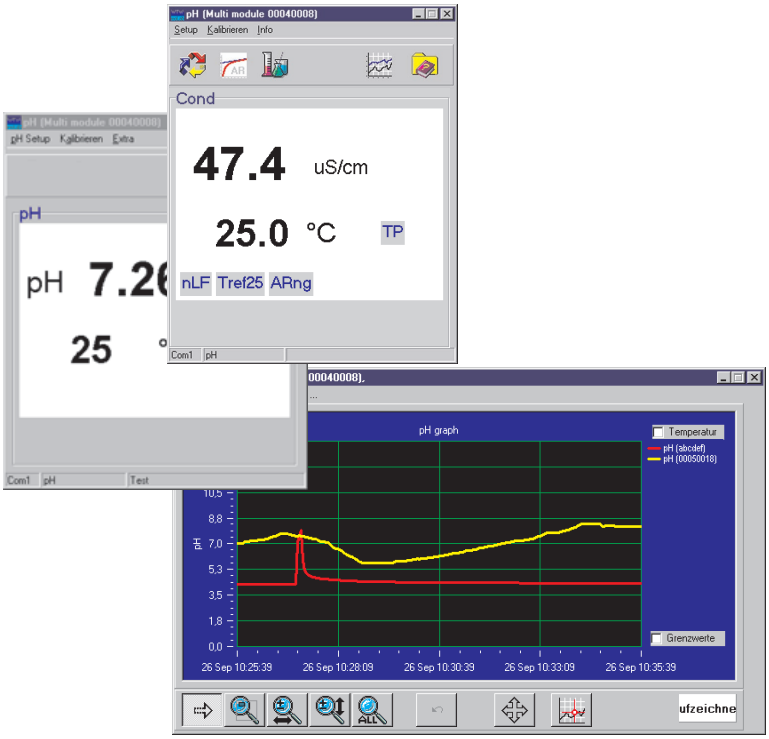
Operating manual

MultiLab® pilot



Software for the
- display and evaluation of measurement data
- remote control of meters

ba75529e04 06/2007

Accuracy when going to press

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

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1 Overview

The MultiLab® pilot software serves to display and evaluate measurement data using the PC and to remotely control meters using the PC.
The meters are connected to the USB interface or serial COM interface of a PC.

The MultiLab® pilot software distinguishes between meters that can or cannot be operated by remote control. Measurement data of meters that can or cannot be operated by remote control can be displayed and evaluated. Meters that can be operated by remote control can be operated using the MultiLab® pilot software.

meters that can be operated by remote control

Type	Model (WTW)
Laboratory instrument	inoLab 740 active multifunction boxes inoLab Level 3 active multifunction boxes inoLab 750 pH/ION/Cond

meters that cannot be operated by remote control

Type	Model (WTW)
Handheld meter	325, 340, 340i, MultiLine P3, MultiLine P4
Field instrument	197, 597
Laboratory instrument	538, inoLab Level 2, inoLab 730, inoLab 735

Type	Model (Schott)
Handheld meter	handylab 1, 2, handylab 11, 12
Field instrument	labstar
Laboratory instrument	CG 843, 853 Lab 860, 870, 960, 970

The present operating manual describes all functions of the MultiLab® pilot.
The usable functions of the MultiLab® pilot software depend on the functions of the connected meters.

Chapters that apply to certain meters only contain a corresponding note.

The software displays a separate window for each sensor on a connected measuring instrument. Several sensors can be displayed simultaneously. The program can administrate up to 4 measuring instruments.

Note
A prerequisite for the automatic recognition of the measuring instruments is that the measuring instruments are set to automatic transmission of data (see operating manual of the measuring instruments). Meters that can be operated by remote control transmit automatically.

The MultiLab® pilot operates in two modes:

- in the online mode, the software processes the measured data sent to the measuring instrument by the PC
- in the offline mode, only stored measured data can be processed.

Note
Even without a measuring instrument, you can gain a first impression of how the MultiLab® pilot displays and processes data. A number of sample files are supplied together with the MultiLab® pilot software.

A detailed description of how to operate the software is given in chapter 4 BASIC PRINCIPLES OF OPERATION.

Note
The current version of the MultiLab® pilot software is available on the Internet on the site of the manufacturer of your meter.

Hardware requirements

- Computer with a Pentium processor or higher
- A minimum of 128 Mbytes RAM
- Hard disk with at least 200 Mbytes available memory
- CD-ROM drive
- One free serial interface (RS232C) for each measuring instrument to be connected

Software requirements

- Windows 98 SE or higher.

Note
If only 256 display colors are selected in the Windows system settings for the screen display, the colors of individual graphics in the online help may be displayed incorrectly. However, the MultiLab® pilot software will run correctly.

2 Safety

This software was developed for the display and evaluation of measurement data. Follow the safety instructions given in the operating manual of your meter when working in the laboratory.

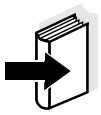
Symbols used



Warning
indicates safety instructions that must be followed to prevent damage to persons and property.



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.

3 Commissioning

3.1 Installing the MultiLab® pilot

Note
The software is subject to continuous development. The current version of the MultiLab® pilot software is available on the Internet on the site of the manufacturer of your meter.

1	Start the MultiLab® pilot installation program.
2	Follow the user guide.

Note
After the installation is finished, the *Data* subdirectory is the standard directory for the *Save file* and the *Open file* functions. Here you will find some sample files, which you can also open in the offline mode.

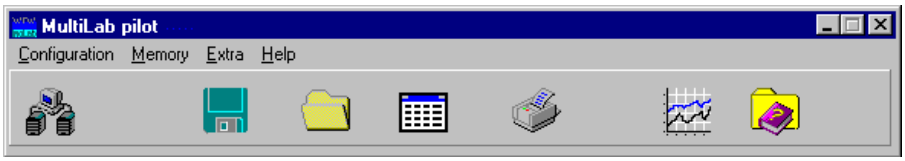
3.2 Starting the MultiLab® pilot

1	Start the MultiLab® pilot program. The *MultiLab pilot login* window appears.
2	In the *User name* field, select a user name, e.g.: • *Anonymous*: Login without password • *Administrator*: Login with password Further information, see section 5.8.
3	If necessary, enter a password in the *Password* field and start the login with *OK*. The *Info* window appears.
4	Scroll down with *Next info*. Close the *Info* window with *Close*. The window, *Establish connection* appears to select the operation mode (online or offline) and the connected instruments.

Note
During the initial commissioning, the *Establish connection* window appears in English.

The language setting is possible in the offline mode (see section 5.3).

5	Confirm the offline mode with *OK*. The MultiLab® pilot program window appears.



Note
Meters that are found while starting the program in online mode are automatically displayed. If no meters are found the offline mode is automatically activated.

The functions available in the MultiLab® pilot depend on the connected meters. With meters that cannot be operated by remote control, only the display and evaluation functions are available. With meters that can be operated by remote control, all functions can also be started using the software.

3.3 Connecting meters to the PC

You can operate up to four measuring instruments at the same time on one PC if enough USB or serial COM interfaces are available.

Each measuring instrument is galvanically isolated from the PC and from the other measuring instruments that are connected.
This prevents the measuring instruments and the PC from interfering with one other.

Installation instructions for the connection of meters to the PC are given as a pdf file in the Help menu of the MultiLab® pilot software.

4 Basic principles of operation

This section provides basic information on the operation and display of the measured values using the MultiLab® pilot software.

The MultiLab® pilot software enables you to receive and evaluate measurement data and to operate meters by remote control that are suitable for it.

To achieve optimum results and to be able to use all the functions of your remotely controllable meter, you have to configure and calibrate the measuring system.
The configuration consists of system settings and probe-dependent settings.

The system settings are given in chapter 5.

The probe-dependent settings can be found in the SETTINGS section in the chapter of the relevant measured parameter
(chapter 9 to chapter 12).

Instructions on how to calibrate the measuring system are given in the CALIBRATION section in the chapter of the relevant measured parameter (chapter 9 to chapter 12).

For clarity, the MultiLab® pilot software displays measured values in different windows. It enables different ways of displaying, printing and saving measured values.

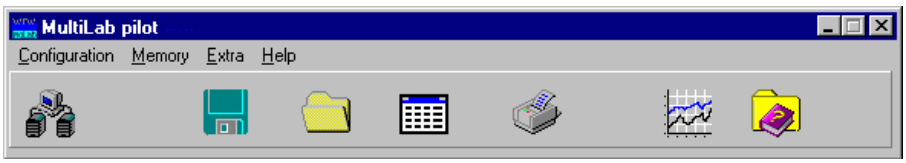
Measured values are displayed on the screen in different windows:

- MultiLab® pilot program window (see section 4.1)
- Sensor window (see section 4.2)
- Recorder window (see section 4.5)
- Data window (see section 4.3)
- Configuration window (see section 4.6)

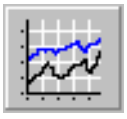
4.1 Program window

The program window offers menus and buttons for functions that are independent of the probes.

- Searching for connected measuring instruments (see section 5.1.1)
- Administrating system configurations (see section 5.6)
- Printing, reading and storing current measured data (see section 6.1)
- Displaying measured data as a graphic (see chapter 7)
- Terminating the MultiLab® pilot software.



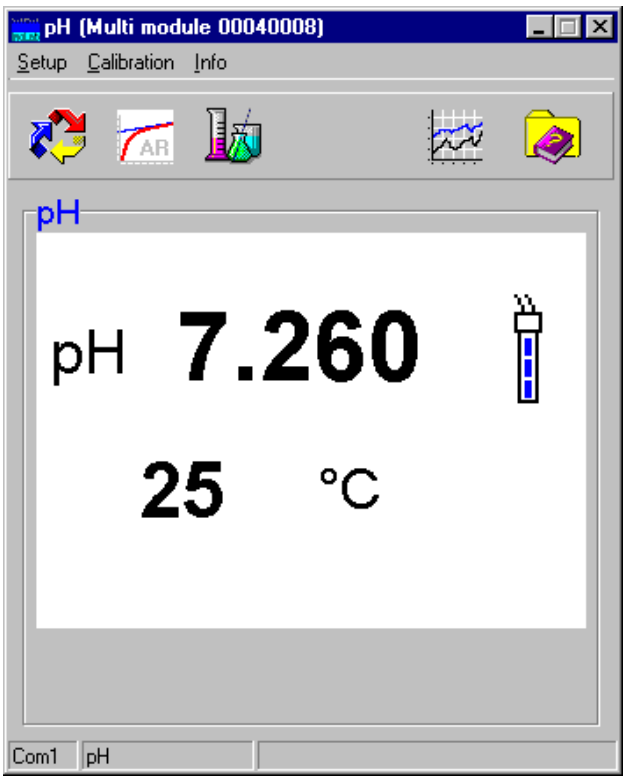
Buttons

	Searching connected measuring instruments (see section 5.1.1)
	Saving current measuring data manually (see section 6.1)
	Displaying manually saved measuring data (see section 6.2)
	*Display database* (see section 6.2)
	Printing selected current measuring data (see section 5.7)
	Opening the offline recorder (see section 7.1)
	Calls up the online help (see section 5.10)

4.2 Sensor window

An individual probe window is displayed for each probe that is connected.

