User's Manual

pH-meter OpH218

1. Safety information

Please read this manual before unpacking, installing, or using this equipment. Pay attention to all paragraphs entitled "Warning!". Failure to do so could result in property damage.
To ensure that this equipment is handled safely, do not use or install this equipment in any other way than the one shown in this manual.

2. Precautionary labels

Read all the labels stuck to the device. Personal or property damage could occur if this instruction is not followed.

	This symbol, marked on the device and/or in this manual, refers to this manual for information relating to the use of the device or a safety directive.
	Electrical and electronic equipment identified by this symbol must no longer be deposited in a European country's household waste collection system since 13 August 2005. In accordance with European and national regulations (Directive 2002/96/EC repealed and replaced by the 2012/19/EU Directive on 15 February 2014), European electrical equipment users must return their old or end-of-life equipment to the manufacturer for recycling. The costs of the treatment are the responsibility of the manufacturer. Note: For equipment produced by "**OrigaLys ElectroChem SAS**", please contact your local partner.

3. CE Marking

OpH218 pH-meter compliance with the following EU directives:

2014/30/EU: Electromagnetic Compatibility Directive (CEM)
2014/35/EU: Low Tension Directive
2011/65/EU: RoHS Directive (Restriction of Hazardous Substances)

Summary

I. Introducing OpH218

1. Introduction

The **OpH218** of the **OrigaMeter** range is a laboratory pH-meter/millivoltmeter dedicated to routine measurement and teaching. Easy to handle, it brings you reliable and fast results.

With the **Auto** function, the pH result freezes on the display as soon as the measurement stability criterion is reached. You can also make pH or mV **continuous** measurements on a sample with printed values at regular time intervals on an Excel sheet via the USB link.

Using **Automatic** Recognition mode, 1, 2- or 3-point calibrations are simple and reliable. Two types of pH standard solutions can be used: IUPAC or 4-7-10 buffers.
In **Manual** mode, you select 1, 2 or 3 stamps from a list of 11 current values.
In both cases, OpH218 guides you through the calibration process and automatically recognizes the pH value of the buffer used at the measurement temperature.
In Free mode, it is not necessary to use standard solutions to calibrate the pH-meter, just know precisely the pH of one or two solutions.

In addition to plugging a temperature sensor, the OpH218 also connects an RS232 printer, a computer with USB and an analog recorder.

2. Connection of electrodes

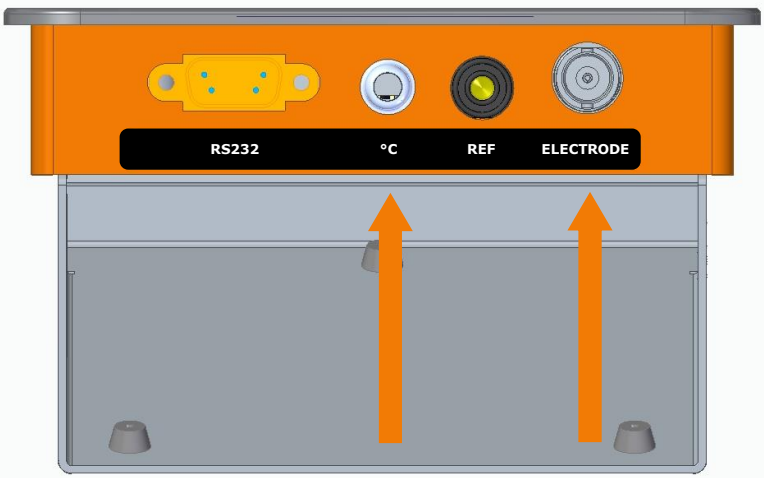
Place the electrodes on the electrode holder. The OrigaStand Electrodes Support, which includes both an electrode holder and a magnetic stirrer, is perfectly suited to pH measurements.

a. Note about the temperature sensor

If you do not plug in a temperature sensor, the temperature of your buffers and samples will be entered manually using the keyboard keys.

b. Using a combined pH electrode with separate temperature sensor

Plug in the combined glass electrode + reference to the coaxial plug type BNC.
Plug the temperature sensor into the RCA/CINCH pH-meter socket.



When the device is turned off, the electrodes are automatically disconnected from the electronics and can remain plugged in without risking damage.

RCA – RCA Cord
supplied with the temperature sensor

BNC - S7 Cord
Ref AR01210

Temperature probe
Ref. OGT-103-7-5-CINCH-CIAL

Glass combined pH Electrode + reference
Ref. OGPH201

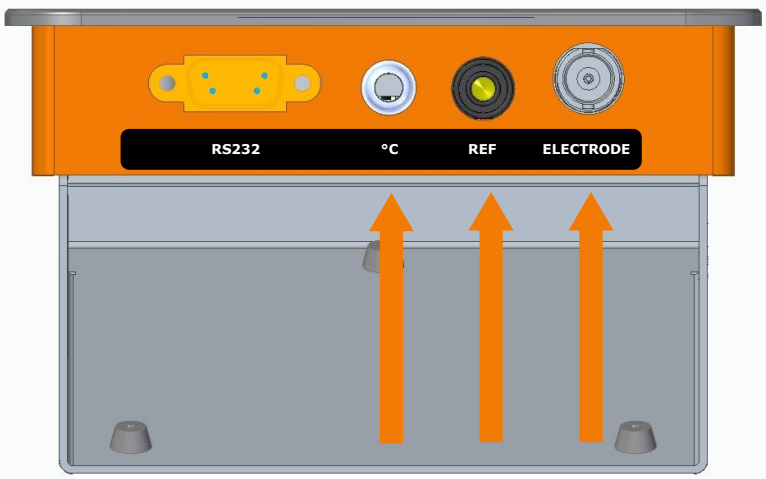
Connection to the Ground:

The pH-meter is not connected to the earth until it is connected to another device such as a printer, recorder or PC, which is itself connected to the earth.

This allows measurements to be made in floating mode, in other words if the sample to be measured is connected to the earth through for example a pipe or a metal magnetic agitator, the pH-meter will make measurements without being disturbed by a mass loop (passing the current in the reference electrode).

c. Use of separate glass electrodes - reference - temperature sensor

If separate electrodes are used:
Connect the reference electrode to the black banana socket (located between the BNC and RCA/CINCH sockets).
Connect the simple pH electrode to the BNC-type coaxial socket.
Plug the temperature sensor into the pH-meter RCA/CINCH socket.



When the device is turned off, the electrodes are automatically disconnected from the electronics and can remain plugged in without risking damage.

RCA – RCA Cord
supplied with the temperature sensor

BNC - S7 Cord
Ref AR01210

Temperature probe
Ref. OGT-103-7-5-CINCH-CIAL

Électrode de pH simple
Réf. OGPH001

In the middle:
Banane - S7 Cord
Ref. AR1206
Reference Electrode
Ref. OGR004

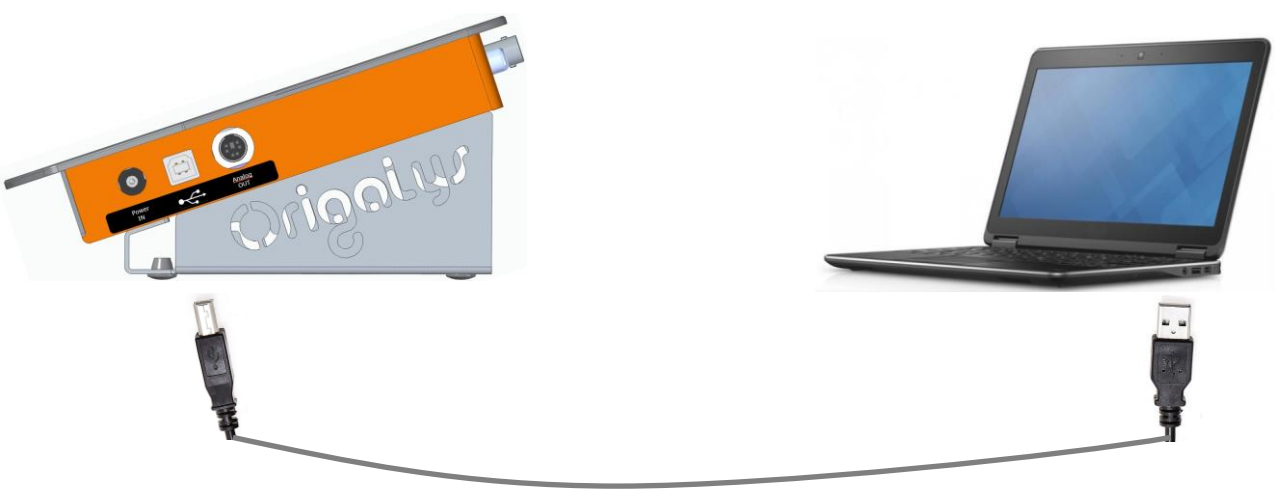
Connection to the Ground:
(See description previous page)

3. Power

Connect the AC adapter provided with the device on the pH-meter Power IN socket. Then connect the sector adapter to the power grid.

	For safety reasons, do not use the sector adapter within a meter of a water point. Use of an EN60601 AC adapter: 80 - 264Vac, 47 - 63Hz / 12Vdc, 1A, 12W We do not accept any responsibility for the use of an adapter other than the one provided by OrigaLys ElectroChem.

It is also possible to power the pH meter via the USB connection.
In this case, disconnect the sector adapter from the power grid and the Power IN socket from the pH-meter.
Connect the pH-meter USB socket to a computer via a standard "USB 2.0 A male to B male" cord (reference OrigaLys ElectroChem AR01195).

