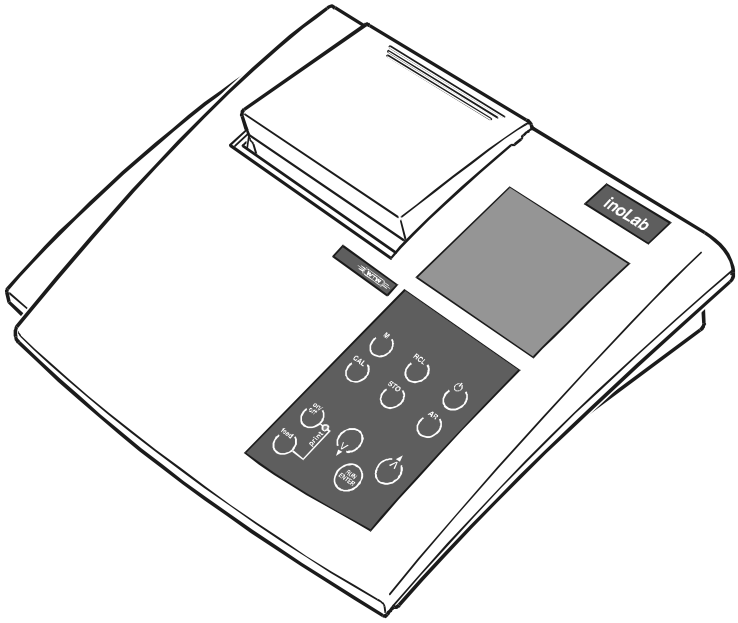
Operating Manual

inoLab
pH/ION Level 2



pH/ION 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.

Copyright

© Weilheim 2002, WTW GmbH & Co. KG
Reprinting - even as excerpts - is only allowed with the explicit written authorization of WTW GmbH & Co. KG, Weilheim.
Printed in Germany.

1 Overview 89
1.1 Keyboard 90
1.2 Display 91
1.3 Sockets 91
1.4 Operating structure 92

2 Safety 93
2.1 Authorized use 94
2.2 General safety instructions 94

3 Commissioning 97
3.1 Scope of delivery 97
3.2 Initial commissioning 97

4 Operation 99
4.1 Switch on the instrument 99
4.2 Measuring the pH value/Redox voltage 100
4.2.1 Measuring the pH value 101
4.2.2 Measuring the Redox voltage 102
4.3 Calibrating 103
4.3.1 Calibration interval (Int 3) 106
4.3.2 AutoCal TEC 107
4.3.3 AutoCal DIN 109
4.3.4 ConCal (pH) 111
4.4 Measuring the ISE concentration 114
4.5 ISE Calibration 117
4.6 Printing measured values 124
4.7 Storing 125
4.7.1 Manual storage 125
4.7.2 Switching on AutoStore (Int 1) 127
4.7.3 Outputting the data storage 129
4.7.4 Clearing the storage 131
4.8 Data transmission 132
4.8.1 Data transmission interval (Int 2) 132
4.8.2 Recorder (analog output) 134
4.8.3 PC/external printer (RS232 interface) .135

4.8.4 Remote control 136
4.9 Configuration 137
4.10 Reset 141

5 Maintenance, cleaning, disposal 143
5.1 Maintenance 143
5.1.1 Changing the batteries 144
5.1.2 Replacing the roll of printer paper 145
5.2 Cleaning 146
5.3 Disposal 146

6 What to do if... 147
6.1 pH system messages 147
6.2 ISE system messages 149
6.3 General errors 151

7 Technical Data 153
7.1 General data 153
7.2 pH/Redox measurement 156
7.3 ISE measurement 157

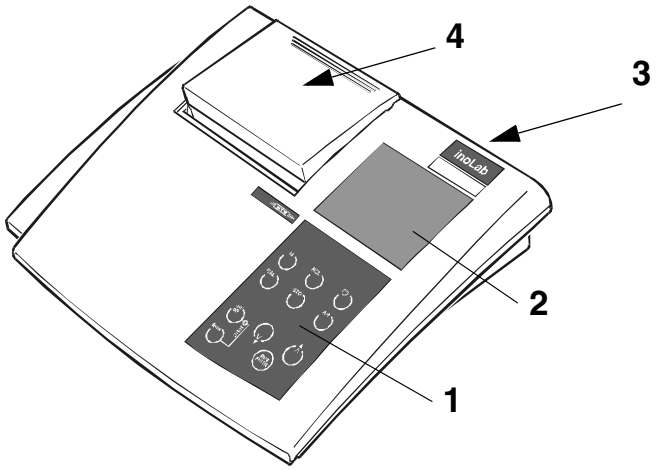
8 Lists 159

9 Appendix 165

1 Overview

The compact *inoLab pH/ION Level 2* precision measuring instrument lets you perform pH, Redox, and concentration measurements using ion selective electrodes rapidly and reliably.
The *inoLab pH/ION Level 2* provides the highest degree of operating comfort, reliability and measuring safety for all applications.

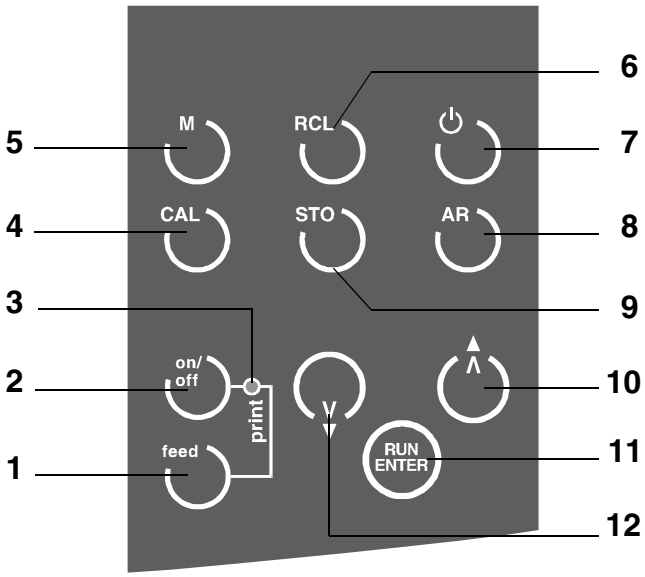
The integrated printer enables the measurements to be documented in compliance with GLP.
The proven MultiCal® calibration procedures and special *AutoRead* function support your work with the meter.



