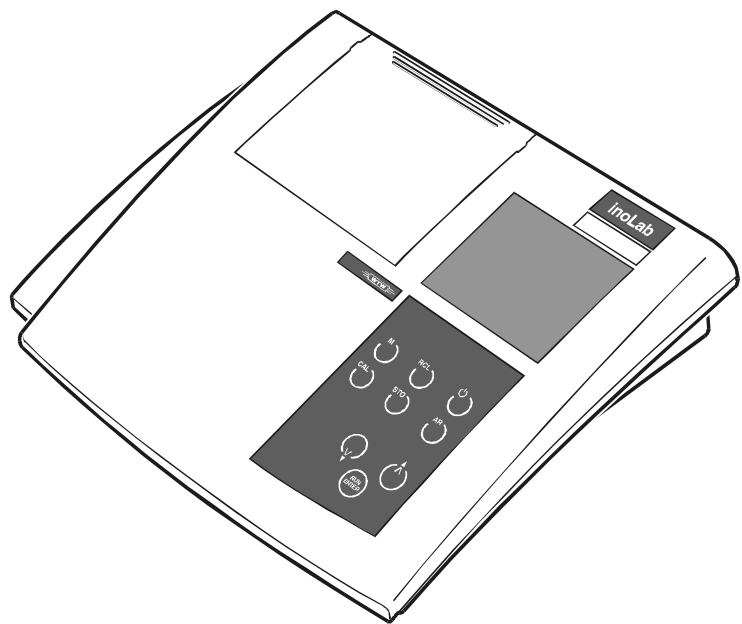# inoLab
pH Level 2

Laboratory pH meter

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.

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 proven MultiCal® calibration procedures and special *AutoRead* function support your work with the pH meter.
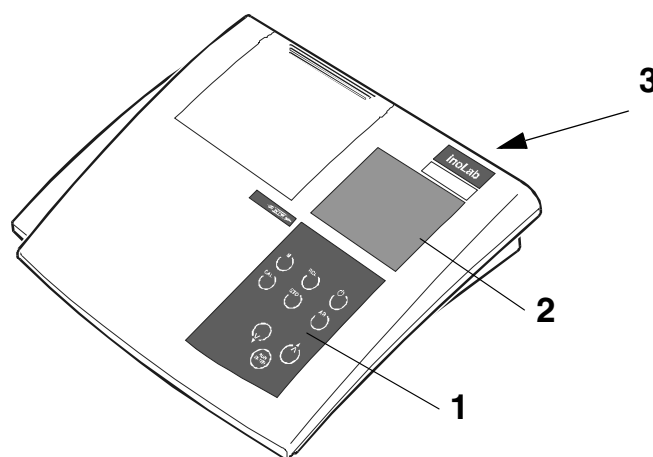
1   Keypad
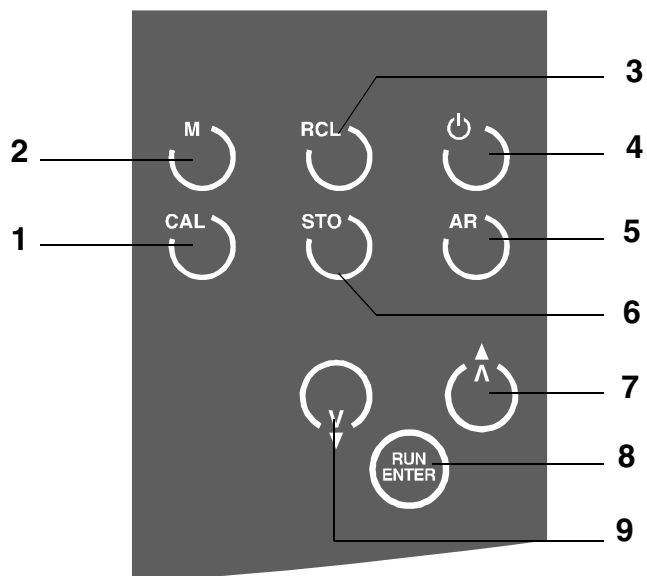
2   Display