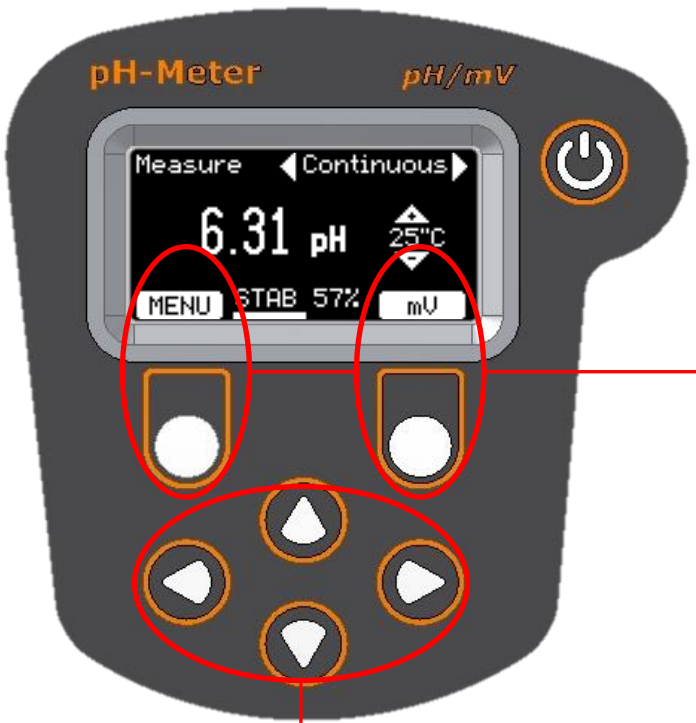


4. Hands-on keyboard

Power the pH-meter by pressing the button to the right of the screen.

The home screen lights up, with time display.

Pressing one of the keys on the keyboard, the pH/mV measurement screen in continuous mode appears:

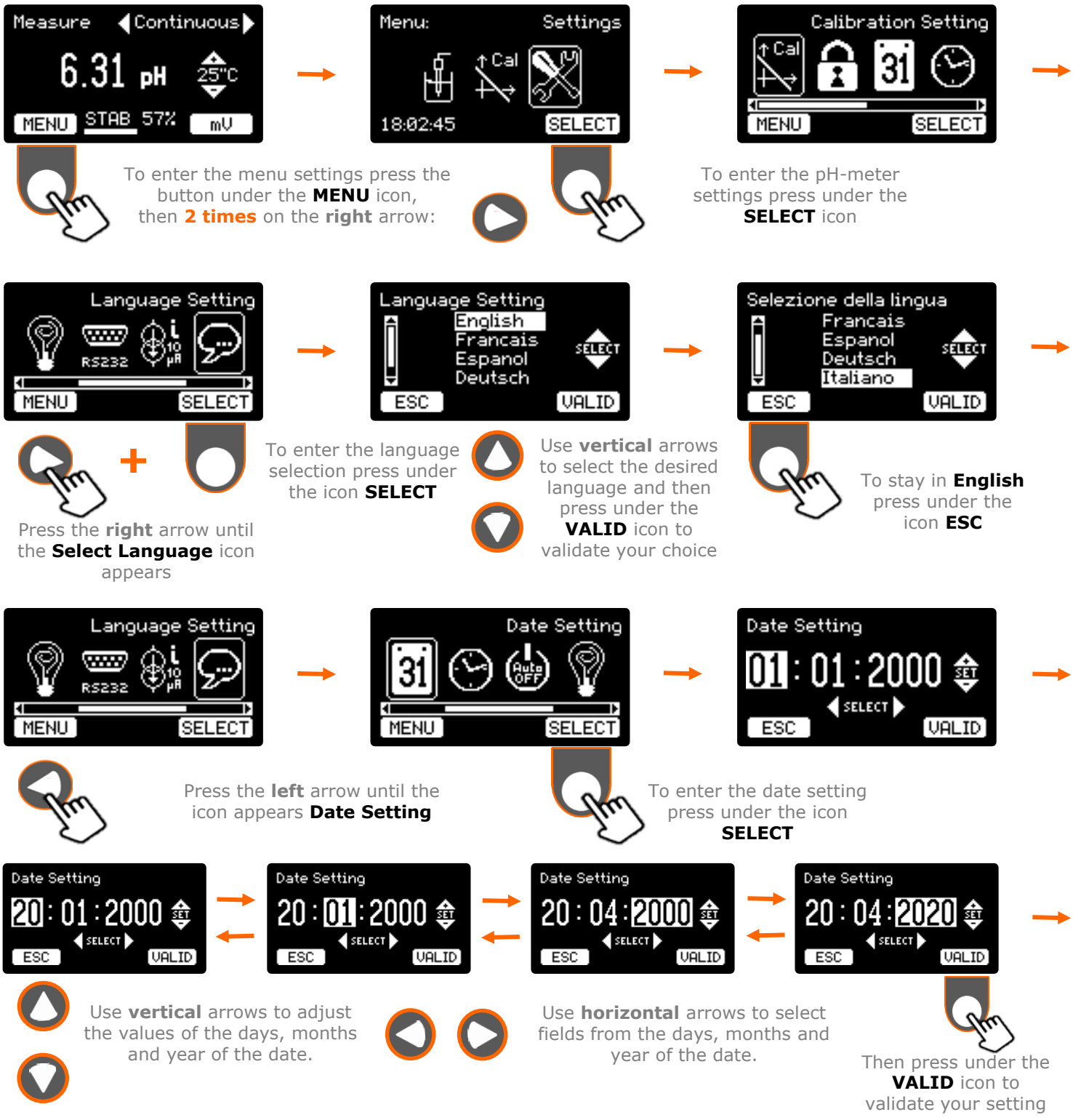


Function keys.
Each key is associated with a function defined in a white rectangle at the bottom of the screen.
In our example the left key allows you to enter the **MENU** to access the other functions of the device. The right key allows you to switch to potential (**mV**).

Adjustment and navigation keys.
These keys allow you to move around menus, select a setting, or adjust the value of a variable.
In our example, **horizontal** arrow keys allow you to select the **Continuous** or **Auto** measurement mode. **Vertical** arrow keys adjust the temperature value.

5. Exercise: Adjusting language and date

Make the next sequence to take control of the keyboard and enter the pH-meter setting menus.



II. Calibration

The pH-meter must be calibrated with buffer solutions for each electrode used. The calibration determines the parameters of the relationship between the potential measured at the electrode terminals and the pH value displayed. It can be done on one, two or three buffer solutions. Select a stamp with a value close to that of your samples. To achieve high accuracy, the pH values of tampons used during a two- or three-point calibration must control the pH value of the samples.

The calibration can be done in three different ways:

- **In Automatic mode:** calibration on one, two or three points with automatic buffer recognition. You can choose between the following two sets of buffers:.
  - IUPAC certified pH standards 1.679 – 4.005 – 7.000 – 10.012 and 12.454
  - 4-7-10 series stamps.

  It is not possible to use tampons in different games. Example: A calibration made from a 4-7-10 series stamp and an IUPAC-certified pH buffer will provide a false result.
- **In Manual mode:** calibration on one, two or three points. The number, order of passage, series and value of the tampons used are set beforehand. The list of proposed tampons is as follows:
  - IUPAC 1.679 – 4.005 – 6.865 – 7.000 – 7.413 – 9.180 – 10.012 and 12.454
  - 4-7-10 series.

  It is possible to use any of the tampons in both sets. Example: A calibration can be made from the 4-7-10 series buffer 4 and the IUPAC-certified 6,865 and 9.180 pH standards.
- **In Free mode:** the values of the tampons are entered freely by the user. Use this mode to calibrate a pH electrode using buffer solutions that do not necessarily belong to the IUPAC or 4-7-10 series. You will need to know exactly the pH value of this solution at the calibration temperature. Achievable calibration on one or two points.

The choice of calibration mode (**Automatic / Manual / Free**) and the choice of the set of tampons (**IUPAC** series or series **4-7-10**) are made in the menu "**Configure the calibration**" of the device.

The pH value of a buffer solution varies with temperature. For calibration calculations, the pH-meter determines the actual value of the buffer at the measurement temperature. The temperature is entered using the vertical arrow keys (setting with a resolution of 1°C) at the beginning of the calibration procedure or measured automatically for each buffer when a temperature sensor is connected (measurement resolution: 0.1°C).

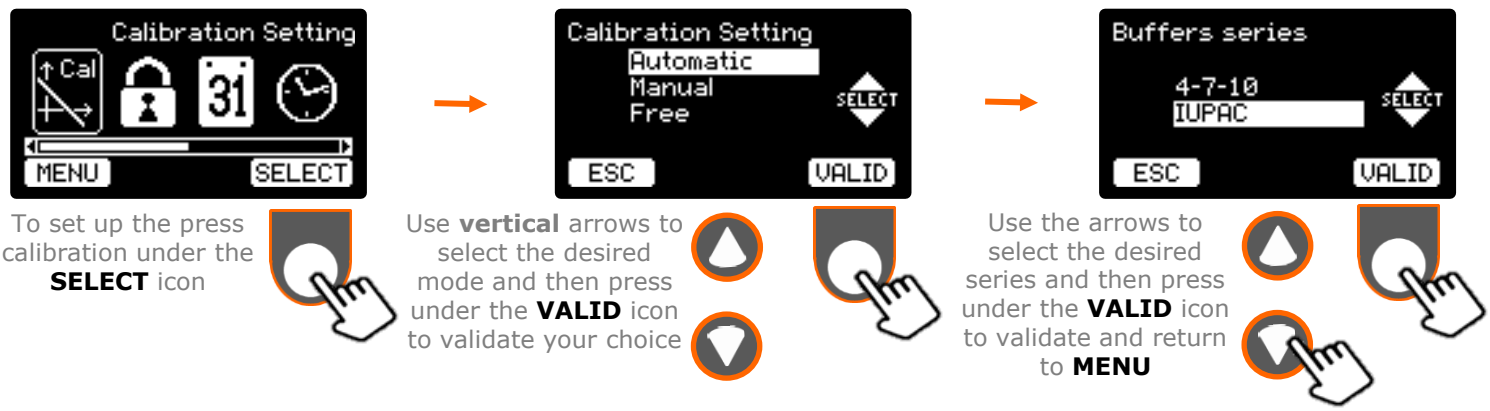
1. Setting calibration settings

Before calibrating, choose one of three modes:

