

Operating instructions PUROTAP® PHpro-21

Installation Function Operation Maintenance



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1. Safety instructions



Wear safety goggles



Maximum 60 °C



Wear protective gloves



It is not permitted to unscrew the device casing. Repair and maintenance of the device must only be carried out by our named qualified personnel!



Avoid any effects caused by the following environmental factors:

- Excessive shaking
- Extended exposure to direct sunlight
- Humidity above 85 %
- Presence of corrosive gases
- Ambient temperatures below 5 °C or above 40 °C
- Strong electrical or magnetic field

2. Function

PUROTAP® PHpro-21 is a portable meter for pH testing. A reading memory is available.

The device has 3-point calibration and automatic temperature compensation (ATC). The LCD screen simultaneously shows the temperature compensated pH reading and the temperature of the liquid.

The automatic switch-off function extends the battery life.

3. Standard delivery

- PHS-1701 portable meter in a case
- Test probe with cable
- Storage solution
- Calibrating solution pH 7.00
- Calibrating solution pH 10.00
- Operating instructions
- Operating instructions, short version, laminated

4. Specification

4.1. Device description



4.2. Technical parameters

Test range	pH	- 2.00 to 16.00
	mV	- 1999 to + 1999
	Temperature	+ 5 °C to + 105 °C
Resolution	pH	0.01 pH
	mV	1 mV
	Temperature	0.1 °C
Electronic device test error	pH	± 0.01 pH
	mV	± 1 mV
	Temperature	± 0.3 °C
pH calibration	1 point, 2 points or 3 points	
Equipotential point	pH 7.00	
Buffer groups	8 groups	
Power supply requirements	DC 6 V/20 mA; 4 x AA/LR6 1.5 V or NiMH 1.2 V rechargeable	
Dimensions/weight	230 × 100 × 35 mm/0.4 kg	
Display	Liquid crystal display LCD	
pH input	BNC, impedance >10e+12 Ω	
Temperature input	RCA (cinch), NTC 30 kΩ	
Data storage	Calibration data: 198 test data (99 both for pH and for mV)	
Operating conditions	Ambient temperature	+ 5 to + 40 °C
	Medium temperature	+ 5 to + 60 °C
	Relative humidity	5 % to 85 % (non-condensing)
	Installation category	II
	Degree of pollution	2
	Altitude	< = 2000 m

5. Operation

5.1. PUROTAP® PHpro-21, probe

The PUROTAP® PHpro-21 test probe comprises a pH glass electrode and a silver/silver chloride reference electrode. The casing is made of extruded polycarbonate. It is the main test component of a pH meter for determining the value (hydrogen ion concentration) of an aqueous solution. It is widely used for pH testing in the light chemical industry, in the pharmaceutical industry and in science and research.

Environmental conditions for probe use

1. Ambient temperature: + 5 to + 40 °C
2. Medium temperature: + 5 to + 60 °C
3. Relative humidity $\leq$ 85 %

Instructions for use, maintenance and precautionary measures



1. When using the probe for the first time or after an extended period without use, immerse the glass membrane in a potassium chloride solution KCL (3 mol/l) for 2 hours to activate it.



2. Before testing, the probe must first be cleaned with distilled water and dried with filter paper to prevent any contamination. Dip the glass membrane into the liquid to be tested.

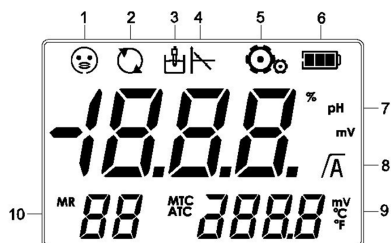


3. Prevent extended immersion in distilled water, protein solution or an acidic chloride solution or contact with organic silicone grease.

Important technical parameters of the probe

Model	PUROTAP® PHpro-21
Item number	102 432
Test range (pH)	0 - 14
Test temperature	+ 5 to + 60 °C
Zero point (pH)	7 ± 0.5
Resistance (MΩ)	≤ 250
Theoretical percentage increase (PTS)	≥ 97
Alkali error (MV)	Alkali error ≤ 15
Repeatability (pH)	≤ 0,017

5.2. Display and keyboard



- 1 Probe status (for probe maintenance, see 7.3)
- 2 Continuous mode
- 3 Test status symbol
- 4 Status of probe calibration
- 5 Parameter setting mode
- 6 Battery status
- 7 Probe slope or pH/mV status
- 8 Read stable/automatic end point
- 9 Temperature during testing/reference temperature for calibration/calibration of probe zero point
- 10 Error index/calibration points/buffer group

Explanation of the buttons

Button		Pressed briefly	Pressed and held down (3 s)
Read		Confirm read/settings	Select end point
Calibrate		Calibrate	Display data from last calibration
Back		Back/switch on	Switch off
Store		Store test data/increase setting value	Display stored data
Mode		Mode/reduce setting value	Settings

6. Calibration

6.1. Using standard solution

Prepare standard solution (e.g. pH 7.00) for calibration. Ensure that the temperature is at the correct and accurate calibration value of **25 °C**.



