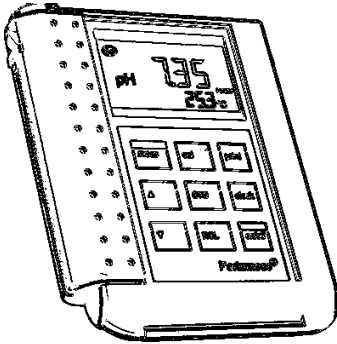


Instruction Manual
Portamess® 911 pH



ProMinent®



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We reserve the right to make technical changes.

TA-193.102-PME01 121101

Software version: 3.x

Safety Precautions

Be sure to read and observe the following requirements!

Whenever it is likely that the protection has been impaired, the meter shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:

- the meter shows visible damage
- the meter fails to perform the intended measurements
- after prolonged storage at temperatures above 70 °C
- after severe transport stresses

Before recommissioning the meter, a professional routine test according to EN 61 010-1 shall be performed. This test should be carried out at our factory.

Information on this Instruction Manual

Italics are used for texts which appear in the Portamess® 911 pH display.

Bold print is used to represent keys, e.g. **cal**.



Display examples

or



keys whose functions are explained are frequently shown in the left-hand column.

Note



Notes provide important information that should be strictly followed when handling the meter.

Warning



Warning means that the instructions given must always be followed for your own safety. Failure to follow these instructions may result in injuries.

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1 The Model 911 pH

Package Contents

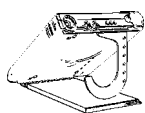


Please check the completeness of the package after unpacking.

The package should include:

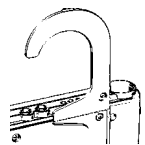
- Portamess® 911 pH (ready for operation)
- Carrying strap
- This instruction manual
- Short instructions in German, English and French
- Field case

Short Description of Meter



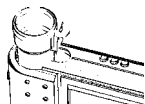
The Portamess® 911 pH is used for pH and temperature measurement in industry, environment, food processing and waste-water treatment.

The meter meets the European EMC regulations (89-336-EEC) and the recommendations of NAMUR NE 21.



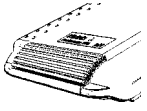
The meter is IP 66 protected to EN 60529 (jet water from all directions).

Temperature compensation is automatic with a Pt 1000 temperature probe, an NTC 30 kΩ (automatic recognition during power-on) or through manual temperature input.



Calibration can be carried out with buffer solutions from various, preselectable buffer sets. The buffer is then automatically recognized by the Calimatic®.

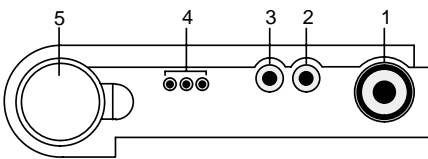
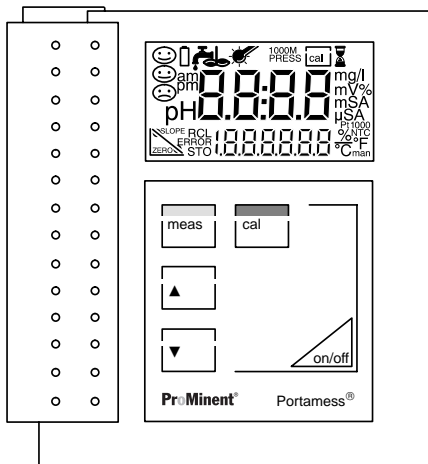
You can also calibrate manually by entering individual buffer values.



- ❑ The Sensoface[®] electrode monitoring system checks the connected electrode and provides information on its state.
- ❑ Only three alkaline AA batteries are required for uninterrupted operation for approx. 2,000 hours.

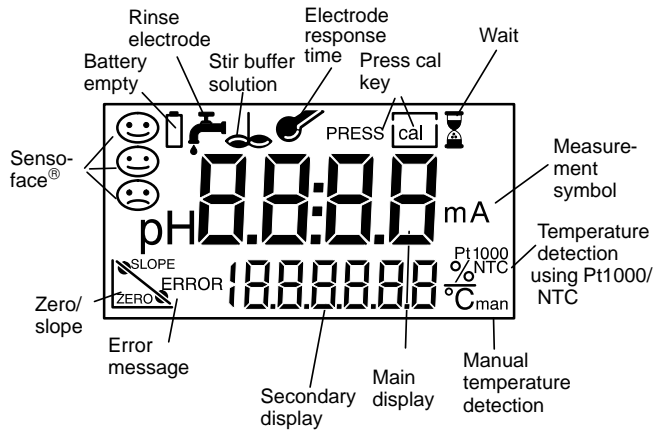
2 Operation

Meter Design



- 1 Electrode connection
- 3 Reference electrode
- 2, 3 Temperature probe connection
- 4 Unused
- 5 Electrode container