Example sensor window pH

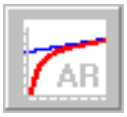
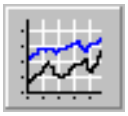


All probe-dependent functions are available in the probe window. These include:

- the selection of the measured parameter to be displayed (see section MEASURING in the chapter of the relevant probe)
- displaying the measured values with the online recorder (see section 7.1)
- calibration functions (see section CALIBRATION in the chapter of the relevant probe)
- temperature settings (see the chapter of the relevant probe).

You will find a detailed description of the functions in chapter 9 to chapter 12.

Buttons

	This function is only available for meters that can be operated by remote control. Switches between different measured parameters in a probe window (see the chapter of the relevant probe)
	This function is only available for meters that can be operated by remote control. Activates/deactivates the AutoRead function (see the MEASURING section in the chapter of the relevant probe)
	This function is only available for meters that can be operated by remote control. Starts the calibrating procedure (see the CALIBRATION section in the chapter of the relevant probe)
	Opening the online recorder (see section 7.1.1)
	Calls up the online help (see section 5.10)

Note
For meters that cannot be operated by remote control, the functions and buttons not available are hidden.

Status indicators in the probe window

Status display indicators show active functions/settings.

AR	"AR" on gray background: Measured value frozen (Hold)
AR	"AR" on yellow background: Measuring with the AutoRead function
ARng	Automatic selection of the measuring range
AutoCal DIN	Automatic pH calibration with standard buffer solutions, prepared according to DIN 19267
AutoCal TEC	Automatic pH calibration with technical buffer solutions
ConCal	Conventional pH calibration with any buffer solutions
Cond Cal	Calibration of the conductivity measuring system
OxiCal	Calibration of the D. O. measuring system
ISECal	Calibration of the ion-sensitive measuring system
TP	Temperature probe is being used
Cond TP	When measuring pH using multiparameter measuring instruments only: Integrated temperature probe of a conductivity measuring cell is being used
O2 TP	When measuring pH using multiparameter measuring instruments only: Integrated temperature probe of a D. O. probe is being used
Sal	D. O. measurement only: The salt content is taken into consideration. The salt content refers to the salinity according to the IOT table.
nLF	Conductivity measurement only: Temperature compensation, "nLF"

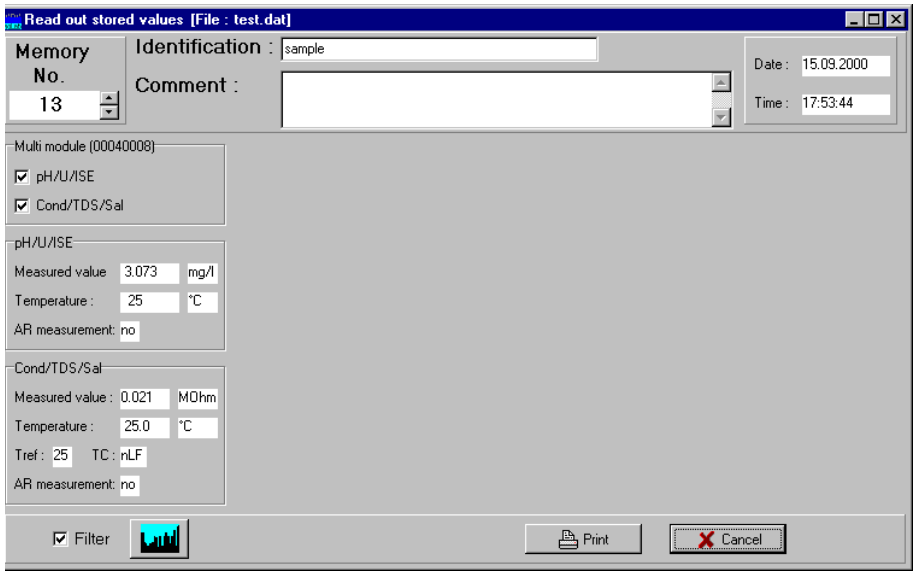
	Conductivity measurement only: Temperature compensation, "TC lin"
	Conductivity measurement only: No temperature compensation, "TC off"
	Only when the StirrOx G D. O. probe with integrated stirrer is connected: Stirrer is running
	Only when the StirrOxG D. O. probe with integrated stirrer is connected: Error at the socket for the stirrer (see operating manual of your meter)
	Conductivity measurement only: The selected reference temperature is T_{Ref} = 20 °C
	Conductivity measurement only: The selected reference temperature is T_{Ref} = 25 °C
	During ion-sensitive measurements only: The concentration values of the calibration standards that were selected are too close together
	During ion-sensitive measurements only: The temperature values of the calibration solutions and/or test sample are too different (> 2°C)

4.3 Data record window

Data record windows appear when saving and displaying individual measured data records.

The *Save* window also appears during manual storage of the measured data with in the MultiLab® pilot program window. Here you can enter an identification and a comment.

The *Read out stored values* window also appears during the call up with in the MultiLab® pilot program window. To simplify the selection of specific data, filter criteria are available.



Buttons

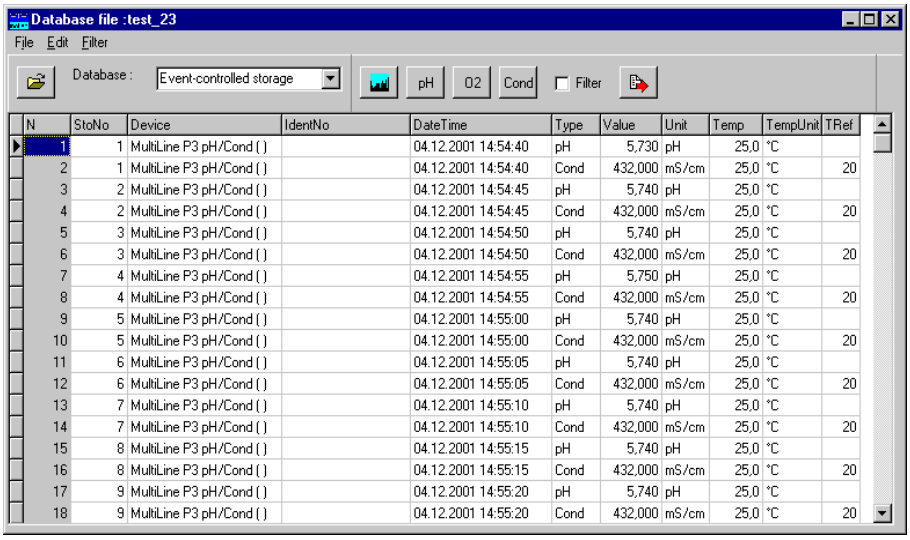
Memory No. 1	Scroll the data records (see section 6.2)
Filter / Filter	Switch the filter criteria on/off (see section 6.2)
	Select the filter criteria (see section 6.2)

In contrast to the database window, further information is listed here. Some information such as, e.g. AR measurement *yes*/*no*, is also contained here.

You will find a detailed description of the functions in chapter 6.

4.4 Database window

The database window is used for the clear display and selection of measured data records.



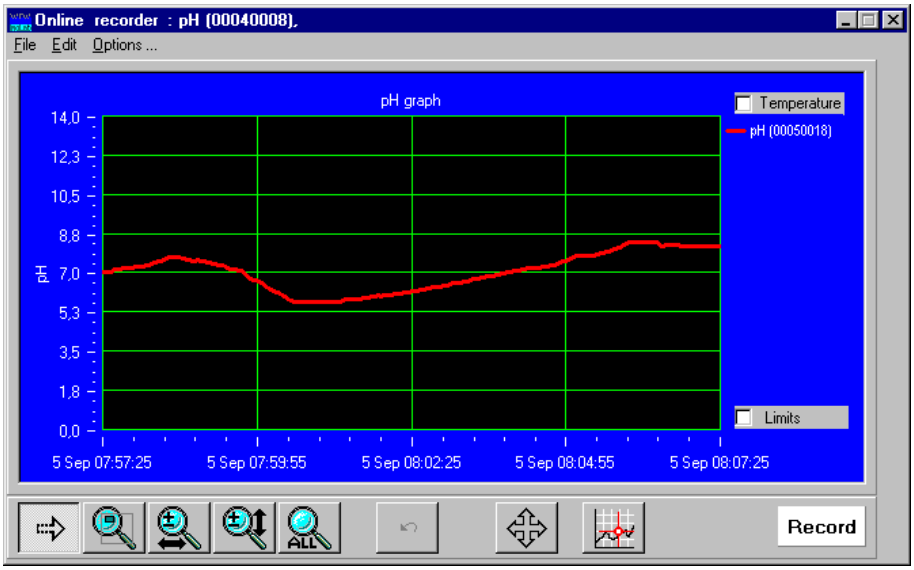
N	StoNo	Device	IdentNo	DateTime	Type	Value	Unit	Temp	TempUnit	TRef
1	1	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:40	pH	5,730	pH	25,0	°C	
2	1	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:40	Cond	432,000	mS/cm	25,0	°C	20
3	2	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:45	pH	5,740	pH	25,0	°C	
4	2	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:45	Cond	432,000	mS/cm	25,0	°C	20
5	3	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:50	pH	5,740	pH	25,0	°C	
6	3	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:50	Cond	432,000	mS/cm	25,0	°C	20
7	4	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:55	pH	5,750	pH	25,0	°C	
8	4	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:55	Cond	432,000	mS/cm	25,0	°C	20
9	5	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:00	pH	5,740	pH	25,0	°C	
10	5	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:00	Cond	432,000	mS/cm	25,0	°C	20
11	6	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:05	pH	5,740	pH	25,0	°C	
12	6	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:05	Cond	432,000	mS/cm	25,0	°C	20
13	7	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:10	pH	5,740	pH	25,0	°C	
14	7	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:10	Cond	432,000	mS/cm	25,0	°C	20
15	8	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:15	pH	5,740	pH	25,0	°C	
16	8	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:15	Cond	432,000	mS/cm	25,0	°C	20
17	9	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:20	pH	5,740	pH	25,0	°C	
18	9	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:20	Cond	432,000	mS/cm	25,0	°C	20

In contrast to the data record window, the data records are shown here in a clear list. However, some information such as, e.g. AR measurement *yes*/*no*, is not shown here.

