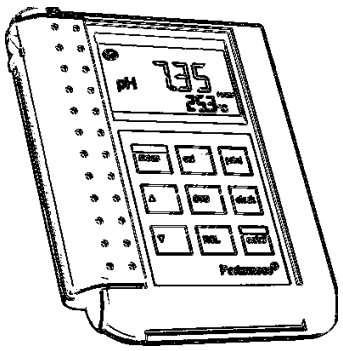
Instruction Manual

Portamess® 913 pH
Portamess® 913 X pH



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TA–193.104–PME01 121101 Software version: 3.x

Safety Precautions

Be sure to read and observe the following requirements!

The Portamess® 913 X pH may only be opened to change the batteries outside hazardous areas. If repairs are necessary, the meter must be sent in to the factory.

Never operate the remote interface within hazardous areas.

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® 913 (X) 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.

Contents

Safety Precautions ..... **III**

Information on this Instruction Manual ..... **IV**

1 The Model 913 (X) pH **1**

Package Contents 1

Short Description of Meter 1

2 Operation **3**

Meter Design 3

Display 4

Keypad 4

Sensoface® Electrode Monitoring 6

Connection and Start-up 6

Configuration 8

Calibration 12

Measurement 17

Data Memory 18

Datalogger 19

Clock Mode 21

Serial Interface 22

Standard Settings for Lab Printer 23

Printing Measured Values and Records 23

3 Troubleshooting and Maintenance **25**

Sensoface® Electrode Monitoring 25

Error Messages 27

Maintenance 32

Appendix **34**
Accessories 34
Specifications Model 913 (X) pH 35
Specifications for Lab Printer 36
Certificate of Conformity 37
4 General Information on Measurement **40**
Notes on pH Measurement 40
Glossary **46**
Index **49**

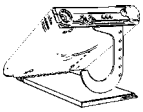
1 The Model 913 (X) pH

Package Contents

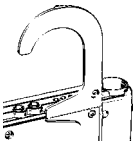
Please check the completeness of the package after unpacking.
The package should include:

- ❑ Portamess® 913 (X) pH incl. batteries and electrode container
- ❑ Carrying strap
- ❑ This instruction manual
- ❑ Short instructions in German, English and French
- ❑ Interface cable incl. adapter
- ❑ Paraly SW105 PC software
- ❑ Field case

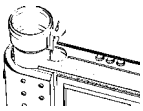
Short Description of Meter



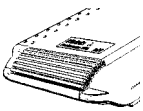
- ❑ The Portamess® 913 (X) pH is used for pH and temperature measurement in industry, environment, food processing and waste-water treatment.
- ❑ Operation of the Portamess® 913 X pH is also permitted in hazardous areas Zone 1.



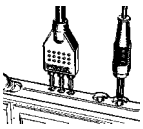
- ❑ The meter meets the European EMC regulations (89-336-EEC) and the recommendations of NAMUR NE 21.
- ❑ The meter is IP 66 protected to EN 60529 (jet water from all directions).
- ❑ Temperature compensation is automatic with a Pt 1000 temperature probe, an NTC 30 kΩ (automatic recognition during power-on) 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.
- ❏ The datalogger records up to 100 measured pH or mV values together with temperature, date and time. Recording is either manually, interval or event–controlled.