Display



Keypad



Pressing **on/off** switches the meter on or off. When the meter is switched off, one of the Sensoface® status indicators is visible in the display. After power-on, the meter automatically performs a self test and checks which temperature probe is connected. After that it automatically goes to pH measuring mode.

Note



The meter can also be switched on with **meas**. However, in this case only a short test is performed and the temperature probe is not determined. The meter assumes that the last temperature probe determined is used.



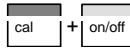
Pressing **meas** selects the desired measured variable (pH or mV) for the main display.



Pressing **cal** starts calibration. With calibration the meter is adjusted to the electrode. You can choose between one, two or three-point calibration either using Calimatic® automatic buffer recognition or with manual buffer entry.



For manual temperature specification (no temperature probe connected), the temperature is set using ▲ and ▼. During buffer selection, you can select the buffer set using ▲ and ▼.



Pressing **cal + on/off** when the meter is switched off, activates buffer selection.

Note



When pressing two keys at the same time, make sure that the key shown at the left is pressed first.

Sensoface® Electrode Monitoring



The Sensoface® automatic electrode monitoring system provides information on the electrode state. Zero point, slope, response time, impedance and drying out are evaluated.

For more detailed information on the displayed electrode state and the individual evaluations of the parameters, please see chapter "Troubleshooting and Maintenance" (Pg. 17).

Connection and Start-up

Electrode connection

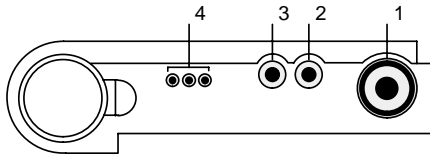
Commercially available electrodes with a nominal electrode zero point of pH 7 and the following plugs can be connected:

- Coaxial standard plug to DIN 19 262 and/or
- 4 mm banana plug.


Connection assignment

Connection Socket


Combination electrode	1
Single measuring electrode	1
Single reference electrode	3
Integrated temperature probe of combination electrodes	2
Separate temperature probe	2, 3
Unused	4



If no temperature probe has been connected, the meter operates with the manually set temperature and *man* appears in the display.

Note  Prior to first measurement, the buffer set to be used must be selected and the meter calibrated.



Start-up With the meter switched-off, one of the Sensoface® status indicators is always visible.

Note  Even with the meter switched off, the calibration data remain permanently stored.




Pressing **on/off** switches the meter into measuring mode. After power-on, the meter determines the connected temperature probe and performs a self test:

- Simultaneous appearance of all display segments, symbols and Sensoface® indicators
- Display of Model No. 911
- Display of software version
- Display of selected buffer set

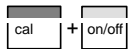
- Note**  The temperature probe is only recognized during the power-on procedure after pressing **on/off**.
- Note**  The meter can also be switched on with **meas**. However, in this case only a short test is performed and the temperature probe is not determined. The meter assumes that the last temperature probe determined is used.

Configuration

Note  If you calibrate using the ProMinent buffer set, generally you do not have to change the configuration.

The following basic settings can be changed in the configuration:

- Automatic calibration (Calimatic®)
on or off (manual), buffer set for automatic calibration
- Three-point calibration on or off



To activate the configuration hold down **cal** with the meter switched off and then press **on/off**.

Conf

The menu items of the configuration menu are worked through in sequence.



To change the setting of the respective menu item, press ▲ or ▼.



Pressing **cal** switches to the next menu item and stores the displayed settings.



Pressing **meas** exits the configuration menu at any time. The value last displayed and possibly changed will then not be saved.

Automatic or manual calibration

By pressing the ▲ or ▼ key, you can select whether you wish to calibrate with the Calimatic® automatic buffer recognition system or with manual entry of the individual buffer values.

On
AUTCAL

When calibrating with Calimatic® automatic buffer recognition (AutCal on), you only have to enter the buffer set used once in the configuration menu. The buffer values are stored at the correct temperature. During calibration the meter then automatically recognizes the buffer used (factory setting: automatic calibration on, ProMinent buffer solution).

