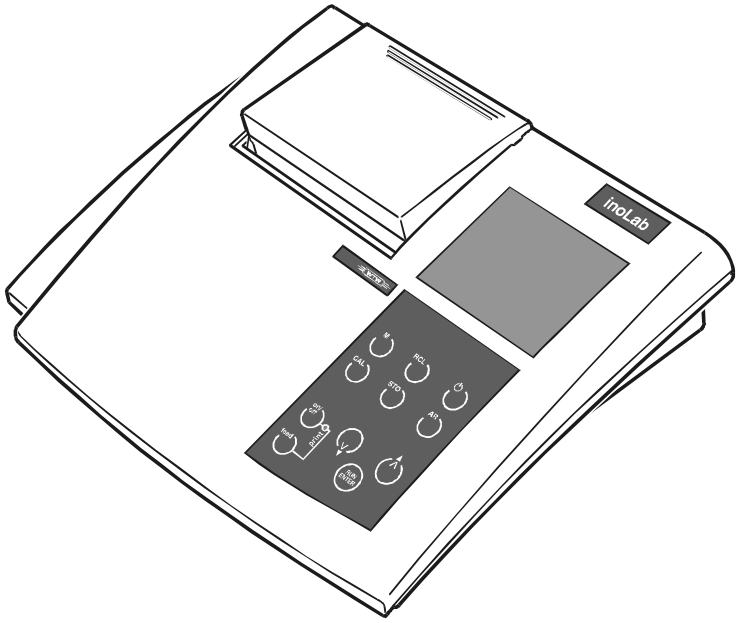
Operating Manual

inoLab
pH Level 2



Laboratory pH meter with integrated printer

Accuracy when going to press

The use of advanced technology and the high quality standard of our instruments are the result of continuous development. This may result in differences between this operating manual and your instrument.
We cannot guarantee that there are absolutely no errors in this manual. We are sure you will understand that we cannot accept any legal claims resulting from the data, figures or descriptions.

Warranty declaration

The designated instrument is covered by a warranty of three years from the date of purchase.
The instrument warranty extends to manufacturing faults that are determined within the period of warranty.
The warranty excludes components that are replaced during maintenance such as batteries, etc.

The warranty claim extends to restoring the instrument to readiness for use but not, however, to any further claim for damages. Improper handling or unauthorized opening of the instrument invalidates any warranty claim.

To ascertain the warranty liability, return the instrument and proof of purchase together with the date of purchase freight paid or prepaid.

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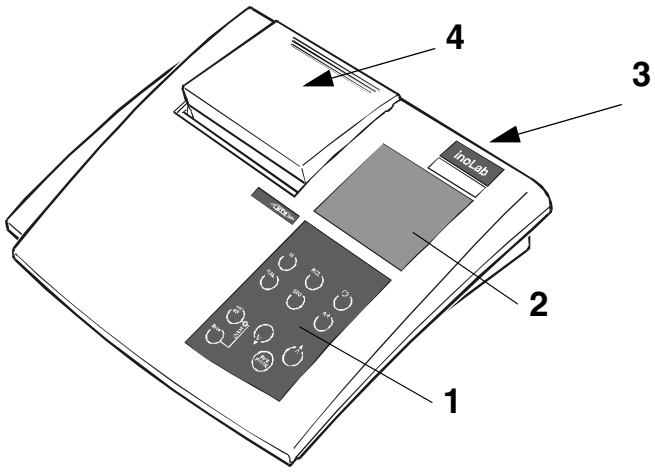
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1 Overview

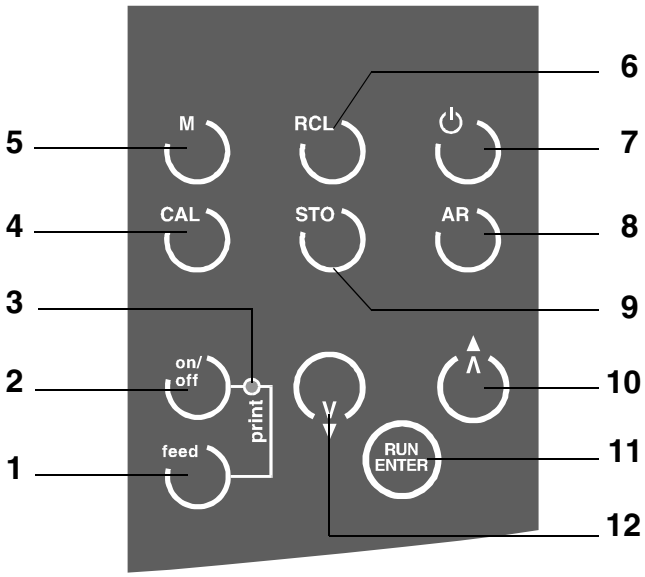
The compact *inoLab pH Level 2* precision pH meter lets you perform pH measurements rapidly and reliably. The *inoLab pH Level 2* provides the highest degree of operating comfort, reliability and measuring safety for all applications.
The integrated printer enables the measurements to be documented in compliance with GLP.
The proven MultiCal® calibration procedures and special *AutoRead* function support your work with the pH meter.



1	Keypad
2	Display
3	Sockets
4	Printer

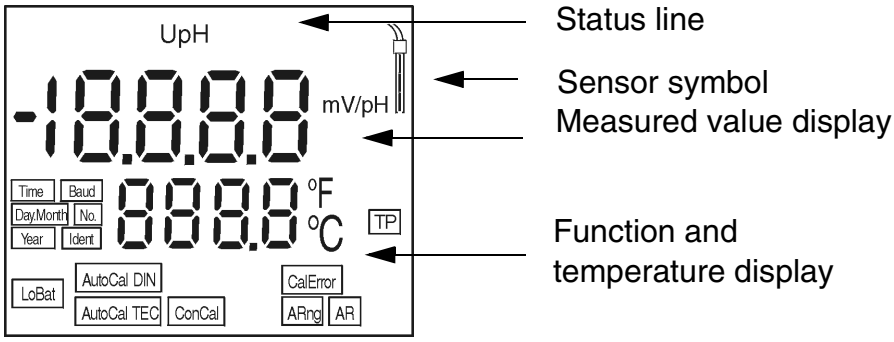
Note
The measuring instrument can also be delivered as part of a set.
Information on this and other accessories is available in the WTW catalog LABORATORY AND FIELD INSTRUMENTATION or via the Internet.

1.1 Keyboard

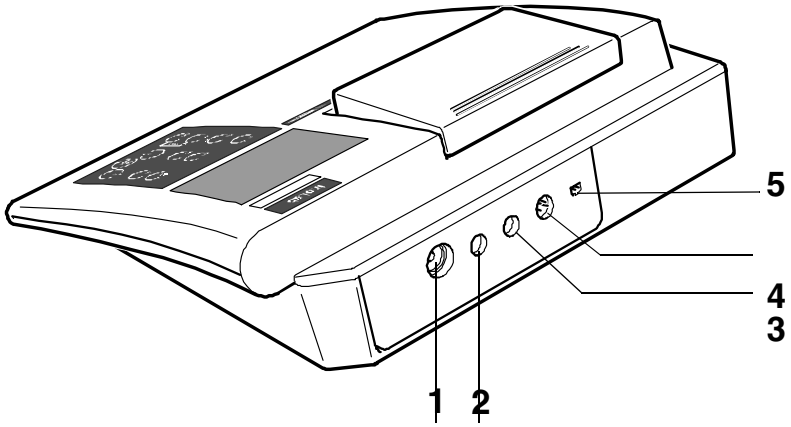


1	Paper feed/line feed (Printer off - Print LED lights up red)
2	Printer ON/OFF
3	Print LED Red: printer off (offline) or malfunction Green: printer ready for operation (online)
4	Call up calibration procedure
5	Select measuring mode
6	Display or transmit measured values
7	Measuring instrument ON/OFF
8	Activate/deactivate AutoRead function
9	Store measured value
10	Increase values, scroll
11	Confirm inputs, start AutoRead
12	Reduce values, scroll

1.2 Display



1.3 Sockets



Connectors:

1	pH electrode
2	Temperature probe
3	Reference electrode
4	RS 232 interface / analog output
5	Plug-in power supply

Caution

Only connect electrodes to the instrument that cannot feed excessive voltages or currents (> SELV and > circuit with current limiter). Almost all commercial electrodes - especially WTW electrodes - meet these requirements.