1	Keypad
2	Display
3	Sockets
4	Printer

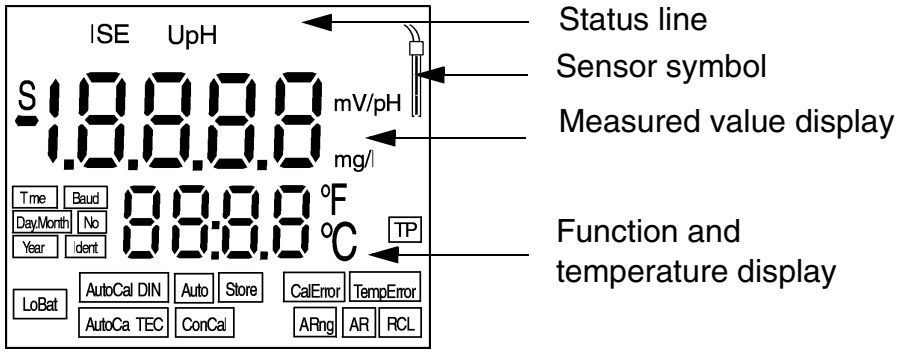
Note
The measuring instrument can also be delivered as part of a set. Information on this and other accessories is available in the WTW catalog LABORATORY AND FIELD INSTRUMENTATION or via the Internet.

1.1 Keyboard

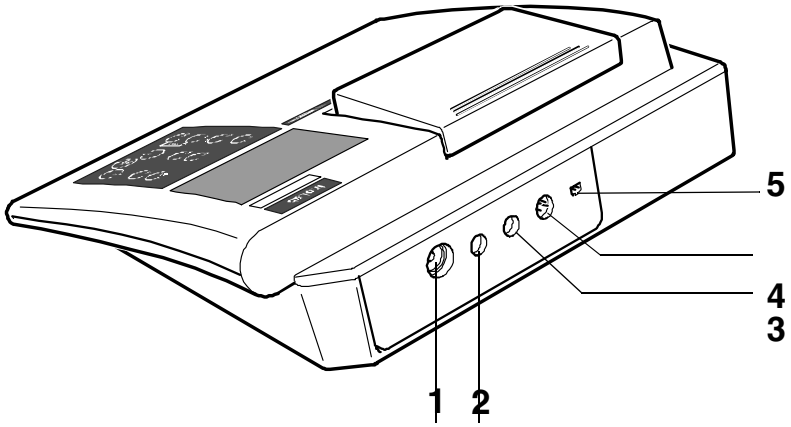


1	Paper feed/line feed (Printer off - Print LED lights up red)
2	Printer ON/OFF
3	Print LED Red: printer off (offline) or malfunction Green: printer ready for operation (online)
4	Call up calibration procedure
5	Select pH/Redox measuring mode or ISE concentration
6	Display or transmit measured values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

1.2 Display



1.3 Sockets



Connectors:

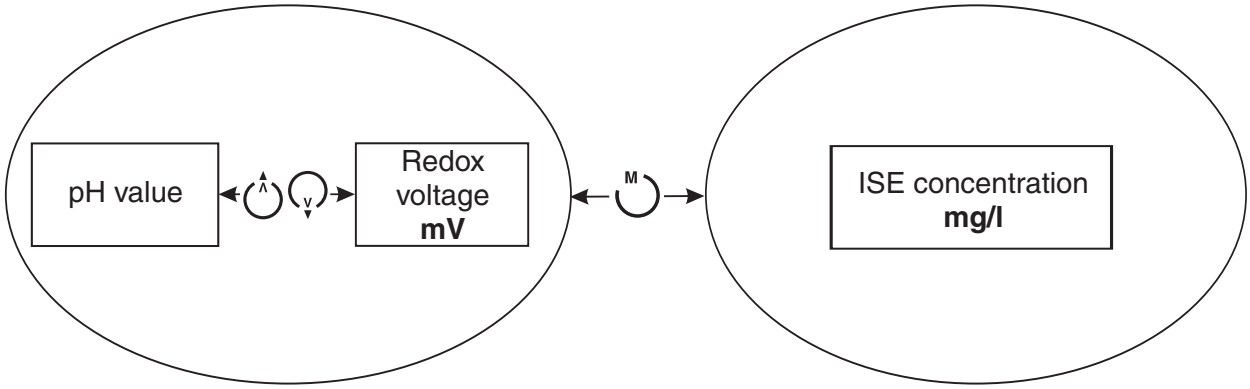
1	pH/ion electrode
2	Temperature probe
3	Reference electrode
4	RS 232 interface / analog output
5	Plug-in power supply

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.

1.4 Operating structure

The following overview diagram shows which keys you have to press to select between the different measuring modes:



Note

For measuring, the electrode suiting the selected measuring mode must be connected to the instrument.

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



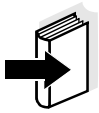
Caution
indicates instructions that have to be followed to prevent damage to your instrument.



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 electrodes, etc.

2.1 Authorized use

This instrument is authorized exclusively for pH, Redox, and ISE concentration 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/ION Level 2*
- Operating manual and short manual in the cover of the printer
- 4 x type AA Mignon 1.5 V batteries
- Plug-in power supply

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 ∧ ∨.

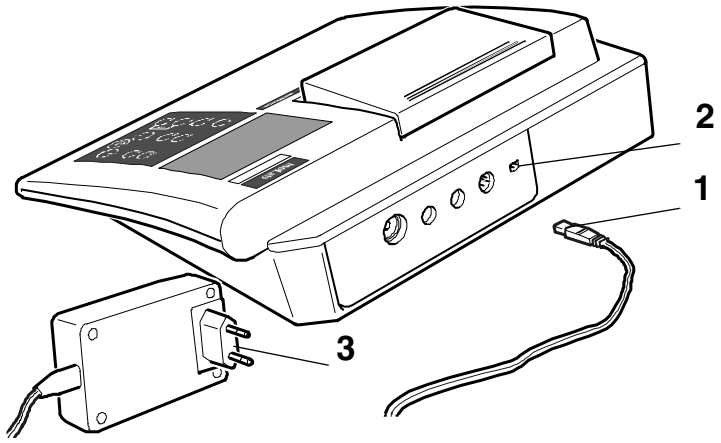
13	Confirm with RUN ENTER. The measuring instrument then switches to the measuring mode.
14	Switch off the instrument by pressing ⏻.

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 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 the pH value/Redox voltage

Preparatory activities

Perform the following 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	Select the measuring mode by pressing M.
4	Calibrate or check the instrument with the electrode.