Temperature	Calibrating solution pH 7.00	Calibrating solution pH 10.00
10 °C	7.06	10.17
20 °C	7.02	10.05
25 °C	7.00	10.00
30 °C	6.99	9.96

6.2. Parameter setting

General information about 6.2.1. to 6.2.6

Pressing the "Mode" button takes you to parameter settings mode.

Press "Store"/"Mode" to select the parameters to be set.

Press "Back" to exit the current setting mode and return to the previous mode;

Press "Read" to call up the corresponding parameter settings page and press "Store"/"Mode" to set the parameters.

6.2.1 Setting the buffer group

Influence of temperature on the pH value of the test solution.

The pH value of the test solution changes depending on the temperature. Dependency is chemical related and therefore individual to each test solution. A meter CANNOT compensate for this influence on the pH test; the pH value is tested at the current temperature. It is therefore important to only compare pH values that were tested at the same temperature. EXCEPTION: the temperature dependency of the pH values of many commercial buffer solutions is stored on the meter. The probe can be calibrated at different temperatures, as the tested potentials are automatically referenced to 25 °C or 20 °C. The prerequisite for this is that the correct buffer group is selected on the device and that the temperature of the solution is recorded during calibration.

If "BUF" appears, press "Read" to call up the mode for setting the buffer group.

Note:

see 6.4.: 8 buffer groups are available to choose from.

Default: 1 (NIST)

buf₂

6.2.2. Setting temperature compensation manually

If "MTC" appears, press "Read" to call up the mode for manually setting the temperature compensation.



If the meter does not detect a temperature sensor, it switches automatically to manual temperature compensation mode and displays MTC.

MTC

26.9 °C

Default: 25 °C

6.2.3 Setting the temperature unit

If "TU" appears, press "Read" to call up the mode for setting the temperature unit.

Default: °C

TU °C

6.2.4 Setting the audible alarm

If "BUZ" appears, press "Read" to call up the mode for setting the audible alarm.

Default: ON (with audible alarm).

BUZ on

6.2.5 Deleting stored data

If "MR CLr" appears, press "Read" to call up the mode for deleting stored data.

Press "Read" to confirm; if "MR nUL" appears, deletion was successful and you exit these settings automatically; press "Back" to exit these settings.

MR CLr

MR nUL

6.2.6 Automatic switch-off setting

If the continuous mode symbol appears, press "Read" to call up the mode for setting automatic switch-off.



OFF: if no button is pressed for more than 10 minutes, the device switches off automatically.

ON: continuous mode

Default: OFF.

6.3. Factory reset

Press "Read", "CAL" and "Back" until the device displays "rST", which means that the factory reset was successful.



6.4. Buffer group

The meter can be used to carry out 1, 2 or 3-point calibration. During calibration, the meter can automatically record the pH value of the standard buffer. The meter is equipped with programs for automatic temperature compensation.

The device has 8 buffer groups.

1 USA (NIST)

Temperature (°C)	pH value			
5	1.67	4.01	7.09	10.25
10	1.67	4.00	7.06	10.18
15	1.67	4.00	7.04	10.12
20	1.68	4.00	7.02	10.06
25	1.68	4.01	7.00	10.01
30	1.68	4.01	6.99	9.97
35	1.69	4.02	6.98	9.93
40	1.69	4.03	6.97	9.89
45	1.70	4.04	6.97	9.86
50	1.71	4.06	6.96	9.83

2 China (JJG)

Temperature (°C)	pH value				
5	1.67	4.00	6.95	9.39	13.21
10	1.67	4.00	6.92	9.33	13.01
15	1.67	4.00	6.90	9.28	12.82
20	1.68	4.00	6.88	9.23	12.64
25	1.68	4.00	6.86	9.18	12.46
30	1.68	4.01	6.85	9.14	12.29
35	1.69	4.02	6.84	9.11	12.13
40	1.69	4.03	6.84	9.07	11.98
45	1.70	4.04	6.83	9.04	11.83
50	1.71	4.06	6.83	9.02	11.70

3 Europe

Temperature (°C)	pH value				
5	2.02	4.01	7.09	9.45	11.72
10	2.01	4.00	7.06	9.38	11.54
15	2.00	4.00	7.04	9.32	11.36
20	2.00	4.00	7.02	9.26	11.18
25	2.00	4.01	7.00	9.21	11.00
30	1.99	4.01	6.99	9.16	10.82
35	1.99	4.02	6.98	9.11	10.64
40	1.98	4.03	6.97	9.06	10.46
45	1.98	4.04	6.97	9.03	10.28
50	1.98	4.06	6.97	8.99	10.10