Automatic	Manual	Free
1 to 3 buffers	1 to 3 buffers	1 to 2 buffers
Series 4-7-10 or IUPAC Series Recognition between 5 different buffers in the IUPAC series	Possible mix of buffers between the 4-7-10 and IUPAC series Choice between 8 different buffers in the IUPAC series	No restrictions on buffers Manually entered value

These choices will be memorized and will remain valid for the following calibrations. These choices can be changed at any time using the same procedure. Enter the device setting menu as described above in the chapter I.5 Exercise: Adjusting language and date

a. Setting the Automatic Mode and the Series Used

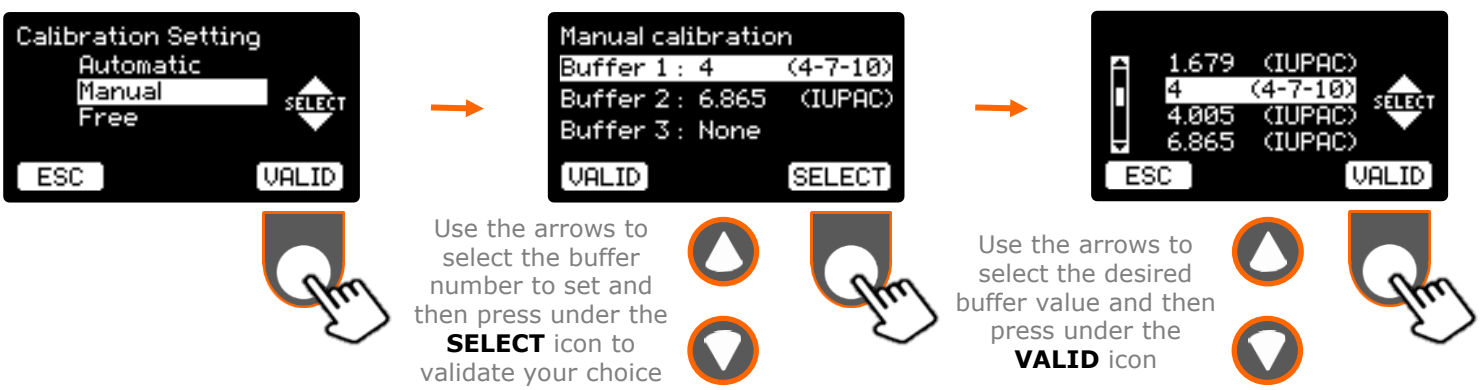


To set up the press calibration under the **SELECT** icon

Use **vertical** arrows to select the desired mode and then press under the **VALID** icon to validate your choice

Use the arrows to select the desired series and then press under the **VALID** icon to validate and return to **MENU**

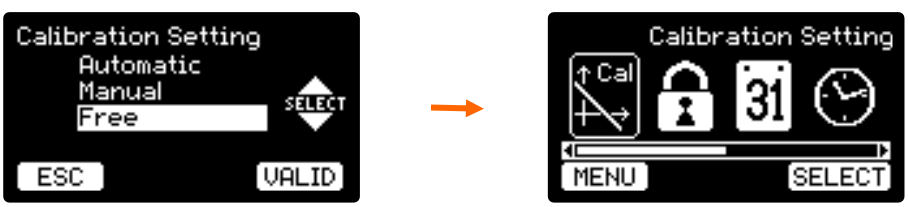
b. Adjusting Manual mode, number and value of tampons used



Use the arrows to select the buffer number to set and then press under the **SELECT** icon to validate your choice

Use the arrows to select the desired buffer value and then press under the **VALID** icon

c. Setting Free Mode

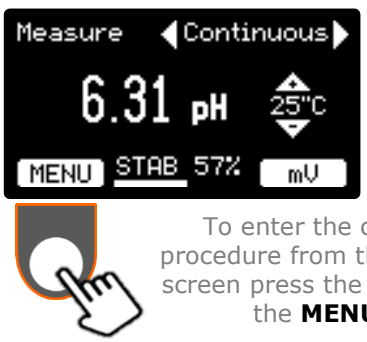


To select free calibration press under the **VALID** icon

2. Calibration procedures

Procedures are different depending on the calibration method chosen, (automatic, manual or free). However, they all start with common steps.

a. Common steps for all calibration methods

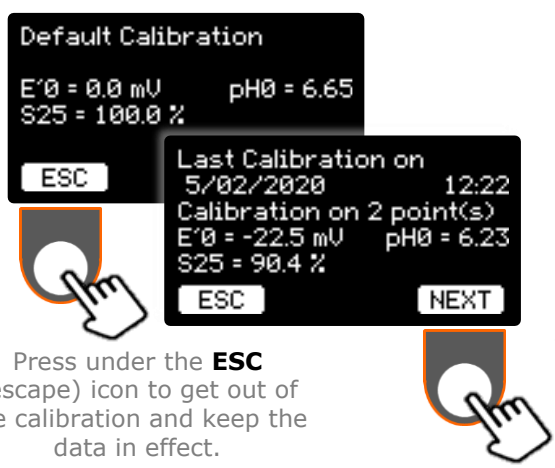


To enter the calibration procedure from the measuring screen press the button under the **MENU** icon

Press under the **SELECT** icon to get into calibration

Then use the **right** arrow to select the **Calibration** icon

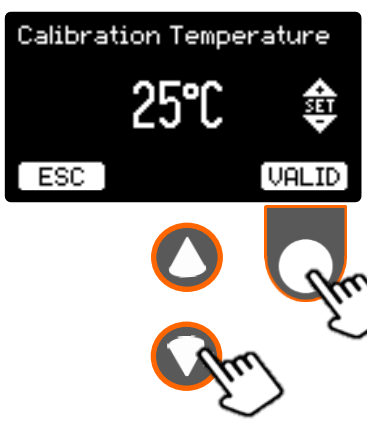
The device displays the current calibration data, either the last calibration done and saved in the device, or the defaults.



Press under the **ESC** (escape) icon to get out of the calibration and keep the data in effect.

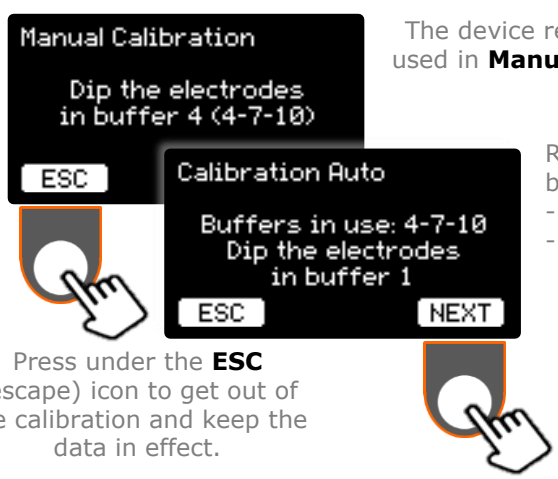
Press under the **NEXT** icon to see the next screen

The **Calibration temperature** input screen does not appear when a temperature sensor is connected.



Use vertical arrows to adjust calibration temperature and then press under the **VALID** icon to validate the setting and continue calibration

b. Automatic and manual calibrations



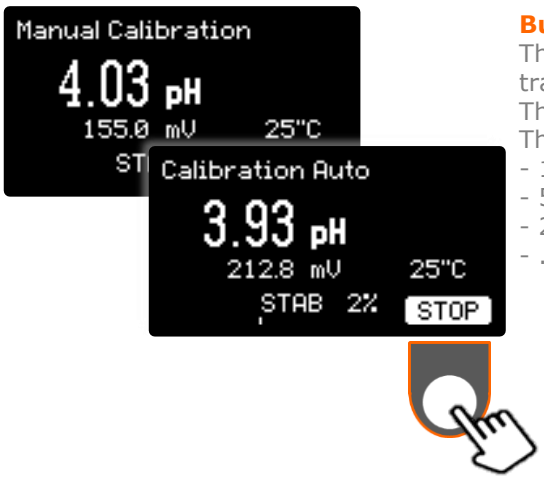
Press under the **ESC** (escape) icon to get out of the calibration and keep the data in effect.

The device recalls the calibration mode chosen as well as the buffer to be used in **Manual** mode (here **buffer 4** of the **4-7-10** series) or the series of tampons used for **Automatic** mode.

Rinse the electrodes with demineralized water and immerse them in the buffer solution:
- whose value is displayed on the screen in **Manual** mode
- or the number one stamp of your choice for **Automatic** mode.
  Depending on the series of tampons used this solution should be:
  - IUPAC series pH 1.679 or 4.005 or 7.000 or 10.012 or 12.454
  - Series 4-7-10 pH 4 or 7 or 10

Set and start the shake, then press under the **NEXT** icon to start the measurements in the 1st buffer and view the next screen

II. Calibration

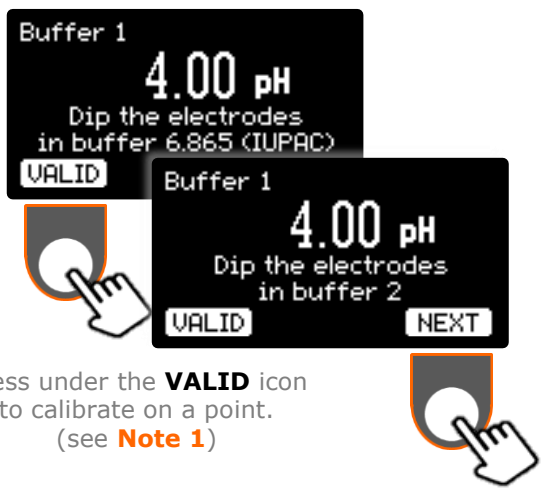


Buffer solution measurement screen:
The pH-meter controls the stability of the measurement. It can be tracked using the visual indicator.
This indicator changes from 0 to 100% of the stability criterion.
The minimum stability criterion is fixed and equal to 3 mV/min.
- 100% means that the drift of the measurement is less than 3 mV/min
- 50% means the drift is less than 6 mV/min
- 25% means the drift is less than 12 mV/min
- ...