2 Safety

This operating manual contains basic instructions that you must follow during the commissioning, operation and maintenance of the instrument. Consequently, all responsible personnel must read this operating manual before working with the instrument.
The operating manual must always be available within the vicinity of the instrument.

Target group

This measuring instrument was developed for use in the laboratory.
Thus, we assume that, as a result of their professional training and experience, the operators will know the necessary safety precautions to take when handling chemicals.

Symbols used



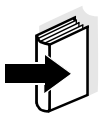
Caution
indicates instructions that have to be followed to prevent damage to your instrument.



Warning
indicates instructions that have to be followed to protect yourself and the instrument from dangerous electrical voltage.



Note
Indicates notes that draw your attention to special features.



Note
Indicates cross-references to other documents, e.g. application reports, operating manuals of combination electrodes, etc.

2.1 Authorized use

This instrument is authorized exclusively for pH and Redox measurements in the laboratory.
The technical specifications as given in chapter 7 TECHNICAL DATA, must be observed. Only the operation and running of the measuring instrument according to the instructions given in this operating manual is authorized.
Any other use is considered **unauthorized**.

2.2 General safety instructions

This instrument is constructed and tested in compliance with the IEC 1010 safety regulations for electronic measuring instruments.
It left the factory in a safe and secure technical condition.

Function and operational safety

The smooth functioning and operational safety of the instrument can only be guaranteed if the generally applicable safety measures and the specific safety instructions in this operating manual are followed.

The smooth functioning and operational safety of the instrument can only be guaranteed under the climatic conditions specified in chapter 7 TECHNICAL DATA.

If the instrument was transported from a cold environment to a warm environment, the formation of condensate can lead to the faulty functioning of the instrument. In this event, wait until the temperature of the instrument reaches room temperature before putting the instrument back into operation.



Caution
The instrument is only allowed to be opened by personnel authorized by WTW.

Safe operation

If safe operation is no longer possible, the instrument must be taken out of service and secured against inadvertent operation.
Safe operation is no longer possible if:

- the instrument has been damaged in transport
- the instrument has been stored under adverse conditions for a lengthy period of time
- the instrument is visibly damaged
- the instrument no longer operates as described in this manual.

If you are in doubt contact the supplier of the instrument.

Obligations of the operator

The operator of this measuring instrument must ensure that the following laws and guidelines are observed when using dangerous substances:

- EEC directives for protective labor legislation
- National protective labor legislation
- Safety regulations
- Safety datasheets of the chemical manufacturer

3 Commissioning

3.1 Scope of delivery

- Laboratory measuring instrument, inoLab pH Level 2
- Plug-in power supply
- Operating manual and short manual in the cover of the printer
- 4 x type AA Mignon 1.5 V batteries

3.2 Initial commissioning

Perform the following activities:

- Set the date and time
- Connect the plug-in power supply (for printer functions).

Setting the date and time

1	Press and hold down the M key.
2	Press the ⏻ key. The *Display test* appears briefly on the display. The measuring instrument then switches automatically to the setting of the baud rate.
3	Press the RUN ENTER key repeatedly until the date flashes on the display.
4	Set today's date by pressing ∧ ∨.
5	Confirm with RUN ENTER. The date (month) flashes on the display.
6	Set the current month by pressing ∧ ∨.
7	Confirm with RUN ENTER. The year appears on the display.
8	Set the current year by pressing ∧ ∨.
9	Confirm with RUN ENTER. The hour field flashes on the display.
10	Set the current time by pressing ∧ ∨.
11	Confirm with RUN ENTER. The minutes field flashes on the display.

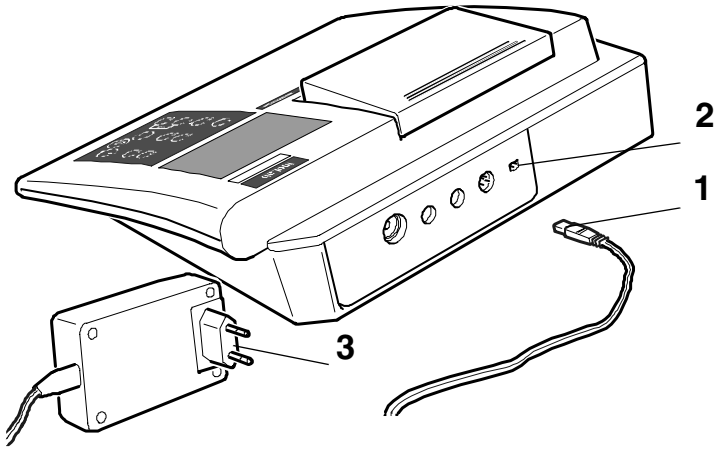
12	Set the current time by pressing ↑ ↓.
13	Confirm with RUN ENTER. The measuring instrument then switches to the pH measuring mode.
14	Switch off the instrument by pressing ⏻.

Connecting the plug-in power supply

The plug-in power supply supplies the pH meter with low voltage (7.5 V ... 12 V DC).

Warning
The line voltage on site must lie within the input voltage range of the original plug-in power supply unit (see chapter 7 TECHNICAL DATA).

Caution
Use original plug-in power supplies only (see chapter 7 TECHNICAL DATA).



1	Insert the plug (1) into the socket (2) of the pH meter.
2	Connect the original WTW plug-in power supply (3) to an easily accessible mains socket.

Note
You can also perform measurements without a plug-in power supply. However, the functions of the integrated printer can only be used with connected plug-in power supply.

4 Operation

4.1 Switch on the instrument

1	Place the instrument on a flat surface and protect it against intense light and heat.
2	Press the ⏻ key. The *Display test* appears briefly on the display. The instrument then switches automatically to the previously selected measuring mode.

Note

The instrument has an energy saving feature to avoid unnecessary battery depletion.
The energy saving feature switches the instrument off if no key has been pressed for an hour.
The energy saving feature is not active:

- if the power is supplied by the plug-in power supply
- if the *AutoStore* function is active
- if the communication cable is connected
- if the recorder cable is connected
- if the printer cable is connected
  (for external printers)

4.2 Measuring

Preparatory activities

Perform the following preparatory activities when you want to measure:

1	Connect the electrode to the instrument.
2	Adjust the temperature of the buffer or test solutions or measure the current temperature if the measurement is made without a temperature probe.
3	Calibrate or check the instrument with the electrode.
4	Select the measuring mode by pressing M.

Note

Incorrect calibration of the pH electrode will result in incorrect measured values. Therefore, regularly perform calibration before measuring.

Caution

When connecting an earthed PC/printer, measurements cannot be performed in earthed media as incorrect values would result.
The RS232 interface is not galvanically isolated.

Temperature probe

Measurements can be performed with and without a temperature probe. A connected temperature probe is indicated by TP on the display.

Note
The pH meter automatically recognizes the type of the temperature probe used. As a result, you can connect electrodes with the NTC30 or Pt1000.

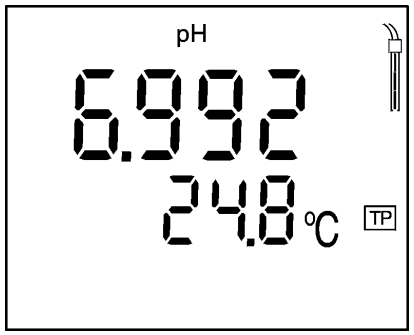
The temperature measurement is absolutely essential for a reproducible pH measurement. If the measurement is made without a temperature probe, proceed as follows:

1	Determine the current temperature using a thermometer.
2	Set up the temperature by pressing ⏲ ⏲.

Note
When calibrating without a temperature probe, set up the current temperature of the respective buffer solution manually by pressing the ⏲ ⏲ keys.

4.2.1 Measuring the pH value

1	Perform the preparatory activities according to section 4.2.
2	Immerse the pH electrode into the test sample.
3	Press the M key until *pH* appears in the status display. The pH value appears on the display.



AutoRead AR (Drift control)

The *AutoRead* function (drift control) checks the stability of the measurement signal. The stability has a considerable effect on the reproducibility of the measured values.