A detailed description of the buttons and functions is given in chapter 6.

4.5 Recorder window

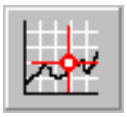
The recorder window displays the development of the measured values graphically. You can save, open and process the graphical display.



You will find a detailed description of the functions in the recorder window in chapter 7.

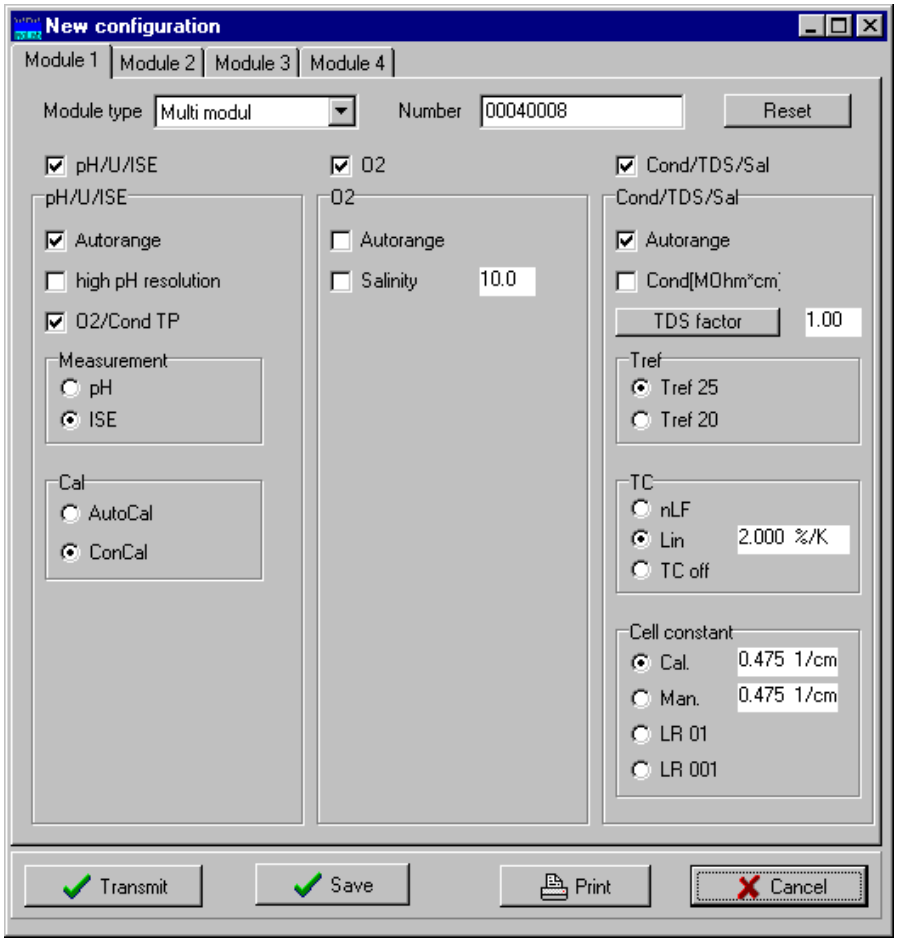
Buttons

	Plot (see section 7.3) shows the temporal progress of the measurement
	Zoom window (see section 7.3) makes it possible to zoom the time (x) axis and the measured value (y) axis simultaneously by selecting the zoom range with the mouse
	Zoom X (see section 7.3) makes it possible to zoom the time (x) axis with the mouse
	Zoom Y (see section 7.3) makes it possible to zoom the measured value (y) axis using the mouse
	Show all (see section 7.3) displays all of the time (x) range, where the scaling of the measured value (y) axis remains unchanged

	Undo (see section 7.3) undoes the last step
	Scroll (see section 7.3) makes it possible to move the curve in the direction of the time (x) axis and the measured value (y) axis with the mouse
 8.750/25.0 5 Sep 15:04:32	Cursor (see section 7.4) displays a cursor and the measured value and the date/ time of the cursor position in the recorder window
	Status indicator in the recorder window shows the active function

4.6 Configuration window

The configuration window is called from the MultiLab® pilot program window. Here you can check, change or save the current configuration of the connected remotely controllable meters (see section 5.6).



You will find a detailed description of the functions in the configuration window in chapter 7.

5 System functions

System functions are all functions that are independent of the probe. System functions are carried out in the *MultiLab pilot* program window. They include system-wide settings and the printing of all current and selected measured values.

5.1 Online/offline operating modes

Because of possible conflicts, some system settings can only be changed in the offline mode. In the online mode, some functions are blocked.

In the offline mode, you can use system functions and settings even when no measuring instruments are connected. You can:

- Open, edit and save configuration files
- Read and save stored measured data records
- Read and save stored recorder data records
- Read and print calibration records.

The following functions are only available in the offline mode because of possible conflicts with probe windows:

- Changing the language
- Changing the temperature unit
- Selecting the COM interfaces where measuring instruments are to be searched for

5.1.1 Switching to the online mode

In the online mode, the connection to all selected interfaces is activated.

1	Use  to establish the connection to all selected interfaces. As soon as the measuring instrument sends data, the sensor windows open. The online mode is active.

5.1.2 Switching to the offline mode

In the offline mode, the connection to all connected measuring instruments is discontinued.



Note
If measuring instruments are connected, the offline mode is only active if all sensor windows are closed.

1	Switch to an open probe window.
2	Close the probe window. All sensor windows belonging to this measuring instrument are closed.
3	If necessary, close further probe windows until all sensor windows are closed. The offline mode is active.

5.2 Selecting the interface

If your PC has several USB or COM interfaces, you can release or block them individually in the search for measuring instruments. This is important if you want to keep an interface free for another instrument.

Note
Changing the selection of the available COM interfaces is only possible in the offline mode.

1	Close all probe windows (offline mode).
2	Change to the *MultiLab pilot* program window.
3	Select or exclude individual interfaces for the measuring instrumente search in the *Extra* / *Interfaces* menu. The selected interfaces are marked.
4	Use  to change back to online mode (see section 5.1.1).

5.3 Selecting the language

Menus and help texts can be displayed in different languages. The language is selected in the *Extra* menu in the *MultiLab pilot* program window.

Note
The language setting can only be changed in the offline mode.

1	Close all probe windows (offline mode).
2	Change to the *MultiLab pilot* program window.
3	Select a language in the *Extra* / *Language* menu. The language is changed. The active language is marked in the menu.

5.4 Temperature

The temperature affects the measuring results. You can select the unit of the temperature display. The temperature is determined automatically via an external temperature probe or a temperature probe integrated in the probe. It is also possible to enter measured temperature values manually.

5.4.1 Temperature unit

You can display temperature values in °C (degrees Celsius) or °F (degrees Fahrenheit).



Note
Changing the temperature setting is only possible in the offline mode.

1	Close all probe windows (offline mode).
2	Change to the *MultiLab pilot* program window.
3	Use *Extra* / *Temperature unit* to select the type of unit, *Celsius* or *Fahrenheit*. The selected temperature unit is active.

5.4.2 Measuring the temperature



Note
The functions described in this section are only available for meters that can be operated by remote control.

For reproducible measurements, it is imperative to determine the respective temperature values.
The measuring system obtains the temperature value from:

- a temperature sensor integrated in the sensor,
- a temperature sensor integrated in another sensor (applies to the inoLab 740 pH/Cond, Multi and inoLab 750 pH/ION/Cond measuring instruments),
- an external NTC30 or Pt1000 temperature sensor (Pt1000 for the inoLab 740 pH, pH/Ion and Cond and inoLab 750 measuring instruments only), or
- by entering a measured temperature value manually.

The temperature probe that is used is indicated in the display with *TP*, *O2 TP* or *Cond TP*.

Using the temperature probe integrated in the probe

When you use probes with an integrated temperature probe, the measured parameter and temperature are always measured simultaneously. As soon as the integrated temperature probe is recognized, the measured temperature value and the *TP* status indicator appear on the display.

Using the temperature probe of another probe (with multiparameter measuring instruments only)

If no temperature probe is available for pH/ISE measurements with multiparameter measuring instruments, you can measure the temperature using the integrated temperature probe of another probe (D. O. probe or conductivity measuring cell).
To do so, proceed as follows:

1	Immerse the D. O. probe or conductivity measuring cell in the test sample.
2	Switch to the *pH* sensor window.
3	Select the *O2/Cond TP* menu item in the *Setup* menu. The temperature measurement is active. *O2 TP* or *Cond TP* appears on the display so that you can check the selection.

Using an external temperature probe

If you want to measure the temperature using an external temperature probe, proceed as follows:

1	Connect the temperature probe to the measuring instrument.
2	Immerse the temperature probe in the test sample. The measured temperature value is displayed.

5.5 Barcode reader



Note
The functions described in this section are only available for meters that can be operated by remote control.

It is possible to use a barcode reader to input barcode sample designations automatically. The program reacts to signals from the barcode reader and/or the keyboard. If the signal is from a barcode reader, the current measured value is automatically stored in the current file for manual storing (see section 6.1). The barcode content is automatically recorded as identification.

Before using the barcode reader, activate the barcode reader function in the *MultiLab pilot* program window.



Note
The barcode has to end with "CR" to be quickly stored using the barcode reader (see section 6.1.7). Please follow the operating manual of your barcode reader in order to do this.

Data input using the barcode reader is always possible whenever it is possible to input data via the keyboard.