STAB (%) - 100 x Stability Criterion / Drift

The **STOP** key allows you to stop the measurements at this point and return to the previous screen if, for example, you have not immersed the electrodes in the correct buffer solution or if the measurement fails to stabilize.

Once the measurement has stabilized (STAB - 100%), the pH-meter displays the recognized buffer solution.

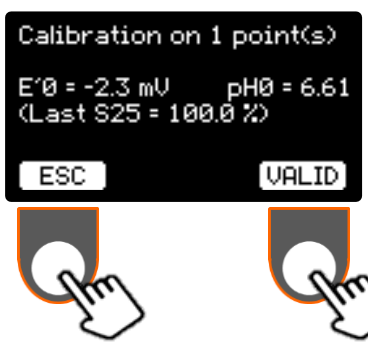


To continue calibrating the second buffer solution,
Rinse the electrodes with demineralized water and immerse them in the buffer solution:
- whose value is displayed on the screen in **Manual** mode
- or the no.2 buffer of your choice for **Automatic** mode.

Press under the **VALID** icon to calibrate on a point. (see **Note 1**)

Start the agitation, then press under the **NEXT** icon to start the measurements in the 2nd buffer and view **the measuring screen**

Calibration on a point



When calibrating on a point, the pH-meter only calculates the values of E'0 and pH0.
The slope shown in brackets corresponds to that obtained during the last calibration on two or three points.

Press under the **VALID** icon to validate and memorize the result of calibration on a point.
The device automatically returns to the **MENU** screen

Press under the **ESC** icon to get out of the calibration and keep the data from the previous calibration and return to the **MENU** screen

*If an error message occurs during calibration, refer to the "**Operating Anomalies**" section.*

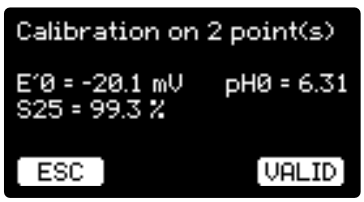
Note 1:
- In **Manual** mode: although calibration is defined with two (or three) buffer solutions, it is still possible to calibrate only on one point.
- In **Automatic** Mode: Exits the calibration procedure to calculate the result on a point.

Two- or three-point calibration

Once the measurement is stabilized in buffer 2, the pH-meter displays the recognized buffer solution.

Manual mode:
In our example, calibration is configured to be done with **two** buffer solutions.
As a result, the device signals that there is no longer a buffer to measure.

Press under the **NEXT** icon to view the screen of calibration results.

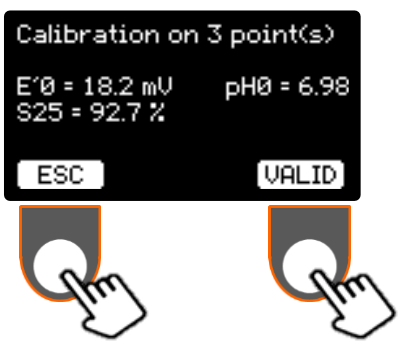


Automatic mode:
To continue calibrating on the third buffer solution,
Rinse the electrodes with demineralized water and immerse them in the buffer solution of your choice.

Press under the **VALID** icon to calibrate on two points

Start the agitation,
then press under the **NEXT** icon to start the measurements in the 3rd buffer and view **the measuring screen**

Once the measurement is stabilized in buffer 3, the pH-meter displays the recognized buffer solution.



*If an error message occurs during calibration, refer to the "**Operating Anomalies**" section.*

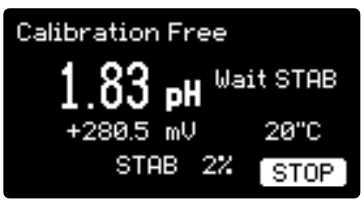
Press under the **ESC** icon to get out of calibration and keep data from previous calibration

Press under the **VALID** icon to validate and memorize the calibration result. The device automatically returns to the **MENU** screen

c. Free calibration

The device recalls the calibration mode chosen.
Rinse the electrodes with demineralized water and immerse them in the buffer solution of your choice.
Warning: In the **free** calibration mode you need to know the exact values of your buffer solutions at the measurement temperature.

Set and start the shake,
then press under the **NEXT** icon to start the measurements in the 1st buffer and view the next screen

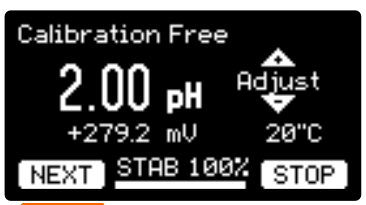


Buffer solution measurement screen:
The pH-meter controls the stability of the measurement. It can be tracked by the visual indicator evolving from 0 to 100% of the stability criterion.

The **STOP** key allows at this point to stop the measurements and return to the previous screen if, for example, the measurement fails to stabilize.

Once the measurement has stabilized (STAB - 100%), the pH-meter shows the **Adjust** indicator

Use the arrows to **adjust** the value of the buffer to the measurement temperature

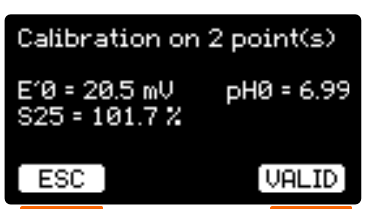


Then press under the **NEXT** icon to validate the setting and continue calibrating

Press under the **VALID** icon to **calibrate on a point**

Rinse the electrodes with demineralized water and immerse them in the 2nd buffer solution of your choice.
Set and start the agitation, then press under the **NEXT** icon to start the measurements. Proceed as for the first tampon.

Then press under the **NEXT** icon to complete the calibration



Press under the **ESC** icon to get out of the calibration and keep the data from the previous calibration

Press under the **VALID** icon to validate and memorize the calibration result.
The device automatically returns to the **MENU** screen

III. Measures

1. Measurement procedures

A pH measurement is calculated from the electrode calibration results. The parameters are:

- **pH_{iso} :** pH value where the temperature has no effect. This is an electrode construction parameter set and equal to 6.65 pH
- **E'0 (mV) :** The electrode's asymmetry potential, where the temperature has no effect. (when pHx = pH_{iso})
- **S25 (%) :** Slope of the electrode at 25°C. (Theory: -59,16 mV/pH @ 25°C)
- **pH0** = pH_{iso} – (E'0 / S25)

It is therefore necessary to calibrate on one, two or three points, or to check the latest calibration results stored in memory.

The pH measurement is determined as follows:

$$\mathbf{pHx} = pH_{iso} + \frac{(\mathbf{Ex} - E'0) \times 298{,}16}{(\mathbf{tx} + 273{,}16) \times S25}$$

with:

- **Ex (mV) :** Potential measured at the electrode terminals
- **tx (°C) :** Temperature of the solution measured with a probe or manually entered

Rinse the electrodes with demineralized water and dip them into the sample.

Set the agitation speed.

pH measurements can be done in two different ways:

- **Continuous measurement:** The pH or potential value of the solution is measured and displayed in real time. A visual indicator can track the stability of the measurement.

- **Automatic measurement:** result freezes on the display once the electrode signal is stable. Stability is defined by a stability criterion equal to 3 mV/min.

2. Continuous measurement

When powered on and once the home screen has passed, the pH-meter enters pH in continuous mode. In this mode, the device continuously measures, calculates and displays the pH value.
As in calibration (see previous chapter), an indicator can track the stability of the measurement.
Data from the last calibration of the electrode are used for pH calculation.
There is no saving of measures.

You connected a temperature sensor to the pH-meter. The temperature measurement is displayed with a resolution of 0.1°C.

You have not connected a temperature sensor to the pH-meter. Measure the temperature of the sample and enter this temperature with the keys (resolution: 1°C).

Press under the **mV** icon to switch to potential.
New support allows you to return to **pH**

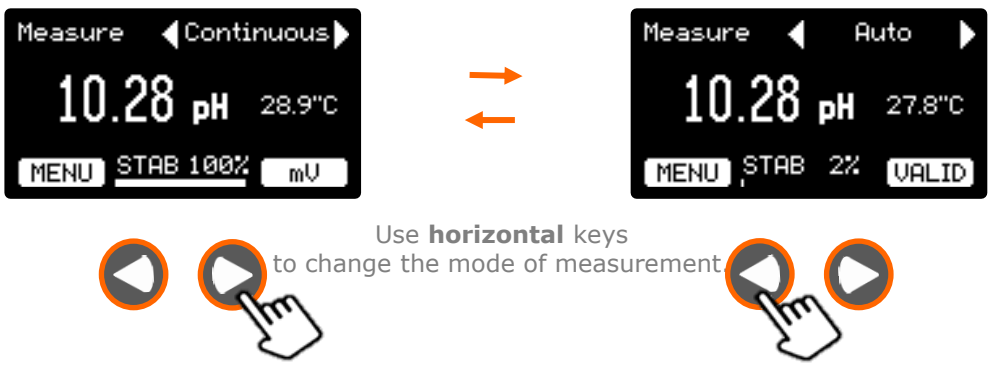
Press under the **MENU** icon to select other pH-meter functions:
Calibration / Settings

*If an error message occurs during the measure, see "**Operational Anomalies**."*

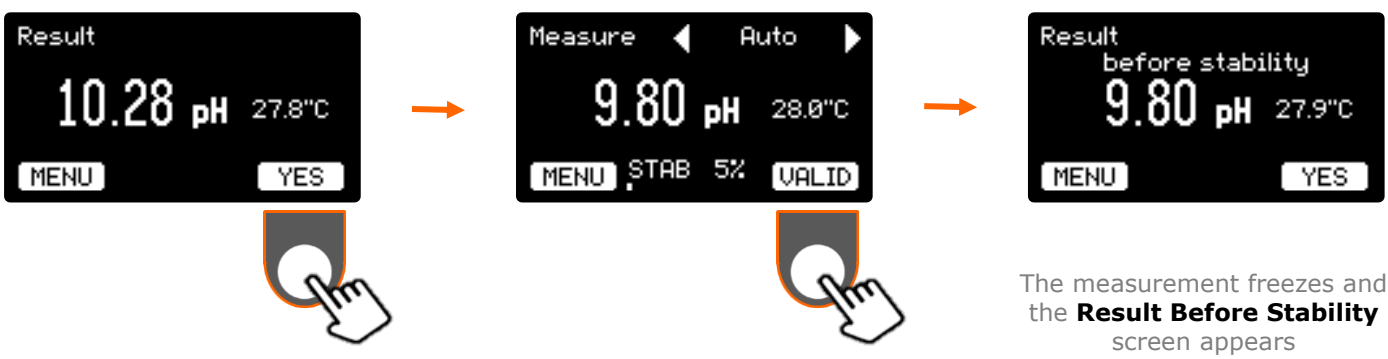
When the **Measure** icon is selected, press under **SELECT** to return to **continuous** able

3. Automatic measurement

When powered on and once the home screen has passed, the pH-meter enters pH in continuous mode. To access Automatic mode, use **horizontal** keys.
The automatic mode is not available in **mV measure**.
In this mode of measurement, the value freezes when the drift is below the stability criterion. The value is backed up. A measure must then be restarted to achieve a new result.