For identical measurement conditions, the following criteria apply:

- pH value: better than 0.02 (response time: > 30 s)

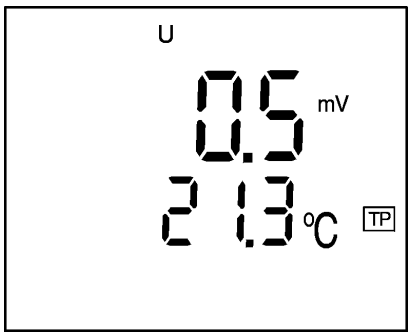
1	Call up the pH measuring mode by pressing M.
2	Activate the AutoRead function by pressing AR. The current measured value is frozen (Hold function).
3	Start the AutoRead function by pressing RUN ENTER. AR flashes on the display until a stable measured value is reached. This measured value is transmitted to a printer/interface.
4	If necessary, start the next AutoRead measurement by pressing RUN ENTER.
5	To cancel the AutoRead function: Press the AR key.

Note
The current AutoRead measurement (with acceptance of the current value) can be terminated at any time by pressing RUN ENTER.

4.2.2 Measuring the Redox voltage

The instrument can measure the Redox voltage (mV) of a solution when connected with a Redox electrode, e.g. SenTix ORP.

1	Perform the preparatory activities according to section 4.2.
2	Immerse the Redox electrode into the test sample.
3	Press the M key repeatedly until U appears in the status line. The Redox voltage (mV) of the sample appears on the display.
4	Wait for a stable measured value.



Note
Redox electrodes are not calibrated. However, you can check Redox electrodes using a test solution.

4.2.3 Printing/transmitting measured values

Measured values (data records) can be:

- printed on the integrated printer or
- transmitted to the interface.

Note
To print, you must switch on the printer using the Print key on/off (Print LED lights up green).
To transmit to the interface, you must connect the interface cable. The integrated printer is then switched off automatically.

You can print measured values (data records) in 3 ways:

- Switch on the data transmission (Int 2) (see page 114)
  - After expiry of the selected interval, the current data record is sent to the printer/interface.
- Switch on AutoStore (Int 1) (see page 108)
  - After expiry of the selected interval, the current data record is sent to the printer/interface and in addition is stored in the data store of the instrument
  - AutoStore (Int 1) covers the *data transmission* interval (Int 2).
- Press the RUN ENTER key
  This manually triggers a printout of the current measured values at any time - independently of the selected intervals.

Note
If you connect a recorder (analog output), both the output to the integrated printer and the digital output are switched off.

4.3 Calibrating

Why calibrate?

pH electrodes age. This changes the asymmetry (zero point) and slope of the pH electrode. As a result, an inexact measured value is displayed. Calibration determines the current values of the asymmetry and slope of the electrode and they are stored in the instrument.
Thus, you should calibrate at regular intervals.

When to calibrate?

- After connecting another electrode
- When the sensor symbol flashes:
  - after expiry of the calibration interval
  - after a voltage interruption, e.g. battery change

Calibration points

Calibration can be performed using one, two or three buffer solutions (single point calibration, two-point calibration and three-point calibration). In three-point calibration, two separate asymmetry and slope values (ASY1/S1 and ASY2/S2) are determined for the two ranges between the three buffers. For measuring, the calibration values relevant for the respective range are used.

You can choose between 3 calibration procedures:

AutoCal TEC

Is specially adapted to the WTW technical buffer solutions as a fully automatic two or three-point calibration. The buffer solutions are automatically recognized by the instrument.

AutoCal DIN

Is specially adapted to permanently programmed buffer solutions according to DIN 19266 as a fully automatic two or three-point calibration. The buffer solutions are automatically recognized by the instrument.

ConCal

Is the conventional two-point calibration with 2 freely selectable buffer solutions or single-point calibration as the rapid method.

AutoRead

In calibration using AutoCal TEC and AutoCal DIN, the *AutoRead* function is automatically activated.
The current AutoRead measurement (with acceptance of the current value) can be terminated at any time by pressing RUN ENTER.

Calibration protocol

The calibration protocol contains the calibration data of the current calibration. You can call up the calibration protocol by outputting the data storage (section 4.3.2).



Note
You can automatically print out a calibration protocol after the calibration. To do so, switch on the printer before the calibration (Print LED lights up green). After a valid calibration, the protocol is printed.

Sample printout:

```
CALIBRATION PROTOCOL
 02.03.99     14:19
Device No.: 12345678
CALIBRATION pH
Cal Time: 01.03.99 / 15:20
Cal Interval:   7d
AutoCal DIN   Tauto
Buffer 1   1.679
Buffer 2   4.008 *
Buffer 3   6.865
Buffer 4   9.180 *
C1      174.1mV  25.0°C
C2     -133.3mV  25.0°C
S1     -59.4 mV/pH
ASY1   -   4 mV
Probe:     +++
```

Calibration evaluation

After the calibration, the instrument automatically evaluates the current status. The asymmetry and slope are separately evaluated. The worst evaluation appears on the display.

Display	Asymmetry [mV]	Slope [mV/ pH]
	-15 ... +15	-60.5 ... -58
	-20 ... +20	-58 ... -57
	-25 ... +25	-61 ... -60.5 or -57 ... -56
 Clean the electrode according to the sensor operating manual	-30 ... +30	-62 ... -61 or -56 ... -50
E3 Clear the fault according to chapter 6 WHAT TO DO IF...	< -30 or > 30	< -62 or > -50

Preparatory activities

1	Switch on the instrument by pressing ⏻.
2	Connect the pH electrode to the instrument.
3	Keep the buffer solutions ready.
4	Adjust the temperature of the solutions and measure the current temperature if the measurement is performed without a temperature probe.

4.3.1 Calibration interval (Int 3)

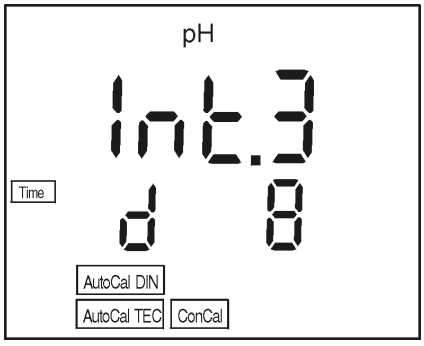
The flashing sensor symbol reminds you to calibrate regularly. After the selected calibration interval (Int 3) expires, the sensor symbol flashes. Measurements can continue.

Note
To ensure the high measuring precision of the measuring system, perform a calibration after the calibration interval expires.

Setting the calibration

The calibration interval (Int 3) is set to 7 days in the factory. The interval can be changed (1 ... 999 days):

1	Switch off the instrument.
2	Press M and hold down the key.
3	Press the ⏻ key. The *display test* appears briefly on the display. The instrument then switches automatically to the configuration level.
4	Press the RUN ENTER key until Int 3 appears on the display.



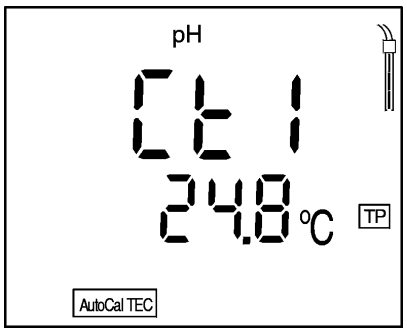
5	Press ∧ ∨ to set the required time interval until the next calibration.
6	Confirm with RUN ENTER.
7	Change to the measuring mode by pressing M.

4.3.2 AutoCal TEC

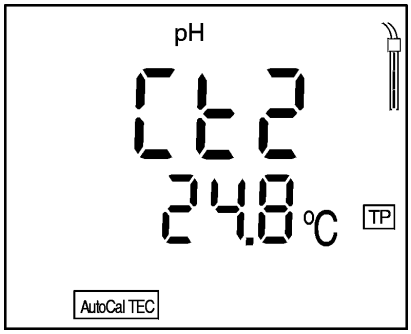
Use any two or three of the WTW technical buffer solutions for this procedure in increasing or decreasing order.

Note
Steps 2, 6 and 13 are not required if you use a temperature probe.