3   Sockets

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	Call up calibration procedure
2	Select measuring mode
3	Display or transmit measured values
4	Measuring instrument ON/OFF
5	Activate/deactivate AutoRead function
6	Store measured value
7	Increase values, scroll
8	Confirm inputs, start AutoRead
9	Reduce values, scroll

1.2   Display

Status line

Measured value display

Function and
temperature display
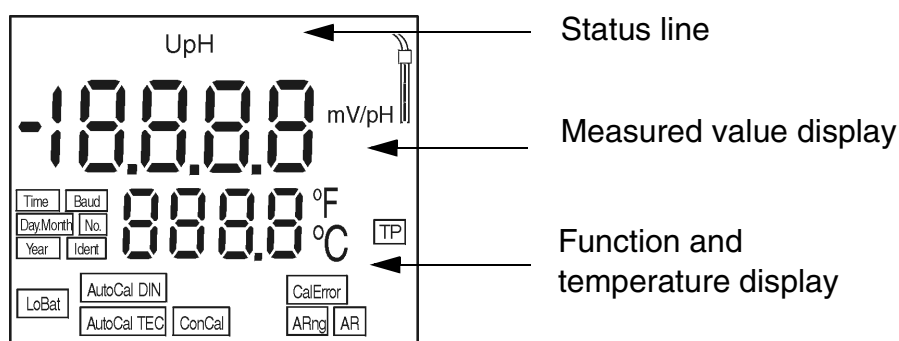
1.3   Sockets
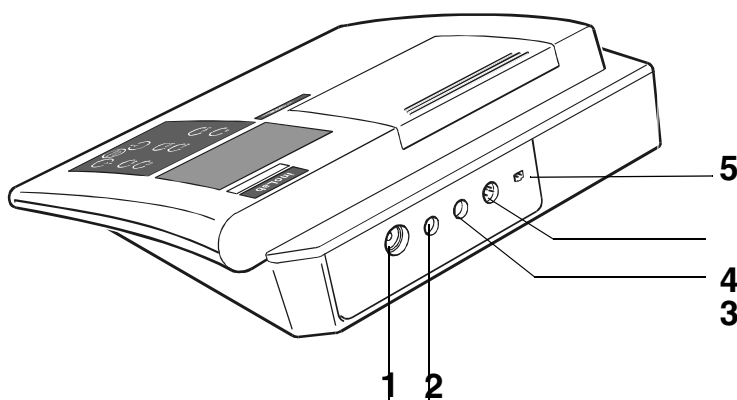
Connectors:

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

Caution

Only connect probes to the instrument that cannot feed ex-
cessive voltages or currents (> SELV and > circuit with cur-
rent limiter).

Overview

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 EN 61010-1 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
- 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.

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 🔘. The measuring instrument then switches to the pH measuring mode.
14	Switch off the instrument by pressing ⏻.

Connecting the plug-in power supply

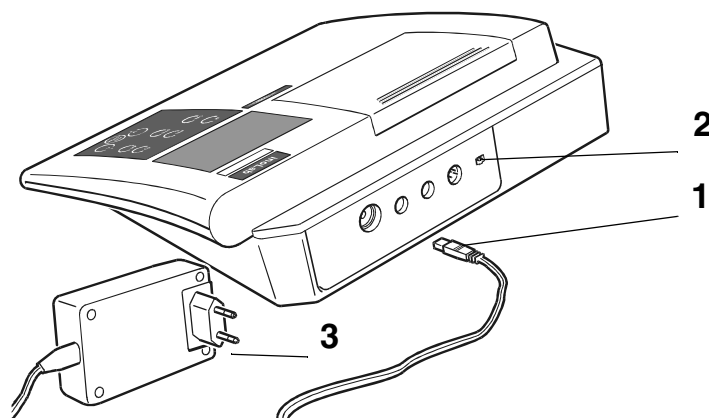The plug-in power supply supplies the pH meter with low voltage (7.5 V ... 12 V DC).

⚡ **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.

ℹ **Note**
You can also perform measurements without a 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 NTC 30 or Pt 1000.

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 $\hat{\bigcirc}$ $\bigcirc_{v}$.

