SENTRON Hot-Line probe series
User manual

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Manual Hot-Line probe, SENTRON reference number E 7500179, Version 2.01, May 2003

1. Introduction

Congratulations!
You have just bought a SENTRON Hot-Line probe; one of the finest pieces of pH-measuring equipment available in the world today.
With proper care and following the given instructions you are likely to enjoy the benefits of your SENTRON pH-system for a long time.

The SENTRON Hot-Line probes series are a series of probes for use in general purposes but also in demanding applications, where elavated sample temperatures, up to 105°C (with the exception of the LanceFET and LanceFET with handle), or contact with more aggresive chemicals are to be expected.
Within the Hot-Line series there are three different probe-tip types available:

- CupFET, for general purpose use and for very small samplevolumes.
- ConeFET, for application in highly viscous materials, jellies, pastes, slurries, pulps water-based polymer-emulsions etc.
- SurFET, for direct surface measurement in paper industry, water based printing inks, paints, coatings etc.
- LanceFET for application in semi-solids: fruit, meat, fish, soil etc.
- LanceFET with handle for LanceFET applications where your hands might get slippery and you might loose your grip on the barrel when applying force to insert the probe in the sample or cold environments where gloves are worn.

To avoid disapointment, please make sure you have selected the right member of the comprehensive SENTRON probe family. This can be seen from the type-name on the barrel of the probe.

Other members of this family are:

- The SENTRON Stream-Line probes, specially designed for low conductivity applications or highly contaminating samples, this probe features a refillable reference-liquid compartment with constant reference liquid outlet through a large area, porous PTFE diaphragm. The Stream-Line probes are equally resistant to temperatures and chemicals as the SENTRON Hot-Line probes.

All SENTRON pH-probes contain an Ion Sensitive Field Effect Transistor (ISFET) sensor, a silver/silverchloride – potassiumchloride reference system and a thermistor for Automatic Temperature Compensation (ATC). Each probe also has an identity of its own, a “fingerprint” so to speak, enabling your SENTRON meter to identify your (new) probe’s fingerprint through calibration.

2. Cleaning tips

Soapy water method for cleaning the probe
To have most pleasure of your probe, good cleaning is a must! If the probe is not properly cleaned it can happen that the probe does not work due to a polluted diaphragm or ISFET. The fluid in which you are measuring can cause this. Is the probe not cleaned regularly, the diaphragm will block the internal electrode. In such case there is no electrical contact between the electrode and the ISFETchip and the probe will not work properly.
To prevent this, you must clean the probe regularly. The frequency is depending of the sample you are measuring in. As reference: it is mostly also visible, the diaphragm is no longer white!

Cleaning
Put the probe in soapy water with a constant temperature of 60°C for minimal 5 minutes. Then start cleaning the probe with the toothbrush.

After this the probe must be placed in a KCl-solution with a temperature of ± 20°C for ½ hour. This 'cold' KCl-dip will regenerate the reference system and the diaphragm.

3. Safety and care.

The pH-sensitive element in a SENTRON probe is an ISFET semi-conductor. This sensing element needs to be driven by an electronic circuit that is built into the SENTRON pH meters. This probe can only perform up to its specification when used in combination with one of the SENTRON pH-meters. Any other combination might cause loss of performance and irreversable damage to both probe and meter.

The fact that SENTRON probes are ruggedly build to last, even in harsh conditions, does not mean that the probe needs no maintenance at all. Read the operating tips well, to ensure lasting satisfaction.

Tris buffers and samples containing proteins should be read quickly and the probe should be rinsed thoroughly with deionized water between samples. When testing is complete, clean with water and a laboratory detergent and rinse with deionized or distilled water.
Avoid prolonged immersion in samples containing Tris or proteins.
Avoid prolonged immersion in samples expected to have pH-values at the ends of the specified pH-range or temperature Range.
When unavoidable, rinse with ample water in between samples. Rinse with neutralizing agents and destilled water when the measurement is completed and prior to storage.

Do not use the probe outside the specified temperature range as this might result in probe failure or irreversable damage to the probe.

Samples must be aqueous solutions or semi-solids and compatible with the probes wetted materials.

If information is required regarding the chemical resistance of the probe, please refer to your SENTRON meter manual or contact your local dealer.

4. Daily use

Remove and save the protection tube from the probe prior to use.

Reference gel may be observed as a viscous material on the tip of the probe. Some gel seepage from a new probe is normal and will not effect the longivity or performance of the probe.

Prior to daily use, scrub the probe tip with a soft bristled toothbrush and water to remove possible residues. Use some mild detergent if required.

Rinse with deionized or distilled water. Soak the probe in pH 7.00 buffer or pH 4.00 buffer with the meter ON (in any mode) prior to calibration for at least 10 minutes.

If the probe has not been used for two or more days and stored dry, clean as above, place in saturated KCl solution (See Tip 1) for 10 to 15 minutes, then in pH 7.00 or pH 4.00 buffer as described above.

For maximum stability and accuracy, perform the calibration sequence twice.

To store the probe, clean it thoroughly with water and a soft bristled toothbrush (again, a mild detergent may be used) and rinse with deionized or distilled water. Replace the protective tube. When doing so, slide the screw-cap onto the probe body, followed by the sealing O-ring. Slide cap and ring onto the rim of the protective tube, press slightly and only then tighten the screw-cap. Leaving a drop of deiononized or distilled water in the protective tube provides a humid environment, avoids dehydration of the reference electrode and therefore allows for faster start-up times.
Note: When used in samples containing small hard particles (e.g. pigments, titaniumoxides, silicates etc.) first rinse the probe with ample water before using the brush.