1	Press the CAL key repeatedly until the AutoCal TEC function display appears.



2	If necessary, set the temperature of the buffer solution by pressing ↑ ↓.
3	Submerse the pH electrode in the first buffer solution.
4	Press the RUN ENTER key. AR flashes on the display. The electrode voltage (mV) appears on the display. As soon as a stable value is recognized, Ct2 appears.



5	Thoroughly rinse the electrode with distilled water.

6	If necessary, set the temperature of the second buffer solution by pressing ∧ ∨.
7	Submerse the electrode in the second buffer solution.
8	Press the RUN ENTER key. AR flashes on the display. The electrode voltage (mV) appears on the display. As soon as a stable value is recognized, AR disappears. The sensor symbol shows the electrode evaluation after the two-point calibration. The value of the slope (mV/pH) appears on the display.
9	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display.
10	To return to the measuring mode: Press the M key or continue with three-point calibration.

Three-point calibration

11	Press the RUN ENTER key. Ct3 appears on the display.
12	Thoroughly rinse the electrode with distilled water.
13	If necessary, set the temperature of the third buffer solution by pressing ∧ ∨.
14	Submerse the electrode in the third buffer solution.
15	Press the RUN ENTER key. AR flashes on the display. The electrode voltage (mV) appears on the display. As soon as a stable value is recognized, AR disappears. The sensor symbol shows the electrode evaluation after the three-point calibration. The value of the slope (mV/pH) appears on the display.
16	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display.
17	To return to the measuring mode: Press the M key.

Note

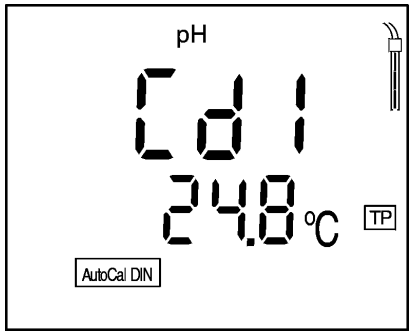
You can also prematurely terminate the three-point calibration by pressing M. The values of the two-point calibration for the slope and asymmetry are then stored.

4.3.3 AutoCal DIN

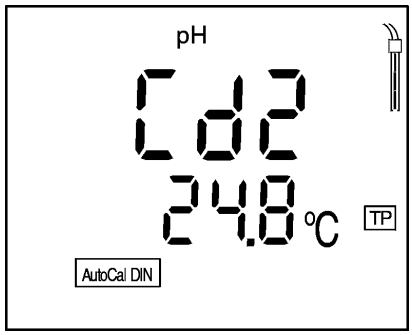
Use two or three different DIN buffer solutions (type A, C, D or F with the pH values 1.679, 4.006, 6.865, 9.180) for this procedure in increasing or decreasing order.

Note
Steps 2, 6 and 13 are not required if you use a temperature probe.

1	Press the CAL key repeatedly until the AutoCal DIN function display appears.



2	If necessary, set the temperature of the buffer solution by pressing ∧ ∨.
3	Submerse the pH electrode in the first buffer solution.
4	Press the RUN ENTER key. AR flashes on the display. The electrode voltage (mV) appears on the display. As soon as a stable value is recognized, Cd2 appears.



5	Thoroughly rinse the electrode with distilled water.
6	If necessary, set the temperature of the second buffer solution by pressing ∧ ∨.
7	Submerse the electrode in the second buffer solution.
8	Press the RUN ENTER key. AR flashes on the display. The electrode voltage (mV) appears on the display. As soon as a stable value is recognized, AR disappears. The sensor symbol shows the electrode evaluation after the two-point calibration. The value of the slope (mV/pH) appears on the display.
9	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display.
10	To return to the measuring mode: Press the M key or continue with the three-point calibration.

Three-point calibration

11	Press the RUN ENTER key. Cd3 appears on the display.
12	Thoroughly rinse the electrode with distilled water.
13	If necessary, set the temperature of the third buffer solution by pressing ∧ ∨.
14	Submerse the electrode in the third buffer solution.
15	Press the RUN ENTER key. AR flashes on the display. The electrode voltage (mV) appears on the display. As soon as a stable value is recognized, AR disappears. The sensor symbol shows the electrode evaluation after the three-point calibration. The value of the slope (mV/pH) appears on the display.
16	Press the RUN ENTER key. The value of the asymmetry appears on the display (mV).
17	To return to the measuring mode: Press the M key.

Note
You can also prematurely terminate the three-point calibration by pressing M. The values of the two-point calibration for slope and asymmetry are retained.

4.3.4 ConCal

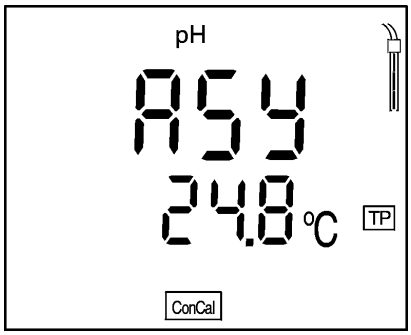
Two-point calibration

Use two buffer solutions for this procedure:

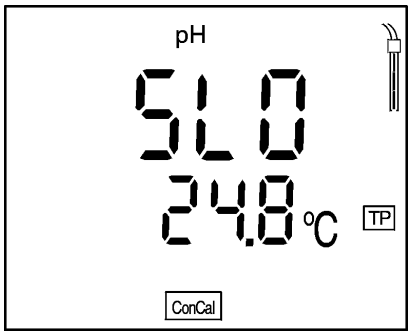
- pH 7.0 ± 0.5
- any other buffer solution

Note
Steps 2 and 9 are not required if you use a temperature probe.

1	Press the CAL key repeatedly until the ConCal function display appears.



2	If necessary, set the temperature of the buffer solution by pressing ∧ ∨.
3	Submerse the pH electrode in the first buffer solution pH 7.0 ± 0.5.
4	Press the RUN ENTER key. The measured pH value appears on the display.
5	Set the nominal pH value of the buffer solution (at the current temperature) by pressing the ∧ ∨ keys.
6	Press the RUN ENTER key. The value of the asymmetry (mV) and the sensor symbol appear on the display.
7	Press the RUN ENTER key. SLO(pe) appears on the display.



8	Thoroughly rinse the electrode with distilled water.
9	If necessary, set the temperature of the second buffer solution by pressing ∧ ∨.
10	Submerse the electrode in the second buffer solution.
11	Press the RUN ENTER key. The second measured pH value appears on the display.
12	Set the nominal pH value of the second buffer solution (at the current temperature).
13	Press the RUN ENTER key. The value of the slope (mV/pH) appears on the display. The sensor symbol shows the evaluation of the electrode after the two-point calibration.
14	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display again.
15	To return to the measuring mode: Press the M key.

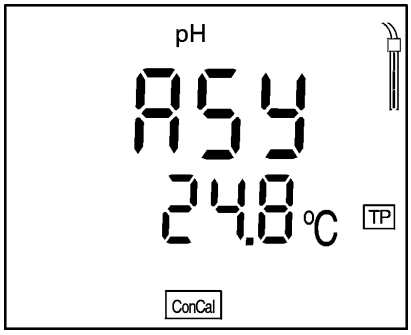
Single-point calibration

Use a buffer solution in the range pH = 7.0 ± 0.5 for this procedure.

Note
Only the electrode asymmetry is determined in single-point calibration. The slope of the last two-point calibration is retained.

Note
Step 2 is not required if you use a temperature probe. The TP message indicates an active temperature measurement.

1	Press the CAL key repeatedly until the ConCal function display appears.



2	Set the temperature of the buffer solution by pressing ∧ ∨.
3	Submerse the pH electrode in the buffer solution.
4	Press the RUN ENTER key. The measured pH value appears on the display.
5	Set the nominal pH value of the buffer solution (at the current temperature) by pressing the ∧ ∨ keys.
6	Press the RUN ENTER key. The value of the asymmetry (mV) and the sensor symbol for the evaluation of the electrode appears on the display.
7	To return to the measuring mode: Press the M key.