1	Change to the *MultiLab pilot* program window.
2	Using *Memory* / *Barcode reader*, prepare the system to store quickly using the barcode reader. The active function is marked in the menu.

Note
For instructions on how to connect the barcode reader to the PC, please read the operating manual of your barcode reader.

5.6 System configurations

Using MultiLab® pilot, you can set up individual system configurations. This can be helpful when several persons use the same measuring system, or when measuring tasks require different basic settings.

System configurations are displayed in the configuration window. Four tab sheets provide an overview of all current settings for each measuring instrumente and each probe. You can adjust the system configuration to your requirements, store and activate it.

Note
The current configuration is given in the *Configuration* / *New...* menu. The current settings are read in from the measuring instruments.

Note
A changed configuration is first active when it has been transferred to the measuring instruments. During the transmission, all configurations shown in the displayed measuring instrumente tab sheet are always transmitted.

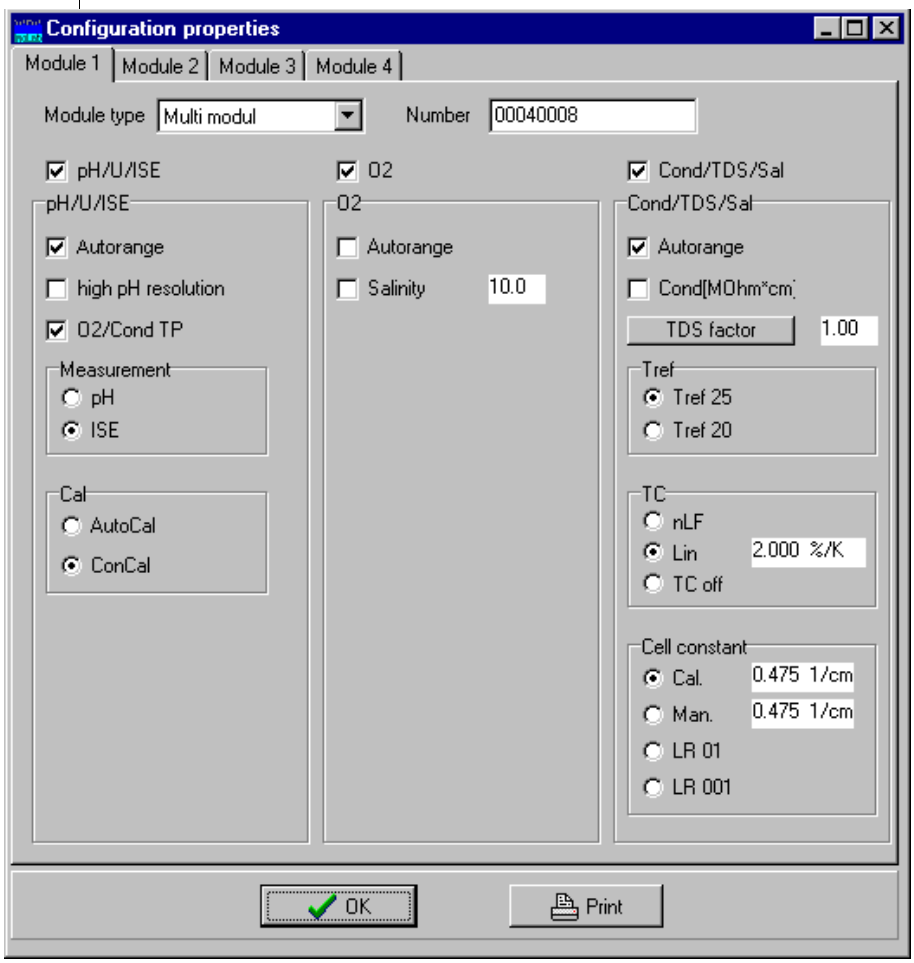
Note
To transmit a configuration to a measuring instrument, the measuring instrumente type and measuring instrumente number of the configuration have to agree with the measuring instrumente type and measuring instrumente number of the measuring instrument.

5.6.1 Viewing a system configuration

If you only want to view the current system configuration, a configuration viewer is available.

Four tab sheets show an overview of all current settings for each connected measuring instrumente and for every possible probe type.

1	Change to the *MultiLab pilot* program window.
2	Open the *Configuration properties* window with *Configuration* / *Properties...* .

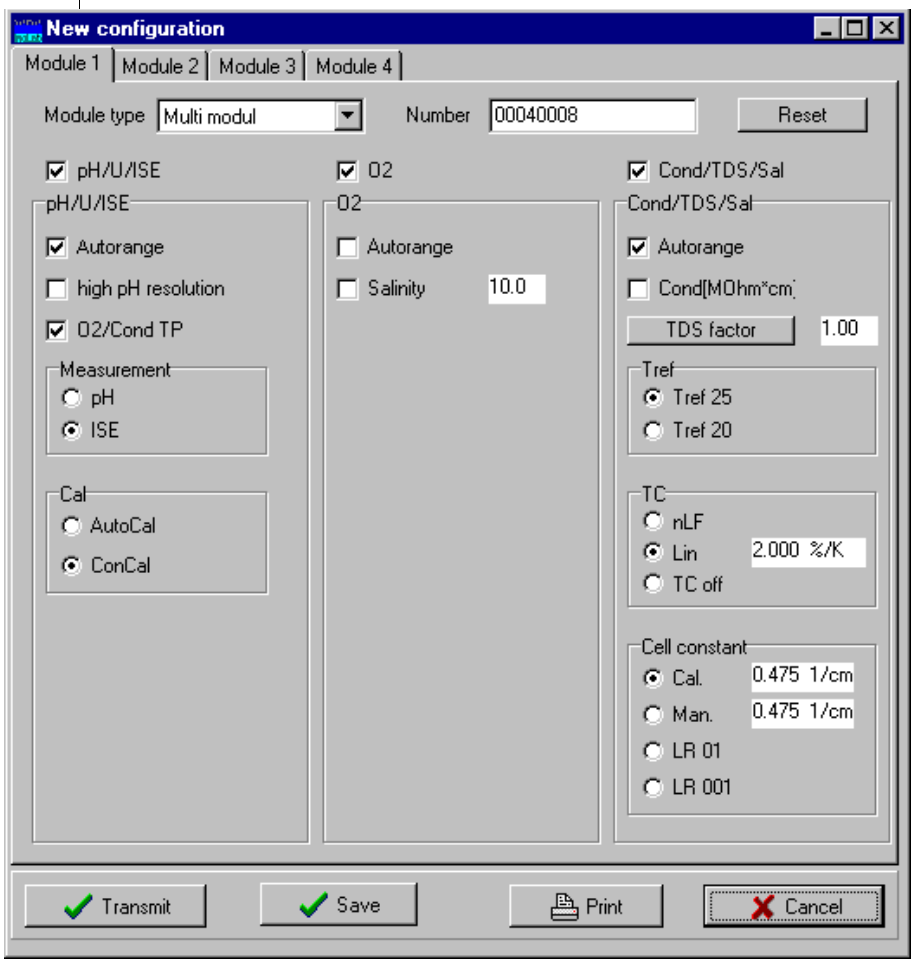


3	Select a tab sheet with *Module 1* ... *Module 4*.
4	Use *Print* to print out the configurations.
5	Use *OK* to close the window.

5.6.2 Loading a system configuration

Loading a configuration is only possible in the *New configuration* window. This function loads the current configuration data from the measuring instruments.

1	Change to the *MultiLab pilot* program window.
2	Open the *New configuration* window with *Configuration / New...*. The configuration files of the measuring instruments are read in and displayed.

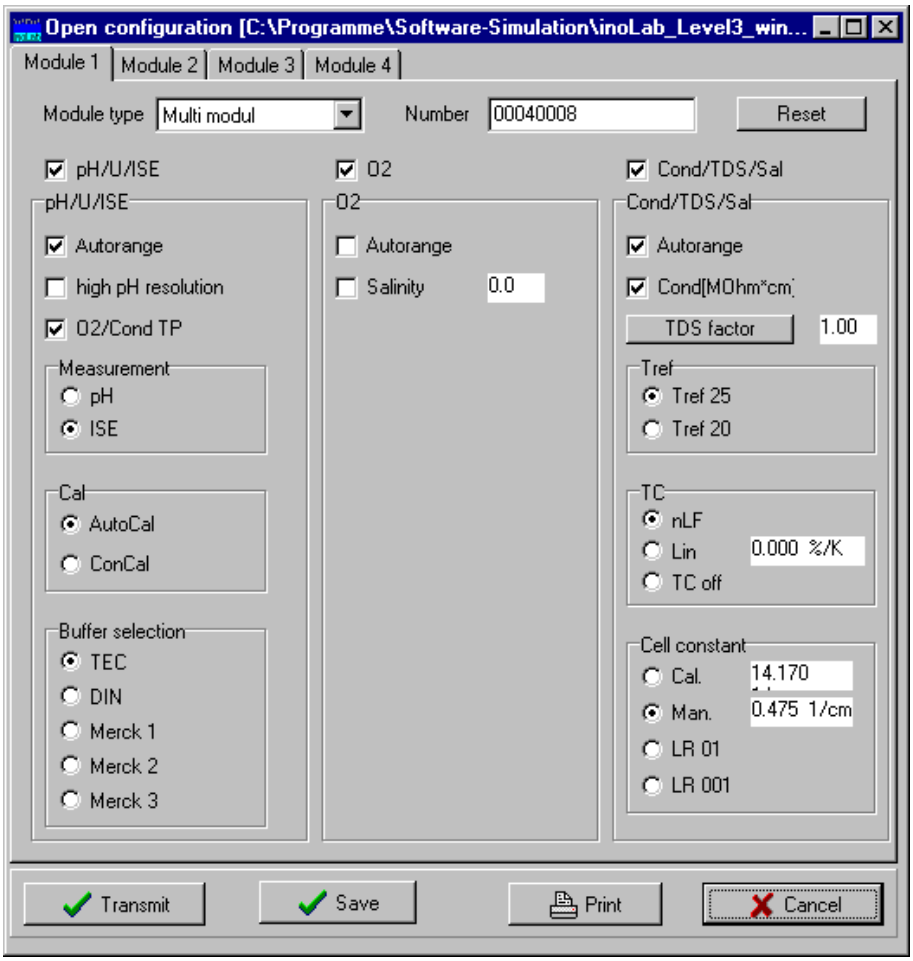


3	Select a tab sheet with *Module 1 ... Module 4*.
4	Display the probe configurations with a tick in the probe selection.
5	Modify and save, print or transmit the configuration (see section 5.6.4).

