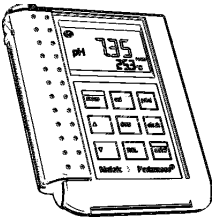


pH-Meter 1120 and pH-Meter 1120-X

Instruction manual

60206

METTLER TOLEDO

Mettler-Toledo GmbH Process,
Postfach, 8902 Urdorf,
Switzerland
Phone: +41 (1) 736 22 11
Telefax: +41 (1) 736 26 36

Warranty
Defects occurring within 3 years from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).
Accessories: 1 year

CE

Safety Precautions

Be sure to read and observe the following requirements!

The pH-Meter 1120-X may only be opened to change the batteries outside hazardous areas. If repairs are necessary, the apparatus must be sent in to the factory.

When using the apparatus in hazardous areas, watch for electrostatic charges! For example, never wipe off the apparatus with a dry cloth. Observe the relevant regulations concerning ESD.

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

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

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

Before recommissioning the apparatus, 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 pH-Meter 1120/1120-X 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 instrument.

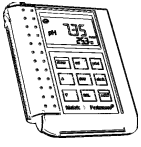
Warning

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

Contents

1 The pH-Meter 1120/1120-X

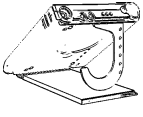
Package Contents



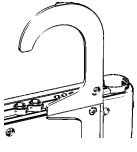
Please check the completeness of the package after unpacking.
The package should contain:

- ❏ pH-Meter 1120/1120-X (ready for operation)
- ❏ carrying strap
- ❏ this instruction manual
- ❏ short instructions in German, English and French

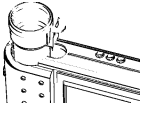
Short Instrument Description



- ❏ The pH-Meter 1120/1120-X is used for pH and temperature measurement in industry, environment, food processing and waste-water treatment.
- ❏ Operation of the pH-Meter 1120-X is also permitted in hazardous areas Zone 1.



- ❏ The instrument meets the European EMC regulations (89-336-EEC) and the recommendations of NAMUR NE 21.
- ❏ The instrument is IP 66 protected to EN 60529 (jet water from all directions).
- ❏ Temperature compensation is automatic with a Pt 1000 temperature probe, an NTC 30 kΩ (automatic recognition during power-on) or through manual temperature input.

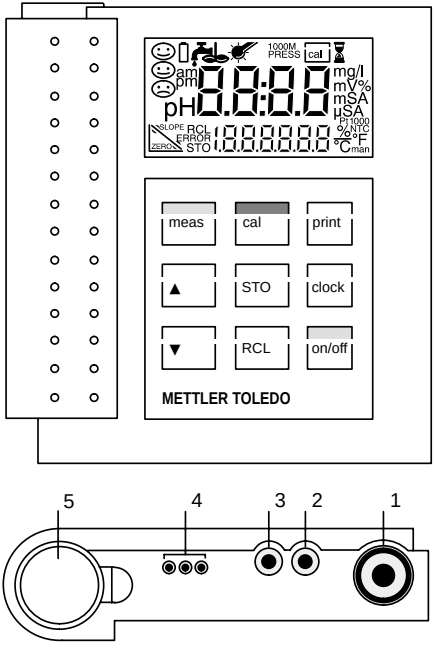


- ❏ Calibration can be carried out with buffer solutions from various, preselectable buffer sets. The buffer is then automatically recognized by the Calimatic®.
- ❏ You can also calibrate manually by entering individual buffer values.

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

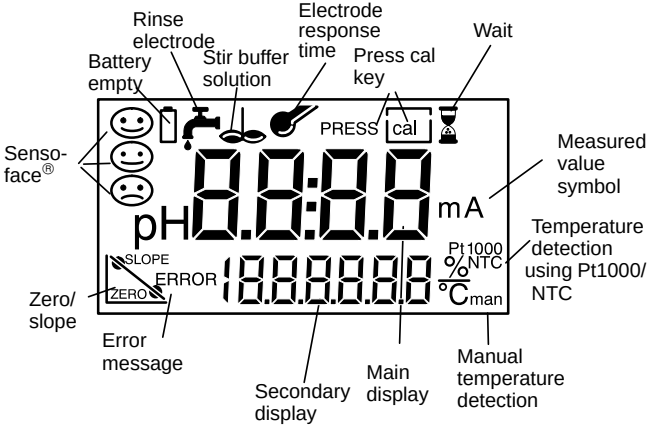
2 Operation

Instrument Design



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

Display



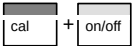
Keypad

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

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

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

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



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

Note

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

Sensoface® Electrode Monitoring

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

For more detailed information on the displayed electrode state and the individual evaluations of the parameters, please see chapter “Troubleshooting and Maintenance” (Pg. 13).