4.4 Storing

The pH meter has an internal data storage device. Up to 800 data records can be stored in it.
A complete data record consists of:

- Memory location
- Date/time
- Measured value
- Temperature
- Temperature measurement procedure
- I.D. number

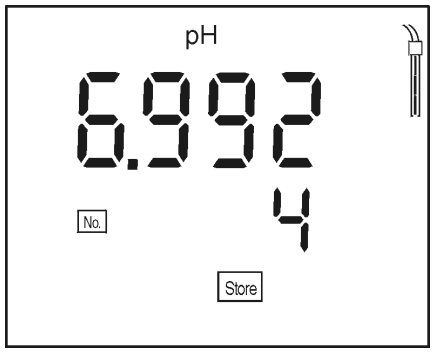
You can transmit measured values (data records) to the data storage in 2 ways:

- Manual storage
- Switching on the AutoStore function (Int 1).

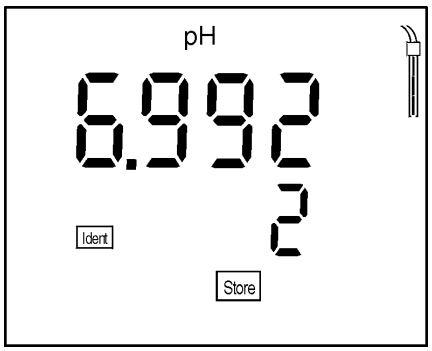
4.4.1 Manual storage

You can transmit a measured value to the data storage as follows:

1	Press the STO key. The current number of the next free memory location appears on the display.



2	Confirm with RUN ENTER. The display changes to the input of the I.D. number.



3	Enter the required I.D. number (1 ... 999) by pressing ↑ ↓.
4	Confirm with RUN ENTER. The instrument changes to the measuring mode.

StoFull message

This message appears if all 800 memory locations are full.

You have the following options:

Store the current measured value. The oldest measured value (memory location 1) is overwritten by this	Press RUN ENTER
Return to the measuring mode without storing	Press any key
Output the data storage	See section 4.4.3
Delete the data storage	See section 4.4.4

4.4.2 Switching on AutoStore (Int 1)

The storage interval (Int 1) determines the time interval between automatic storage processes.
After the time interval expires, the current data record is transmitted to the data storage and to the printer/interface.

Setting the storage interval

The storage interval (Int 1) is set to OFF in the factory. Thus, the *AutoStore* function is switched off.
To switch the function on, set up a time interval (5 s, 10 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min):

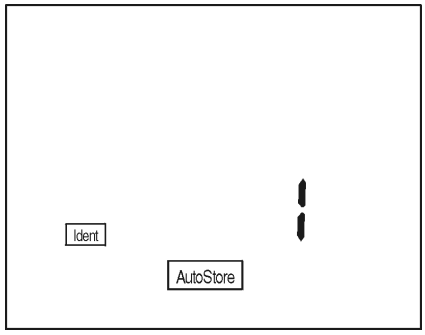
1	Press and hold down the RUN ENTER key.
2	Press the STO key. *Int 1* appears on the display.



3	Press the ∧ ∨ keys to set up the required time interval between storage processes.
4	Confirm with RUN ENTER. The number of free memory locations appears on the display.



5	As soon as all 800 memory locations are full, the AutoStore function is terminated (Int 1 = OFF). If too few storage locations are available for your measurements: – backup the data storage (see page 110) and – clear the data stored (see page 113).
6	Confirm with RUN ENTER. The prompt for the I.D. number appears on the display.



7	Press ∧ ∨ to set the required I.D. number.
8	Confirm with RUN ENTER. The instrument changes to the pH measuring mode and starts the measuring and storage procedure. *AutoStore* flashes on the display.

Note
The *AutoStore* function is interrupted if you perform other functions, e.g. output data storage.
After completing the other function, the *AutoStore* function continues. However, as a result, gaps can occur in the recording of the measured values.

Switching off the AutoStore

Switch off the *AutoStore* function by:

- Setting the storage interval (Int 1) to OFF or
- Switch the pH meter off and on again.

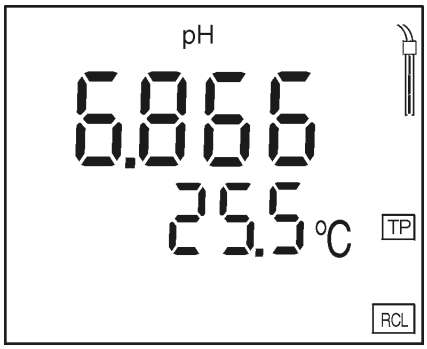
4.4.3 Outputting the data storage

The contents of the data storage can be output to the:

- display
- printer/interface

Outputting to the display

1	Press the RCL key repeatedly until *Sto disp* appears on the display.
2	Press the RUN ENTER key. A measured value appears on the display. The memory location of the data store appears for approx. 2 s. This is followed by the corresponding temperature.



You can perform the following activities:

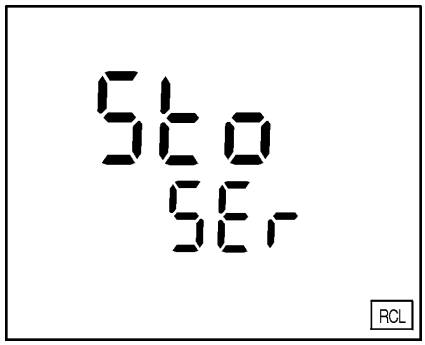
Display further parameters of the data record (I.D. no., date, time, memory location)	Press RUN ENTER
Advance one data record (memory location)	Press ∧
Go back one data record (memory location)	Press ∨

Note
If you want to find a specific parameter (e.g. date), proceed as follows:

1	Select the parameter (e.g. date) by pressing RUN ENTER.
2	Press ∧ or ∨ repeatedly until the required date appears on the display. After approx. 2 s, the temperature of the displayed measured value appears.

Outputting to printer/interface

1	Press the RCL key repeatedly until *Sto SEr* appears on the display.



2	Press the RUN ENTER key. *Sto CAL* appears on the display. The calibration protocol is transmitted to the printer/interface. Following the calibration protocol, the complete contents of the storage is transmitted to the printer/interface.

Note
You can the cancel the transmission by pressing M or RUN ENTER.

Sample printout:

```
CALIBRATION PROTOCOL
 02.03.99     14:19
Device No.: 12345678
CALIBRATION pH
Cal Time: 01.03.99 / 15:20
Cal Interval:   7d
AutoCal DIN   Tauto
Buffer 1   1.679
Buffer 2   4.008 *
Buffer 3   6.865
Buffer 4   9.180 *
C1      174.1mV  25.0°C
C2     -133.3mV  25.0°C
S1     -59.4 mV/pH
ASY1   -   4 mV
Probe:     +++

No.    1:
 09.03.99       17:10
pH 10.01        25    °C
Tman          AR
Ident :  1

No.    2:
 09.03.99       17:11
pH 10.01        24,7  °C
Tauto          AR
Ident :  1

No.    3:
 09.03.99       17:12
  305 mV
Tauto
Ident :  13
```

The printout contains:

- calibration protocol
- storage contents

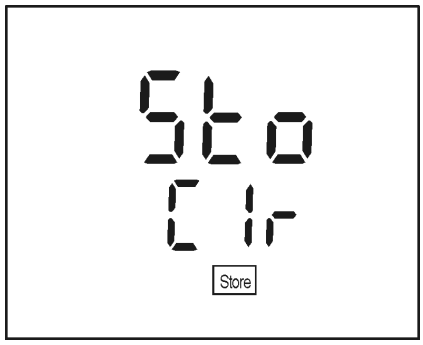
4.4.4 Clearing the storage

This function can erase the stored data records. 800 memory locations will then become available again.

Note
The *Clear store* function only appears if data records have already been stored in the storage. Otherwise, the pH meter automatically changes to the measuring mode.

In order to delete all the data records, proceed as follows:

1	Switch off the instrument.
2	Press and hold down the STO key.
3	Press the ⏻ key. The *display test* appears briefly on the display.



4	Confirm the clearing process by pressing RUN ENTER. Pressing any other key stops the clearing process and the data records remain in the storage.

Note
The calibration data remain in the storage and can be called up via the calibration protocol.