Once the measurement has stabilized (STAB - 100% for 3 sec), pH value and temperature freeze, the result is memorized and remains displayed:



Press under the **YES** icon to launch a new measure.

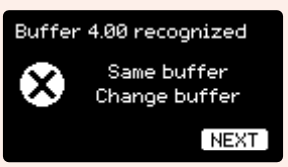
You can stop the measurement before stabilization by support under the **VALID** icon

The measurement freezes and the **Result Before Stability** screen appears

*If an error message occurs during the measure, see "**Operational Anomalies**."*

IV. Anomalies

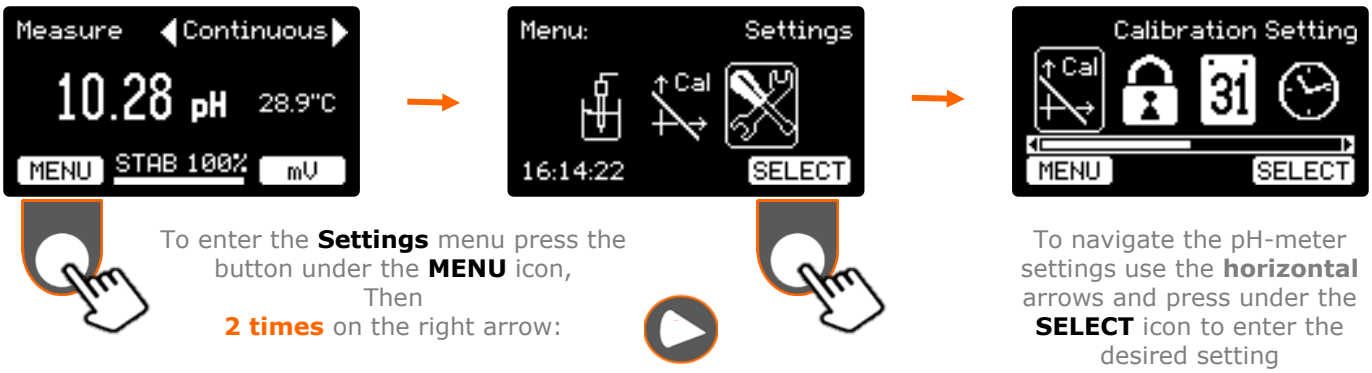
Operating anomalies are indicated by the following error messages:

	Message	Error	Solution
Calibration phase		The buffer is not recognized in the list of chosen buffers.	• Go back to the calibration settings and make sure it's in the list • Make sure the tampon is not out of date or contaminated • Check the condition of the electrode and its connection
		The recognized buffer is identical to one of the buffers already used.	Change the buffer and then press **NEXT** to continue
		Buffer 7.00 has already been recognized or the electrode is out of service. In a 7.00 buffer the electrode measures a potential close to 0 mV, which is also the case with a defective electrode.	• Change the buffer and then press **NEXT** to continue • Check the condition of the electrode and its connection
		The slope is less than 95% The same type of alert may appear if the slope is greater than 102%	• Check the validity date of the tampons and their values • Check the condition of the electrode and its connection • Then, press **ESC** to redo calibration • Or press **VALID** to ignore the warning and validate the calibration
		Zero pH is less than 5.8. The same type of alert may appear if the value is greater than 7.5	
		The value of pH buffers is guaranteed over a temperature range. The measured temperature is outside the temperature range of this buffer	• Check the temperature value in or measured • Change buffers (temperature ranges are different depending on the buffer)
Measure phase		The signal is unstable (derived more than 3mV/s) for more than 3 minutes during calibration (except Free mode) or during automatic measurements	Check the condition of the electrode, its connection and the agitation conditions. Then click on **NEXT** to redo the measurement
		The measured potential exceeds the ranges -1999.9 to 1999.9 mV or -9 to 23 pH	Check the condition of the electrode and its connection

V. Other settings

1. Access and list of settings

Enter the pH-meter setting menus.



To enter the **Settings** menu press the button under the **MENU** icon,
Then
2 times on the right arrow:

To navigate the pH-meter settings use the **horizontal** arrows and press under the **SELECT** icon to enter the desired setting

List of available settings.

Set up calibration. (See chapter **II. Calibration**)

Change the password. The settings can be locked and protected by a password of your choice. (See chapter V.2. Password management)

Set the date. (See chapter I.5. Exercise: Adjusting language and date)

Set the time. Same procedure as the date.
(See chapter I.5. Exercise: Adjusting language and date)

Set the AUTO stop. To limit pH-meter consumption and save the screen, it is possible to turn off the display after a non-use period. (See chapter V.3. Setting the time to extinguish)

Set the contrast. To limit the consumption of the pH meter and save the screen, it is possible to decrease the brightness of the display. (See chapter V.4. Contrast adjustment)

Set up the RS232. Adjusting the communication speed of the RS232 port.
(See chapter VI.2.d. Set up of RS232 port)

Activate the imposed current. Imposing a current of 10 µA in the electrodes.
(See chapter V.5. Imposed current function)

Select language. (See chapter I.5. Exercise: Adjusting language and date)

Default setting. Return to default settings and settings.

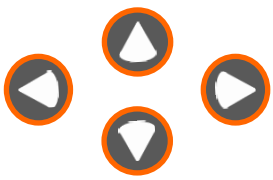
Update the software. Loads a new version of the software embedded in the device.
(See chapter V.6. Software update)

V. Other settings

2. Password management

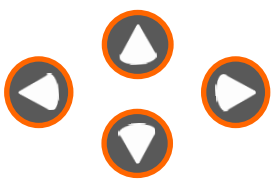
At the first power-up or after a return to the default settings, no password is required to enter the device settings. It is possible to lock and protect your settings with a password of your choice:

Select the **Password Setting** icon and tap under the **SELECT** icon to enter the setting



Use **horizontal** arrows to select the digit to be set and the **vertical** arrows to adjust the value of the digit, then press under the **VALID** icon to validate your password.
(In our example the password is **1Z9A**)
Note: To disable password protection enter the value **0000**.

When a different code of 0000 has been validated, it is imperative to enter your code to enter the device settings:



Use **horizontal** and **vertical** arrows to enter your password, then press under the **VALID** icon to validate.
If the code entered is not correct (example **1234**), the display returns to the value of **0000** and it is impossible to enter the settings
Note: press under the **MENU** icon to return to the **Menu**.

If your code is lost or forgotten, the pH-meter has a backup code. To obtain this, please contact OrigaLys ElectroChem SAS after-sale or your local representative.

3. Setting the time to extinguish

To limit pH-meter consumption and save the screen, which has a lifespan of about 50,000 hours (± 20%) 10 years for 12 hours of operation per day, it is possible to turn off the display after a non-use period.

By no use time we mean no tap on the keyboard keys, no communication RS232 or USB.

Select the **Auto-off Setting** icon and press under the **SELECT** icon to enter the setting

Use **vertical** arrows to select your choices, then tap under the **VALID** icon to return to settings.

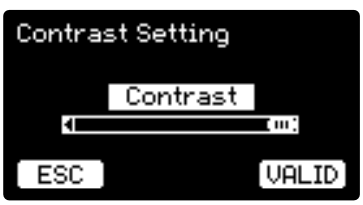
In our example, if no action on the keyboard, or activity on the RS232 or USB is detected after validation, the screen will go out in 45 minutes,

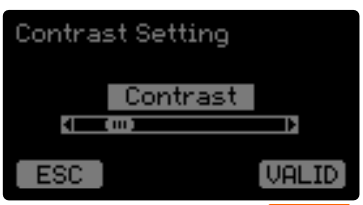
To reactivate the display on the last screen used, press one of the keyboard keys (except On/Off), or use RS232 or USB communication.

4. Contrast adjustment

To limit pH-meter consumption and increase screen life (see previous chapter V.3. Setting the time to extinguish), it is possible to decrease the brightness of the display.

Select the **Contrast Setting** icon and press under the **SELECT** icon to enter the setting



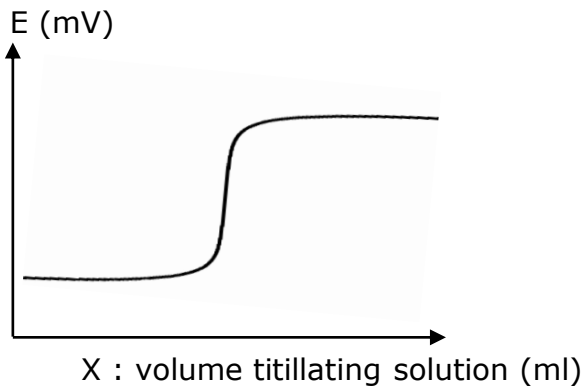


Use **horizontal** arrows to adjust the contrast, then press under the **VALID** icon to return to settings.