Note
When calibrating without a temperature probe, set up the current temperature of the respective buffer solution manually by pressing the $\hat{\bigcirc}$ $\bigcirc_{v}$ 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 ⟲ key until *pH* appears in the status display. The pH value appears on the display.
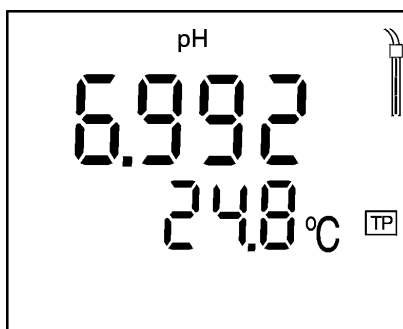
AutoRead AR (Drift control)

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 ⟲.
2	Activate the AutoRead function by pressing ⟲. 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 the interface.
4	If necessary, start the next AutoRead measurement by pressing (RUN/ENTER).
5	To cancel the AutoRead function: Press the ⟲ key.

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

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 $\overset{M}{\circlearrowleft}$ 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.

U

0.5 mV

21.3 °C TP
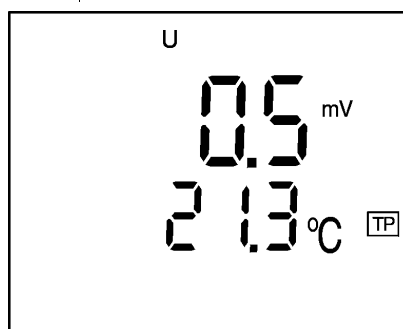
Note
Redox electrodes are not calibrated. However, you can check Redox electrodes using a test solution.

4.2.3 Transmitting measured values

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

- Switch on the data transmission (Int 2) (see page 112)
  - After expiry of the selected interval, the current data record is sent to the interface.
- Switch on AutoStore (Int 1) (see page 106)
  - After expiry of the selected interval, the current data record is sent to the interface and in addition is stored in the data storage of the instrument
  - AutoStore (Int 1) covers the *data transmission* interval (Int 2).
- Press the (RUN ENTER) key
  This manually transmits the current measured values at any time - independently of the selected intervals.

Note

If you connect a recorder (analog output), the output to the digital output is 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, connect a printer according to section 4.5.3 before the calibration. 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 interval

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 🖐 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.
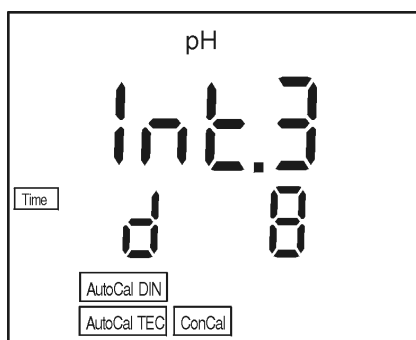
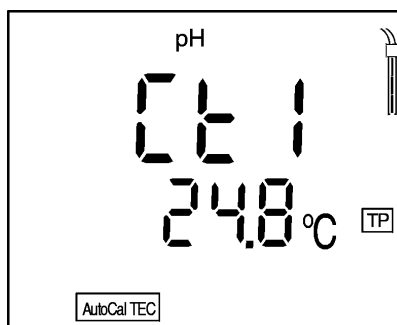| 5	Press 🔼 🔽 to set the required time interval until the next calibration.
6	Confirm with (RUN ENTER).
7	Change to the measuring mode by pressing 🖐.

4.3.2 AutoCal TEC

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

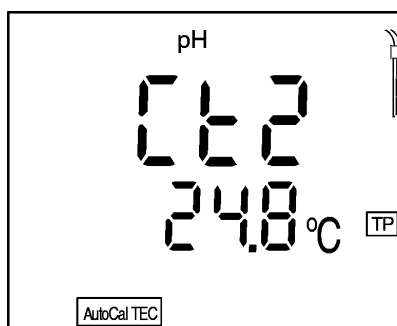**Note**
Steps 2, 6 and 13 are not required if you use a temperature probe.