4.5 Data transmission

You can use the following options to transmit data:

- One of the following options:
  - The *AutoStore* function (page 108) is used to periodically (*Int 1* storage interval) save measured values internally and output them on the printer/ interface.
  - The *data transmission interval (Int 2)* function is used to periodically output measured values to a printer/ interface (see below).
- The *Output data store* function (page 110) is used to output calibration data and stored measured values to a printer/interface.
- The analog recorder output (page 116) is used to output measured values as voltages.
- Data can be transmitted bidirectionally (page 118) using the KOM pilot communication package (accessory).

4.5.1 Data transmission interval (Int 2)

The interval for the data transmission (Int 2) is determined by the time interval between automatic data transmissions. After the time interval expires, the current data record is transmitted to the interface.

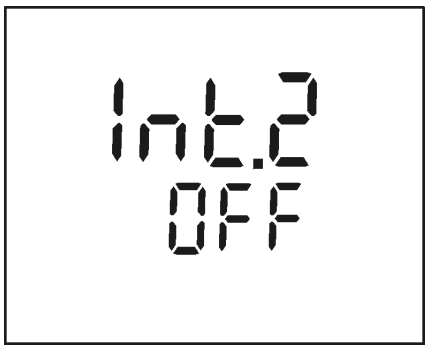


Note
The setting of the interval (Int 2) only has an effect when the storage interval (*AutoStore* function) is switched off.

Setting the *data transmission* interval

The interval is set to OFF in the factory.
To start the data transmission, set up an interval (5 s, 10 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min):

1	Press and hold down the RUN ENTER key.
2	Press the AR key. *Int 2* appears on the display.



3	Press ∧ ∨ to set up the required time interval between storage processes.
4	Confirm with RUN ENTER. The instrument changes automatically to the pH measuring mode.

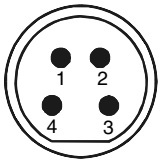
Note
If the *AutoStore* function is active, the data transmission is performed according to the setting of the storage interval (Int 1). Set the storage interval (Int 1) to OFF to activate the *data transmission* interval (Int 2).

Note
You can also set the *data transmission* interval (Int 2) in the *Configuration* menu (see page 119).

4.5.2 Recorder (analog output)

You can transmit the data to a recorder via the analog output. Connect the analog output to the recorder via the AK323 interface cable.
The data output switches automatically to *recorder output*.

Socket assignment



RS 232
REC

1 Free
2 Plug coding
3 Ground
4 Analog output
low impedance electrode signal
corresponds to 50 ... 62 mV/pH
(internal resistance < 5 Ohm)

Note
Activate the analog output by connecting 2 and 3.

4.5.3 PC/external printer (RS232 interface)

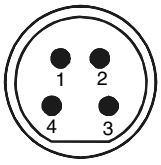
You can transmit data to a PC or an external printer via the RS232 interface.
Connect the interface to the instrument via the AK340/B cable (PC) or AK325/S cable (external printer).
The data output switches automatically to *RS232*.

Note
The RS232 interface is not galvanically isolated.
If it is connected to an earthed PC/printer, measurements cannot be made in earthed media as this would give incorrect results!

Set up the following transmission data on the PC/printer:

Baud rate	Selectable between: 1200, 2400, 4800, 9600
Handshake	RTS/CTS + Xon/Xoff
PC only:	
Parity	None
Data bits	8
Stop bits	1

Socket assignment

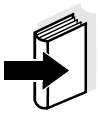


RS 232
REC

1 CTS
2 RxD
3 Ground
4 TxD

4.5.4 Remote control

The pH meter can be remotely controlled from a PC. This requires the KOM pilot communication package that is available as an accessory.
The instrument is then controlled via commands that simulate keystrokes and request the current display contents.



Note
A more detailed description is provided within the scope of delivery of the communication package.

4.6 Configuration

You can adapt the pH meter to your individual requirements. To do this, the following parameters can be changed (the status on delivery is marked in bold):

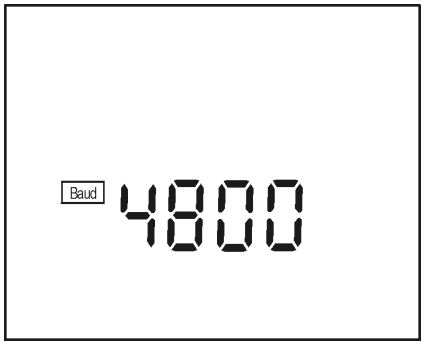
Baud rate	1200, 2400, **4800**, 9600
Data transmission interval (Int 2)	**OFF**, 5 s, 10 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min
Calibration interval (Int 3)	1 ... **7** ... 999 d
Temperature unit	°**C**, °F
Date/time	As required
Resolution of pH display	**0.01**, 0.001

Note

You can leave the configuration menu at any time. Parameters that have already been changed are stored.
To do this, press the M key.

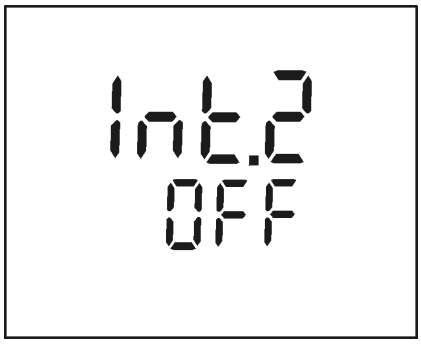
1	Switch off the instrument.
2	Press and hold down the M key.
3	Press the ⏻ key. *The display test* appears briefly on the display. The instrument then switches automatically to the setting of the baud rate.

Baud rate



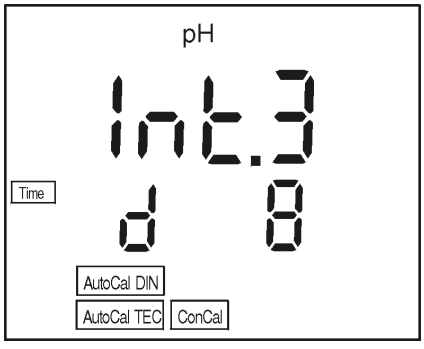
4	Set up the required baud rate by pressing ∧ ∨.
5	Confirm with RUN ENTER. *Int 2* appears on the display.

Data transmission interval



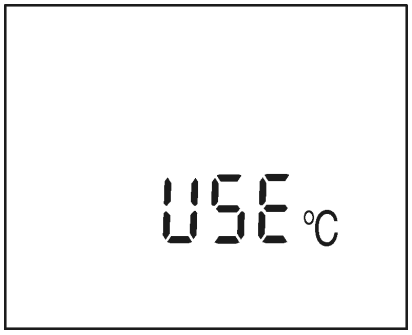
6	Set up the required time interval by pressing ∧ ∨.
7	Confirm with RUN ENTER. *Int 3* appears on the display.

Calibration interval



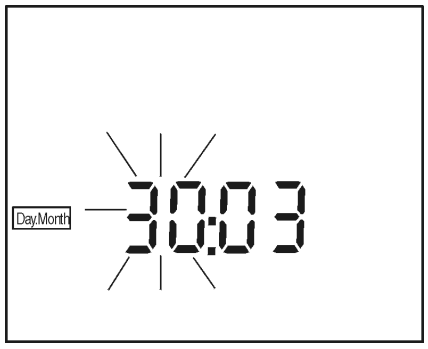
8	Set up the required time interval by pressing ∧ ∨.
9	Confirm with RUN ENTER. USE °C appears on the display.

Temperature unit



10	Change between °C and °F by pressing ∧ ∨.
11	Confirm with RUN ENTER. The date flashes on the display.

Date and time



12	Set today's date by pressing ∧ ∨.
13	Confirm with RUN ENTER. The date (month) flashes on the display.
14	Set the current month by pressing ∧ ∨.
15	Confirm with RUN ENTER. The year appears on the display.
16	Set the current year by pressing ∧ ∨.
17	Confirm with RUN ENTER. The hours flash on the display.
18	Set the current time by pressing ∧ ∨.
19	Confirm with RUN ENTER. The minutes flash on the screen.
20	Set the current time by pressing ∧ ∨.

21	Confirm with RUN ENTER. The instrument changes automatically to the pH measuring mode.

Adjusting the resolution

1	Press and hold down the RUN ENTER key.
2	Press the M key. The measured values appear with the higher resolution on the display, e.g. pH = 4.012.
3	Press the RUN ENTER key and M key again. The measured values with the lower resolution appear on the display, e.g. pH = 4.01.