5. Imposed current function

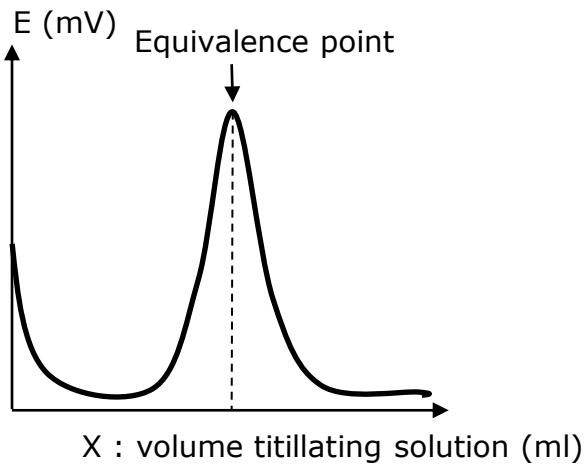
A pH-meter makes it possible to make **potentiometric titrations** with zero current. An E titling curve (or pH) can be traced according to the volume of titrant added gradually using a graduated burette.

Traditionally the measurement performed is the tracking of the potential according to the titling volume. The equivalence point is spotted by the inflection point on the S-shaped curve.



Sometimes the resulting curve is difficult to exploit and does not allow the precise identification of the inflection point.

The **OpH218** has a function to impose a continuous current of 10 µA in the electrodes. This technique makes it possible to make **potentiometric titrations with imposed current**. The curve obtained by using, for example, double-platinum electrodes is very different and is like a derivative of the S-curve. This method allows for a more direct and accurate determination of the equivalency point.



The best known example is Karl Fisher's method of titillating water by iodine.

V. Other settings

To activate the generation of the current imposed in the electrodes follow the following procedure:

Select the **Imposed Current Setting** and Press icon under the **SELECT** icon to enter the setting

Press under the **VALID** icon to **Imposed Current Setting** and go back to the settings.

During measurements (Continue or Auto) the generation of the imposed current is displayed on the screen by a small symbol:

Note that the generation of the imposed current is automatically deactivated when one enters a calibration procedure and reactivated at the exit of it.

6. Software update

It is highly recommended that you only update your pH-meter on-board software in case the OrigaLys ElectroChem SAS after-sale service or your local representative recommends it.

To update the device you need to connect the pH meter to a PC via a USB cord. Then refer to the application note provided with the new version of the embedded software.

For the record, you can view the software version and the serial number of your pH meter by:

Select the Icon **Software update** and tap under the **SELECT** icon to enter the feature

Press under the **ESC** icon to return to settings.

VI. Communications

1. "Analog OUT" output

Generally used to connect to analog recorders (such as a tracking table or analog/digital acquisition and conversion devices...) or to control an OrigaStand stirrer, OpH218 offers analog outputs for the following three types of signals:

8 Pin Mini DIN

Pin 1: Repetitive direct output of the potential measured at the Electrodes (± 2000 mV) (*)

Pin 4: Calibrated output of the pH value displayed (100 mV/pH) (0 to 16.50 pH) (*)

Pin 6: OrigaStand stirrer's order output (400 rpm/V) (0 to 1320 rpm) (*)

Pins 2 and 5: Zero electric (Masse)

Pins 3, 7 and 8: Not Connected

(*) Exit resistance = 1 KΩ

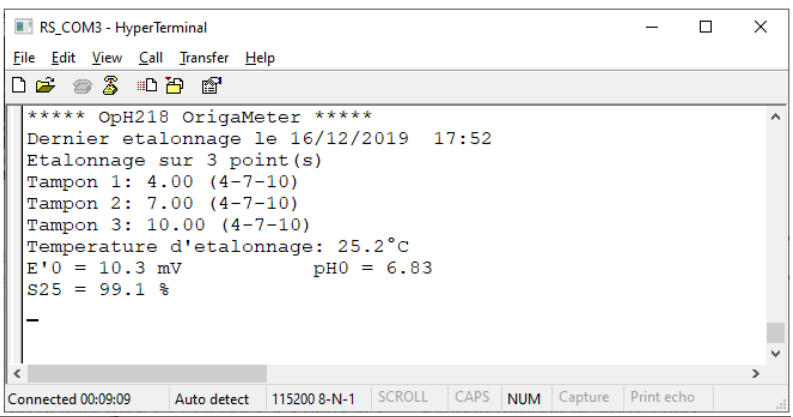
2. Communication "RS232"

The RS232 link allows for several types of communications:
- Printing results at the end of calibration and in automatic measurement mode
- pH-meter control via a set of commands and specific RS232 communication software (Hyper Terminal, TTyEmulator, Regressi, LabView...)

a. Printing results

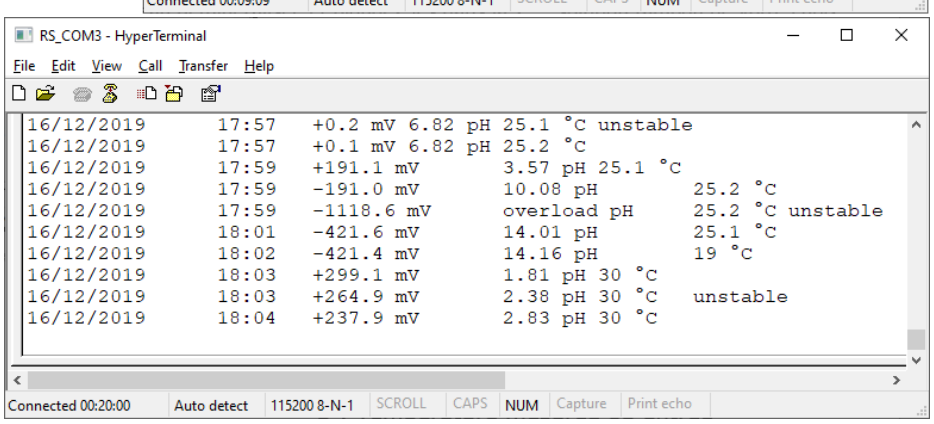
At the end of each calibration, a summary of the data and results is sent on the RS232 link.

It has the following form:



In automatic measurement mode, when the measurement freezes on the screen, a measuring bulletin on a line is sent to the RS232 link.

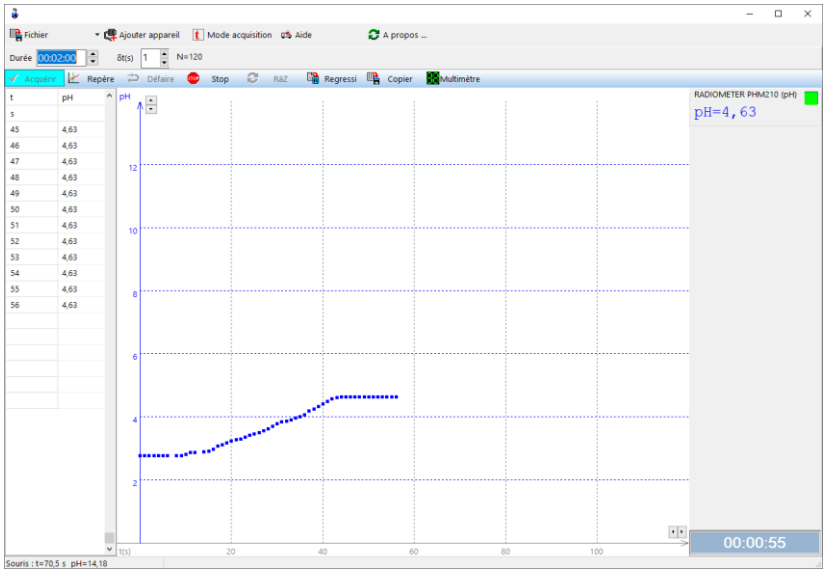
It has the following form:



b. Remote control

The pH-meter features a set of controls compatible with the open source software "Regressi" very popular in education. These controls allow the device to be controlled via numerous RS232 communication software.

Example of control by the "Regressi" software:



c. List and descriptions of RS232 orders

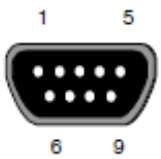
Order syntaxes are ASCII strings of characters that end with the "Carriage Return" control character (ASCII code 13)

Function	Syntaxe	Parametrer	Answer
Designer / Manufacturer	maker	-	OrigaLys
Product name	product	-	OrigaMeter OPH218
Serial number	SN	-	PxxLxxR015Nxxx
Version of the app	ver	-	Vxx.yyyy.mmdd.hhmm
Hardware references	hard	-	PCB041rv? STM32F205RFT6 DspRef DspDriver
Setting the date	date	jj mm aa	<Ok
Setting the time	time	hh mm ss	<Ok
Analog output rpm. Out (rpm)	rpm	0…1320	<Ok
Imposed current output (10 µA) on pH/mV input	iimp	off / on	<Ok
Reading date and time	?rtc	-	dd/mm/aaaa hh:mm:ss
Reading the results of the calibration	?cal	-	9 lignes… (voir § Impression résultat)
Reading the results of the latest measurement in automatic mode	?res	-	1 ligne… (voir § Impression résultat)
Potential measurement or pH or temperature or stability	?RD	mV / pH / t / stab	x.x mV / x.xx pH / x.x °C / x %
Key Up Simulation	}U	-	<Ok
Key Down Simulation	}D	-	<Ok
Left Key Simulation	}L	-	<Ok
Right Key Simulation	}R	-	<Ok
Simulation Key Left Function	}A	-	<Ok
Right Function Key Simulation	}B	-	<Ok

d. Set up RS232 port

Communication format:
- The speed of communication is adjustable to 9600, 19200, 38400 or 115200 bauds. (see RS232 Setting Menu)
- 8 bits of data, No Parity, 1 bit Stop

Brushing the SUB-D 9 pins socket:

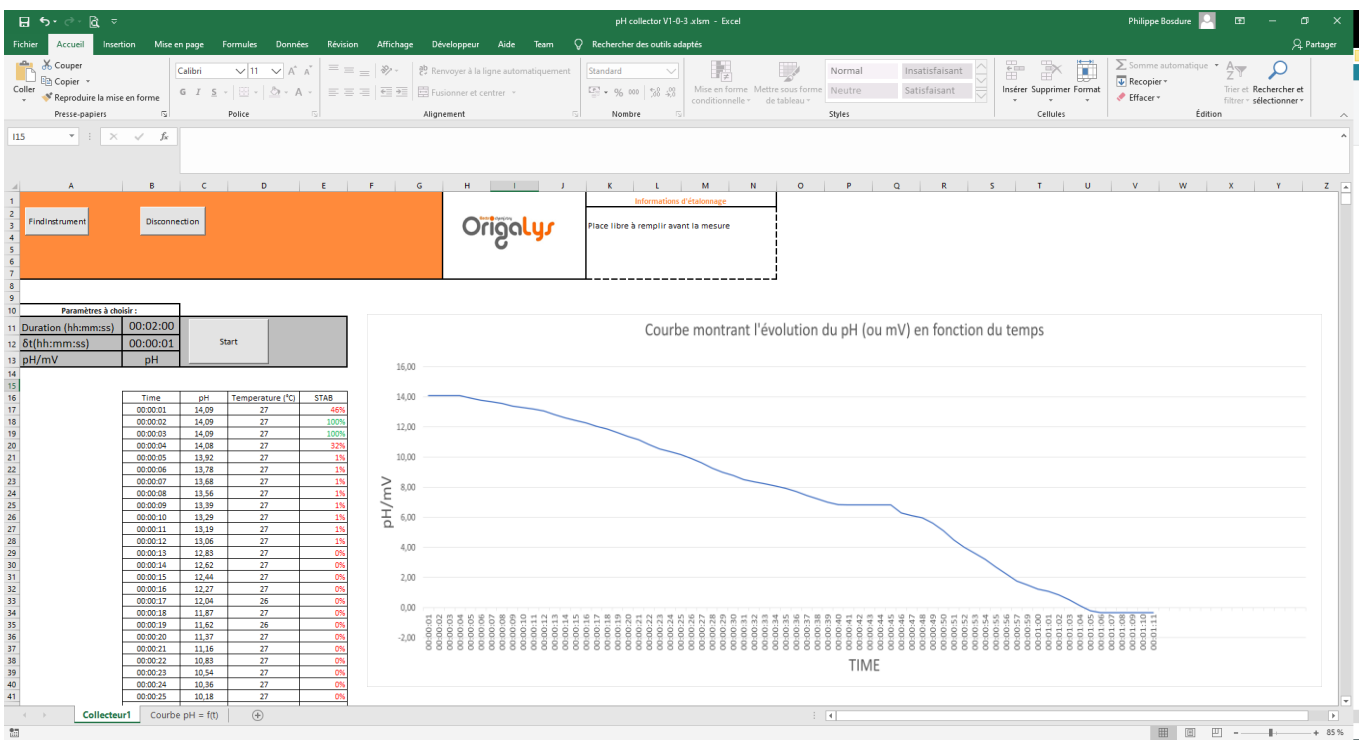


Pin 2: Entering data (Receiving Data : RxD)
Pin 3: Data output (Transmitted Data : TxD)
Pin 5: Zero electric (Masse)
Pin 7: Out of control (Request to Send : RTS)
Pin 8: Control entry (Clear to Send : CTS)
Pins 1, 4, 6 and 9: Not Connected

3. USB communication and remote control

USB communication with a PC is provided by a DLL (Dynamic Link Library) developed and provided by OrigaLys. This DLL allows via a set of controls to control the pH-meter.

Full documentation and an example of use with Microsoft Excel software are available for download on our website. This example is a "pH Collector" that allows real-time storage, display and tracing on a graph, pH/mV measurements based on time, performed by the pH-meter at a user-defined rate.



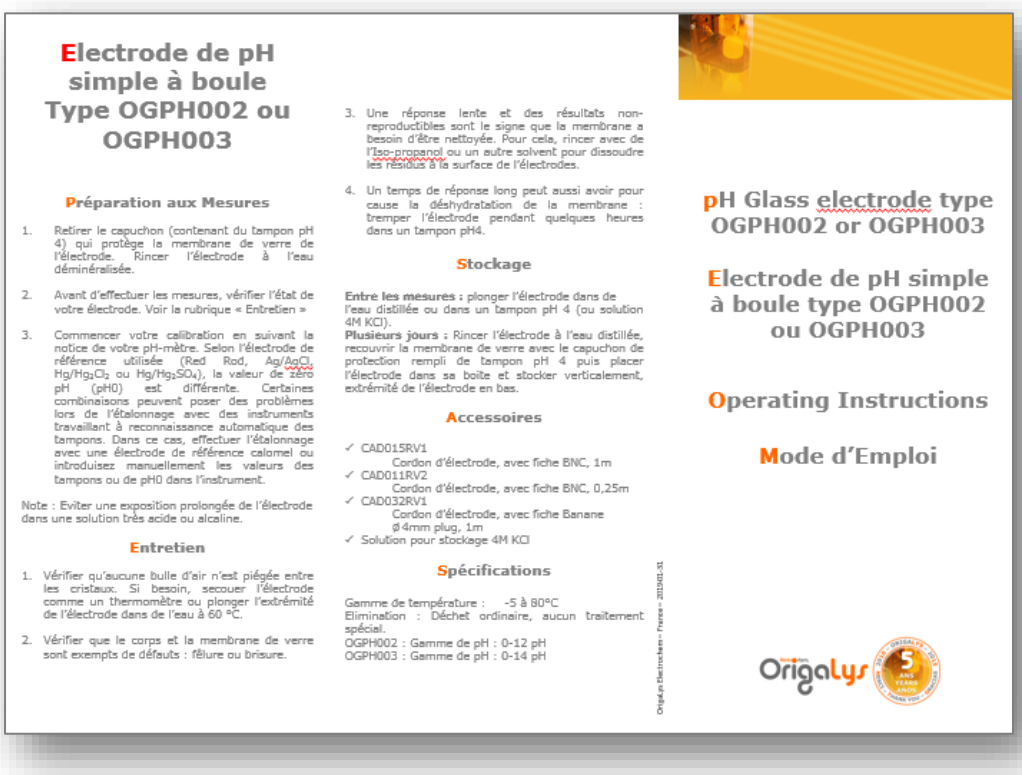
VII. Maintenance

The OpH218 pH-meter requires minimal maintenance.

- The outer surface of the appliance should be cleaned regularly with a soft cloth moistened with lukewarm water.
- Any solvent should be prohibited without prior notice from an OrigaLys representative.
- NEVER TO HELP THE DEVICE ON YOUR OWN.

For device maintenance, please contact OrigaLys ElectroChem SAS after-sales or your local representative.

pH and reference electrodes require maintenance that is described in the documents provided with the electrodes.



Electrode de pH simple à boule Type OGPH002 ou OGPH003

Préparation aux Mesures

1. Retirer le capuchon (contenant du tampon pH 4) qui protège la membrane de verre de l'électrode. Rincer l'électrode à l'eau déminéralisée.
2. Avant d'effectuer les mesures, vérifier l'état de votre électrode. Voir la rubrique « Entretien »
3. Commencer votre calibration en suivant la notice de votre pH-mètre. Selon l'électrode de référence utilisée (Red Rod, Ag/AgCl, Hg/Hg_2Cl_2 ou Hg/Hg_2SO_4), la valeur de zéro pH (pH0) est différente. Certaines combinaisons peuvent poser des problèmes lors de l'étalonnage avec des instruments travaillant à reconnaissance automatique des tampons. Dans ce cas, effectuer l'étalonnage avec une électrode de référence calomel ou introduisez manuellement les valeurs des tampons ou de pH0 dans l'instrument.

Note : Eviter une exposition prolongée de l'électrode dans une solution très acide ou alcaline.

Entretien

1. Vérifier qu'aucune bulle d'air n'est piégée entre les cristaux. Si besoin, secouer l'électrode comme un thermomètre ou plonger l'extrémité de l'électrode dans de l'eau à 60 °C.
2. Vérifier que le corps et la membrane de verre sont exempts de défauts : fêlure ou brisure.
3. Une réponse lente et des résultats non-reproductibles sont le signe que la membrane a besoin d'être nettoyée. Pour cela, rincer avec de l'Iso-propanol ou un autre solvent pour dissoudre les résidus à la surface de l'électrodes.
4. Un temps de réponse long peut aussi avoir pour cause la déshydratation de la membrane : tremper l'électrode pendant quelques heures dans un tampon pH4.

Stockage

Entre les mesures : plonger l'électrode dans de l'eau distillée ou dans un tampon pH 4 (ou solution 4M KCl).
Plusieurs jours : Rincer l'électrode à l'eau distillée, recouvrir la membrane de verre avec le capuchon de protection rempli de tampon pH 4 puis placer l'électrode dans sa boite et stocker verticalement, extrémité de l'électrode en bas.

Accessoires

- ✓ CAD015RV1 Cordon d'électrode, avec fiche BNC, 1m
- ✓ CAD011RV2 Cordon d'électrode, avec fiche BNC, 0,25m
- ✓ CAD032RV1 Cordon d'électrode, avec fiche Banane ø 4mm plug, 1m
- ✓ Solution pour stockage 4M KCl

Spécifications

Gamme de température : -5 à 80°C
Elimination : Déchet ordinaire, aucun traitement spécial.
OGPH002 : Gamme de pH : 0-12 pH
OGPH003 : Gamme de pH : 0-14 pH

OrigaLys ElectroChem - France - 2019/01-S1

pH Glass electrode type OGPH002 or OGPH003

Electrode de pH simple à boule type OGPH002 ou OGPH003

Operating Instructions

Mode d'Emploi

OrigaLys

Example of a technical sheet of an OrigaLys glass electrode

The following accessories are provided by OrigaLys. The list presented below is non-exhaustive and is intended to make it easy to find references to lost or damaged accessories.