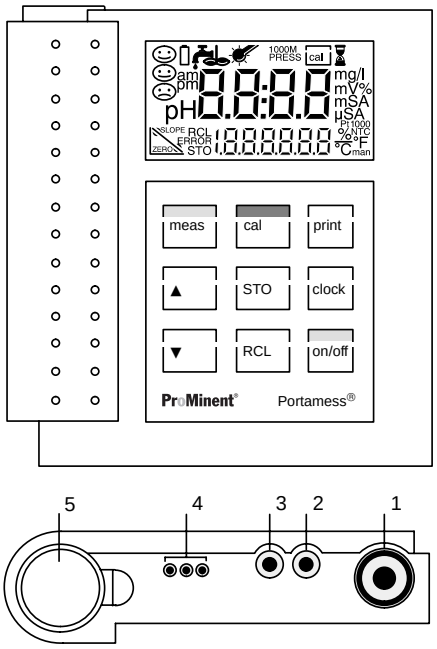
- ❏ Only three alkaline AA batteries are required for uninterrupted operation for approx. 2,000 hours.
- ❏ Paraly SW 105 software allows complete remote control of the Portamess® 913 (X) pH via PC. All measured values and parameters can be read out and easily processed further (e.g. using Microsoft Excel).
- ❏ Measured values and meter record can also be sent directly to a printer via the serial interface.
- ❏ Via the serial interface, the Portamess® 913 (X) pH can be completely remote controlled by a PC. All measured values and parameters can be read out. Measured values and meter record can be sent directly to a printer.

Warning

Never use the remote interface in hazardous areas!

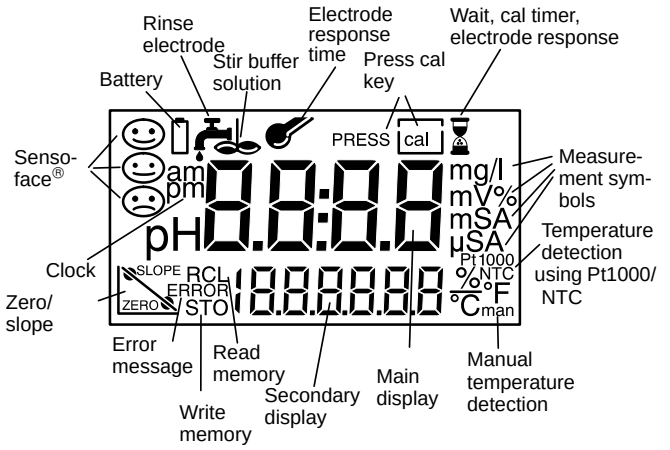
2 Operation

Meter Design



1	Electrode connection
3	Reference electrode
2, 3	Temperature probe
4	PC/printer interface
5	Electrode container

Display



Keypad

on/off

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

You can also switch on the meter using **meas**. However, in this case, only a short test is conducted and no determination of the temperature probe. The meter assumes that the last temperature probe determined is used.

meas

Pressing **meas** returns the meter to measuring mode from any function. Pressing **meas** while in measuring mode 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.

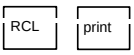
For manual temperature specification (no temperature probe connected), the temperature is set using ▲ and ▼. These keys are also used to set the clock, to select the memory locations and to edit selected parameters.

Pressing **clock** switches the meter into the clock mode. All measurement processes are cancelled and battery consumption is reduced to a minimum.

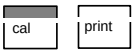
Pressing **STO** activates the data memory for writing measured values.

Pressing **RCL** activates the data memory for reading measured values.

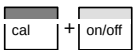
Pressing **print** sends the currently measured value to a printer or PC.



Pressing **RCL** and **print** prints out the data stored in memory.



Pressing **cal** and **print** prints out the meter record.



Pressing **cal** + **on**/**off** when the meter is switched off, activates the configuration menu.

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 of the electrode are evaluated.
In addition, Sensoface® reminds you to regularly calibrate the meter.

For more detailed information on the displayed electrode state and the individual evaluations of the parameters, please see chapter “Troubleshooting and Maintenance” (Pg. 25).

Connection and Start-up

Electrode connection

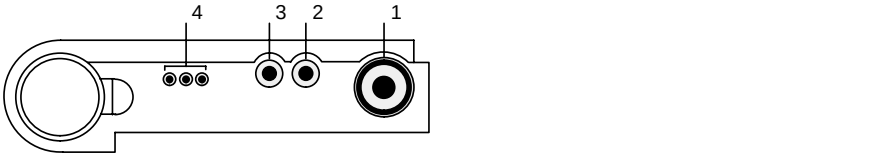
Commercially available electrodes with a nominal electrode zero point of pH 7 and the following plugs can be connected:

– 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
Remote interface 4



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

Note

If the Portamess® 913 (X) pH is connected to a PC and is used to take measurements in grounded liquid, measuring errors may result.