5.6.3 Opening a system configuration

You can open stored system configurations, adjust them to your requirements, store and activate them.

1	Change to the *MultiLab pilot* program window.
2	Use *Configuration* / *Open...* to open a file with configuration information (*.ste). The *Open configuration* window appears.



3	Select a tab sheet with *Module 1* ... *Module 4*.
4	Display the probe configurations with a tick in the probe selection.
5	Modify and save, print or transmit the configuration (see section 5.6.4).

5.6.4 Activating a system configuration

Activating a configuration is possible in the windows, *New configuration* and *Open configuration*.

When a configuration is activated, all the displayed settings are transmitted to the selected measuring instrumente.

1	Change to the *MultiLab pilot* program window.
2	Open a configuration window with *Configuration* / *New...* or *Configuration* / *Open...*.
3	Select a tab sheet with *Module 1* ... *Module 4*.
4	Display the probe configurations with a tick in the probe selection.
5	If necessary, modify the configuration.
6	Use *Transmit* to transmit the displayed settings to the measuring instruments.

5.6.5 Saving a system configuration

Saving a configuration is possible in the windows, *New configuration* and *Open configuration*.

When storing the system configuration, all current settings for all the measuring instruments and probes are stored.

1	Change to the *MultiLab pilot* program window.
2	Open a configuration window with *Configuration* / *New...* or *Configuration* / *Open...*.
3	Select a tab sheet with *Module 1* ... *Module 4*.
4	Display the probe configurations with a tick in the probe selection.
5	If necessary, modify the configuration.
6	Use *Save* to save the settings. The *Save as* dialog box opens. Configuration files end with "*.ste".

5.6.6 Printing a system configuration

Printing configuration data is possible in all configuration windows.

1	Change to the *MultiLab pilot* program window.
2	Open a configuration window with *Configuration* / *New...* or *Configuration* / *Open...*.
3	Select a tab sheet with *Module 1* ... *Module 4*.
4	Use *Print* to print the displayed settings.

5.6.7 Reset

You can restore the default setting for individual measuring instruments and measured parameters.

Reset in the probe window

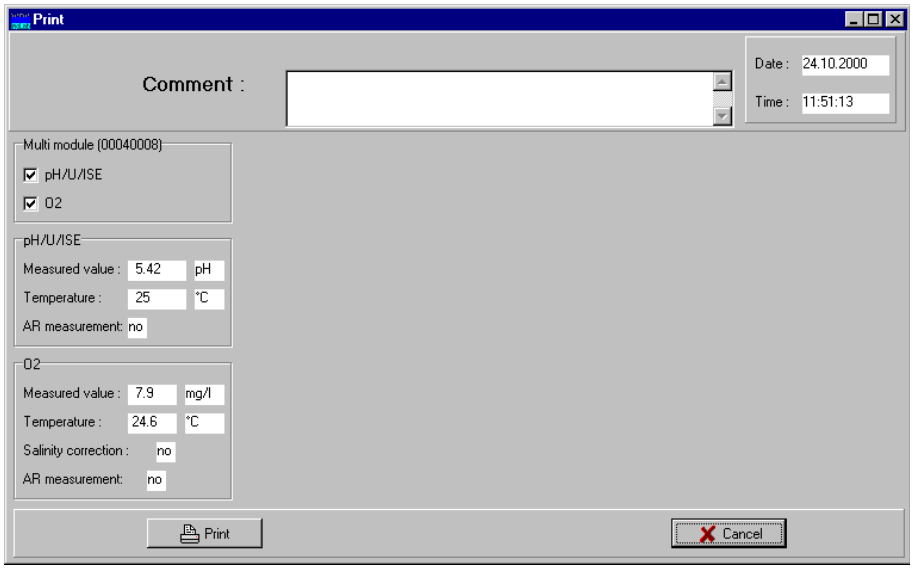
1	Switch to a probe window.
2	Use *Setup* / *Reset* to restore the default settings for this measured parameter.

Reset in the configuration window

1	Change to the *MultiLab pilot* program window.
2	Open the *New configuration* window with *Configuration* / *New...*. The current settings for all measured parameters are read in from the connected measuring instruments.
3	Select or exclude individual measured parameters within a measuring instrument.
4	Use *Reset* to reset all settings for the selected measuring instrument and the selected measured parameters to the default settings.
5	Click *Transmit* to transmit the settings for the selected measured parameters to the selected measuring instrumente.

5.7 Printing selected current measured data

1	Change to the *MultiLab pilot* program window.
2	Use  to open the *Print* window in the *MultiLab pilot* program window.



3	If necessary, enter a *Comment*.
4	Display the measured data to be printed with a tick in the channel selection.
5	Click *Print* to print the selected measured data.

Note
If several measuring instruments and probes are connected, the measuring instrumente boxes are tiled. All measured values that were selected with a tick are printed.

5.8 User profiles

All documented measurement or calibration data are output together with the user name of the provider. User profiles contain the name and authorization assigned to the user.

Name	Access	Authorization
Administrator	protected by a password	• to measure all measured variables • to calibrate all measured variables • to change all settings • to save all settings • to enable/disable the login with the user name, *Anonymous* • to set up/delete user profiles
Anony-mous	free	• to measure all measured variables • to calibrate all measured variables • to change all settings • to save all settings
User profiles created by the administrator	protected by a password	*without a profile assigned to it* • to measure all measured variables • to calibrate all measured variables • to change all settings • to save all settings *with a profile assigned to it* • to measure one measured variable • to calibrate one measured variable • to change the setting of one measured variable.

The administration of user profiles is only possible if a user logs in with the user name, *Administrator*.

Note
The user name *Anonymous* provides rapid access to the measuring system without having to enter a password.

The administrator can disable or enable this access (see section 5.8.3).

The password "00001" is the default setting for the user name *Administrator* when the instrument is delivered.

The administrator (login with the user name *Admin*) administrates user names and authorizations (see section 5.8.3):

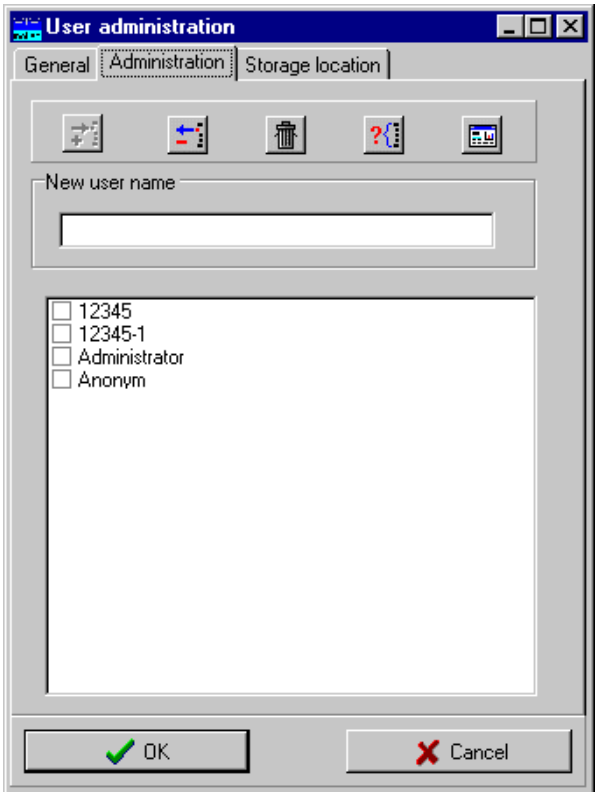
- enabling/disabling the login with the user name, *Anonymous*
- creating a user profile

- changing a user profile
- deleting a user profile
- printing out the list of user profiles

5.8.1 *User administration*

The administration of users is only possible if a user logs in with the profile, Administrator.

1	Change to the *MultiLab pilot* program window.
2	Using *User/Setup ...*, switch to the *User administration* window.



The window has the following tabs:

- *General*:
  Use user administration and password protection or switch off
- *Administration*:
  Creating, editing, hiding, erasing a user profile or resetting a password
- *Storage location*:
  Saving or exporting user profiles

5.8.2 Switching the user administration on or off

You can select whether the user administration will be used or not. When the user administration is switched off, all functions can be performed without restriction.

1	Open the *General* tab (see section 5.8).
2	Mark the *Use user administration and password protection* field with a tick. User administration and password protection are switched on.
3	Remove the tick in the *Use user administration and password protection* field. User administration and password protection are switched off.

5.8.3 Creating, editing, or deleting a user profile

Hiding a user profile

1	Open the *Administration* tab (see section 5.8).
2	Tick a user name in the list of user names.
3	Use  to hide the user name. The user name gets a gray status field. The user name will no longer be offered for the login.
4	Use  to uncover the user name again. The gray status field disappears. The user name will be offered for the login.

Creating a user profile

1	Open the *Administration* window (see section 5.8).
2	Enter a name in the New user name field (min. 5 characters).
3	Use  to add the new user name to the list of user names. The user name has all rights of the Anonymous profile.

Changing a user profile

1	Open the *Administration* tab (see section 5.8).
2	Tick a user name in the list of user names.
3	Use  to select a stored measuring configuration for the profile. A window to select a configuration file opens.
4	Select a configuration file. The name of the configuration appears after the user name.

Deleting a user profile

1	Open the *Administration* tab (see section 5.8).
2	Tick a user name in the list of user names.
3	Use  to erase the selected user name. The user name has been erased and will no longer be offered for the login.

5.8.4 Printing out the list of user profiles

The administrator (login with the user name, *Administrator*) can print out a list of current user profiles or all user profiles.

The list of current user profiles (*Current*) contains the user profiles which can be used for login.

The list of all user profiles (*Complete*) contains all current and all deleted user profiles, which have been used for at least one login.



Note
A consecutive number for each user profile is also assigned internally.

5.9 Password for user names



Note
The functions described in this section are only available for meters that can be operated by remote control.

The login with the user name *Administrator* and all self-created user names is protected by a password.

The MultiLab® pilot software is delivered with the password "00001" for the user name, *Administrator*. Change this password as soon as possible.

5.9.1 Changing the password

A valid password consists of at least 5 characters.