Connection and Start-up

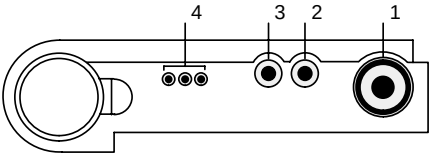
Electrode connection

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

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

Connection assignment

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



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

Note

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

Start-up

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

Note

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

on/off

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

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

Note

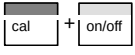
The temperature probe is only recognized during the power-on procedure after pressing **on**/**off.**

Note

The instrument 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 instrument assumes that the last temperature probe determined is used.

Buffer Selection

During buffer selection you only once have to select the buffer set with the buffers you are using. The temperature-corrected buffer values are stored. During calibration, the instrument then automatically recognizes the buffer used (factory setting: automatic calibration on, Mettler-Toledo technical buffers).



To activate buffer selection, hold down **cal** and then press **on**/**off** while the instrument is switched off.

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

Select the buffer set using ▲ and ▼. Press **cal** to confirm and return to measuring mode.

Pressing **meas** allows to exit buffer selection without storing the buffer set.

The following buffer sets are permanently stored in the instrument:

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–	Merck/Riedel pH 2.00 4.00 7.00 9.00 12.00
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–	Mettler Toledo (USA) pH 4.00 7.00 10.01

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 instrument can only operate properly if the buffer solution used corresponds 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.

Calibration

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

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 instrument automatically recognizes the buffer solution, 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.

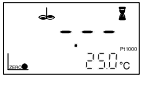
Note

The instrument can only operate properly when the buffer solutions used correspond with the buffer set selected in the configuration menu.
Other buffer solutions even if with the same nominal values, may demonstrate a different temperature behavior, which leads to measurement errors.

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

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

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



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

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

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 cancelled with **cal**. However, this reduces calibration accuracy.

Calibration with the first buffer is completed. 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 instrument 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. Now start calibration again with **cal**. The calibration process runs again as for the first buffer.

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

Manual calibration

For calibration with manual buffer specification, you must enter the pH 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 again by pressing **meas**. In that case, zero and slope of the last calibration are displayed for a moment.

Enter the temperature-corrected pH of your buffer solution using ▲ and ▼. Press **cal** to start calibration.
The buffer value set is stored so that you do not have to enter it for the next calibration at the same temperature.

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 cancelled with **cal**. However, this reduces calibration accuracy.

Calibration with the first buffer is completed. 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 instrument 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 of the second buffer solution. Now start calibration again with **cal**. The calibration process runs again as for the first buffer.

At the end of the calibration the zero point and slope (based on 25 °C) of the electrode are displayed. Then the instrument 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 instrument operates with the manually specified temperature. The specified temperature can be edited using ▲ and ▼.

3 Troubleshooting and Maintenance

Sensoface® Electrode Monitoring

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

Note

The deterioration of the electrode condition is signified by 😐 or ☹ of the Sensoface® indicator ("smiley"). This 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 to replace it. It may be possible to achieve an improvement by cleaning or, for an electrode returned to duty after dry storage, by rehydrating.

☹ The electrode response is very slow. Correct measurement is no longer ensured. The electrode should be replaced.

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

😐 Zero and slope of the electrode are still okay, however the electrode should be 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.

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

ERROR 3 Problem with 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 instrument 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.
This message appears in measuring mode following a calibration. It can only be eliminated by recalibration.

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)

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 eliminated by recalibration.

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)

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

Possible causes:

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

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

Possible causes:

- ❏ Buffer does not belong to configured buffer set
- ❏ Electrode defective or dirty
- ❏ 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.

Possible causes:

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

ERROR 18 If the instrument 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 instrument.

ERROR 19

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

Possible causes:

- ❏ EPROM or RAM defective
- ❏ Error in instrument 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 instrument must be repaired and recalibrated at the factory.

Maintenance

Changing batteries

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

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

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

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

Note

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

Warning

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

Cleaning the instrument

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

Warning

Beware of electrostatic charging when using the instrument in hazardous areas!
Never wipe the instrument with a dry cloth, for example.

Appendix

Accessories

Designation	Order no
Puncture pH-electrode LoT406-M6-DXK-S7/25 *)	10 406 3123
Puncture knife	00 406 3000
Puncture kit (puncture electrode and knife)	00 406 3002
Electrode container, 5 pieces (for leak-proof storage of pH electrode)	52 120 695
Adapter 1 (for electrodes with S7, S7M screw cap and fixed cable of the InLab® series)	52 000 500
Adapter 2 (for puncture electrodes LoT406-M6-DXK-S7/25 and InLab® 427)	52 000 501
Coaxial cable AS7/1m/-15,30, DIN 19 262	1 003 0100
Temperature probe	52 120 350
Buffer pH 2.00 (colorless), 250 ml	20 9852 250
Buffer pH 4.01 (red), 250 ml	20 9863 250
Buffer pH 7.00 (green), 250 ml	20 9865 250
Buffer pH 9.21 (blue), 250 ml	20 9866 250
Single-use sealed buffer pouches pH 4.01, 30 pieces	51 302 069
Single-use sealed buffer pouches pH 7.00, 30 pieces	51 302 047
Single-use sealed buffer pouches pH 9.21, 30 pieces	51 302 070

*) For other types of sensors, please ask for the relative ordering information.