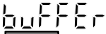
Buffer selection



Press **cal** to display the current buffer set.



With ▲ or ▼ you can select the buffer set with the buffers used.



Pressing **cal** enters the choice and returns you to measuring mode.



Pressing **meas** exits the buffer selection function without storing the buffer set.

The following calibration buffer sets are permanently stored in the meter:

<i>BUFFER -00-</i>	Knick technical buffers pH 2.00 4.01 7.00 9.21
<i>BUFFER -01-</i>	Mettler Toledo technical buffers (former Ingold) pH 2.00 4.01 7.00 9.21
<i>BUFFER -02-</i>	ProMinent pH 2.00 4.00 7.00 9.00
<i>BUFFER -03-</i>	DIN 19 267 pH 1.09 4.65 6.79 9.23 12.75
<i>BUFFER -04</i>	Ciba (94) pH 2.06 4.00 7.00 10.00
<i>BUFFER -05-</i>	NIST pH 1.68 4.00 7.00 10.01 12.46
<i>BUFFER -06-</i>	DIN 19 266 and NIST (NBS) pH 1.679 4.006 6.865 9.180
<i>BUFFER -07-</i>	HACH pH 4.00 7.00 10.18

Note



The meter can only operate properly if the buffer solutions used correspond to the selected, activated buffer set. Other buffer solutions, even those with the same nominal values, demonstrate a different temperature behavior. This leads to measurement errors.

OFF
AutCAL

For manual buffer specification (AutCal off), the pH value of the buffer solution must be entered for the correct temperature.
This allows calibration using any other buffer solution.

Three-point calibration on/off

You can choose whether you want to perform three-point calibration in addition to one- or two-point calibration.

On
3P-CAL


With three-point calibration turned on (3P-Cal on), you can calibrate with a third buffer solution after two-point calibration has been completed. The sequence of the buffer solutions is unimportant. With three-point calibration zero point and slope are calculated using a mean straight line (to DIN 19268).

OFF
3P-CAL


With three-point calibration turned off (3P-Cal off), only one- or two-point calibration is possible (default setting: (3P-Cal off)).

Calibration

By calibration the pH meter is adjusted to zero point and slope of the electrode used.

Note  For calibrations and measurements at temperatures other than room temperature, the following must always be observed:
Not only the buffer solution and the measured medium, but also the electrode must be brought to the corresponding temperature before the calibration is started or the measured value is read.

Calimatic® automatic calibration For calibration using Calimatic® automatic buffer recognition, you only have to enter the buffer set used once in the configuration menu. With the patented Calimatic® system, the meter automatically recognizes the buffer solutions, calculates the electrode zero point and slope and carries out the corresponding adjustment.

Note  The meter can only operate properly when the buffer solutions used correspond with the buffer set selected during buffer selection.
Other buffer solutions, even with the same nominal values, may demonstrate different temperature behavior, which leads to measurement errors.

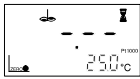


Pressing **cal** activates calibration.
Calibration can be exited again by pressing **meas**. If exited prior to entry of the first calibration point, zero and slope of the last calibration are displayed for a moment.

Immerse electrode and temperature probe in the first buffer solution. Either buffer solution can be used first.



Press **cal** again to start calibration. If you do not want to calibrate, press **meas** to cancel the process.



During buffer recognition the lower line indicates the temperature. The hour glass flashes.



The nominal value of the recognized buffer solution is displayed for approx. 5 s. Electrode and temperature probe must remain in the first buffer solution until the display prompts for the second buffer.

Note



The response times of electrode and temperature probe are considerably reduced if you first move the electrode in the buffer solution and then keep it still to read the values. This provides stable values more quickly.



The electrode stability is checked and the measured mV value is displayed. Stability check can be overridden with **cal**. However, this reduces calibration accuracy.



Calibration with the first buffer is complete. Remove electrode and temperature probe from the first buffer solution and rinse off both thoroughly.

- If you want to perform a one-point calibration, press **meas** to terminate the calibration now. The meter then shows the newly determined zero point in the main display and the old slope in the lower display and returns to pH measuring mode.
- For two-point calibration, immerse the electrode and temperature probe in the second buffer solution. Continue the calibration with **cal**. The calibration process runs again as for the first buffer.