1	Change to the *MultiLab pilot* program window.
2	Using *User*/*Change password ...*, switch to the *Change MultiLab pilot password* window.
3	Enter the old password in the *Old password* field.
4	Enter the new password in the *New password* field.
5	Enter the new password in the *Confirm new password* field.
6	Confirm the new password with *[OK]*. The *Change MultiLab pilot password* window is closed. The password is changed.

5.9.2 Assigning a password

During the first login with the new user name the *Change MultiLab pilot password* window appears. The user determines the password here. A valid password consists of at least 5 characters.

5.9.3 Forgotten the password?

Self-created user profile

It is not possible to log in with this user name without a password.

The administrator can erase the password for user profiles (see section 5.8.3).

Administrator

In emergencies, it is also possible to log in with the user name Administrator using a special enabling code obtained from the manufacturer of your meter.

5.10 Calling up the online help

Calling up the online help is possible in the MultiLab® pilot program window and also in the probe window.

1	Use  in the program window or in the sensor window or open the Help window with *Help* / *Contents* in the program window.

5.11 List of the windows of the MultiLab® pilot

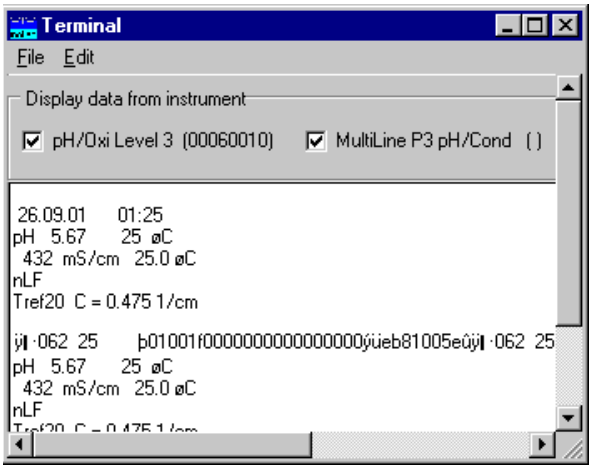
The *Window* menu item in the program window gives an overview about the open windows of the MultiLab® pilot.

1	Using *Window* in the program window, open the list of open windows. The active window is marked by a dot.
2	Select a window from the list. The window is activated and displayed in the foreground.

5.12 Terminal

To check the connection between the measuring instrument and PC, a terminal program is integrated.

1	Open the terminal window with *Extra* / *Terminal* in the program window.



If data are transmitted, the terminal window displays all transmitted data without any additional formatting. If no data are transmitted, the terminal window remains empty.

Note
You can display (by a tick) or suppress the transmitted data for each measuring instrument in the terminal window.

6 Storing functions

The MultiLab® pilot software enables you to store and recall all important measurement data. For meters that can be operated by remote control you can also store and recall the configuration data.

The MultiLab® pilot enables you to save and read in again all important measuring and configuration data from meters that can be operated by remote control.

Each data type has an individual storage format.

- Measured data records "*.sto" (see section 6.1.3)
- Measured data records "*.dat" (see section 6.1.4)
- Online and offline recorder "*.rdt" (see chapter 7)
- Configurations "*.ste" (see section 5.6)
- Calibration protocols "*.cal" (see section 6.7)
- Limiting value protocols "*.log" (see section 7.6.3)
- Database "*.dbf" (see section 6.1)

Note
The files for storing the measured data records or calibration records are permanently open in the background. Data is automatically stored in them (without any further query). Therefore, check the open calibration record file before calibrating and check the open measured data record file before saving measured data.

6.1 Measured data records

You can save measured data in the following ways:

- Manually
  - Using  in the MultiLab® pilot program window:
    saves all current selected measured values
  - With the *Enter* key of the PC keyboard:
    saves all current selected measured values
  - Using a barcode reader:
    saves all current selected measured values
- Automatically
  - after every AutoRead measurement
  - at the specified interval (see section 6.1.4)
  - event-controlled (see section 6.1.6)

6.1.1 Creating a file for measured data records

You can create the file for saving your measured data records yourself. Files for measured data records have the file extension "*.dat". When the current measured values are stored, they are written into this file.

1	Change to the MultiLab® pilot program window.
2	Use *Memory* / *Manual storing* / *New...* to create a new file. If the file already exists, it is overwritten.

Note
The file for storing the measured data records is permanently open in the background. Each manual storage process stores data in it.

6.1.2 Opening a file for measured data records

You can open an existing file for manually stored measured data records in order to append new measured data records. Files for these measured data records have the file extension "*.dat".

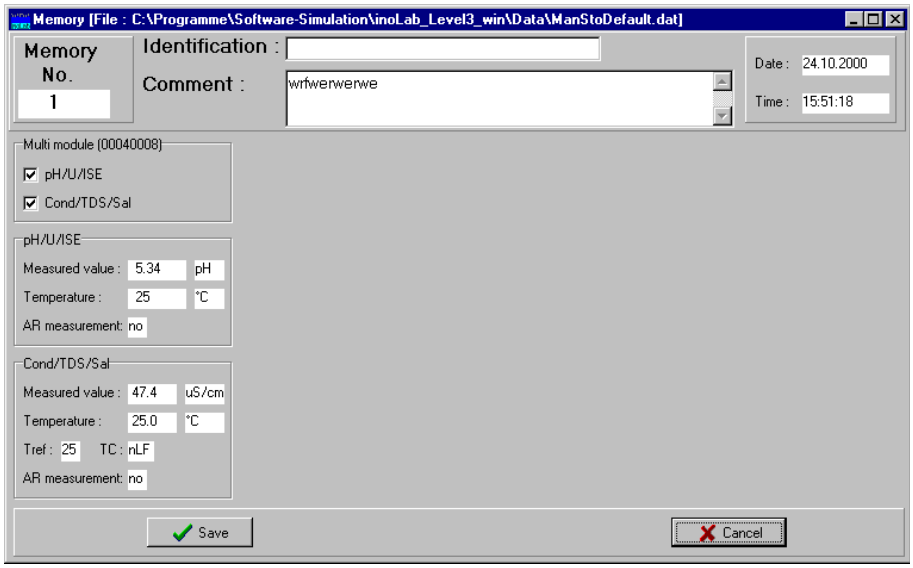
1	Change to the MultiLab® pilot program window.
2	Select a file (*.dat) with *Memory* / *Manual storing* / *Open...* and open it for storing future measured data. The measured data is added to the selected file.

Note
The file for storing the measured data records is permanently open in the background. Each manual storage process stores data in it.

6.1.3 Manually storing individual measured data records

You can save individual measured data records in a file. Allocating an *Identification* to the data record makes it easier to find it again.

1	Switch to the MultiLab® pilot program window.
2	Use  to open the *Save* window. The current data record is displayed.



3	Enter an *Identification* for the measurement.
4	Enter an additional text in the *Comment* field of the measurement.

Note
What you entered in the *Identification* and *Comment* fields is automatically offered when you store the next data record.

5	Select the measured values to be stored for each instrument in the measuring instrument selection field.
6	Use *Save* to save the selected data. The window is closed.

6.1.4 Storing measured data records automatically

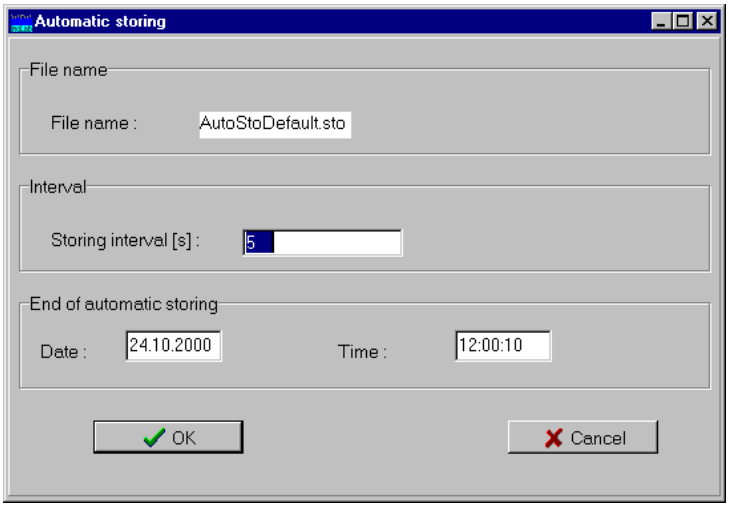
The following storage methods are possible for automatic storage:

- *Time-controlled*:
  Selected measured data records can be stored at specified time intervals using a time-controlled automatic storage function (see section 6.1.5).
- *Event-controlled*:
  All transmitted measured data records can be stored using an event-controlled automatic storage function (see section 6.1.6).

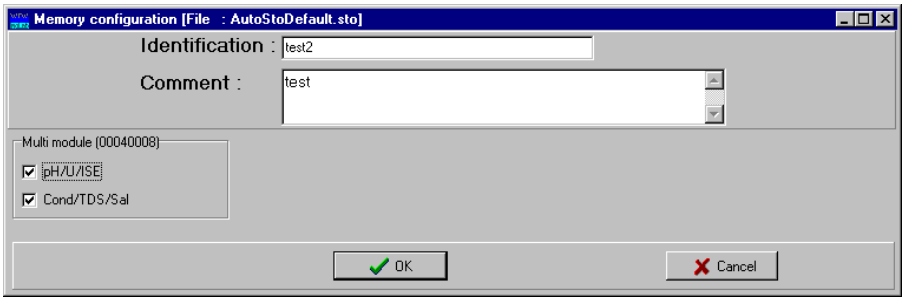
6.1.5 Time-controlled automatic storage

The measured values last transmitted from all connected measuring instruments are always stored at selected intervals. The data are always stored to two files at the same time ("*.sto" and "*.dbf").

1	Change to the MultiLab® pilot program window.
2	Select the menu item, *Memory* / *Time-controlled* / *New ....* The *New* window opens.
3	Enter the name and directory for the AutoStore file and confirm with *Open*. AutoStore files are given the file extension "*.sto". The *Automatic storing* window opens.



4	Enter the *Storing interval [s]* and the end time of the automatic storing.
5	Confirm with *OK*. The *Memory configuration* window opens.



6	Mark the measured data to be stored with a tick.
7	Enter *Identification* and *Comment*.
8	Confirm with *OK*. The automatic storing process is active. The *Automatic storing active* window appears.