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

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

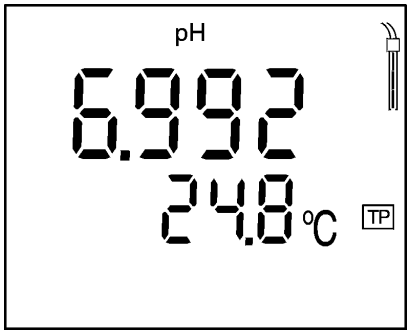
The temperature measurement is absolutely essential for a reproducible pH measurement. If the measurement is made without a temperature probe, proceed as follows:

1	Determine the current temperature using a thermometer.
2	Set up the temperature by pressing ∧ ∨, while keeping the RUN ENTER key depressed.

Note
When calibrating without a temperature probe, set up the current temperature of the respective buffer solution manually using ∧ ∨ while keeping the RUN ENTER key depressed.

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 repeatedly until the pH/Redox measurement appears on the display.
4	Select the pH measuring mode by pressing ↑ or ↓. *pH* appears in the status line. 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.

1	Activate the AutoRead function by pressing AR. The current measured value is frozen (Hold function).
2	Immerse the pH electrode into the test sample.
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.

AutoRead criteria

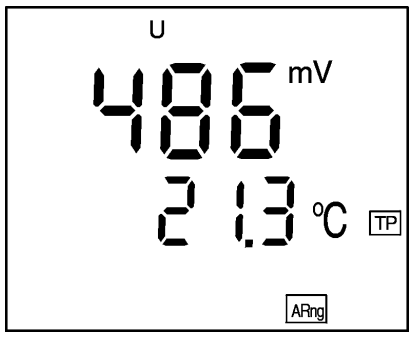
For identical measurement conditions, the following criteria apply:

Reproducibility	better than ± 0.01
Response time	> 30 seconds

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 the pH/Redox measurement appears on the display.
4	Select the Redox measuring mode by pressing ∧ or ∨. *U* appears in the status line. The pH value appears on the display.
5	Wait for a stable measured value.



Note

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

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.

You can choose between 3 calibration procedures:

AutoCal TEC is specially adapted to the WTW technical buffer solutions as a fully automatic two-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-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 4.7.3).

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 electrode 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)

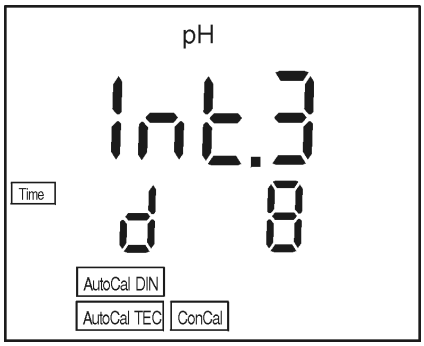
The calibration interval (Int 3) determines the time interval between 2 calibrations. After the selected calibration interval expires, the sensor symbol flashes. Measurements can continue.

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 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.



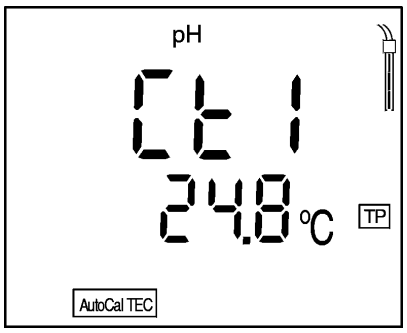
5	Press ∧ ∨ to set the required time interval until the next calibration.
6	Confirm with RUN ENTER.
7	Change to the measuring mode by pressing M.

4.3.2 AutoCal TEC

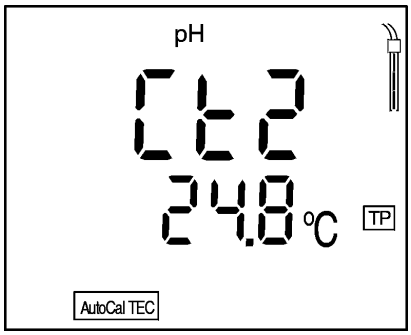
Use any two of the WTW technical buffer solutions for this procedure in increasing or decreasing order.

Note
Steps 3 and 7 are not required if you use a temperature probe.

1	Press the M key repeatedly until the pH/Redox measurement appears on the display. *pH* or *U* appears in the status line.
2	Press the CAL key repeatedly until the *AutoCal TEC* function display appears.



3	If necessary, set the temperature of the buffer solution using ∧ ∨ while keeping the RUN ENTER key depressed.
4	Submerse the pH electrode in the first buffer solution.
5	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.



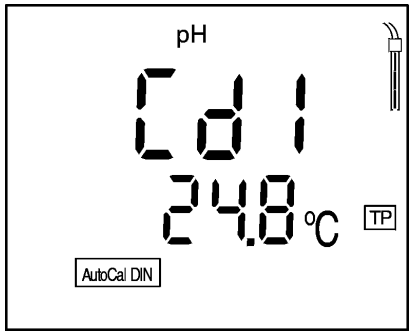
6	Thoroughly rinse the electrode with distilled water.
7	If necessary, set the temperature of the second buffer solution by pressing ∧ ∨ while keeping the RUN ENTER key depressed.
8	Submerse the electrode in the second buffer solution.
9	Press the RUN ENTER key. *AR* flashes on the display. The electrode 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.
10	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display.
11	To return to the measuring mode: Press the M key.

4.3.3 AutoCal DIN

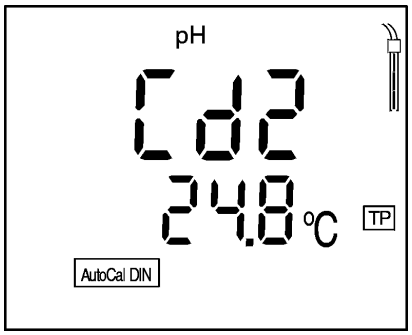
Use two different DIN buffer solutions (type A, C, D or F with the pH values 1.679, 4.006, 6.865, 9.180) for this procedure in increasing or decreasing order.

Note
Steps 3 and 7 are not required if you use a temperature probe.

1	Press the M key repeatedly until the pH/Redox measurement appears on the display. *pH* or *U* appears in the status line.
2	Press the CAL key repeatedly until the *AutoCal DIN* function display appears.



3	If necessary, set the temperature of the buffer solution using ∧ ∨ while keeping the RUN ENTER key depressed.
4	Submerse the pH electrode in the first buffer solution.
5	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.



6	Thoroughly rinse the electrode with distilled water.
7	If necessary, set the temperature of the second buffer solution using ∧ ∨ while keeping the RUN ENTER key depressed.
8	Submerse the electrode in the second buffer solution.
9	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.
10	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display.
11	To return to the measuring mode: Press the M key.