Note

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

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 and the contents of the data memory 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, measurement symbols and Sensoface® indicators
- ❏ Display of Model No. *913*
- ❏ 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.

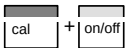
Configuration

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:

- ❏ Calibration timer
  Interval
- ❏ Automatic calibration (Calimatic®)
  on or off (manual), buffer set for automatic calibration
- ❏ Three-point calibration on or off
- ❏ Automatic switch-off after
  1 hour or 12 hours
- ❏ Remote interface
  Printer output on/off, baud rate
- ❏ Temperature display
  °C or °F
- ❏ Date and time format
  24 hours and day, month, year or
  12 hours (am/pm) and month, day, year



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

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

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

Pressing **STO** 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 hanged will then not be saved.

Calibration timer

With the calibration timer, the period of time can be specified within which calibration should occur. The interval range is 0 to 1,000 hours.

When approx. 80 % of the preset interval has passed, the calibration timer switches the Sensoface® display from ☺ to 😐. When the total interval has run out, the display is set to ☹.
The timer is reset with a calibration.
To switch off the calibration timer, enter 0 as the interval. (Factory setting: calibration timer off).

Automatic or manual calibration

You can select whether you wish to calibrate with the Calimatic® automatic buffer recognition system or with manual entry of the individual buffer values.

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 solutions.

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).

Select the buffer set with the buffers used in the buffer set selection. Various calibration buffer sets are stored in the Portamess® 913 (X) pH.

The following buffer sets are permanently stored in the meter:

BUFFER –00–	Knick technical buffers pH 2.00 4.01 7.00 9.21
BUFFER –01–	Mettler Toledo technical buffers (former Ingold) pH 2.00 4.01 7.00 9.21
BUFFER –02–	ProMinent pH 2.00 4.00 7.00 9.00

BUFFER –03–	DIN 19 267 pH 1.09 4.65 6.79 9.23 12.75
BUFFER –04–	Ciba (94) pH 2.06 4.00 7.00 10.00
BUFFER –05–	NIST pH 1.68 4.00 7.00 10.01 12.46
BUFFER –06–	DIN 19 266 and NIST (NBS) pH 1.679 4.006 6.865 9.180
BUFFER –07–	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.

Three-point calibration on/off

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

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).

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

Automatic switch–off

To protect the batteries, the meter switches off automatically when not operated for a long time.
You can select whether switch-off is to take place after one hour or after twelve hours (factory setting: 1 hour).
If the datalogger is active and during remote interface operation, the auto switch-off feature.

Interface

If the Portamess® 913 (X) pH is controlled by a PC and interface conflicts occur when the print key is pressed, you should deactivate the print function (factory setting: Print on, 4800 baud).

The transmission speed can be set to 600, 1200, 2400, 4800 or 9600 baud.
The transmission speed must correspond to that set in the printer or PC.
Data format and protocol are permanently set to 7 bits, one stop bit, even parity and XON/XOFF protocol (to NAMUR NE28).

Temperature display

The temperature can be displayed either in °C or °F (factory setting: °C).

Time and date format

The time and date format can be set to either 24 hours and day.month.year or 12 hours am/pm and month.day.year).

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 (based on 25 °C) and carries out the corresponding adjustment. The sequence of the buffer solutions is unimportant.

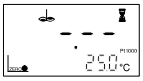
Note

The meter can only operate properly when the buffer solutions used correspond with the buffer set selected in the configuration menu.
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 by pressing **meas**. In that case, zero, slope, time and date 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 calibrate to the first buffer solution. If you do not want to calibrate, press **meas** to cancel the process.



During buffer recognition the lower line indicates the temperature while the hour glass indicator 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 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 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 buffer entry, you must first disable the Calimatic. Then, you must enter the pH value of the buffer solution used for the correct temperature.
This allows to calibrate with any buffer solution.