Note
Some functions are blocked during the automatic storing process.

Terminating the automatic storing

The automatic storing process is automatically finished when the specified end of the storing is reached. If you want to quit the automatic storing process before the specified period has expired, proceed as follows:

1	Change to the instruction window, *Automatic storing active*.
2	Terminate the storage function with *Cancel automatic storing*. A security prompt appears.
3	Use *yes* to terminate the automatic storing. Values that are already saved remain stored.

Data are also stored in database format ("*.dbf") during all storage functions.

6.1.6 Storing automatically using an event-controlled storage function

The measured data records are stored in a database file (e.g. if automatic storage is selected on the measuring instrument, or during manual storage on the measuring instrument).
The database is open and the data are constantly displayed.

Note
How to set the measuring instruments for automatic sending is described in the operating manual of your measuring instrument.

Note
The *Memory* / *Event-controlled* function is only possible as a database application.

1	Change to the MultiLab® pilot program window.
2	Open a new database file with *Memory* / *Event-controlled* / *New ....* Event-dependent dataflows are automatically stored in the database file and are constantly displayed.

6.1.7 Rapid storing

The following methods for rapid storing simplify the storing function.

- Storing via the barcode reader
- Storing using the *Enter* key on the PC keyboard

Preparing the rapid storing

1	Change to the MultiLab® pilot program window.
2	Prepare the system for signals from the barcode reader or keyboard with *Memory* /*Barcode reader*.
3	Use *Memory* / *Manual storing* / *New...* or *Open...* to open a new or already existing file. This file remains open in the background. Measured data records are written in this file during rapid storing.
4	Enter *Identification* and *Comment* for the following measured values and confirm with *OK*. The system is ready for rapid storing. The rapid storing methods write to the open file.

Note
The last entries in the *Identification* and *Comment* fields are automatically adopted.

Storing with *RunEnter* on the measuring instrument

1	Prepare the rapid storing.
2	Press the *RunEnter* key RUN ENTER on the measuring instrument. The selected current measured values are stored in the file that is open in the background.

Note
The last entries in the *Identification* and *Comment* fields are

automatically adopted.

Storing via the barcode reader

1	Prepare the rapid storing.
2	Read in the barcode. The selected current measured values are stored in the file that is open in the background.



Note
The content of the *Identification* field is replaced by the barcode read. What was entered last in the *Comment* field is automatically stored.

Storing using the *Enter* key on the PC keyboard

1	Prepare the rapid storing.
2	Press the *Enter* key of the PC keyboard. The selected current measured values are stored into the file that is open in the background.



Note
The last entries in the *Identification* and *Comment* fields are automatically adopted.

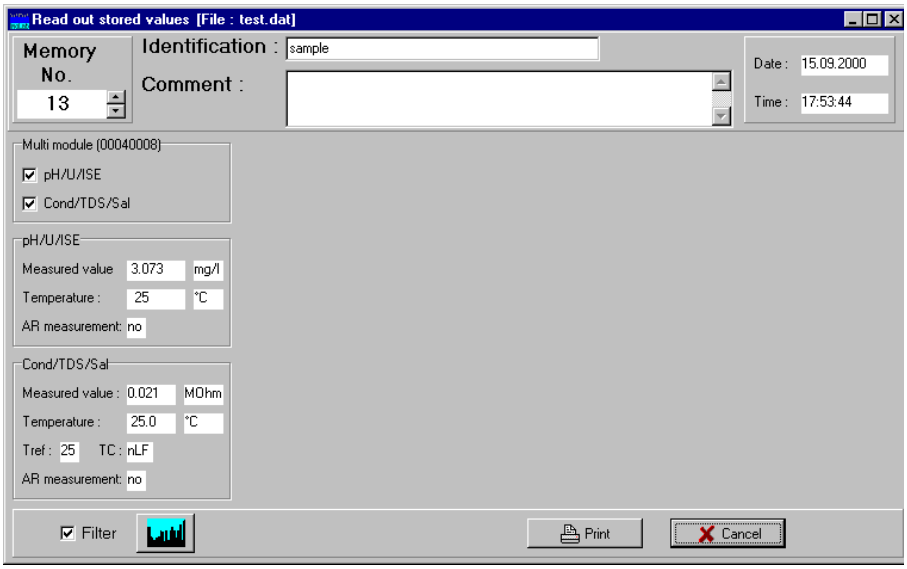
6.2 Displaying and filtering stored measured data records

6.2.1 Displaying measured data records

You can display stored measured data records automatically or manually.

Displaying the opened file

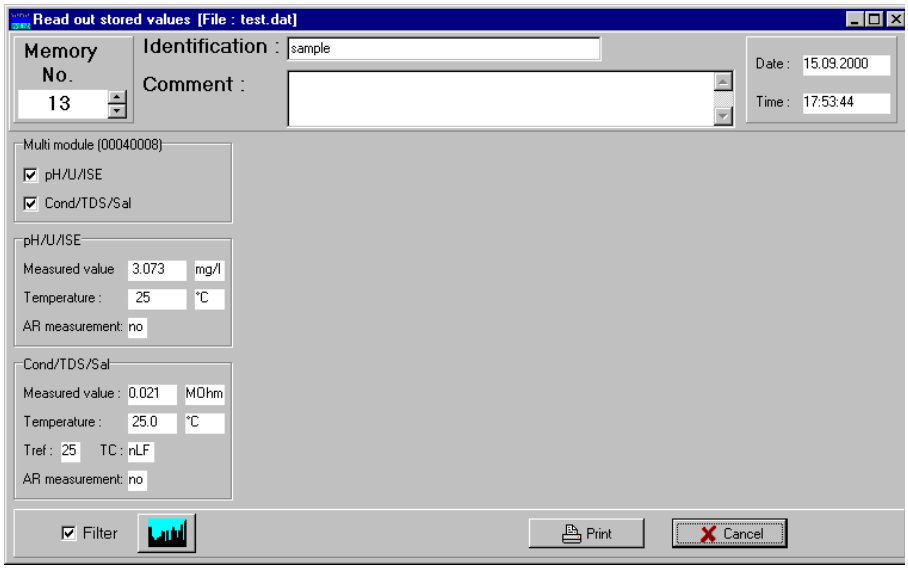
1	Change to the MultiLab® pilot program window.
2	Use  to open the currently selected file in order to store the measured values. The *Read out stored values* window opens.



3	Filter the measured data records (see section 6.2.2).

Displaying a stored file

1	Change to the MultiLab® pilot program window.
2	Use *Memory* / *Manual storing* / *Display ...* to open the file to be displayed. The *Read out stored values* window opens.

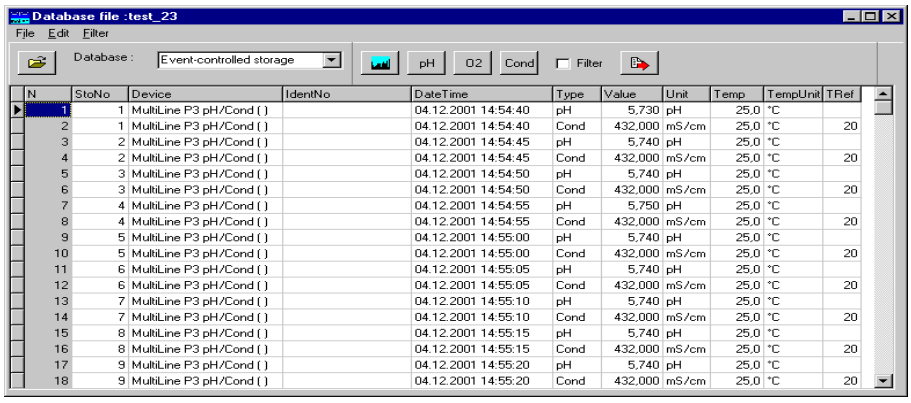


3	Filter the measured data records (see section 6.2.2).

Displaying data in database format

When storing data, database files ("*.dbf") are also automatically stored. To filter data and/or export data in another format, open the data in the database format.

1	Change to the MultiLab® pilot program window.
2	Open the database window with *Memory* / *Export...*.
3	Select a database in the *Database* field.
4	Select and open a file with *File* / *Open...*. The file is displayed in the database window.



N	StoNo	Device	IdentNo	DateTime	Type	Value	Unit	Temp	TempUnit	TRef
1	1	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:40	pH	5,730	pH	25,0	°C	
2	1	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:40	Cond	432,000	mS/cm	25,0	°C	20
3	2	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:45	pH	5,740	pH	25,0	°C	
4	2	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:45	Cond	432,000	mS/cm	25,0	°C	20
5	3	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:50	pH	5,740	pH	25,0	°C	
6	3	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:50	Cond	432,000	mS/cm	25,0	°C	20
7	4	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:55	pH	5,750	pH	25,0	°C	
8	4	MultiLine P3 pH/Cond ( )		04.12.2001 14:54:55	Cond	432,000	mS/cm	25,0	°C	20
9	5	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:00	pH	5,740	pH	25,0	°C	
10	5	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:00	Cond	432,000	mS/cm	25,0	°C	20
11	6	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:05	pH	5,740	pH	25,0	°C	
12	6	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:05	Cond	432,000	mS/cm	25,0	°C	20
13	7	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:10	pH	5,740	pH	25,0	°C	
14	7	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:10	Cond	432,000	mS/cm	25,0	°C	20
15	8	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:15	pH	5,740	pH	25,0	°C	
16	8	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:15	Cond	432,000	mS/cm	25,0	°C	20
17	9	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:20	pH	5,740	pH	25,0	°C	
18	9	MultiLine P3 pH/Cond ( )		04.12.2001 14:55:20	Cond	432,000	mS/cm	25,0	°C	20

5	Filter the measured data records (see section 6.2.2).

The clearly arranged display of the data in the database format enables the displayed data to be filtered according to all available criteria.

The event-controlled storage function provides another storage method when using the database.