4.3.4 ConCal (pH)

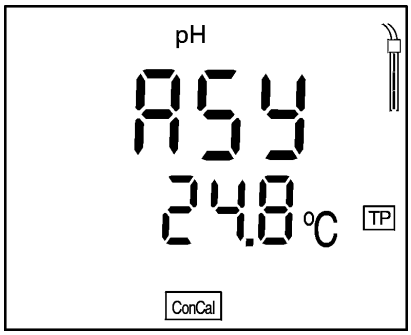
Two-point calibration

Use two buffer solutions for this procedure:

- pH 7.0 ± 0.5
- any other buffer solution

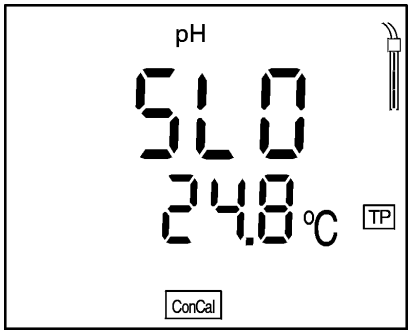
Note
Steps 3 and 10 are not required if you use a temperature probe.

1	Press the M key repeatedly until the pH/Redox measurement appears on the display. *pH* or *U* appears in the status line.
2	Press the CAL key repeatedly until the *ConCal* function display appears.



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

8	Press the RUN ENTER key. *SLO*(pe) appears on the display.



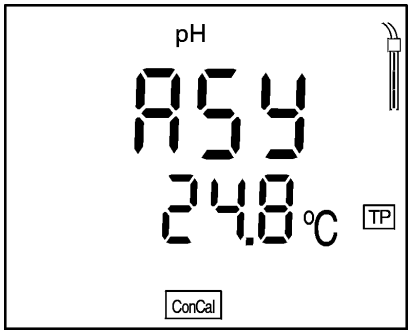
9	Thoroughly rinse the electrode with distilled water.
10	If necessary, set the temperature of the buffer solution using ∧ ∨ while keeping the RUN ENTER key depressed.
11	Submerse the electrode in the second buffer solution.
12	Press the RUN ENTER key. The second measured pH value appears on the display.
13	Set the nominal pH value of the second buffer solution (at the current temperature).
14	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.
15	Press the RUN ENTER key. The value of the asymmetry (mV) appears on the display again.
16	To return to the measuring mode: Press the M key.

Single-point calibration

Only the electrode asymmetry is determined in single-point calibration. The slope of the last two-point calibration is retained.
Use a buffer solution in the range pH = 7.0 ± 0.5 for this procedure.

Note
Step 3 is not required if you use a temperature probe. The *TP* message indicates an active temperature measurement.

1	Press the M key repeatedly until *pH* or *U* appears in the status line.
2	Press the CAL key repeatedly until the *ConCal* function display appears.



3	Set the temperature of the buffer solution using ∧ ∨ while keeping the RUN ENTER key depressed.
4	Submerse the pH electrode in the buffer solution.
5	Press the RUN ENTER key. The measured pH value appears on the display.
6	Set the nominal pH value of the buffer solution (at the current temperature) by pressing the ∧ ∨ keys.
7	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.
8	To return to the measuring mode: Press the M key.

4.4 Measuring the ISE concentration

Preparatory activities

Perform the following preparatory activities when you want to measure the concentration using an ion sensitive electrode:

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

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

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 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 measurement. If the measurement is made without a temperature probe, proceed as follows:

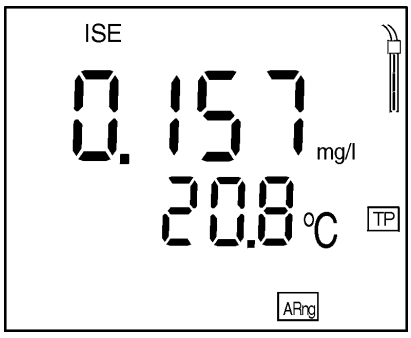
1	Measure the current temperature.
2	Temper the test sample and the calibration standards to the same temperature (in the range ± 2 °C).

Note
It is not possible to enter temperature values manually for ISE measurements and calibration.

Measuring the concentration

To measure the concentration proceed as follows:

1	Perform the preparatory activities.
2	Immerse the electrode into the test sample.
3	Press the M key repeatedly until *ISE* appears in the status line. The concentration 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.

1	Call up the ISE measuring mode by pressing M.
2	Immerse the electrode into the test sample.
3	Activate the AutoRead function by pressing AR. The current measured value is frozen (Hold function).
4	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.
5	If necessary, start the next AutoRead measurement by pressing RUN ENTER.
6	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.

AutoRead criteria

For identical measurement conditions, the following criteria apply:

Reproducibility	better than ± 0.05 mV
Response time	> 30 seconds

4.5 ISE Calibration

Why calibrate?

Ion sensitive electrodes age and are temperature dependent. This changes the slope. As a result, an inexact measured value is displayed. Calibration determines the current values of the slope of the electrode and stores it in the instrument.

Thus, you should calibrate before each measurement (if possible), and at regular intervals.



Note
For calibration, use tempered standard solutions with a temperature that differs by maximum ± 2 °C from the temperature of the test sample.

When to calibrate?

- Before each ISE measurement if possible
- After connecting another electrode
- When the sensor symbol flashes after a voltage interruption, e.g. battery change.

ConCal

is the conventional two-point calibration or three-point calibration with 2 or 3 freely selectable buffer solutions. The concentration of the calibration standards depends on the concentration that is expected to be measured.

AutoRead

In calibration, 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.

***TP* display**

If you use a temperature probe, a flashing *TP* display indicates that the temperature difference between the test sample and the standard solutions is too high (± 2 °C).

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 4.7.3 OUTPUTTING THE DATA STORAGE).