Note



Only with three-point calibration turned on (3P-CAL On, see Pg. 10) the calibration menu offers the possibility to evaluate a third buffer solution after two-point calibration has been completed. With three-point calibration turned off (3P-CAL OFF, see Pg. 10) the calibration procedure is automatically ended at this point.



With three-point calibration turned on (3P-CAL On), you can now evaluate a third buffer solution.

- For two-point calibration, press **meas** to terminate the calibration. The meter then shows the newly determined zero point in the main display and the new slope in the lower display and returns to pH measuring mode.
- If you want to perform a three-point calibration, immerse the electrode and temperature probe in the third buffer solution. Continue the calibration with **cal**. The calibration process runs again as for the previous buffers and is automatically terminated. Zero and slope are calculated using a mean straight line (to DIN 19268).



At the end of the calibration the zero point and slope (based on 25 °C) of the electrode are displayed. Then the meter switches back to measuring mode.

Manual calibration

For calibration with manual buffers, you must first disable the Calimatic. Then, you must enter the pH of the buffer solution used for the correct temperature. This allows calibration with any buffer solution.



Pressing **cal** activates calibration. Calibration can be cancelled by pressing **meas**. In that case, zero and slope of the last calibration are displayed for a moment.



Enter the temperature-corrected pH of your buffer solution using ▲ and ▼. Press **cal** to start the calibration. The buffer value set is stored so that you do not have to enter it for the next calibration (which must be performed at the same temperature). If the temperature has changed, the pH value must be adjusted before proceeding.

Note



The response times of electrode and temperature probe are considerably reduced if you first move the electrode in the buffer solution and then keep it still to read the values. This provides stable values more quickly.



The electrode stability is checked and the measured mV value displayed. Stability check can be overridden with **cal**. However, this reduces calibration accuracy.



Calibration with the first buffer is complete. Remove electrode and temperature probe from the first buffer solution and rinse off both thoroughly.

- If you want to perform a one-point calibration, press **meas** to terminate the calibration now. The meter then shows the newly determined zero point in the main display and the old slope in the lower display and returns to pH measuring mode.
- For two-point calibration, immerse the electrode and temperature probe in the second buffer solution. Enter the pH value of the second buffer solution. Continue the calibration with **cal**. The calibration process runs again as for the first buffer.

Note



Only with three-point calibration turned on (3P-CAL On, see Pg. 10) the calibration menu offers the possibility to evaluate a third buffer solution after two-point calibration has been completed.

With three-point calibration turned off (3P-CAL OFF, see Pg. 10) the calibration procedure is automatically ended at this point.

- For two-point calibration, press **meas** to terminate the calibration. The meter then shows the newly determined zero point in the main display and the new slope in the lower display and returns to pH measuring mode.
- If you want to perform a three-point calibration, immerse the electrode and temperature probe in the third buffer solution. Enter the pH value of the third buffer solution. Continue the calibration with **cal**. The calibration process runs again as for the previous buffers and is automatically terminated. Zero and slope are calculated using a mean straight line (to DIN 19268).



At the end of the calibration the zero point and slope (based on 25 °C) of the electrode are displayed. Then the meter switches back to measuring mode.

Converting slope % -> mV/pH			
%	mV/pH	%	mV/pH
78	46.2	91	53.9
79	46.8	92	54.5
80	47.4	93	55.1
81	48.0	94	55.6
82	48.5	95	56.2
83	49.1	96	56.8
84	49.7	97	57.4
85	50.3	98	58.0
86	50.9	99	58.6
87	51.5	100	59.2
88	52.1	101	59.8
89	52.7	102	60.4
90	53.3	103	61.0

Measurement

Measuring mode



Pressing **meas** accesses the measuring mode from all functions. In measuring mode the main display indicates the measured variable and the secondary display the temperature. The measured variable is selected with **meas**. You can choose between the following variables:

- pH
- Electrode potential [mV]

Note



The response times of electrode and temperature probe are considerably reduced if you first move the electrode in the buffer solution and then keep it still to read the values. This provides stable values more quickly.

Manual temperature

The *man* indicator signals that no temperature probe is connected. The meter operates with the manual temperature. The manual temperature can be edited using ▲ and ▼.

3 Troubleshooting and Maintenance

Sensoface® Electrode Monitoring



The automatic Sensoface® electrode monitoring system provides information on the electrode state. It evaluates zero point, slope and response time of the electrode.