4 Japan (JIS)

Temperature (°C)	pH value			
5	1.67	4.00	6.95	9.40
10	1.67	4.00	6.92	9.33
15	1.67	4.00	6.90	9.28
20	1.68	4.00	6.88	9.23
25	1.68	4.01	6.87	9.18
30	1.68	4.02	6.85	9.14
35	1.69	4.02	6.84	9.10
40	1.69	4.04	6.84	9.07
45	1.70	4.05	6.83	9.04
50	1.70	4.06	6.83	9.01

5 Merck

Temperature (°C)	pH value				
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	2.00	4.00	7.00	9.00	12.00
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	2.00	4.01	6.95	8.82	11.44
50	2.00	4.00	6.95	8.79	11.33

6 DIN (19266)

Temperature (°C)	pH value			
5	1.67	4.00	6.95	9.40
10	1.67	4.00	6.92	9.33
15	1.67	4.00	6.90	9.28
20	1.68	4.00	6.88	9.22
25	1.68	4.01	6.86	9.18
30	1.68	4.02	6.85	9.14
35	1.69	4.02	6.84	9.10
40	1.69	4.04	6.84	9.07
45	1.70	4.05	6.83	9.04
50	1.71	4.06	6.83	9.01

7 DIN (19267)

Temperature (°C)	pH value				
5	1.08	4.67	6.87	9.43	13.63
10	1.09	4.67	6.84	9.37	13.37
15	1.09	4.66	6.82	9.32	13.16
20	1.09	4.66	6.80	9.27	12.96
25	1.09	4.65	6.79	9.23	12.75
30	1.10	4.65	6.78	9.18	12.61
35	1.10	4.65	6.77	9.13	12.45
40	1.10	4.66	6.76	9.09	12.29
45	1.10	4.67	6.76	9.04	12.09
50	1.11	4.68	6.76	9.00	11.98

8 Technical

Temperature (°C)	pH value			
5	2.02	4.01	7.09	10.65
10	2.01	4.00	7.06	10.39
15	2.00	4.00	7.04	10.26
20	2.00	4.00	7.02	10.13
25	2.00	4.01	7.00	10.00
30	1.99	4.02	6.99	9.87
35	1.99	4.02	6.98	9.74
40	1.98	4.03	6.97	9.61
45	1.98	4.04	6.97	9.48
50	1.98	4.06	6.97	9.35

6.5. 1 to 3-point calibration

6.5.1. 1-point calibration

Dip the probe into the buffer and press the "CAL" button to start calibration. The calibration symbol is displayed. Once the signal has stabilised, the meter determines the end point of the calibration automatically according to the preset end point method or the end point is determined manually by pressing "Read".

6.5.2. Storing the calibration result

Once the reading has stabilised, press the "Read" button. The device then displays the zero point and the slope and returns automatically to the test interface.



If 1-point calibration is selected, only the zero point is set. If the probe has previously undergone multi-point calibration, its slope is retained. Otherwise, the theoretical slope (-59.16 mV/pH) is used. If you press and hold down the "CAL" button, the meter displays the slope and zero point value, then the device returns to the test interface.

6.5.3. 2-point calibration

Step 1: perform a 1-point calibration as described under 6.5.1.

(Once the end point has been determined automatically by the device or manually, do not press the "Read" button, otherwise the device returns to test status.)

Step 2: rinse the probe with demineralised water.

Step 3: dip the probe into the next calibration buffer and press the "CAL" button to start the next calibration.

Once the signal has stabilised, the meter determines the end point of the calibration automatically according to the preset end point method or the end

point is determined manually by pressing "Read".

Step 4: see 6.5.2. Storing the calibration result

6.5.4. 3-point calibration

Perform a 2-point calibration as per 6.5.3. and repeat steps 2 + 3.



The use of a temperature sensor or a probe with an integral temperature sensor is recommended. When using MTC mode (manual temperature compensation) all buffer and sample solutions must be kept at the same set temperature. To ensure accurate pH values, calibration should be carried out regularly. At least before each use.

6.6. Sample testing

Insert the probe into the sample solution and press the "Read" button to start testing; the decimal point on the display will flash. An automatic end point for the test (shown by symbol A) is the device's default setting. When the result is stable, the decimal point no longer flashes and the display shows $\sqrt{A}$.

Press "OK" to toggle between automatic and manual end point mode. If you wish to test an end point manually, press "OK" and the displayed value is held.

If you wish to call up the mV value during a pH test, simply press the "Mode" button. To perform an mV test (ORP), follow the same steps as for a pH test.