1	Press the $\overset{CAL}{\circlearrowleft}$ key repeatedly until the AutoCal TEC function display appears.

pH

Ct1

24.8 °C TP

AutoCal TEC

2	If necessary, set the temperature of the buffer solution by pressing $\overset{\wedge}{\circlearrowleft}$ $\underset{v}{\circlearrowleft}$.
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.

pH

Ct2

24.8 °C TP

AutoCal TEC

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 🔘 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 🔘 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 🔘 key. The value of the asymmetry (mV) appears on the display.
	17	To return to the measuring mode: Press the 🔘 key.

Note

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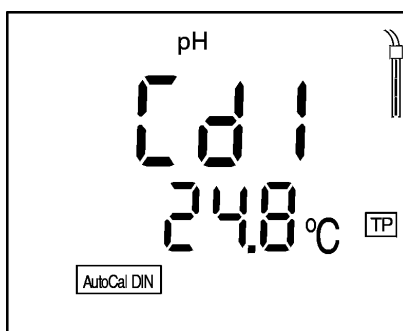
4.3.3 AutoCal DIN

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

i

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

|	
1	Press the $\overset{CAL}{\circlearrowleft}$ key repeatedly until the ConCal function display appears.
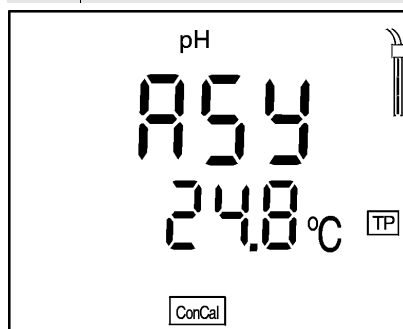
2	If necessary, set the temperature of the buffer solution by pressing $\overset{\wedge}{\circlearrowleft}$ $\underset{v}{\mathbb{Q}}$.
3	Submerse the pH electrode in the first buffer solution pH 7.0 ± 0.5.
4	Press the $\overset{RUN}{\underset{ENTER}{\bigcirc}}$ key. The measured pH value appears on the display.
5	Set the nominal pH value of the buffer solution (at the current temperature) by pressing the $\overset{\wedge}{\circlearrowleft}$ $\underset{v}{\mathbb{Q}}$ keys.
6	Press the $\overset{RUN}{\underset{ENTER}{\bigcirc}}$ key. The value of the asymmetry (mV) and the sensor symbol appear on the display.
7	Press the $\overset{RUN}{\underset{ENTER}{\bigcirc}}$ key. SLO(pe) appears on the display.

pH

SLO

24.8 °C TP

ConCal
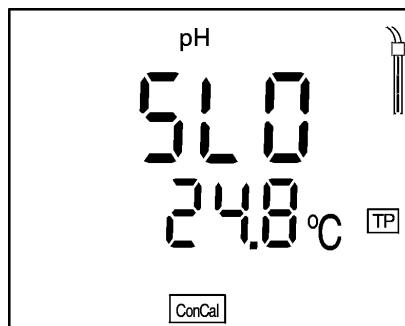
8	Thoroughly rinse the electrode with distilled water.
9	If necessary, set the temperature of the second buffer solution by pressing ⌃ ⌄.
10	Submerse the electrode in the second buffer solution.
11	Press the (RUN ENTER) key. The second measured pH value appears on the display.
12	Set the nominal pH value 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 pro-
cedure.

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.

