happen if the pH standard solution is dirty or if storing the solution for a long time. It is advisable to use a new pH standard solution, where applicable.

### **(3) Washing**

Be sure to wash the pH electrode after each pH calibration or measurement with water (distilled, pure or tap water). If left unwashed, the liquid measured tends to form a film on the surface of the electrode, causing measurement errors. Always wash the pH electrode every time after use. Washing can be done with water (distilled, pure or tap water) in most cases, but if there is a stubborn stain, use neutral detergent diluted in water to wash only the glass electrode section (spherical part). After using neutral detergent, thoroughly rinse the electrode with water (distilled, pure or tap water) to remove the neutral detergent, and then immerse the electrode in the pH standard solution (pH 4) before measurement.

Note that neutral detergent cannot be used on the liquid junction of the sensor probe. Otherwise, the performance of the inner solution could be damaged if the neutral detergent penetrates inside the sensor.

### **(4) Useful life**

It is not possible to replenish or repair the inner solution of the sensor probe. The pH electrode is a consumable. Its useful life varies depending on the liquid to be measured, pH value or temperature.

### **(5) Deposit of white potassium chloride crystals**

A deposit of white crystals is sometimes found on the tip of the electrode or protection bottle; this does not pose a problem when using the instrument. The deposit is easily washed off with tap water. If it does not come off with tap water, soak the electrode in warm water to remove it. Do not lick or swallow the potassium chloride crystals. If the eyes or skin becomes contaminated with the crystals, immediately consult a doctor.

## **Error Messages**

If an error occurs, one of error codes listed below will be displayed on the LCD.

Item	Error codes	Description	Action
Temperature	E02	The measured value is exceeded display range	Use the unit within the measuring range. Otherwise, sensor may be damaged
	E03		
pH/mV	E02	The measured value is exceeded display range	. Use the unit within the measuring range. . Sensor may be deteriorated or damaged. If the problem remains after washing the glass electrode, replace the glass electrode to new one.
	E03		
	E04	Auto-temperature compensation function does not work correctly	Use the unit within the temperature measuring range. Otherwise, sensor may be damaged
	E13	the sensitivity of the electrode or asymmetric potential difference is exceed calibration range	. Calibration may be failed. Calibrate the unit again. . Sensor may be deteriorated or damaged. If the problem remains after washing the glass electrode, replace the glass electrode to new one.
	Other	Electronic parts of the main unit has problem	Contact the shop purchased or our service network.

## **Trouble shooting**

Problem	Possible cause	Action
Readings are unstable.	The amount of sample is small	Immerse the sensor probe (up to liquid junction) into the sample solution.
	The sample being measured is pure water with a low electric conductivity.	Because of the characteristic of glass electrode, the measured value of the low electric conductivity may be unstable.
	The temperature of the sample largely fluctuated.	Make the sample temperature stable.
	Effect of noise	Grand the earth from the GND terminal at the rear of the main body
Readings are abnormal	The glass electrode of the sensor probe is dirty.	Wash the glass electrode. (--> About the glass electrode)
	The glass electrode of the sensor probe is dry.	Wash the glass electrode. (-->About the glass electrode)
	The glass electrode is broken	Replace the glass electrode to new one
	Calibration has not been performed.	Perform calibration before measurement.
	The amount of sample is small	Immerse the sensor probe (up to liquid junction) into the sample solution.
	The difference between the sample temperature and the calibration temperature is too large.	Perform calibration with a temperature close to the sample temperature
	If the problem remains after taking the actions mentioned, sensor may be deteriorated or damaged. Replace the sensor to the new one.	
Clock does not keep time 65 is displayed in clock section	The back-up battery is insufficient	Replace the back-up battery to new one

## **Specifications**

Product	Desk-top type pH meter		
Cat. No.	6427-00		
Model	SK-650PH		
	pH	Voltage	Temperature
Display Range (Main unit)	0.00 to 14.00pH	-2002 to +2002mV	-6.0 to 82.0°C
Repeatability (Main unit) (*)	±(0.01 + 1 digit) pH	-----	±(0.01+1 digit)°C
Resolution	0.01pH	0.1mV (±199.9mV) 1mV (other than above)	0.1°C
Sampling time	approx. 1 sec.		
Power Requirement	AC adapter 9VDC		
Operation ambient	Temperature: 5 to 40°C Humidity: lower than 95%rh no condensing		
Storage ambient	-10 to 50°C (no condensing)		
Materials	Case / sensor arm: ABS resin		
Dimensions	215 (W) × 58(H) × 170(D)mm (exclusive of sensor arm)		
Weight	About 915g (exclusive of sensor arm)		
Standard accessories	Sensor arm, AC adapter (AD-09650-2), Instruction manual		

## **Specifications of 3IN1Probe (option)**

Measuring item	pH	Temperature
Measuring Range	0.00 to 14.00pH	0.0 to 50.0°C
Measuring Accuracy	±0.28pH (0 to 2pH) ±0.08pH (2 to 12pH) ±0.38pH (12 to 14pH)	±0.3°C (20 to 30°C) ±0.5°C (other than above)

**SATO KEIRYOKI MFG.CO.,LTD.**