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 / 16:20
Device No.: 1234
CALIBRATION ISE
Cal Time: 01.03.99 / 15:10
Std 1   10,01  mg/l
Std 2   20,00  mg/l
Std 3   50,00  mg/l
C1           0,5 mV  25.0°C
C2           8,4 mV  24.9°C
C3          21,2 mV  25.0°C
S1          26.4 mV
S2          32,1 mV
Probe:      +++
```

Electrode evaluation

After the calibration, the instrument evaluates the current status of the electrode, i. e. the slope of the electrode (mV). The evaluation appears on the display.

Display	Slope [mV]
	50.0 ... 70.0 25.0 ... 35.0
E3	Clear the fault according to chapter 6 WHAT TO DO IF...

Preparatory activities

Perform the following preparatory activities:

1	Switch on the instrument by pressing ⏻.
2	Connect the electrode to the instrument.
3	Connect a temperature probe to the instrument in order to notice whether there are temperature differences too high while calibrating.
4	Keep the standard solutions ready.
5	Adjust the temperature of the solutions.

Note
For calibration, use tempered standard solutions with a temperature that differs by maximum ± 2 °C from the temperature of the test sample.

Calibration

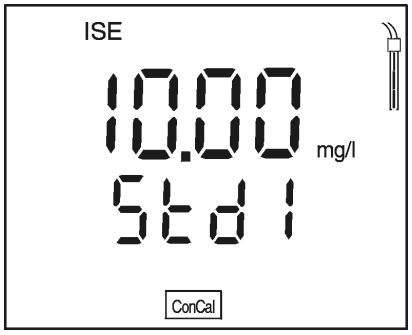
Use two or three different standard solutions out of the following range. For the three point calibration, the standards must be selected in increasing or decreasing order.

Parameter	Values [mg/l]
Std 1	0.01; 0.02; 0.05; 0.1; 0.2; 0.5; 1; 2; 5; 10; 20; 50; 100; 200; 500; 1000 If Std 2 > Std 1, Std 3 must be > Std 2 If Std 2 < Std 1, Std 3 must be < Std 2
Std 2	
Std 3	

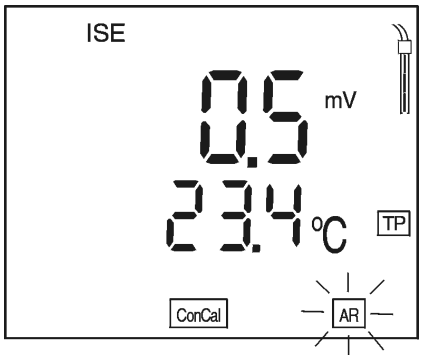
Note
The measuring accuracy depends on the standard solutions selected and on the expected concentration of the ISE measurement following.

Two point calibration

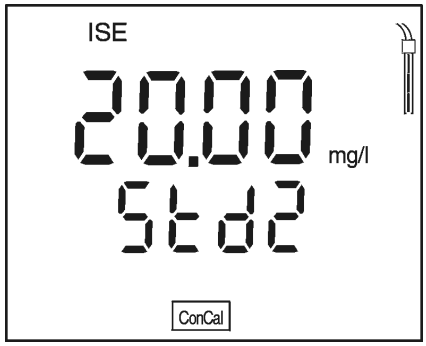
1	Select the ISE measuring mode using M.
2	Press the CAL key. The previously set up concentration of the first standard solution and the *ConCal* display indicator appear on the display.



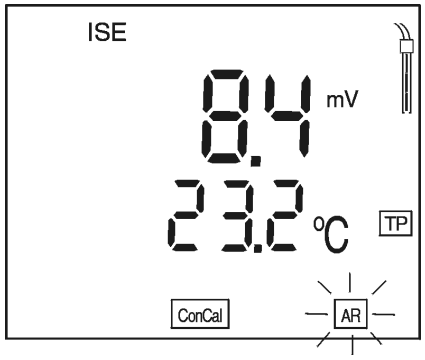
3	Enter the current concentration of the first standard solution using ↑ ↓.
4	Immerse the electrode into the first standard solution.
5	Press the RUN ENTER key. The electrode voltage appears on the display, the *AR* display indicator flashes.



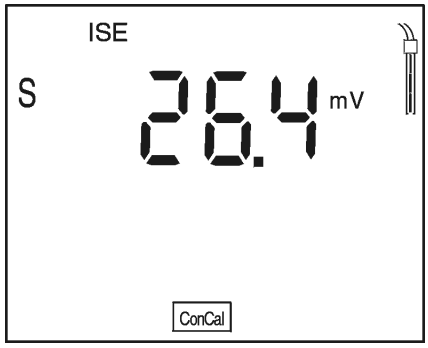
6	As soon as a stable value is achieved *AR* stops flashing. The previously set up concentration of the second standard solution appears on the display.



7	Enter the current concentration of the second standard solution using ▲ ▼.
8	Thoroughly rinse the electrode with distilled water.
9	Immerse the electrode into the second standard solution.
10	Press the RUN ENTER key. The electrode voltage appears on the display, the *AR* display indicator flashes.



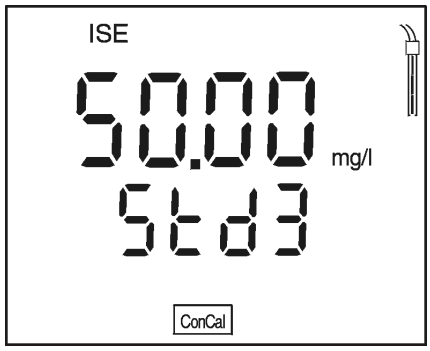
11	The *AR* display indicator stops flashing as soon as a stable value is achieved. The slope of the electrode (mV) appears on the display. The sensor symbol shows the evaluation of the electrode for the measuring range I after the two point calibration.



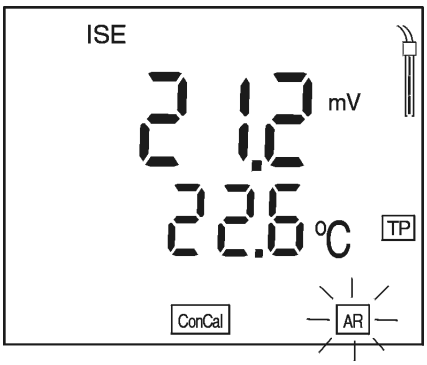
12	To return to the measuring mode: press the M key or continue with the three point calibration.

Three point calibration

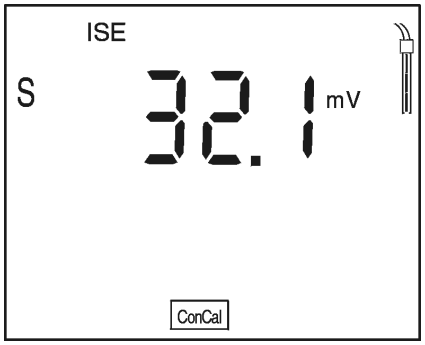
13	Press the RUN ENTER key. The previously selected concentration of the third standard solution appears on the display.



14	Enter the current concentration of the third standard solution using ∧ ∨.
15	Thoroughly rinse the electrode with distilled water.
16	Immerse the electrode into the third standard solution.
17	Press the RUN ENTER key. The electrode voltage appears on the display, the *AR* display indicator flashes.



18	The *AR* display indicator stops flashing as soon as a stable value is achieved. The slope of the electrode (mV) for the measuring range II appears on the display. The sensor symbol shows the evaluation of the electrode after the three point calibration.



19	To return to the measuring mode: press the M key.

Note
You can prematurely terminate the three point calibration by pressing M. The values of the two point calibration will then remain stored.

4.6 Printing 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 132).
  - After expiry of the selected interval, the current data record is sent to the printer/interface.
- Switch on AutoStore (Int 1) (see page 127).