Note



The deterioration of the electrode condition is signified by ☹️ or 😐 of the Sensoface® indicator ("smiley"). This devaluation is permanent. An improvement 😊 can only take place after a calibration.



This Sensoface® display provides information on the electrode response time, i.e. on the amount of time an electrode requires to supply a stable measured value. The value is determined during calibration. Due to wear, aging and as the result of incorrect handling, e.g. drying out, the swelling layer of the glass membrane of an electrode may recede. This leads to a longer response time and the electrode becomes sluggish.

😊 The electrode response is slow. You should consider maintaining or replacing it. It may be possible to achieve an improvement by cleaning or, for an electrode returned to duty after dry storage, by rehydrating.

😞 The electrode response is very slow. Correct measurement is no longer ensured. The electrode should be maintained. If appropriate maintenance fails to remedy the situation, the electrode should be replaced.



This Sensoface® display provides information on the electrode zero point and the slope.

😊 Zero and slope of the electrode are still okay, however the electrode should be maintained or replaced soon.

😞 Zero and/or slope of the electrode have reached values which no longer ensure proper calibration. It is advisable to replace the electrode.

Note



The zero and slope values are determined during calibration. Accurate information is required for proper calibration. For this reason, always use fresh buffer solutions.

Error Messages

Sensor problems If there are problems with a sensor, an error message appears and the measured-value display flashes.

ERROR 1 Problem with the electrode

Possible causes:

- Electrode defective
- Too little electrolyte in the electrode
- Electrode not connected
- Break in electrode cable
- Wrong electrode connected
- Measured pH less than -2 or greater than +16

ERROR 2 Problem with the electrode


Possible causes:

- Electrode defective
- Electrode not connected
- Break in electrode cable
- Measured electrode potential less than -1,300 mV or greater than +1,300 mV

ERROR 3 Problem with temperature probe

Possible causes:

- Temperature probe defective
- Short circuit in temperature probe
- Wrong temperature probe connected
- Measured temperature less than -20 °C or greater than +120 °C

Note		When changing the temperature probe (also for electrodes with integrated temperature probe), note that the temperature probe type (Pt 1000/NTC 30 kΩ) is only recognized when the meter is switched on with on/off .
Calibration error messages		If errors occur during calibration, or if the determined electrode data are outside the valid range, an error message appears (ERROR 4 ... ERROR 11).
ERROR 4		<p>The electrode zero point determined during calibration is outside the permissible range. The zero point is less than pH 6 or greater than pH 8. This message appears in measuring mode following a calibration. It can only be remedied by recalibration with fresh buffer solutions.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Electrode "worn out" <input type="checkbox"/> Buffer solutions unusable or falsified <input type="checkbox"/> Buffer does not belong to configured buffer set <input type="checkbox"/> Temperature probe not immersed in buffer solution (for automatic temperature compensation) <input type="checkbox"/> Wrong buffer temperature set (for manual temperature specification)
ERROR 5		<p>The electrode slope determined during calibration lies outside the permissible range. The slope is less than 78 % or greater than 103 %. This message appears in measuring mode following a calibration. It can only be remedied by recalibration with fresh buffer solutions.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Electrode "worn out" <input type="checkbox"/> Buffer solutions unusable or falsified <input type="checkbox"/> Buffer does not belong to configured buffer set <input type="checkbox"/> Temperature probe not immersed in buffer solution (for automatic temperature compensation)

- Wrong buffer temperature set (for manual temperature specification)

ERROR 8 The meter has recognized two identical buffer solutions. This message is only displayed during calibration. Calibration must be repeated with fresh buffer solutions.

Possible causes:

- Same or similar buffer solution was used for both calibration steps
- Buffer solutions unusable or falsified
- Electrode defective
- Electrode not connected
- Break or short circuit in electrode cable

ERROR 9 The meter cannot recognize the buffer solution used. This message is only displayed during calibration. Calibration must be repeated with fresh buffer solutions.

Possible causes:

- Buffer does not belong to configured buffer set
- Electrode defective
- Electrode not connected
- Break in electrode cable
- Wrong buffer temperature set (for manual temperature specification)

ERROR 10 During manual calibration, the buffer solutions were not used in the specified order. Calibration must be repeated.

ERROR 11 Calibration was cancelled after approx. 2 minutes because the electrode drift was too large. This message is only displayed during calibration. Calibration must be repeated with fresh buffer solutions.