5. Operating tips

Tip 1: To prepare saturated KCl (potassium chloride) solution: Add KCl-granules to distilled water untill no more KCl will dissolve. Adding 38 grams of KCl to 100 ml water is sufficient. Let this stand for at least two hours and decant the clear solution. Now you have saturated KCl.

Tip 2: To ensure correct measurement values, samples or buffers need to be mixed well. This may be done by a magnetic stirrer or by stirring with the probe for at least 5 seconds. Stop stirring and record results when the read-out is stable.

Tip 3: Proteins, fats and oils may be removed by scrubbing in a solution of Terg-A-Zyme (Alconox company), a pepsin solution or a similar product. Afterwards, rinse thouroughly with deionized or distilled water. Cleaning agents are available at Sentron, ask your local dealer. Do not use hydrofluoricacid, acetone, MEK or similar agents to clean the probe.

Tip 4: When testing in direct sunlight or on a bright reflecting surface, please use brown, opaque or shielded sample containers. Very bright light might influence the performance of the sensor.

Tip 5: Buffer-handling: pH 7.00 buffers (phosphate-based) and pH 4.00 buffers (biphtalate-based) are less susceptible to carbondioxide contamination than pH 10.00 buffers (borax or carbonate based). When slope errors occur, it usually indicates a failing probe or a contaminated buffer. If seen when using pH 10.00 buffer, try calibrating with pH 7.00 and pH 4.00 buffer. If a good slope is achieved, try a new bottle or different lot pH 10.00 buffer. Fresh buffers are available at Sentron, ask your local dealer.

Tip 6: When using ConeFET probes with semi-solids, insert probe to desired depth, then rotate left and right several times and tilt to ensure sample contact.

Tip 7: To avoid scratches on the chip and/or epoxy it is advised only to use the toothbrush after cleaning procedure in the soapy water or after rinsing the probe in water.
Most scratches cause when there are hard pieces in the sample and on the ISFET. Together with the toothbrush these hard pieces can occur scratches on the surface of the chip and damage the epoxy around the chip, which can give bad readings.

6. Trouble shooting

If any of the following events occur: low slope, drift, instability of the reading, slow calibration, probe will not calibrate, pH value doesn't change as expected when changing samples,.....

Put the probe in soapy water with a constant temperature of 60ºC for minimal 5 minutes. Then start cleaning the probe with the toothbrush.
After this the probe must be placed in a KCl solution with a temperature of ± 20ºC for ½ hour. This 'cold' KCl-dip will regenerate the reference system and the diaphragm.

7. Specifications

Sensor:		Semi-conductor Ion Sensitive Field Effect Transistor (ISFET) sensor with patented ESD protection circuit.
Operating temperature:		-5°C to 105°C **For the LanceFET and LanceFET with handle -5°C to 60°C**
pH-range:		pH 0 to pH 14
Reference compartment:		saturated KCl-gel, non-refillable
Dimensions:	Probe lenght:	200 mm
	Probe diameter:	10 mm
	Cable lenght:	1.5 mtr
	Connector:	There are different types of connector available. Please make sure that the probe you have received has a connector that matches with your meter. This can be done by checking the last two digits of your probe label: for the Argus and Titan series 08; for 1001 and 2001 series: 01; for 3001 series: 03; for 701 series: 11.
Wetted materials:	Barrel and tip:	PEI (poly ether imide)
	Packaging material:	epoxy-resin
	Reference liquid:	gelled KCl
	Diaphragm:	porous PTFE
Chemical resistance:		Refer to your SENTRON meter manual. If doubts concerning applicability arise, please contact your local dealer. If you have purchased a new probe to fit your old type pH-meter (701, 1001, 2001, 3001), contact your dealer to receive updated information on the chemical resistance of the prob

Storage

You can store the probes dry or for some days in KCl solution. If stored in a KCl solution the value of the pH measurement can be influenced by the KCl. To prevent this and to have a good measurement we advise you to clean the probe after the storage for some minutes (at least 5 minutes) in demiwater of ± 25°C.

8. Warranty

This SENTRON probe is produced, packed and shipped with the utmost care. If, the former notwithstanding, defects do arise, be advised that this SENTRON probe is warranted to be free from defects in material and craftmanship for the period of 6 months.

SENTRON will repair or replace, at SENTRON's option, any defective part free of charge if this product fails within 6 months from the date of purchase, provided that the failure is due to defective material or lack of craftsmanship and has occurred under normal conditions of usage, to be judged by SENTRON.

SENTRON disclaims any liability to customers, to users of its products, or to any other person or persons for any special or consequential damage that might arise out of, or that might in any way be connected with, the use of this probe

The warranty described in this paragraph shall be in lieu of any other warranty, expressed or implied, including but not limited to any implied warranty or merchantability or fitness for a particular purpose. The buyer's sole and exclusive remedy is for repair or replacement of defective parts as provided therein.

Representations and warranties made by any person, including dealers, representatives and employees of SENTRON, which are inconsistent or in conflict with the terms of this warranty, shall not be binding upon SENTRON unless in writing and signed by one of its officers.

SENTRON reserves the right to ask for proof of purchase, such as the original invoice or packing slip.