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

Enter the temperature-corrected pH of your buffer solution using ▲ and ▼. Press **cal** to start 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 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 specification

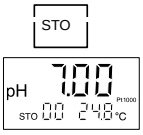
The *man* indicator signals that no temperature probe is connected. The meter operates with the manually specified temperature. The specified temperature can be edited using ▲ and ▼.

Data Memory

Up to one hundred measured values can be stored in the data memory together with temperature, date and time. Storage is performed either manually or automatically using the datalogger. The currently measured value (pH or mV) is stored.

Write memory

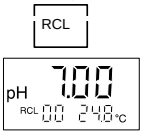
At pressing **STO** the currently measured value is at first only shown in the display (HOLD).



Now you can select any memory location using ▲ and ▼. Press **STO** to store the measured value in the selected memory location. After storing, the memory location number is automatically incremented and the unit returns to measuring mode.

Read memory

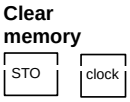
Pressing **RCL** displays the last measured values stored.



Now you can select any memory location using ▲ and ▼. Pressing **RCL** switches between the measured value and time/date of storage. In this way, for example, you can search for a value that was stored at a certain time. Pressing **meas** returns you to measuring mode.

Clear memory

To clear the entire data memory, press **STO** to access memory mode and then **clock** to access datalogger mode. Select Clear (Clr) using ▲ or ▼.



By confirming this with **STO,** the entire memory area is cleared.

If you do not want to clear the memory, press **meas** to abort the procedure.

Datalogger

Datalogger

The datalogger records up to 100 measured values together with temperature, time and date. Data storage is performed either manually (at the press of a key), interval or event-controlled. The datalogger always stores the currently measured variable (pH or mV).

STO clock

Press **STO** to access memory mode and then **clock** to access datalogger mode. Now choose between three different recording modes and the parameter setting of the datalogger using ▲ or ▼.

STO

Pressing **STO** confirms the selected mode. In the Continue and Start mode this also starts the datalogger. The current memory location is shown in the display.
If ”Clear“ has been selected, all memory locations are cleared and the instrument returns to measuring mode.

meas

Pressing **meas** ends the datalogger mode.

Recording modes

After pressing **STO**, logging is continued after the memory location in which the last measured value was stored (continue). Press **meas** to end logging.

After pressing **STO**, the entire data log memory is cleared without starting the datalogger (clear).

After pressing **STO**, the entire data log memory is cleared. Storage begins from memory location “00” (start).
Press **meas** to end logging.

Setting parameters of the datalogger

In the parameter setting mode, you select whether data storage is to be interval, event-controlled or manual. Press **STO** to access the logging functions.

To select interval-controlled storage of measured values, press **STO** and set the interval in which the recording is to take place using ▲ and ▼. The interval range is between 5 seconds and 60 minutes. Default time (factory-set) is 2 minutes. After selecting your interval time, press **STO** to enter the value.

With event-controlled data storage, a measured value is not stored until it deviates from the last memory value by the preset differential value. Using the time also stored, you can determine when the value has changed. The differential value is entered in the subsequent parameter-setting step.

Note

The differential value is always based on the currently set measured variable (pH or mV). This means that if differential pH values are to be logged, the instrument must be set to pH measurement prior to parameter setting and recording.

With manual data logging, the measured values are saved with **STO**.

After selecting the above parameters, select “Continue” or “Start” using the ▲ and ▼ keys and then press **STO** to commence logging.

Note

The datalogger does not stop after reaching the last memory location (99). Recording is automatically continued with memory location number 00. To avoid losing data by overwriting, download stored data and clear the logger before beginning a new set of data. Be aware of this when using interval-controlled data collection.

Clock Mode

clock

Pressing **clock** activates the clock mode. The time and date are displayed.
In this mode, the battery consumption of the Portamess® 913 (X) pH is reduced to a minimum.

Setting clock

clock + STO

To set the time or date, the clock mode must be activated. Press **clock** and **STO** simultaneously to set the clock.

The time display flashes. Now the time can be set using ▲ and ▼.