Specifications pH-Meter 1120/1120-X

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	
Meas. Cycle	approx. 1 s	
Measurement Error (+ 1 count)	pH: mV: °C:	< 0.01 < 0.1 % of meas. value + 0.3 mV < 0.3 K
Input	DIN 19 262	
Input Resistance	> 1 x 10^{12} Ω	
Inp. 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	
Instrument and Electrode Monitoring	Sensoface®:	evaluates the calibration interval, electrode zero, slope, response time and glass impedance, optical indication good/average/poor
	Meter self test:	during power-on
Temperature Compensation	Pt 1000 / NTC 30 kΩ (automatic recognition during power-on) or manual	
Data Retention	configuration and calibration data, factory settings >10 years	
Auto Switch-off	after 1 hour	
RFI Suppression	to EN 50 081-1 and EN 50 081-2	
Immunity to ESD	to EN 50 082-1, EN 50 082-2 and NAMUR NE 21	
Explosion Protection (only 1120-X)	EEX ia IIC T6, PTB No. Ex–96.D.2139	
Environmental Temperature	Operation: Transport and storage:	–10 ... +55 °C –20 ... +70 °C
Power Supply	3 alkaline AA cells	
Operating Time	approx. 2,000 h[1)]	

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

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

Certificate of Conformity

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(1) **CERTIFICATE OF CONFORMITY**

(2) **PTB No. Ex-96.D.2140**

(T R A N S L A T I O N)

(3) This certificate is issued for the electrical apparatus

pH-Transmitter type 11.0X

(4) manufactured by Mettler Toledo AG
CH-8902 Urdorf

(5) This electrical apparatus and any acceptable variation thereto is specified in the Schedule to this Certificate of Conformity.

(6) The Physikalisch-Technische Bundesanstalt, being an Approved Certification Body in accordance with article 14 of the Council Directive of the European Communities of December 18, 1975 (76/117/EEC), confirms that this electrical apparatus has been found to comply with the harmonized European Standards

Electrical apparatus for potentially explosive atmospheres

EN 50 014 1977 + A1...A5 (VDE 0170/0171 Part 1/1.87) General Requirements
EN 50 020 1977 + A1...A5 (VDE 0170/0171 Teil 7/4.92) Intrinsic Safety "i"

after the apparatus has been successfully subjected to pattern evaluation. The results of this pattern evaluation have been recorded in a confidential test report.

(7) The apparatus marking shall include the code:

EEx ia IIC T6

(8) The manufacturer shall be responsible for ensuring that any apparatus bearing the above marking conforms to the test documents specified in the Schedule to this certificate and that the routine verifications and tests prescribed have been carried out successfully.

(9) The electrical apparatus may be marked with the Distinctive Community Mark according to Annex II to the Council Directive of February 6, 1979 (79/196/EEC). A facsimile of this mark is printed on this sheet of the certificate.

By order

Braunschweig, 26.11.1996

Dr.-Ing. Johannsmeier
Oberregierungsrat

Test certificates without signature and official stamp shall not be valid.
The certificates may be circulated only without alteration.
Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

755.32634-10.93

Physikalisch-Technische Bundesanstalt

SCHEDULE

to Certificate of Conformity PTB No. Ex-96.D.2140

The apparatus and the according pH- resp. Redox- and temperature measuring electrodes are used for measurement in the electrochemical and environmental range of application.

PT 1000- resp. NTC-sensors which are either separate or mounted inside the pH-electrode enable general, precise temperature measurements and an automatic temperature compensation during the pH-measurement.

The permissible ambient temperature range is -10 °C to +55 °C.

Electrical Data

Auxilliary supply	three mounted Alkaline-Manganese-cells, type AA
pH temperature measuring circuit (BU 2, 3, 4)	type of protection "Intrinsic Safety" EEx ia IIC maximum values: $U_o \leq 5$ V $I_o \leq 11$ mA $P_o \leq 13$ mW $R_i > 487$ Ω maximum permissible external capacitance 1 µF maximum permissible external inductance 5 mH internal capacitance 30 nF internal inductance negligible small
Interface circuits RxD, TxD (BU 5, 6, 7)	$U_m = 250$ V Operation outside hazardous areas only. The pH temperature measuring circuit may not lead into the hazardous area if the interface is connected to a non intrinsically safe circuit.