pH

ASY

24.8 °C TP

ConCal
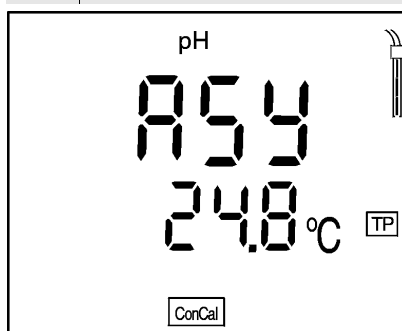
2	Set the temperature of the buffer solution by pressing ⟲ᐱ ⟲ᵥ.
3	Submerse the pH electrode in the buffer solution.
4	Press the (RUN ENTER) key. The measured pH value appears on the display.
5	Set the nominal pH value of the buffer solution (at the current temperature) by pressing the ⟲ᐱ ⟲ᵥ keys.
6	Press 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 $\overset{\text{STO}}{\circlearrowleft}$ key. The current number of the next free memory location appears on the display.
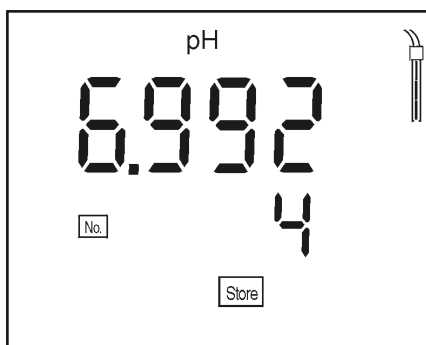
2	Confirm with (RUN ENTER).
	The display changes to the input of the I.D. number.

```
            pH

     6.992
Ident          2
           Store
```
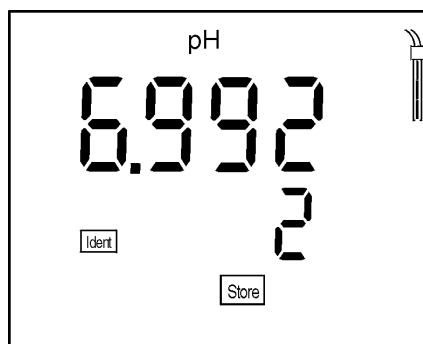
3	Enter the required I.D. number (1 ... 999) by pressing (▲) (▼).
4	Confirm with (RUN ENTER).
	The instrument changes to the measuring mode.

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 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.

```
Int.1
  OFF
 [AutoStore]
```

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.

```
 199
FrEE
 [AutoStore]
```

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 108) and
	– clear the data stored (see page 111).
6	Confirm with (RUN ENTER). The prompt for the I.D. number appears on the display.
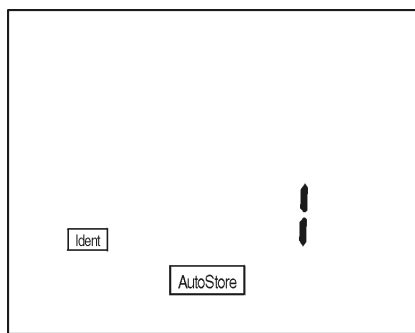
7	Press (∧) (∨) to set the required I.D. number
8	Confirm with (RUN ENTER). The instrument changes to the pH measuring mode and starts the measuring and storage procedure. *AutoStore* flashes on the display.

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
- interface

Outputting to the display

1	Press the $\overset{RCL}{\circlearrowright}$ key repeatedly until *Sto disp* appears on the display.
2	Press the (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.
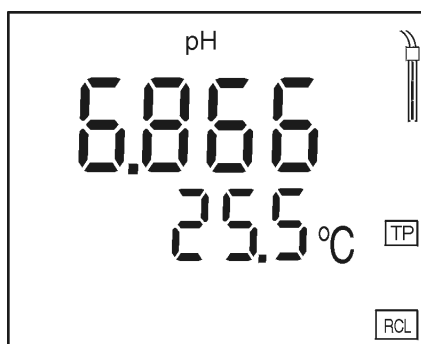
You can perform the following activities:

Display further parameters of the data record (I.D. no., date, time, memory location)	Press (ENTER)
Advance one data record (memory location)	Press $(\overset{\wedge}{\circlearrowright})$
Go back one data record (memory location)	Press $(\underset{\vee}{\circlearrowleft})$

	Note
i	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 the interface

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

Sto
SEr

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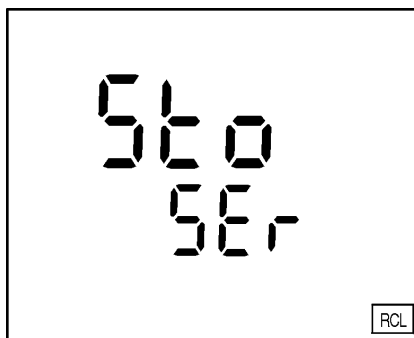
2	Press the (RUN ENTER) key. *Sto CAL* appears on the display. The calibration protocol is transmitted to the interface. Following the calibration protocol, the complete contents of the storage is transmitted to the interface.