Press **STO** again to store the displayed time. Now the date can be set.

Press **STO** again to store the date. Now the year can be set.
Press **STO** to confirm the year. The unit returns to clock mode.

meas

Press the **meas** key to return to measuring mode.

Serial Interface

Note

If the Portamess® 913 (X) pH has been connected to a PC and measurement are taken in a grounded liquid, measurement errors may result.

With the remote interface, you can directly send data to a printer with serial port or set up a direct connection to a computer. Via the computer, the meter can be completely remote controlled and all data and parameters can be read. Using the printer (e.g. Lab printer, Order No.P 1008717), you can directly print measured values, data points and records.

Interface parameters

The RS 232 interface can be defined for all common baud rates.
Setting is carried out in the configuration menu

- ❏ Baud rate: 600 Bd
  1,200 Bd
  2,400 Bd
  4,800 Bd (default setting)
  9,600 Bd

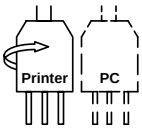
Data format and protocol are permanently set to:

- ❏ 7 data bits
- ❏ even parity
- ❏ one stop bit
- ❏ XON/XOFF protocol

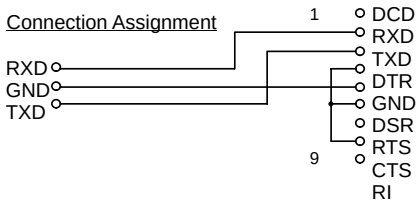
Note

For the command set of the Portamess® 913 (X) pH, refer to the online help of Paraly SW 105 transfer software.

Interface cable



Only one interface cable is required to operate a printer or PC. By simply turning the plug around on the Portamess® 913 (X) pH, the cable can be used to connect to either a printer or a PC.



Standard Settings for Lab Printer

Meter configuration

Parameter	Setting
baud rate	*4800*
printer	*ON*

Printing Measured Values and Records

Note

Make sure that the print function is activated in the configuration (*Print on*) and the baud rate corresponds to that of the printer.

Printing measured values

print

Press **print** while in measuring mode to print out the currently measured value. The measured value is printed out together with temperature, date and time and a three-digit identification number. The identification number is reset when the meter is switched off.

Printing memory

RCL print

Press **RCL** and then **print** to print out the stored data. All data points are printed out with temperature, date and memory location number (Sxx).
If you only want to print individual data points, press **RCL** first. Then select the desired data point using ▲ or ▼ and confirm with **print**.

Note

If Sensoface® was ☹ during data logging, the memory location will be marked with *, and if the measurement range (pH, mV, °C) was exceeded, with #.

Printing record

To print out the meter record, press **cal** and then **print**. The record print-out contains:

– a calibration record with the exact data from the last calibration,
– the settings of the configuration menu,
– a record of the last self-test and
– a list of the current Sensoface® criteria.

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.
In addition, Sensoface® requests calibration at regular intervals.

Note

Sensoface® is specially designed for monitoring pH electrodes.

Note

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

This Sensoface® indicator 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 the electrode. It may be possible to achieve an improvement by cleaning or, for an electrode returned to duty after dry storage, by hydrating.

☹ 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. Therefore, the condition for accurate information is proper calibration. For this reason, always use fresh buffer solutions.

cal

Using the calibration timer, you can set an interval within which calibration should take place.
The calibration timer continues to run with the meter switched off.

Over 80 % of the calibration interval has passed.

The calibration interval has been exceeded.

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 is less than -1,300 mV or greater than +1,300 mV

ERROR 3

Problem with the 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

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.

Possible causes:

- ❏ Electrode ”worn out“
- ❏ Buffer solutions unusable or falsified
- ❏ Buffer does not belong to configured buffer set
- ❏ Temperature probe not immersed in buffer solution (for automatic temperature compensation)
- ❏ Wrong buffer temperature set (for manual temperature specification)
- ❏ Electrode has different nominal zero point

ERROR 5

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.