Possible causes:

- Electrode defective or dirty
- No electrolyte in the electrode
- Electrode cable insufficiently shielded or defective
- Strong electric fields influencing the measurement
- Major temperature fluctuation of the buffer solution
- No buffer solution or extremely diluted

ERROR 18 If the meter determines an error during the self-test, this error message appears: Configuration data defective

Possible causes:


- Configuration or calibration data are defective. Completely reconfigure and recalibrate the meter.

ERROR 19 Error in the factory settings or system memory. "FAIL" appears in the display.

FAIL

Possible causes:

- EPROM or RAM defective
- Error in meter factory settings

Note  This error message should normally not occur as the data are protected from loss by multiple safety functions. Should this error message nevertheless appear, no remedy is available. The meter must be repaired and recalibrated at the factory.

Maintenance

Changing batteries



If the battery symbol appears in the display, the batteries need replacement. However, you can still use the meter for a few days. When the battery voltage decreases further, the meter switches off.

- Close the meter protection cover and remove the electrode container.
- Unscrew the four screws on the back of the meter and remove the cover.
- Remove the old batteries from the battery holder.
- Insert the new batteries in the specified direction.
- Make sure the meter protection cover is in the notches provided and the rubber seal is correctly seated, especially near the pH socket.
- Remount the cover and secure it with the screws. Be sure to tighten the screws thoroughly.
- Remount the electrode container.

Note



When changing the batteries, all calibration data are retained. The meter switches to pH measurement.

Warning



If you want to store the meter for a longer time, the batteries must always be removed beforehand. Leaky batteries may damage the meter.

Cleaning the meter

To remove dust and dirt, the external surfaces of the meter may be cleaned with water, and also with a mild household cleaner if necessary.

Appendix

Accessories Available

		Ref. No.
	Electrode container, 5 pieces (for leak-proof storage of pH electrode)	1008716
	Quality buffer solutions pH	
	pH 4.0 50 ml	506251
	pH 7.0 50 ml	506253
	pH 9.0 50 ml	506254
	KCl solution, 3-molar 250 ml	791440
	Cleaning solution	791443
	pepsin/hydrochloric acid 250 ml	
Sensors	PHEKT-013-F combination electrode body: plastic, 110 mm	1007774


Specifications Portamess® 911 pH

Ranges	pH:	-2.00 to +16.00
	mV:	-1,300 to +1,300
	°C:	-20.0 to +120.0
Display	LC display 35 x 67 mm, character height 15 mm	
Measurement Cycle	approx. 1 s	
Measurement Error (± 1 count)	pH:	< 0.01
	mV:	< 0.1 % of meas. value ± 0.3 mV
	°C:	< 0.3 K
Input	DIN 19 262	
Input Resistance	> 1 x 10 ¹² Ω	
Input Current (20 °C)	< 1 x 10 ⁻¹² A	
Electrode Standardization	Calimatic® automatic calibration with automatic buffer recognition (German patent 29 37 227) manual electrode standardization	
Meter and Electrode Monitoring	Sensoface®:	evaluates the calibration interval, zero point, electrode slope, response time and glass impedance of the electrode, optical indication good/average/poor
	Meter self test:	during power-on
Temperature Compensation	Pt 1000 / NTC 30 kΩ (automatic recognition during power-on) or manual	
Data Retention	configuration and calibration data, factory settings > 10 years	
Auto Switch-off	after 1 hour	
EMC	Emitted interference: EN 61 326 Class B	
	Immunity to interference: EN 61 326, EN 61 326/A1 and NAMUR NE 21	
Environmental Temperature	Operation:	-10 to +55 °C
	Transport and storage:	-20 to +70 °C
Power Supply	3 alkaline AA cells	
Operating Time	approx. 2,000 h*	

* Due to storage, the service life of the included battery may be shorter.

Enclosure	Material: PA, IP 66 protected, with integrated electrode container
Dimensions	133 x 160 x 30 mm (w x h x d)
Weight	approx. 560 g including batteries

4 General Information on Measurement

Note  The chapter “General Information on Measurement” provides a summary of the most important points to be observed during pH measurement. You can skip this chapter if you are sufficiently familiar with the practice of pH measurement.

Notes on pH Measurement

General information Two electrodes, a glass electrode and a reference electrode, are required for electrometric pH measurement. They are usually offered combined in a glass or plastic body as a so-called combination electrode.