  - 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.

4.7 Storing

The 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

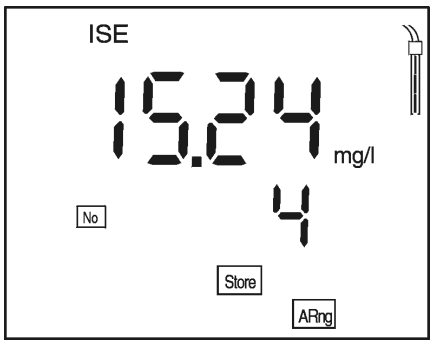
You can transmit measured values (data records) to the data storage in 2 ways:

- Manual storage
- Switching on the AutoStore function (Int 1) (see page 127).

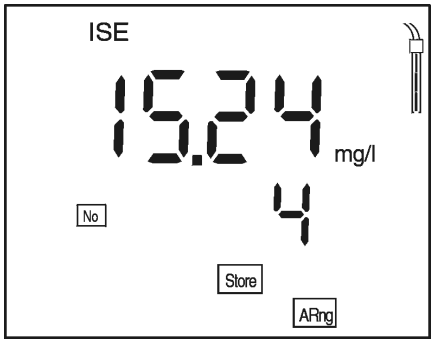
4.7.1 Manual storage

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 ∧ ∨.

Note
Up to this point, you can cancel with M the procedure without storing.

4	Confirm with RUN ENTER. The measured value is stored in the data storage. 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 4.7.3
Delete the data storage	See section 4.7.4

4.7.2 Switching on AutoStore (Int 1)

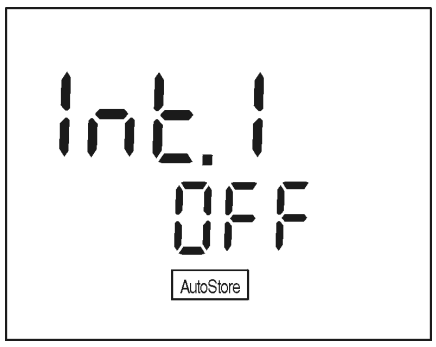
The storage interval (Int 1) determines the time interval between automatic storage processes.
After the time interval expires, the current data record is transmitted to the data storage and to the printer/interface.

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).

Note
If AutoStore is switched on, the setting of the data transmission interval (Int 2) is ineffective (see see page 132).

Setting the storage interval

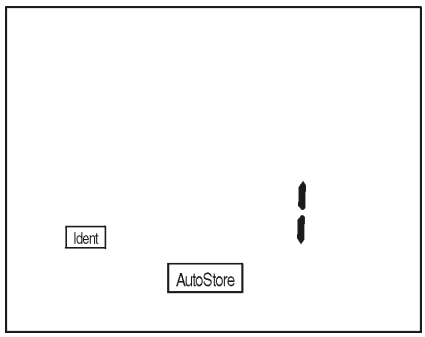
1	Press and hold down the RUN ENTER key.
2	Press the STO key. *Int 1* appears on the display.



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 see page 129) and – clear the data storage (see see page 131).
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 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 meter off and on again.

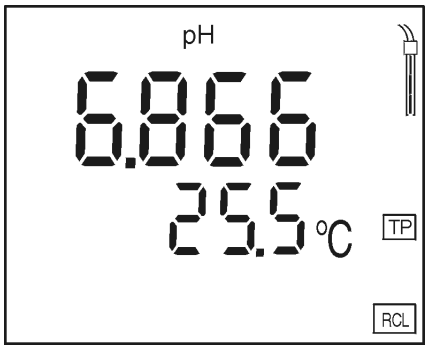
4.7.3 Outputting the data storage

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:

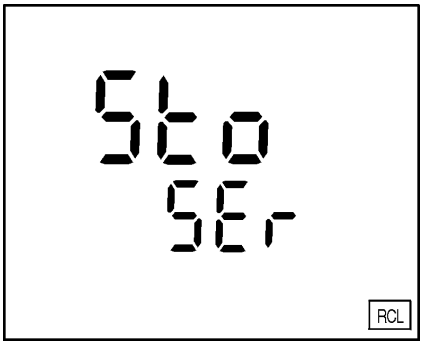
Display further parameters of the data record (I.D. no., date, time, memory location)	Press RUN ENTER
Advance one data record (memory location)	Press ∧
Go back one data record (memory location)	Press ∨

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.

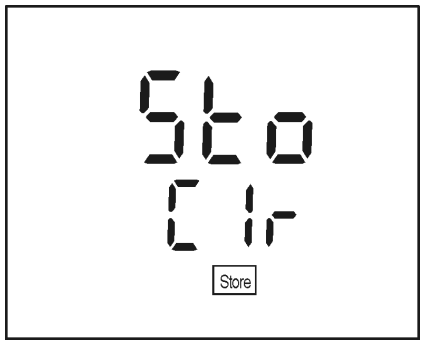
4.7.4 Clearing the storage

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 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.

4.8 Data transmission

You can use the following options to transmit data:

- One of the following options:
  - The *AutoStore* function (see page 127) 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 (see page 129) is used to output calibration data and stored measured values to the interface.
- The analog recorder output (see page 134) is used to output measured values as voltages.
- Data can be transmitted bidirectionally (see page 136) using the KOM pilot communication package (accessory).

4.8.1 Data transmission interval (Int 2)

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



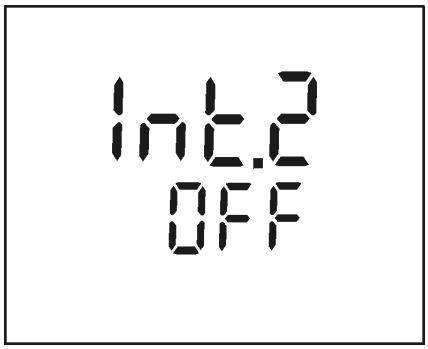
Note
The setting of the data transmission interval (Int 2) only has an effect when the storage interval (*AutoStore* Int 1 function) is switched off.

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 measuring mode.

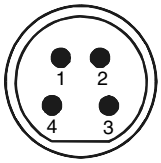
Note
If the *AutoStore* function is active, the data transmission is performed according to the setting of the storage interval (Int 1). Set the storage interval (Int 1) to OFF to activate the *data transmission* interval (Int 2).

Note
You can also set the *data transmission* interval (Int 2) in the *Configuration* menu (see page 137).

4.8.2 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

Output:
Low impedance electrode signal;
corresponds to 50 ... 62 mV/pH on the pH electrode (internal resistance < 5 Ohm)

Note
Activate the analog output by connecting 2 and 3.

4.8.3 PC/external printer (RS232 interface)

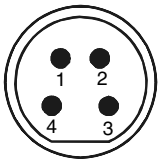
You can transmit data to a PC or an external printer via the RS232 interface.
Connect the interface to the instrument via the AK340/B cable (PC) or AK325/S cable (external printer).
The data output switches automatically to RS232.

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

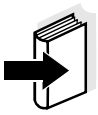


RS 232
REC

1 CTS
2 RxD
3 Ground
4 TxD

4.8.4 Remote control

The 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.

4.9 Configuration

You can adapt the 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) - only for pH	1 ... **7** ... 999 d
Temperature unit	°**C**, °F
Date/time	As required