	Note
i	You can 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 $\overset{\text{STO}}{\circlearrowleft}$ key.
3	Press the $\circlearrowleft$ key. The *display test* appears briefly on the display.
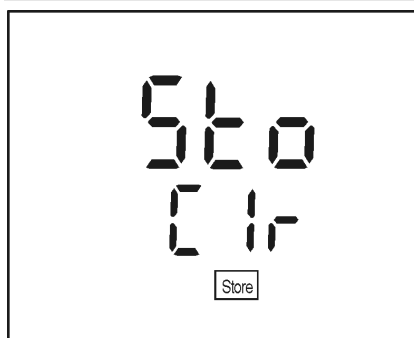
4	Confirm the clearing process by pressing (RUN ENTER). Pressing any other key stops the clearing process and the data records remain in the storage.

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 106) is used to periodically (*Int 1* storage interval) save measured values internally and output them on the interface.

  – The *data transmission interval (Int 2)* function is used to periodically output measured values to the interface (see below).
- The *Output data store* function (page 108) is used to output calibration data and stored measured values to the interface.
- The analog recorder output (page 114) is used to output measured values as voltages.
- Data can be transmitted bidirectionally (page 116) 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.

```
Int.2
OFF
```

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 (Int1). Set the storage interval (Int1) to OFF to activate the *data transmission* interval (Int2).

Note
You can also set the *data transmission* interval (Int2) in the *Configuration* menu (see page 117).

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
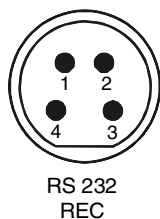
RS 232
REC

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
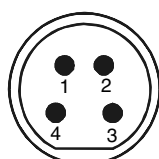
1 CTS
2 RxD
3 Ground
4 TxD

RS 232
REC

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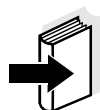
Note
A more detailed description is provided within the scope of delivery of the communication package.

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 (⌃) (ᵥ).
5	Confirm with (RUN ENTER). *Int 2* appears on the display.

Data transmission interval

Int.2
OFF

6	Set up the required time interval by pressing (⌃) (ᵥ).
7	Confirm with (RUN ENTER). *Int 3* appears on the display.

Calibration interval

pH

Int.3
d   8

Time

AutoCal DIN
AutoCal TEC | ConCal
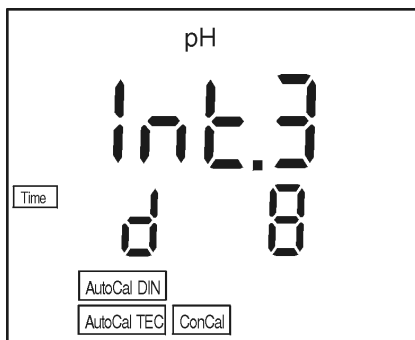
8	Set up the required time interval by pressing (⌃) (ᵥ).
9	Confirm with (RUN ENTER). USE °C appears on the display.

Temperature unit

USE °C
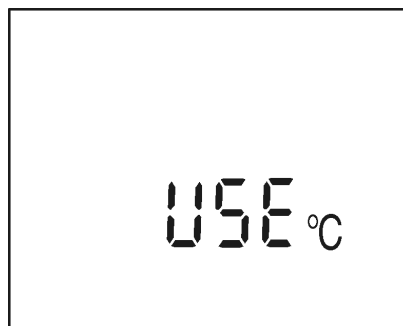
10	Change between °C and °F by pressing ⟳ ⟲.
11	Confirm with (RUN ENTER). The date flashes on the display.