During pH measurement, simultaneous temperature detection is required. For a correct pH value, you must always specify the respective measurement temperature, e.g. $\text{pH}_{25^\circ\text{C}} = 7.15$.

Using a temperature probe together with the electrode allows to optimally use the advantages of the microprocessor controlled pH meter.

Combination electrodes with integrated temperature probe, e.g. PHEKT-013-F combination electrode (order no. 1007774), are particularly advantageous.

Calibration and measurement The measuring characteristics of pH electrodes are different for each electrode, are variable and temperature-dependent. Therefore, the meter must be adjusted to the respective current electrode characteristics. This process is called calibration.

For calibration, you take measurements of buffer solutions. These are solutions with exactly defined pH values. With the Portamess® 911 pH two calibration modes are available, i.e. automatic calibration using Calimatic® and manual calibration.

**Calimatic[®]
automatic
calibration**

In the Portamess[®] 911 pH the chart values of various buffer sets are stored for the correct temperatures. Simply select and enter the buffer set once when commissioning the meter (see Pg. 9). Then the patented Calimatic[®] will calibrate the meter at the press of a key.

Calibration is conducted with two different buffer solutions from the preset buffer set. The sequence of buffers is irrelevant. The pH meter measures the electrode voltages and the temperatures and compares them with the programmed pH temperature charts for the buffer solutions. From the measured values the meter calculates the zero point and slope of the electrode. This type of calibration with two buffer solutions is a two-point calibration.

For one-point calibration, only one buffer solution is used and the calibration process is discontinued after the first calibration step. Only zero point is adjusted in the process. The previous slope value is retained.

The Portamess[®] 911 pH also allows to perform a three-point calibration. Here, three buffer solutions are required. Zero point and slope are calculated using a mean straight line (to DIN 19268).

Note

The buffer solutions used for calibration must always correspond to the buffer set selected in the meter.

**Manual
calibration**

If you want to work with special buffer solutions not included in the stored buffer sets, select manual calibration (see Pg. 13). Here, you enter your individual buffer value at the correct temperature (pH at calibration temperature). Values entered once remain stored. During the next calibration the meter will suggest these values. That means, you do not have to enter the values once more provided that the sequence of the last calibration is retained.

Note

Make sure that the buffer values are entered for the proper temperature. Do not enter the nominal buffer value but instead the pH of the buffer solution at the calibration temperature.

Calibration intervals

The calibration interval is highly dependent on the conditions under which measurements are taken. As a result, no generally valid interval can be given here.

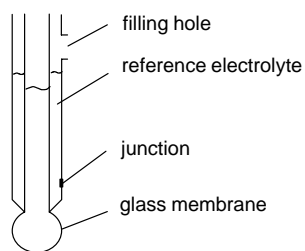
However, the calibration can be repeated frequently at the beginning. If the calibration values (electrode zero and slope) show only minor differences, the time between calibrations can be increased.

For measurements under constant conditions, weekly calibration may be sufficient. On the other hand, calibration may be necessary prior to each measurement when measuring in media with large temperature or pH differences.

Observe the following:

- For electrodes with liquid electrolyte, open the KCl filling hole for calibration, measurement and cleaning.
- Immerse the electrode in the buffer solution ensuring that the junction is completely immersed.
- Electrode response time is considerably reduced if you first move the electrode in the buffer solution and then keep it still to read the values.
- Always rinse the electrode with deionized water before immersing it in the buffer solution.
- If you calibrate without a temperature probe, make sure that the manually set temperature matches the actual temperature of the buffer solutions and the substance to be measured.

Design of a combination electrode with liquid electrolyte



Buffer solutions

Two buffer solutions are required for a two-point calibration. The pH values of the buffer solutions should differ by at least two pH units and bracket the expected measured value.

Note



To ensure measurement accuracy, the buffer solutions should be fresh.

- Never pour used buffer solution back into the storage container. Never use used buffer solution.
- Never immerse the electrode directly in the storage container.
- Always keep the storage container closed. The carbon dioxide from the air can lead to incorrect buffer solution values.

Note



The problems described above can be avoided by using buffer bags (see Accessories Available on Pg. 24).

Electrodes Today combination electrodes are commonly used due to the simpler handling involved. When using combination electrodes, ensure a symmetric design when interconnecting:

- ❑ The dissipation systems of glass and reference electrodes have the same potential (e.g. both Ag/AgCl, KCl 3 mol/l, AgCl saturated or both "calomel", KCl saturated).
- ❑ Only combine Thalamide glass electrodes with Thalamide reference electrodes.