Resolution of pH display	0.01, **0.001**

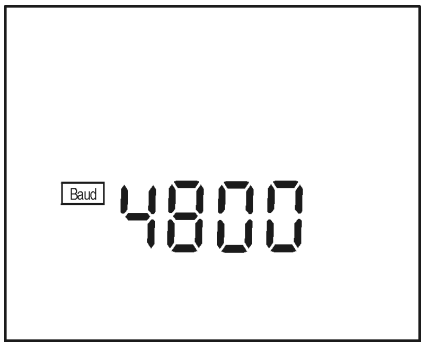
1	Switch off the instrument.
2	Press and hold down the M key.
3	Press the key. The display test appears briefly on the display. The instrument then switches automatically to the setting of the baud rate.



Note

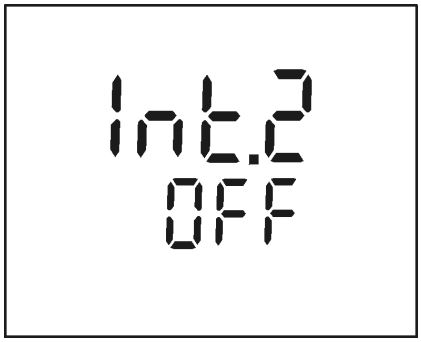
You can leave the configuration menu at any time. Parameters that have already been changed are stored.
To do this, press the M key.

Baud rate



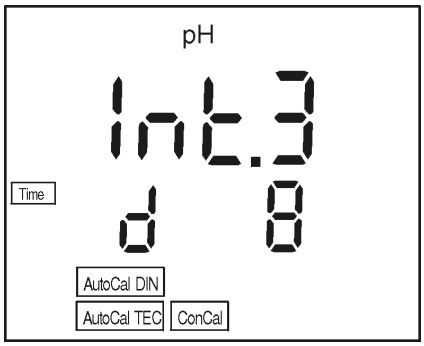
4	Set up the required baud rate by pressing ∧ ∨.
5	Confirm with RUN ENTER. *Int 2* (data transmission interval) appears on the display.

Data transmission interval



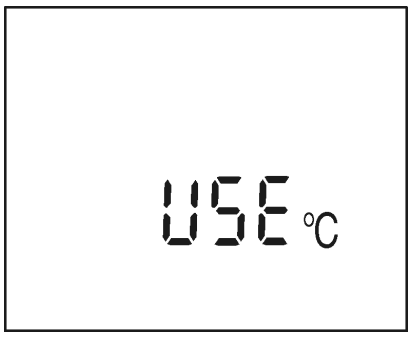
6	Set up the required time interval by pressing ∧ ∨.
7	Confirm with RUN ENTER. *Int 3* (calibration interval) appears on the display.

Calibration interval



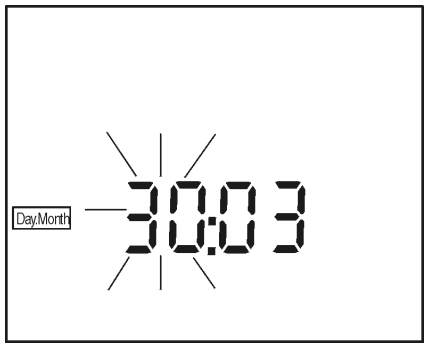
8	Set up the required time interval by pressing ▲ ▼.
9	Confirm with RUN ENTER. *USE °C* appears on the display.

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 measuring mode.

Adjusting the resolution for the pH/ Redox measurement

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.

4.10 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 of the pH electrode	0 mV
Slope of the pH electrode	-59.16 mV/pH
pH calibration procedure	AutoCal TEC
Temperature, manual	25 °C
Resolution of pH display	0.001



Note

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

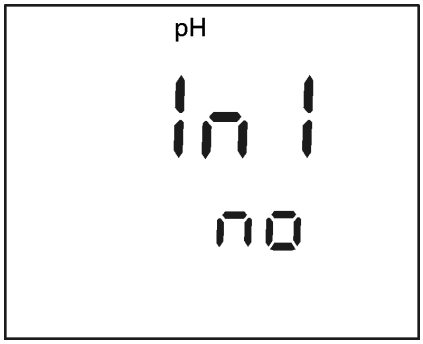
Configuration parameters

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

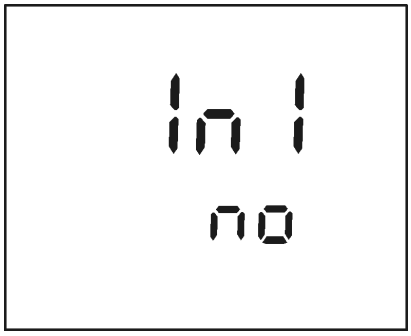
Baud rate	4800
Interval 1 (automatic storing)	OFF
Interval 2 (for data transmission)	OFF

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

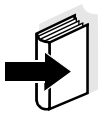
5	Toggle between *no* and *YES* by pressing ∧ ∨. YES: reset configuration parameters. no: retain settings.
6	Confirm with RUN ENTER. The instrument changes automatically to the measuring mode.

5 Maintenance, cleaning, disposal

5.1 Maintenance

The maintenance tasks are restricted to the following activities:

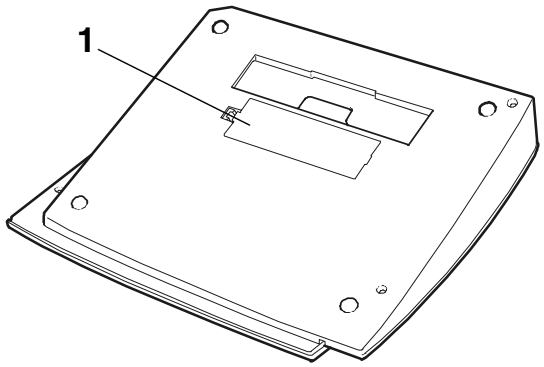
- replacing the batteries and
- replacing the roll of printer paper.



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

5.1.1 Changing the batteries

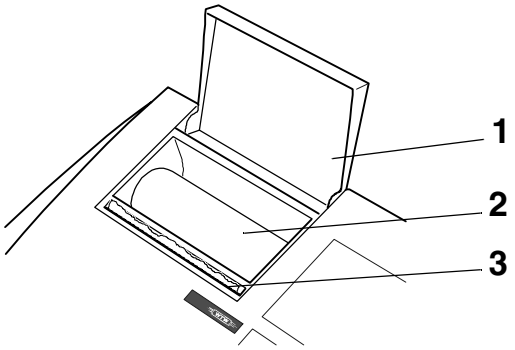
1	Open the battery compartment (1) on the underside of the instrument.
2	Remove the four batteries from the battery compartment.
3	Insert four new batteries (Type Mignon AA) into the battery compartment.
4	Close the battery compartment (1). The date (day) flashes on the display.
5	Set up the date and 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 it in household refuse.

6 What to do if...

6.1 pH system messages

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 temp. 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

Obviously incorrect measured values 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

6.2 ISE system messages

Error message OFL

Cause	Remedy
Ion sensitive electrode:	
– Not connected	– Connect electrode
– Cable broken	– Replace electrode

Error message, E3

Cause	Remedy
Ion sensitive electrode:	
– Slope not in the range 50 ... 70 mV or 23 ... 35 mV	– Replace electrode – Recalibrate
– Moisture in the plug	– Dry plug
– Electrode obsolete	– Replace electrode
– Electrode broken	– Replace electrode
Measuring instrument:	
– Calibration procedure: order of the standards wrong in three point calibration	– Select correct order
– Socket moist	– Dry socket

Concentration display flashes

Cause	Remedy
During measurement:	
– Measured value is outside the range determined by calibration	– Select calibration standards bracketing the measured value
During calibration:	
$\lvert U2 - U1 \rvert \leq 5\,mV$ $\lvert U3 - U2 \rvert \leq 5\,mV$	– Calibration standards are too close together. Select other calibration standards

TP flashes Temp Error

Cause	Remedy
During calibration:	
– Calibration standards have the wrong temperature (maximum temperature difference ± 2 °C)	– Temper the calibration standards
During measurement:	
– Test sample has the wrong temperature (maximum temperature difference ± 2 °C)	– Temper the test sample

Calibration Std 2 flashes

Cause	Remedy
– Standard 2 = Standard 1	– Use different calibration standards

Calibration Std 3 flashes

Cause	Remedy