Date and time

Day.Month — 30:03
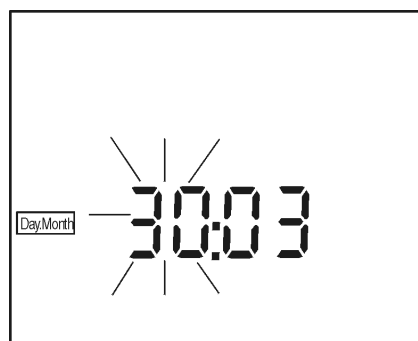
12	Set today's date by pressing ⟳ ⟲.
13	Confirm with (RUN ENTER). The date (month) flashes on the display.
14	Set the current month by pressing ⟳ ⟲.
15	Confirm with (RUN ENTER). The year appears on the display.
16	Set the current year by pressing ⟳ ⟲.
17	Confirm with (RUN ENTER). The hours flash on the 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.

```
pH

In 1

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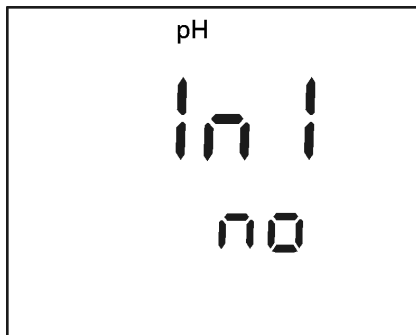
3	Use (∧) (∨) to toggle between no and yes. yes: reset measuring parameters. no: retain settings.
4	Confirm with (RUN ENTER). The instrument changes to the configuration parameters.

```
In 1

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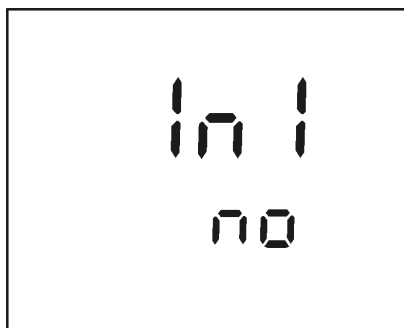
Resetting configuration parameters	5	Toggle between no and yes by pressing (∧) (∨). yes: reset configuration parameters. no: retain settings.
	6	Confirm with (RUN ENTER). The instrument changes automatically to the pH measuring mode.

5 Maintenance, cleaning, disposal

5.1 Maintenance

The measuring instrument is almost maintenance-free. The only maintenance task is replacing 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.
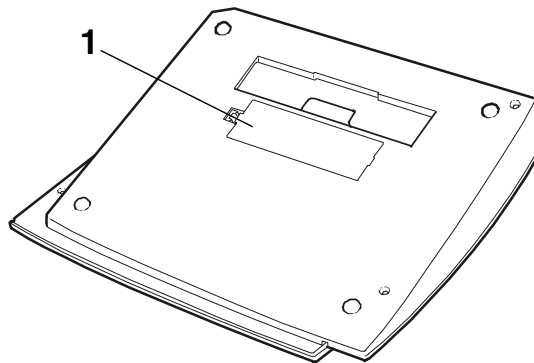
Caution
Make sure that the poles of the batteries are the right way round. The ± signs in the battery compartment must correspond to the ± signs on the batteries.
Only use leakproof alkaline manganese batteries.

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

5.2   Cleaning

Occasionally wipe the outside of the measuring instrument with a damp, lint-free cloth. Disinfect the housing with iso-propanol 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 trans-port 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-consum-ers in other countries to follow their local statutory provi-sions.

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 instruments 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

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

	Cause	Remedy
to display	– Timeout of the interface	– Checkout connected instrument

	Cause	Remedy
Obviously incorrect measured values	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

	Cause	Remedy
Instrument does not react to keystroke	– Operating state undefined or EMC electric stress unallowed	– Processor reset: Press the (AR) key and switch on instrument

	Cause	Remedy
You would like to know which software version is in the instrument	– e.g. question of the WTW service department	– Press the (AR) key and switch on instrument. The software version is displayed.

	Cause	Remedy
$StoFull$ **message**	– 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 ... + 105.0
	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
	Mains power supply (option)	Connection max. overvoltage category II (valid for all plug-in power supplies): Plug-in power supply (Euro plug): FRIWO FW1199, 11.7864 Friwo Part. No. 1762613 Input: 230 V ~ / 50 Hz / 5.6 VA Output: 12 V = / 130 mA / 1.56 VA Plug-in power supply (US plug): FRIWO FW1199, 11.7880 Friwo Part. No. 1794043 Input: 120 V ~ / 60 Hz / 6 VA Output: 12 V = / 150 mA Plug-in power supply (UK plug): FRIWO FW3288, 11.8453 Friwo Part No. 1816491 Input: 230V ~ / 50 Hz / 23 VA Output: 12 V = / 130 mA / 1,56 VA

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
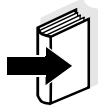
Note

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.