Possible causes:

- ❏ Electrode ”worn out“
- ❏ Buffer solutions unusable or falsified
- ❏ Buffer does not belong to configured buffer set

- ❏ Temperature probe not immersed in buffer solution (for automatic temperature compensation)
- ❏ Wrong buffer temperature set (for manual temperature specification)
- ❏ Electrode used has different nominal slope

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 14 If the clock has not been set, e.g. after battery replacement, this error message is displayed. To clear the message, set the clock (see Pg. 21).

ERROR 15 If errors occur during transmission via the RS 232 interface, this error message appears.
This message will not occur if ”Printer on“ is configured.

Possible causes:

- ❏ No valid end character transmitted (receiver overflow)
- ❏ Wrong transmission rate (baud rate) set (see Pg. 11)
- ❏ Error during transmission
- ❏ Wrong data format (see Pg. 22) e.g. parity bit

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

FAIL

Error in the factory settings or system memory. ”FAIL“ appears in the display.

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. (Since battery consumption is higher when the remote interface is used, the battery symbol is displayed earlier in that case.)

Never change the batteries within a hazardous area. Only use alkaline AA cells. Make sure the meter is carefully closed again and the protective cover with the rating plate is properly mounted on the meter after changing the batteries.

To replace the batteries, you need 3 alkaline AA cells and a screwdriver (either straight-blade or Philips).

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

Note

When changing the batteries, all calibration and configuration data are retained. The calibration timer runs out. Time and date must be reset. The meter switches to pH measurement (as does the event-controlled datalogger). The current memory location is set to 00.

Warning

If you want to store the meter for a longer time, the batteries must always be remove 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

			Ref. No.
	Printer		1008717
	Printer paper (5 rolls)		1008718
	Printer ribbon (5 pieces)		1008719
	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 pepsin/hydrochloric acid	250 ml	791443
Sensors	PHEKT–013–F combination electrode with integrated Pt 1000 body: plastic, 110 mm		1007774

Specifications Model 913 (X) pH

Ranges	pH: mV: °C:	–2.00 to +16.00 –1,300 to +1,300 –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: mV: °C:	< 0.01 < 0.1 % meas. value ± 0.3 mV < 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
	Calibration timer:	monitors the calibration intervals, configurable from 1 to 1,000 hours, can be disabled
	Meter self test:	during power-on
Temperature Compensation	Pt 1000 / NTC 30 kΩ (automatic recognition during power-on) or manual	
Data Memory	100 memory locations: pH/mV, temp, time, date	
Datalogger	manual, interval or event-controlled*	
Remote Interface	serial RS 232 interface, bidirectional, asynchronous, baud rate user-definable, can be used as either printer or computer interface	
Data Retention	configuration and calibration data >10 years	
Auto Switch-off	after either 1 or 12 hours*	

* Configurable

EMC	Emitted interference: EN 61 326 Class B Immunity to interference: EN 61 326, EN 61 326/A1 and NAMUR NE 21	
Explosion Protection (913 X pH only)	EEx ia IIC T6	
Environmental Temperature	Operation: Transport and storage:	–10 ... +55 °C –20 ... +70 °C
Power Supply	3 alkaline AA cells	
Operating Time	approx. 2,000 h*, clock mode > 2 years	
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	

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

Specifications for Lab Printer

Printer Type	impact printer
Interface	serial RS 232 interface
Paper	normal paper, width 57.5 mm (2.25 inches)
Data Transfer	baud rate: 4,800 baud, data bits: 7, stop bits: 1, parity: even, protocol: no
Power Supply	230 V AC ± 10 %
Dimensions	197 x 73 x 153 mm (w x h x d)
Weight	approx. 1.2 kg including plug-in power pack

Certificate of Conformity

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. $pH_{25°C}$ = 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 characteristics of the current electrode. This process is called calibration.

For calibration, you take measurements of buffer solutions. These are solutions with exactly defined pH values. With the Portamess® 913 (X) pH two calibration modes are available, i.e. automatic calibration using Calimatic® and manual calibration.