4.7 Reset

You can reset (initialize) measuring and configuration parameters separately from one another.

Measuring parameters

The following measuring parameters (pH InI) are reset to the values they had on delivery:

Measuring mode	pH
Asymmetry	0 mV
Slope	-59.16 mV/pH
Calibration procedure	AutoCal TEC
Temperature, manual	25 °C
Resolution of pH display	0.01

Note
When the measuring parameters are reset, the calibration data are lost. After the parameters have been reset, calibrate!

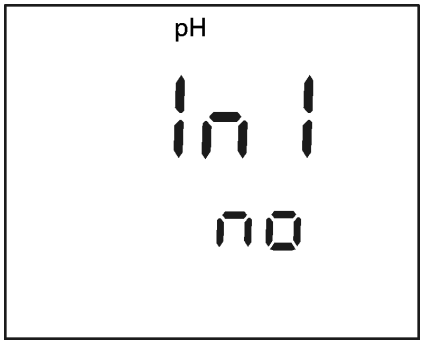
Configuration parameters

The following configuration parameters (InI) are reset to the values they had on delivery:

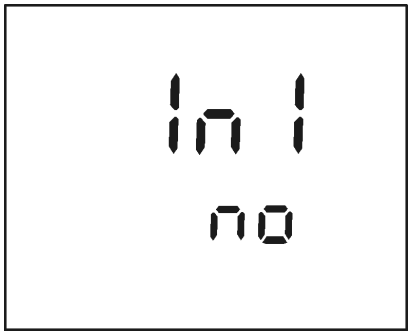
Baud rate	4800
Interval 1 (automatic storing)	OFF
Interval 2 (for data transmission)	OFF

Resetting measuring parameters

1	Press and hold down the RUN ENTER key.
2	Press the CAL key.



3	Use ∧ ∨ to toggle between no and yes. yes: reset measuring parameters. no: retain settings.
4	Confirm with RUN ENTER. The instrument changes to the configuration parameters.



Resetting configuration parameters

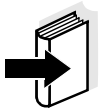
5	Toggle between no and yes by pressing ∧ ∨. yes: reset configuration parameters. no: retain settings.
6	Confirm with RUN ENTER. The instrument changes automatically to the pH measuring mode.

5 Maintenance, cleaning, disposal

5.1 Maintenance

The maintenance tasks are restricted to the following activities:

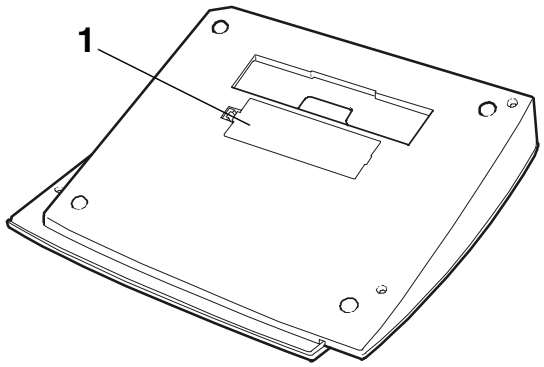
- replacing the batteries and
- replacing the roll of printer paper.



Note
See the relevant operating manual of the electrode for instructions on maintenance.

5.1.1 Changing the batteries

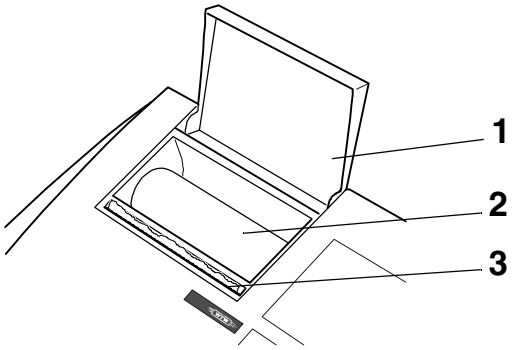
1	Open the battery compartment (1) on the underside of the instrument.
2	Remove the four batteries from the battery compartment.
3	Insert four new batteries (Type Mignon AA) into the battery compartment.
4	Close the battery compartment (1). The date (day) flashes on the display.
5	Set up the date and time according to section 3.2.



Caution
Make sure that the poles of the batteries are the right way round.
The ± signs in the battery compartment must correspond to the ± signs on the batteries.
Only use leakproof alkaline manganese batteries.

5.1.2 Replacing the roll of printer paper

1	Switch off the printer (Print LED lights up red).
2	Open the lid of the printer (1).
3	Remove the empty roll of paper (2).
4	Insert the new roll of paper: – Fold the leading edge of the paper inwards and thread it into the printer (3) from underneath. – Press the feed Print key (paper feed)
5	Close the lid of the printer (1).



Note
Only use original WTW rolls of printer paper. Information on this is given in the WTW catalog, LABORATORY AND FIELD INSTRUMENTATION or via the Internet.
You can also use HQ thermal paper that remains legible for at least 10 years.

5.2 Cleaning

Occasionally wipe the outside of the measuring instrument with a damp, lint-free cloth. Disinfect the housing with isopropanol as required.



Caution

The housing is made of synthetic material (ABS). Thus, avoid contact with acetone or similar detergents that contain solvents. Remove any splashes immediately.

5.3 Disposal

Packing

The measuring instrument is sent out in a protective transport packing.
We recommend: Keep the packing material. It protects the instrument against damage during transport.

Batteries

This note refers to the battery regulation that applies in the Federal Republic of Germany. We would ask end-consumers in other countries to follow their local statutory provisions.



Note

In compliance with §14 of the BATTERY REGULATION, we would like to point out that this instrument contains batteries. Batteries that have been removed must only be disposed of at the recycling facility set up for this purpose or via the retail outlet.
It is illegal to dispose of them in household refuse.

Measuring instrument

Dispose of the measuring instrument as electronic waste at an appropriate collection point. It is illegal to dispose of them in household refuse.

6 What to do if...

Error message, OFL

Cause	Remedy
pH electrode:	
– Not connected	– Connect electrode
– Air bubbles in front of the diaphragm	– Remove air bubbles
– Air in the diaphragm	– Extract air or moisten diaphragm
– Cable broken	– Replace electrode
– Gel electrolyte dried out	– Replace electrode

Error message, E3

Cause	Remedy
pH electrode:	
– Diaphragm contaminated	– Clean diaphragm
– Membrane contaminated	– Clean membrane
– Moisture in the plug	– Dry plug
– Electrolyte obsolete	– Replenish electrolyte or replace electrode
– Electrode obsolete	– Replace electrode
– Electrode broken	– Replace electrode
Measuring instrument:	
– Incorrect calibration procedure	– Select correct procedure
– Incorrect solution temperature (without temperature probe)	– Set up correct temperature
– Socket damp	– Dry socket

Buffer solutions:	
– Incorrect buffer solutions	– Change calibration procedure
– Buffer solutions too old	– Only use once. Note the shelf life
– Buffer solutions depleted	– Change solutions

No stable measured value

Cause	Remedy
pH electrode:	
– Diaphragm contaminated	– Clean diaphragm
– Membrane contaminated	– Clean membrane
Sample:	
– pH value not stable	– Measure with air excluded if necessary
– Temperature not stable	– Adjust temperature if necessary
Electrode + sample:	
– Conductivity too low	– Use suitable electrode
– Temperature too high	– Use suitable electrode
– Organic liquids	– Use suitable electrode

Sensor symbol flashes

Cause	Remedy
– Calibrating interval expired	– Newly calibrate measuring system

LoBat display

Cause	Remedy
– Batteries almost depleted	– Replace batteries (see section 5.1 MAINTENANCE)

to display

Cause	Remedy
– Timeout of the interface	– Checkout connected instrument

Obviously incorrect measured values

Cause	Remedy
pH electrode:	
– pH electrode unsuitable	– Use suitable electrode
– Temperature difference between buffer and sample too large	– Adjust temperature of buffers or samples
– Measuring procedure not suitable	– Follow special procedure

Instrument does not react to keystroke

Cause	Remedy
– Operating state undefined or EMC electric stress unallowed	– Processor reset: Press the AR key and switch on instrument

You would like to know which software version is in the instrument

Cause	Remedy
– e.g. question of the WTW service department	– Press the AR key and switch on instrument. The software version is displayed.