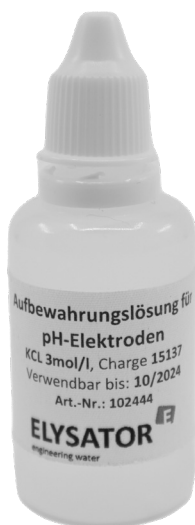
After each test, the probe must be cleaned with demineralised water.



If only one water sample is available for pH and conductivity testing, the conductivity test must be carried out before the pH test. Conductivity is increased by pH testing!



Testing the pH value of demineralised water is difficult, as it is not very conductive. The test can therefore take several minutes. To simplify testing, 1-2 drops of the storage solution can be added to the sample. This drastically increases conductivity and makes pH testing easier.



6.7. Temperature testing

To increase accuracy, the use of a temperature sensor or a probe with an integral temperature sensor is recommended. When using a temperature sensor, the display shows ATC and the temperature of the sample solution.



The meter is designed exclusively for an NTC temperature sensor with 30 k Ω .

6.8. Storing data

6.8.1. Storing readings

The device can store 99 results both for pH and for mV. Once the test has ended, press the "Store" button. The data is then stored and the display shows the current memory index in the data memory position.

If M99 is displayed and then the "Store" button is pressed again, "FUL" appears on the display, indicating that the memory is full and must be cleared. Follow the instructions described in 6.2.5.



Each reading can only be stored once. If storing is repeated, the index does not increase.

6.8.2. Displaying stored data

If you press and hold down the "Store" button in test mode, you can display the data stored in the memory.

Pressing "Store"/"Mode" allows you to scroll through the stored results. Press "Back" to exit the memory.



In pH test mode, only the pH test results can be retrieved, and in mV test mode, only the mV test values can be retrieved.

6.9. Error message

If an error occurs, the error code is displayed in display field 10 (see 5.2), e.g.

Err2 = error code 2 (see Err2).

Err1	Readings (pH/mV) out of range pH: < -2.00 or > 16.00 mV: < -1999 or > 1999	Check that the probe cap has been removed, that the probe has been connected correctly and that it has been immersed in the liquid to be tested. If the probe is not connected, plug the short circuit connector into the socket.
Err2	Measured temperature out of range Calibration: [°C] < 5.0 or > 40.0 Reading: [°C] < -5.0 or > 105.0	Ensure that the temperature of the solution to be tested is within the range.
Err3	Zero potential of the probe out of range Offset > 60 mV	Check that the buffer you are using is correct and not out of date. → Expiry date Clean or replace the probe.
Err4	Probe slope out of range Slope < 70 % or > 120 %	Check that the buffer you are using is correct and not out of date. → Expiry date Clean or replace the probe.
Err5	Meter cannot detect the buffer Eref < 10 mV	Check that the buffer you are using is correct and not out of date. → Expiry date Check whether the same buffer was reused during the calibration process.

7. Maintenance

7.1. Battery replacement

If the symbol for low battery appears on the display (display field 6), replace the batteries with 4× AA batteries. Open the battery compartment on the back of the device.

7.2. Meter maintenance

Clean the meter occasionally with a damp cloth. Apart from this, no further maintenance or care is required. The casing is made of plastic and may corrode in contact with some organic solvents, e.g. toluene, xylene or butanone. Wipe off any spilt solvent from the casing immediately.

7.3. Test probe maintenance

Ensure that the test probe is always kept in a suitable storage solution KCL (3 mol/l). To achieve maximum accuracy, any liquid residue that may have hardened or may be adhering to the outside of the probe must be removed immediately with distilled water. Always store the probe in accordance with the manufacturer's specifications and never allow it to dry out. If the steepness of the reading curve drops or the response time decreases, this can be rectified by following the steps below. Try the following methods, depending on the sample:

1. For oil or grease, use a cotton cloth soaked in acetone or soapy water to clean the surface of the probe.
2. If the test probe has dried out, place it overnight in an HCl solution (0.1 mol/l).
3. For protein deposits in the diaphragm, place the probe in an HCl/pepsin solution to remove the deposits.
4. For silver sulphide contamination, place the probe in a thiourea solution to remove the deposits. After treatment of the probe, perform another calibration.



Treat the cleaning or filling solutions according to the regulations for toxic or corrosive substances.

8. Spare parts

Item no.	Designation
100 268	PUROTAP® device batteries AA (4 required)
102 491	PUROTAP® PHpro-21 replacement probe
102 484	PUROTAP® PHpro-21 maintenance kit
102 107	PUROTAP® calibrating solution pH 7.00
102 411	PUROTAP® calibrating solution pH 10.00
102 444	PUROTAP® storage solution for pH probe