One of the following requirements is not met: – Standard 3 > standard 2, if Std 2 > Std 1 or – Standard 3 < standard 2, if Std 2 < Std 1	– Use different standard 3

6.3 General errors

LoBat display

Cause	Remedy
– Batteries almost depleted	– Replace batteries (see section 5.1.1 CHANGING THE BATTERIES)

to display

Cause	Remedy
– Timeout of the interface	– Checkout connected instrument

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

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
Cal Error	Calibration error
Cd...	Calibration with DIN buffer solutions (acc. to DIN 19 266)
ConCal	Conventional one/two point calibration; in the ISE measuring mode also three 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
ISE	Ion sensitive electrode
LoBat	Low Battery Batteries are almost empty
mg/l	Concentration unit in ISE measurement
mV	Voltage unit
mV/pH	Unit of the electrode slope

OFL	Overflow Display range exceeded
pH	pH value
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
Temp error	Temperature measurement error
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.

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.

Buffer solution Stable solution with a precisely known pH value.

Calibration Action to adjust the measuring instrument to a probe.

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.

Redox voltage Potentiometric quantity.

Resolution Number of decimal places that appear for a measured value.

Slope Specifies the voltage change per pH unit.

Standard Solution with a defined concentration for calibration.

7 Technical Data

7.1 General 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 %

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	± 0,5 % of measured value ± 4mV
Internal resistanace	< 5 Ohm (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

Dimensions and weight

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

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

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

7.2 pH/Redox measurement

Measuring ranges and resolution

pH	- 2.000 ... + 19.99 - 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 (± 2 pH units around the calibration point)	± 0.005 at +15°C ... to +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

7.3 ISE measurement

Measuring ranges and resolution

Measuring range 1 Resolution	0.000 ... 9.999 mg/l 0.001 mg/l
Measuring range 2 Resolution	0.00 ... 99.9 mg/l 0.01 mg/l
Measuring range 3 Resolution	0.0 ... 999.9 mg/l 0.1 mg/l
Measuring range 4 Resolution	0 ... 1999 mg/l 1 mg/l

Used electrodes

Combined or double electrodes with plug according to DIN 19262

Calibration procedures

Two point or three point calibration with standards suiting the sample

Slope ranges

± 25 to 35 mV and ±50 to 70 mV

Index

A
analog output 134
asymmetry 103
authorized use 94
AutoCal DIN 103, 109
AutoCal TEC 103, 107
AutoRead 101, 115
AutoRead criteria (ISE) 116
AutoRead criteria (pH) 102

B
batteries, replacing 143
battery compartment 144
baud rate, setting 138

C
calibrating (ISE) 117
calibrating (pH) 103
calibration
  evaluation 105
  interval (pH) 106
  procedures (pH) 103
  protocol 104, 118
ConCal (ISE) 117
ConCal (pH) 103, 111
condition on delivery 141

D
data record 125
data transmission (interval) 132
date, setting 97, 139
display 91
drift control 101, 115

E
electrode evaluation 118
energy saving feature 99
error messages 147, 149

I
initial commissioning 97
initialize 141
interval
  data transmission 132
  pH calibration 106
  storing 127

K
keys 90

L
LoBat 151

M
measuring precision 106

O
operating structure 92
operational safety 94

P
paper roll, replacing 143
place of the instrument 99
plug-in power supply, connecting 98
printing
  calibration protocol 104, 118
  measured values 124

R
Redox electrode 102
Redox voltage 102
remote control 136
reset 141
RS232 interface 135

S
safety 93

safety precautions 93
scope of delivery 97
single-point calibration
    ConCal 113
single-point calibration (pH) 103
slope 103, 117
sockets 91

T

temperature probe 100, 114
three-point calibration
    ConCal (ISE) 122
time, setting 97, 139
two- point calibration
    ConCal (ISE) 120
two-point calibration 103, 117
    AutoCal DIN 110
    AutoCal TEC 108
    ConCal 111

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

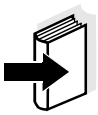
March 10, 1999

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.