The pH-meter is compatible with competing brand electrodes.

1. Cords:
   - AR01210: BNC – S7 cord (to connect pH electrode screw head)
   - AR01206: Banana – S7 cord (to connect reference electrode screw head)
   - AR01209: RCA – RCA cord (to connect temperature probe)
   - AR01195: USB cord to connect to PC and/or supply

2. Electrodes with screw head (S7):

   - Glass electrode:
     - OGPH001: glass electrode, refillable – pH range: 0-12pH
     - OGPH002: glass electrode, refillable – pH range: 0-14pH

   - Combined pH electrodes (Ag/AgCl):
     - OGPH201: combined electrode, refillable – pH range: 0-12pH – Annular Junction – glass body
     - OGPH202: combined electrode, refillable – pH range: 0-12pH – ball head – glass body
     - OGPH203: gel combined electrode – pH range: 0-12pH – ball head – epoxy body
     - OGPH204: combined electrode, refillable – pH range: 0-14pH – ball head – glass body

   - Reference electrodes:
     - OGR004: calomel electrode, refillable – glass body
     - OGR005: Ag/AgCl electrode, refillable – glass body

   - Titration electrodes:
     - Electrode with double platinum rod (Karl Fisher type)
     - Selective electrode, combined or non-combined (fluoride, calcium, nitrate…)

Ask for the catalog « Electrode 2020 » on www.origalys.com

Check the prices directly on our website and request quotes online.

IX. Technical Features

Measurement ranges	pH: - 9 to 23 pH
	mV: ± 2000 mV
	°C: - 10°C to 110°C
Resolution	pH: ± 0,01 pH
	mV: ± 0,1 mV
	°C: ± 0,1°C
Electrode entry impedance	> 2 x 10^{12} Ohms
Polarization electrodes	It is possible to impose a current of 10 µA in the connected electrode on the BNC input
Stability criterion	3 mV/min (≃ 0,05 pH/min)
Measures	2 modes : • Continuous: Continuous display of pH/mV and temperature • Automatic: The pH result is frozen and memorized when the drift is below the stability criterion.
Calibration	1 to 3 points
Choosing buffers	3 modes: • Automatic recognition of buffers (Series: IUPAC or 4-7-10) • Handbook selection of buffers among the series IUPAC and 4-7-10 • Free by manual adjustment of pH value
Criteria for agreeing to calibration	• Slope: 95 to 102% • Zero-pH: 5.80 to 7.50 pH Non-blocking criteria generating a warning
Languages	French, English, Spanish, German and Italian
Display	Chart 128x64, OLED Technology, Size 60 x 30 mm
Input / Output	• 1 input for glass electrode or combined (BNC socket) • 1 input for reference electrode (TAKE BANANE 4 mm) • 1 input for temperature sensor (take RCA / CINCH) • 1 RS232 series port (take SUB-D 9 pins) • 1 USB 2.0 port (type B socket) • 1 analog output (take mini-DIN8)
Box	Project-resistant and dirt-resistant (INOX - PC - PMMA)
Dimensions (H x W x D)	80 x 140 x 180 mm
Weight	1 Kg
Power	2 possibilities: • By AC adapter 12Vdc, 1A, 12W (JACK plug) • By USB 2.0 port (type B socket)
Environmental conditions	• Temperature of use: 5 to 40°C • Relative use humidity: 20 to 80%

X. Buffer solutions

1. How to recognize a tampon

When calibrating, buffer solutions are recognized if:

$$| E_{théo} - Ex | < 57 \text{ mV}$$

with:

- **Ex (mV) :** Potential measured at the electrode terminals.
- **E_{theo} (mV) :** Theoretical potential of the buffer solution obtained with an ideal electrode (pH_{iso} = 6.65 and slope 100%) at the measurement temperature.

There is therefore automatic recognition of the buffer solution when the measured pH is equal to the value of the buffer at 25°C ±1 pH unit.

2. IUPAC buffers - pH based on temperature

BUFFER at 25°C (pH)	TEMPERATURE (°C)															
	0	5	10	15	20	25	30	35	40	45	50	60	70	80	90	95
1.679	1.67	1.67	1.67	1.67	1.68	1.68	1.68	1.69	1.69	1.70	1.71	1.72	1.74	1.77	1.79	1.81
4.005	4.00	4.00	4.00	4.00	4.00	4.00	4.01	4.02	4.03	4.04	4.05	4.08	4.12	4.16	4.21	4.24
7.000	7.12	7.09	7.06	7.04	7.02	7.00	6.99	6.98	6.97	6.97	6.96	6.97	6.98	7.00	7.03	7.05
10.012	10.32	10.24	10.18	10.12	10.06	10.01	9.97	9.93	9.89	9.86	9.83					
12.454	13.42	13.21	13.00	12.81	12.63	12.45	12.29	12.13	11.98	11.84	11.70	11.45				

3. Series 4-7-10 - pH depending on temperature

BUFFER at 25°C (pH)	TEMPERATURE (°C)															
	0	5	10	15	20	25	30	35	40	45	50	60	70	80	90	95
4	4.00	4.00	4.00	4.00	4.00	4.00	4.01	4.02	4.03	4.04	4.05	4.08	4.12	4.16	4.21	4.24
7	7.12	7.09	7.06	7.04	7.02	7.00	6.99	6.98	6.97	6.97	6.96	6.97	6.98	7.00	7.03	7.05
10	10.32	10.24	10.18	10.12	10.06	10.01	9.97	9.93	9.89	9.86	9.83					

4. Influence of temperature on pH measurement

Temperature plays an important role in the result of pH measurement.
It has an influence on the sample, on the value of the buffer solutions and on the characteristics of the electrode. Thus, to be rigorous, a pH value must always be associated with the temperature at which the measurement was made.

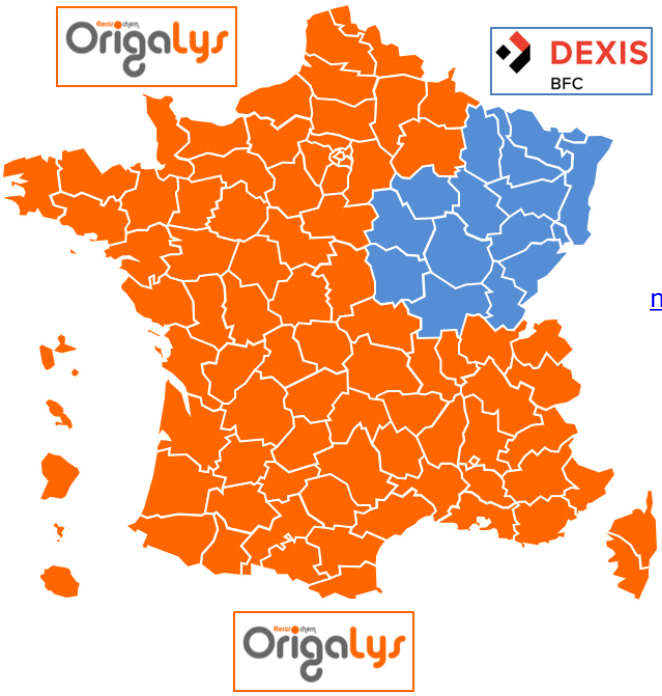
Ideally, the measurement should be done at the same temperature as the calibration. This can sometimes be complicated, depending on the storage conditions of samples and tampons and a significant temperature differential may exist.

The generic value of a tampon is always given at a temperature of 25°C.
The influence of temperature on buffering solutions values is well known. It is shown on all pH tampon vials or accompanying documentation (see previous chapter) and responds to an algorithm programmed in the pH-meter.

Therefore, during calibration, for each buffer solution presented, the pH-meter corrects the expected pH value based on the temperature measured or manually entered. This correction is available in automatic and manual mode. For the free mode, the pH-meter does not know the type of buffer used, no automatic temperature compensation will be applied (ideally, favor buffers that evolve little according to the temperature).

We are talking about ATC (Automatic Temperature Compensation) or MTC (Manual Temperature Compensation)

➢ The team in France



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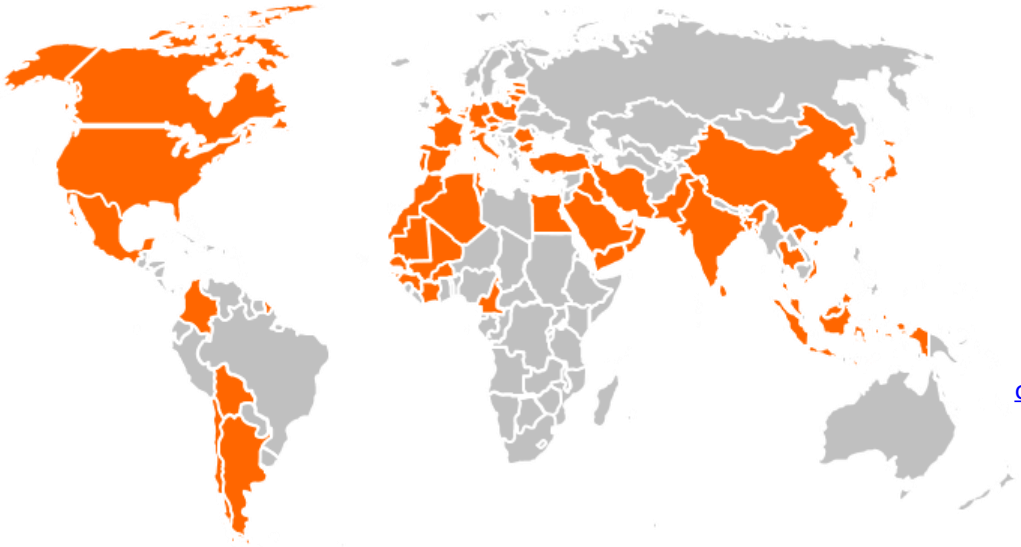
Patrick Balland
03 29 62 40 70
ctb-choffel@dexis.eu

➢ The distributor network



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