The nominal zero point of commercially available electrodes is pH 7. For additional information, refer to the appropriate electrode instruction manual.

Electrode care Proper cleaning and care increases electrode service life and measurement accuracy. Therefore, you should observe the following points:

- ❑ When not in use, store electrodes in KCl solution (reference electrolyte). Never store them dry. For a few hours the electrode can also remain in the electrode container, without liquid.
- ❑ Soak dry electrodes in KCl solution for up to 12 hours prior to initial use.
- ❑ For electrodes with liquid electrolyte, open the KCl filling hole for calibration, measurement and cleaning.
- ❑ Make sure the electrolyte in the electrode is always at least 2 cm (1 ") higher than the medium to be measured. Top up the KCl solution if necessary. Use the KCl solution specified by the manufacturer.

Grease and oil deposits on the electrode can be removed with hot water and a household dishwashing liquid. Protein contaminations can be removed by soaking the electrode in a pepsin-hydrochloric acid solution (electrode cleaner) for one hour.

-
- ❑ Do not rub the electrode dry with a cloth or fleece, as this will cause electric charging which may later result in incorrect measurements or even make them impossible.

Temperature compensation

The temperature compensation takes the temperature dependency of the electrode slope into account. Reference temperature for zero and slope of the meter is 25°C. The pH of the medium to be measured is also temperature-dependent. This temperature dependence is unknown and depends on the composition of the measured medium. As a result, this temperature dependence cannot be compensated. Therefore, always indicate the measuring temperature together with the pH (observe when comparing measured pH values!).

Note



In the case of a major temperature difference between the calibration and measuring temperature, an additional temperature effect may affect the electrode performance. These effects are not subject to any general rules (in contrast to the temperature dependence of the slope). To achieve a particularly high degree of measurement accuracy, this error can be eliminated by calibrating at the measuring temperature (recommended by DIN 19268). The temperature dependence of the calibration buffer pH values is automatically taken into consideration during calibration with Calimatic®.

Glossary

Auto switch-off	To protect the batteries, the meter switches off automatically after one hour when not operated for a longer period.
Buffer set	Contains selected buffer solutions which can be used for automatic calibration with the Calimatic®. The buffer set must be selected prior to initial calibration.
Buffer solution	Solution with an exactly defined pH for calibrating a pH measuring instrument.
cal	Key for activating calibration.
Calibration	Adjustment of the pH meter to the current electrode characteristics. The zero point and slope are adjusted. A one-, two-, or three-point calibration can be carried out. With one-point calibration only the zero point is adjusted.
Calibration buffer set	See buffer set.
Calimatic®	Automatic buffer recognition. Before the first calibration, the buffer set used must be activated once. The patented Calimatic® then automatically recognizes the buffer solution used during calibration.
Combination electrode	Combination of glass and reference electrode in one body.
Electrode slope	Is indicated in % of the theoretical slope (59.2 mV/pH at 25 °C). The electrode slope is different for every electrode and changes with age and wear.
Electrode zero point	The voltage which a pH electrode gives off at a pH of 7. The electrode zero point is different for every electrode and changes with age and wear.
GLP	Good Laboratory Practice: Rules for conducting and documenting measurements in the laboratory.

meas	This key is used to return to measurement mode from all other levels. In measuring mode it switches between mV and pH.
NAMUR	German committee for measurement and control standards in the chemical industry
One-point calibration	Calibration with which only the electrode zero point is taken into consideration. The previous slope value is retained. Only one buffer solution is required for a one-point calibration.
pH electrode system	A pH electrode system consists of glass and reference electrodes. If they are combined in one body, they are referred to as a combination electrode.
Response time	Time from the start of a calibration step to the stabilization of the electrode potential. This time is one of the criteria for the Sensoface [®] indicator.
Sensoface[®]	Automatic electrode monitoring. The Sensoface [®] indicators provide information on the status of the electrode and the meter. Calibration interval, zero, slope and response time of the electrode are evaluated.
Slope	See electrode slope.
Three-point calibration	Calibration in which the electrode zero and slope are taken into consideration. Three buffer solutions are required for three-point calibration. Zero point and slope are calculated using a mean straight line (to DIN 19268).
Two-point calibration	Calibration in which the electrode zero and slope are taken into consideration. Two buffer solutions are required for two-point calibration.
Zero point	See electrode zero point

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