Calimatic® automatic calibration

In the Portamess® 913 (X) 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 selected 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 a 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. The previous slope value is retained.

The Portamess® 913 (X) 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. 9). 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.
For monitoring the calibration interval, you should configure the calibration timer (see Pg. 9).

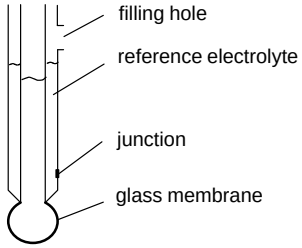
Observe the following:

- ❏ 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.

Note

For additional information, refer to the electrode instruction manual.

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.

- ❏ Therefore, 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. 34).

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.

Note

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 on the electrode zero 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 when not operated for a longer period. Switch-off can take place after either one hour or twelve hours. When datalogger or remote interface are active, the auto switch-off feature is disabled.
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 meter.
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.
Datalogger	The datalogger records up to 100 measured values (pH or mV) together with the temperature, date and time in the data memory. Recording takes place either interval or event-controlled (measured-value difference) or manually at the press of a key.

Data memory	Up to 100 measured values (pH or mV) can be stored in the data memory together with temperature, time and date.
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 electrode. If they are combined in one body, they are referred to as combination electrode.
Response time	Time from the start of a calibration step to the stabilization of the electrode potential.
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

Index

 , 25

A

accessories, 34

auto switch–off, definition, 46

automatic calibration, 41

B

battery replacement, 32

baud rate, setting, 11

buffer set
  definition, 46
  selection, 9

buffer solution, 43
  definition, 46

C

calibration, 12, 40
  automatic, 12, 41
    configuration, 9
  buffer solution, 43
  definition, 46
  manual, 14, 41
    configuration, 9

calibration buffer set, definition, 46

calibration intervals, 42

calibration timer, configuration, 9

Calimatic, 12, 41
  configuration, 9
  definition, 46

Certificate of Conformity, 37

cleaning, 33

clock mode, 21

combination electrode, definition, 46

configuration, 8

configuration menu, 8

connection, electrode, 6

connection assignment, 6

D

data memory, 18
  definition, 47

datalogger, 19
  definition, 46
  setting, 19, 20

date format, configuration, 11

diagnostics, Sensoface, 25

display, 4

E

electrode monitoring, Sensoface, 25

electrode slope, description, 47

electrode zero point, definition, 47

electrodes, 44
  care, 44
  connection, 6
  monitoring, 6

error messages, 27–30

G

glossary, 46

GLP, definition, 47

I

interface, 22
  commands, 22
  configuration, 11
  data format, 22
  parameters, 22
  protocol, 22

interface cable, 23

interface commands, 22

interface parameters, 22

K

keypad, 4

L

lab printer, specifications, 36

laboratory-printer ZU 0244, standard settings, 23

M

maintenance, 32

manual calibration, 41

manual temperature specification, 17

measured values
  reading out, 18
  storing, 18

measurement, 17

measurement, general, 40

measuring mode, 17

memory
  clearing, 18
  reading, 18
  writing, 18

messages, Sensoface, 25

meter design, 3

mV measurement, 17

N

NAMUR, definition, 47

O

one–point calibration, 13, 15
  definition, 47

P

package contents, 1

pH electrode system, definition, 47

pH measurement, 17
  notes, 40

printer ZU 0244, standard settings, 23

printing
  measured values, 23
  records, 23

R

response time, definition, 47

RS–232 interface, 22

S

safety precautions, III

Sensoface, 6, 25
  definition, 47
  diagnostic, 25
  messages, 25

setting clock, 21

short description, 1

slope, definition, 48

smiley, 25

specifications, 35
  lab printer, 36

start–up, 6

storing, 18
  automatic, 19
  measured values, 18

switch–off, automatic, 10

T

temperature compensation, 45

temperature display, configuration, 11

three–point calibration, 14, 15
  definition, 48
  on/off, 10

time format, configuration, 11

two–point calibration, 13, 15
  definition, 48

Z

zero point, definition, 48

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