Test document

Certificate of Conformity PTB No. Ex-96.D.2139

By order

Dr.-Ing. Johannsmeyer
Oberregierungsrat

Braunschweig, 26.11.1996

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Physikalisch-Technische Bundesanstalt

Schedule to Certificate of Conformity PTB No.-Ex-96.D.2140

National Annex

to Certificate of Conformity PTB No. Ex-96.D.2140

In the area of application of the "Regulation concerning electrical equipment in potentially explosive atmospheres" (ElexV), the following is additionally applicable to the use of the equipment:

Use of the equipment in the zone 0 hazardous area

(a) Appraisal

Based on the documents submitted and the present state of knowledge, there will be no safety reservations about short time use of the pH/Pt-1000 sensors type ZU 6979 X0 in zone 0 of tanks for all flammable liquids of classes of hazard AI, AII and B, with the exception of carbon bisulphide, if the equipment is used inside tanks or pipings in whichexplosive vapour/air mixtures occur at pressures of 0,8 to 1,1 bar and at mixture temperatures of -20 °C to +60 °C (explosive atmospheres).

(b) Conditions

1. In portable application in hazardous area zone 0 the pH/Pt-1000 sensors type ZU 6979 X0 have to be connected to the tank via a ground terminal in advance.
2. The pH-Tranmitter type 11.0X (portable apparatus) shall only be used in hazardous area Zone 1.
3. The pH temperature measuring circuit of the pH-Transmitter type 11.0X shall only be connected to the pH/Pt 1000 sensors type ZU 6979 X0.

By order

Braunschweig, 26.11.1996

Dr.-Ing. Johannsmeyer
Oberregierungsrat

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT

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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.

Calibration and measurement

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

For calibration, you take measurements in buffer solutions. These are solutions with exactly defined pH values. With the pH-Meter 1120/1120-X two calibration modes are available, i.e. automatic calibration using Calimatic® and manual calibration.

Calimatic® automatic calibration

In the pH-Meter 1120/1120-X the chart values of various buffer sets are stored for the correct temperatures. Simply select and enter the buffer set once when commissioning the instrument (see Pg. 7). Then the patented Calimatic® will calibrate the instrument at the press of a key.

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

For one-point calibration, only one buffer solution is used and the calibration process is discontinued after the first calibration step. Only zero point is adjusted in the process. The previous slope value is retained. As two-point calibration with modern microprocessor controlled meters is only slightly more complicated, it is always preferable.

Note

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

Manual calibration

If you want to work with special buffer solutions not included in the stored buffer sets, select manual calibration (see Pg. 10). Here, you enter your individual temperature-corrected buffer value (pH at calibration temperature). Values entered once remain stored. During the next calibration, the instrument will suggest these values again. That means you do not have to enter the values once more provided that the sequence of the last calibration is retained .

Note

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

Calibration intervals

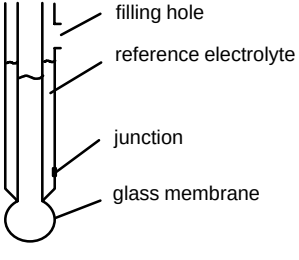
The calibration interval is highly dependent on the conditions under which measurements are taken. As a result, no generally valid interval can be given here.

However, the calibration can be repeated frequently at the beginning. If the calibration values (electrode zero and slope) show only minor differences, the time between calibrations can be increased.
For measurements under constant conditions, weekly calibration may be sufficient. On the other hand, calibration may be necessary prior to each measurement when measuring in media with large temperature or pH differences.

Observe the following:

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

Design of a combination electrode with liquid electrolyte



Buffer solutions

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

Note

To ensure measurement accuracy, the buffer solutions must not be dirty.

- ❏ 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 pouches (see Accessories on Pg. 21).

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 “Kalomel”, KCl saturated).
- ❏ Only combine Thalamide glass electrodes with Thalamide reference electrodes.

The nominal zero point of commercially available electrodes is pH 7.

Electrode care

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

- ❏ 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 inch) 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; for heavier dirt deposits, a household cleanser may also be used.
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 instrument 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 additionally present temperature dependence of the electrode zero may disturb the electrode. This dependence is 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®.

Technical Terms

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

meas	This key is used to return to measurement mode from all other levels. In measuring mode it switches between mV and pH.
NAMUR	German committee for measurement and control standards in the chemical industry
One-point calibration	Calibration with which only the electrode zero point is taken into consideration. The previous slope value is retained. Only one buffer solution is required for a one-point calibration.
pH electrode system	A pH electrode system consists of glass and reference 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 pH meter. Calibration interval, zero, slope and response time of the electrode are evaluated.
Slope	See electrode slope.
Two-point calibration	Calibration in which the electrode zero and slope are taken into consideration. Two buffer solutions are required for two-point calibration.
Zero point	See electrode zero point

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