Integrated printer does not print

Cause	Remedy
– Printer switched off	– Switch on printer
– No mains power supply connected	– Connect mains power supply
– Interface cable connected	– Unplug cable
– No paper available	– Replace roll of paper
– *AutoStore* function is switched on with a longer interval duration (Int 1)	– Switch off *AutoStore* function

Integrated printer prints automatically

Cause	Remedy
– *AutoStore* function (Int 1) or *Data transmission* (Int 2) is switched on	– Switch off functions

Print key feed does not react

Cause	Remedy
– Printer is switched on	– Switch off printer
– Interface cable connected	– Unplug cable

Printer operating - paper not being printed

Cause	Remedy
– Paper inserted with wrong side upwards	– Turn the roll of paper around and insert it with the other side upwards

StoFull message

Cause	Remedy
– All 800 memory locations are full	– Output data store and clear data store

7 Technical Data

Ambient temperature

Storage temperature	- 25 °C ... + 65 °C
Operating temperature	0 °C ... + 55 °C
Allowable relative humidity	Annual mean: < 75 % 30 days/year: 95 % Other days: 85 %

Measuring ranges and resolution

pH	- 2.000 ... + 19.999 - 2.00 ... + 19.99
U [mV]	- 999.9 ... + 999.9 - 1999 ... + 1999
T [°C]	- 5.0 ... + 109.0
T [°F]	+ 23.0 ... + 221.0

Accuracy (± 1 digit)

pH (in the measuring range of 2 pH units around the calibration point)	± 0.005 (at operating temperature + 15°C ... + 35 °C) ± 0.01
U [mV]	± 0.3 (at + 15 °C ... + 35 °C) ± 1
T [°C]	NTC 30: ± 0.1 PT 1000: ± 0.5 at 0 °C ... 15 °C ± 0.1 at 15 °C ... 35 °C ± 1 at 35 °C ... 55 °C
T [°F]	NTC 30: ± 0.2 PT 1000: ± 0.9 at 32 °F ... 59 °F ± 0.2 at 59 °F ... 95 °F ± 1.8 at 95 °F ... 131 °F

Dimensions and weight

Length [mm]	250
Width [mm]	300
Height [mm]	70
Weight [kg]	Approx. 1.3 (without plug-in power supply)

Analog output

Automatic switch-over when the AK 323 recorder cable is connected.

Output signal	corresponds to electrode voltage, i. e. 50...62 mV/pH unit
Accuracy	± 0.1% of measured value ± 4mV
Internal resistanace	< 5 ohms (current limitation to max. 0.2 mA output current)

Serial interface

Automatic switch-over when the AK 340/B or AK 325/S cable is connected.

Type	RS 232, data output
Baud rate	can be set to 1200, 2400, 4800, 9600 Baud
Data bits	8
Stop bit	1
Parity	none
Handshake	RTS/CTS+Xon/Xoff
Cable length	max. 15m

Energy supply	Batteries	4 x 1.5 V AA type alkaline manganese batteries
	Runtime	Approx. 3000 operating hours
	Power supply	Plug-in power supply (Connection max. overvoltage category II) Plug-in power supply (Euro plug): FRIWO FW3288, 11.8134 Friwo Part No. 1816492 Input: 230V ~ / 50 Hz / 23 VA Output: 6 V = / 1,8 A /10,8 VA Plug-in power supply (US plug): FRIWO FW3288, 11.8451 Friwo Part No. 1816493 Input: 120V ~ / 60 Hz / 21,5 VA Output: 6 V = / 1,8 A Plug-in power supply (UK plug): FRIWO FW3288, 11.8453 Friwo Part No. 1770896 Input: 230V ~ / 50 Hz / 23 VA Output: 6 V = / 1,8 A

Guidelines and norms used	EMC	E.C. guideline 89/336/EEC EN 61326-1:1997 EN 61000-3-2 A14:2000 EN 61000-3-3:1995 FCC Class A
	Instrument safety	E.C. guideline 73/23/EEC
	Protective class	3, EN 61010-1 A2:1995
	Climatic class	2, VDI/VDE 3540
Test marks	TÜV GS, UL/CUL, CE	

8 Lists

This chapter provides additional information and orientation aids.

Abbreviations The list of abbreviations explains abbreviations that appear on the display or when dealing with the instrument.

Specialist terms The glossary briefly explains the meaning of the specialist terms. However, terms that should already be familiar to the target group are not described here.

Index The index helps you find the topics that you are looking for.

Abbreviations

AR	AutoRead (drift control)
ARng	Automatic range switching Measuring instrument measures with highest resolution
ASY	Asymmetry
AutoCal DIN	Automatic calibration with DIN buffer solutions
AutoCal TEC	Automatic calibration with WTW technical buffer solutions
Cal	Calibration
Cd...	Calibration with DIN buffer solutions (acc. to DIN 19 266)
ConCal	Conventional one/two point calibration
Ct...	Calibration with WTW technical buffer solutions
disp	Display Displays the data storage on the screen
E3	Error message (see WHAT TO DO IF ...)
InI	Initialization Resets individual basic functions to the status they had on delivery
LoBat	Low Battery Batteries are almost empty
mV	Voltage unit
mV/pH	Unit of the electrode slope
OFL	Overflow Display range exceeded
pH	pH value
RCL	Recall memory dump

S	Slope
SELV	Safety Extra Low Voltage
SEr	Serial interface Output of the data storage on the RS 232 or on the internal printer
SLO	Slope Slope setting on calibration
Sto	Store Memory
TP	Temperature probe Temperature measurement active
U_{ASY}	Asymmetry potential
°C	Temperature unit, °Celsius
°F	Temperature unit, °Fahrenheit

Glossary

Asymmetry	Zero point of a pH electrode.
Resolution	Number of decimal places that appear for a measured value.
AutoRead	Monitors the electrode drift and releases the measured value only after the stability criterion has been reached. In this way, this procedure ensures the highest degree of precision and reproducibility.
Baud rate	Transmission rate in bits/s.
Diaphragm	Contact point between the reference electrolytic solution and the sample.
Drift control	See AUTOREAD.
MultiCal®	Group term for the various WTW calibration procedures used for automatic calibration in buffer solutions.
Test sample	Sample to be measured (can be liquid or solid).
Test solution	Stable solution with a precisely known Redox voltage.
Buffer solution	Stable solution with a precisely known pH value.
Redox voltage	Potentiometric quantity.
Slope	Specifies the voltage change per pH unit.

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9 Appendix

SENTON

CERTIFICATE

to the Electromagnetic Compatibility
to Test Report No. 52501-90109/-1

EUT:	InoLab pH Level 2 with printer
Uniform EMC-design:	InoLab pH Level 1, InoLab pH Level 2, InoLab pH Level 2 with printer, InoLab pH/ION Level 2, InoLab pH/ION Level 2 with printer, CG842, CG843, CG843P
Applicant:	WTW GmbH
Regulations:	EN 50081-1:1992 EN 50082-1:1992 FCC part 15 subpart B

Test result:

The tested sample is in compliance with the RFI requirements and the immunity requirements according to above referenced regulations.

The following severity levels have been achieved:

RFI-Emissions:	Requirements according to EN 50081-1:1992 FCC part 15 subpart B limit class A
Immunity:	Electrostatic Discharge according to IEC 801-2:1984 Air discharge: 8 kV
	Radiated Electromagnetic Fields according to IEC 801-3:1984 27 - 500 MHz: 3 V/m
	Electrical Fast Transients (Burst) according to IEC 801-4:1988 Power line: 1 kV; data line: 0.5 kV

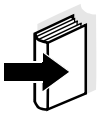
March 10, 1999

Roidt Johann — Date
Senton GmbH

Deutscher Akkreditierungs Rat DAR

DAR-Registration No. TTI-P-G 062/94-30
DAR-Registration No. TTI-P-G 109/95-20

SENTON GmbH - EMV-Prüfzentrum - Äußere Frühlingsstraße 45 - D-94315 Straubing - Tel. 09421/55 22-0



Note
If you need further informationen or application notes you can ask for:

- Application reports
- Primers
- Safety data sheets.

You can find information on available literature in the WTW catalog, LABORATORY AND FIELD INSTRUMENTATION or via the Internet.