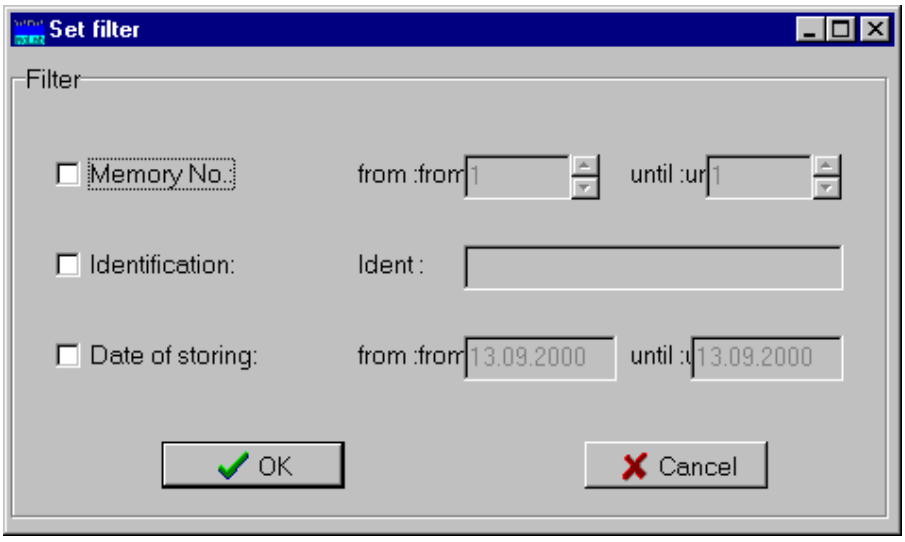
6.2.2 Filtering data records

Filters help you to select specific data records from a large quantity of data.

Filtering stored data records

- Memory location number (*Memory no.*)
- *Identification*
- Date and time of storing

1	Change to the MultiLab® pilot program window.
2	Open the measured data window (see section 6.2).
3	Use a tick in *Filter* to activate the display of the *Set filter* filter criteria .
4	Use to open the *Set filter* window.



5	Specify the filter criteria and confirm with *OK*. The filter criteria are active.
6	Scroll through the individual data records with the arrow buttons next to the *Memory no.* Only those data records are displayed that correspond to the specified filter criteria.
7	Use *Print* to print the data records.
8	Use *Cancel* to terminate the storage display.

Filtering database data

The database offers a variety of filtering possibilities. All filter settings can be combined.

The following filter settings are possible:

- *StoNo* (memory location number)
- *Instrument* (instrument name)
- *Ident* (identification)
- *DateTime* (date)
- *Type* (measured parameter)

As soon as the filter settings are activated, a tick appears in the *Filter* field of the database window.

Standard filter settings

Standard filter settings are filter settings that can be reached directly via the buttons or *Filter* menu.



Note
These filter settings deactivate any and all other filter settings. Active filters can be recognized by the buttons that are pressed. The active filter is marked by a dot in the *Filter* menu.

Menu / Button	Description
Display pH only	Displays the data of measured pH values only.
Display Oxi only	Displays the data of measured oxygen values only.
Display Cond only	Displays the data of measured conductivity values only.

Menu	Description
ID only	Displays the data with the specified identification only.
Instrument only	Displays the data with the specified measuring instrument identification only.

Via the buttons:

1	Switch on the filter settings with the *pH*, *O2*, and *Cond* buttons. Only the data records with the selected filter settings *pH*, *O2* or *Cond* can be seen in the database window. Any previous filter settings are deactivated.

Via the *Filter* menu:

1	Switch on a filter setting with *Filter* / *Display pH only*, *Display Oxi only*, *Display Cond only*. Switch on further filter settings with *Filter* / *Instrument only* or *ID only*. The old tab selection (tick) is removed. The filter settings are, however, not deleted. Only the data records with the selected filter settings *pH*, *O2* or *Cond* can be seen in the database window.

Activating combined filter settings

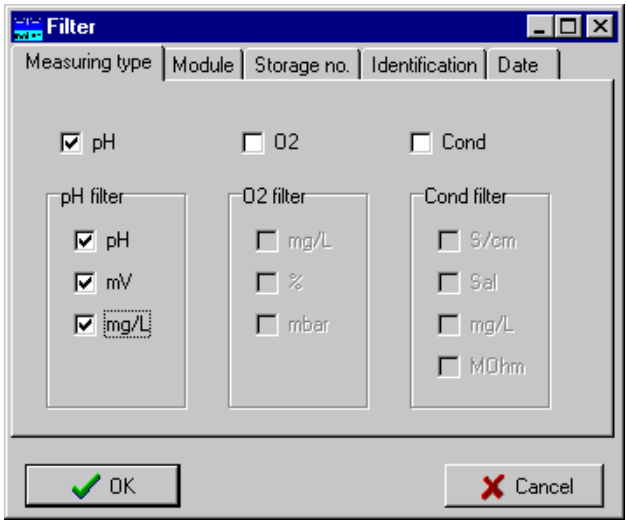
The last combination of filter settings in the *Filter* window can simply be activated via the *Display database* button.

1	Use  to activate the last combination of filter settings. Only the data records with the selected filter settings can be seen in the database window.

Combining standard filter settings

Filter settings can be combined in the *Filter* window in the tab sheets, *Measuring type*, *Module*, *Storage no.*, *Identification* and *Date*.

1	Use *Filter* / *Filter ...* to open the *Filter* window.
2	Select one of the tab sheets *Measuring type*, *Module*, *Storage no.*, *Identification*, or *Date*.



3	Activate or deactivate tab sheet settings with a tick.
4	Carry out filter settings in the individual tab sheets.
5	Close the filter window with *OK*. The filter settings are activated. Only the data records with the selected filter settings can be seen in the database window.

Note
A rapid import of the database entries in the filter window is possible for the entries, *Instrument*, *Ident* and *Type*.

Importing database entries in the *Filter* window

Import the identification in the *Instrument no.* field of the *Module* tab sheet:

1	Switch to the database window.
2	Click on an entry in the *Instrument no.* column with the right mouse key. A popup menu appears.
3	Click on *Filter...* in the popup menu. The *Filter* window opens with the *Module* tab sheet. The entry from the database window is already imported.
4	Mark a tick in the tab selection field. The filter setting is activated.
5	Activate the selected filter criteria with *OK*. Only the data records with the selected characteristics can be seen in the database window.

Import the identification in the *Ident* field of the *Identification* tab sheet:

1	Switch to the database window.
2	Click on an entry in the *Ident* column with the right mouse key. A popup menu appears.
3	Click on *Filter...* in the popup menu. The *Filter* window opens with the *Identification* tab sheet. The entry from the database window is already imported.
4	Mark a tick in the tab selection field. The filter setting is activated.
5	Activate the selected filter criteria with *OK*. Only the data records with the selected characteristics can be seen in the database window.

Import the measurement type from the selection *pH*, *O2*, or *Cond* into the *Measuring type* tab sheet:

1	Switch to the database window.
2	Click on an entry in the *Type* column with the right mouse key. A popup menu appears.
3	Click on *Filter...* in the popup menu. The *Filter* window opens with the *Measuring type* tab sheet. All measured variables of the selected type are selected with a tick.
4	Mark a tick in the tab selection field. The filter setting is activated.
5	Activate the selected filter criteria with *OK*. Only the data records with the selected characteristics can be seen in the database window.

Deleting filter settings

You can deactivate and delete all filter settings.

1	Delete all filters with *Filter* / *Erase filter*. All filter settings are deactivated (all ticks removed) and deleted. All entries in the *Filter* window are deleted. All data records can be seen in the database window.

6.2.3 Selecting the degree of accuracy of the measured data display

The degree of accuracy of the measured values can be selected in the database window.

1	Switch to the database window.
2	Click on an entry in the *Value* or *Temp* column. An input field appears for the number of decimal places to be displayed (0 to 3).
3	Enter a value. The measured value appears with the specified number of decimal places.



Note
The last digit of the measured value is rounded.

6.3 Exporting measured data records

In order to be able to further process the data from manually or automatically stored measured data records in other programs, various export settings are also available above the *Edit / Export* export function in the *Export* window.

Note
Basically, data can only be exported from the database.

The format of the export file can be further adapted. Possible formats are specified in the following fields: *Export format*, *Options*, *Separators*.

The following export formats can be selected:

- *Text* ("*.txt")
- *RTF* ("*.rtf")
- *Excel* ("*.xls")
- *Works* ("*.wk1")
- *Quattro Pro* ("*.wq1")
- *Access* ("*.mdb")
- *HTML* ("*.htm")

The current filename appears in the *File name* field. The file extension is automatically added to the filename when the export format is selected.

1	Change to the MultiLab® pilot window.
2	Open the directory of the database files with *Memory* / *Export...* and select a file. The database opens.
3	Start the export with *Edit* / *Export* or the *Export* button. The *Export* window opens. Several export data formats are offered here.
4	Select the export format.
5	Select one of the following *options* • *with field names*: also exports column headings • *Subsequently open export file*: opens the exported data in the relevant program.
6	For the "*.txt" export format only: Select *Separators*.
7	Use *Export* to confirm the export.
8	Store the file.

Exporting data via the clipboard

You can copy the displayed data into the clipboard in the *Copy* field of the *Export* window. The data can now be copied into another application via the Windows clipboard.

6.4 Deleting measured data records

Stored measured data records can be removed from the system in the *Memory* / *Manual storing* menu and *Automatic storing* via the *Erase ...* menu items. As a result, all associated data (all database files and the files for manual and automatic storing) are deleted.

1	Change to the MultiLab® pilot window.
2	Open the directory of the measured data and select a file with *Memory* / *Manual storing* or *Automatic storing* / *Erase ...*.
3	Confirm the deleting of the selected data. A security prompt opens.
4	Confirm the deleting of the selected files with *yes*. All selected data and the associated database files are deleted.

6.5 Graphical display of measured values

Information on storing and displaying measurements graphically can be found in chapter 7.

Files with a graphical series of measurements have the file extension "*.rdt".

6.6 Configurations

Information on storing and displaying configuration files can be found in section 5.6.

Files containing configuration data have the file extension "*.ste".

6.7 Calibration records

After each valid calibration, the current calibration record is automatically saved in the measuring instrument and also in a separate calibration file on the PC.

In the measuring instrument, the current calibration record is stored only. All calibration records are collected in the calibration file.

6.7.1 Creating a file for calibration records

Note
The functions described in this section are only available for meters that can be operated by remote control.

You can create the file for saving your calibration data yourself. Files for calibration records have the file extension "*.cal". After each calibration, data is automatically stored in this file.

1	Change to the MultiLab® pilot program window.
2	Use *Memory* / *Calibration memory* / *New...* to create a new file.

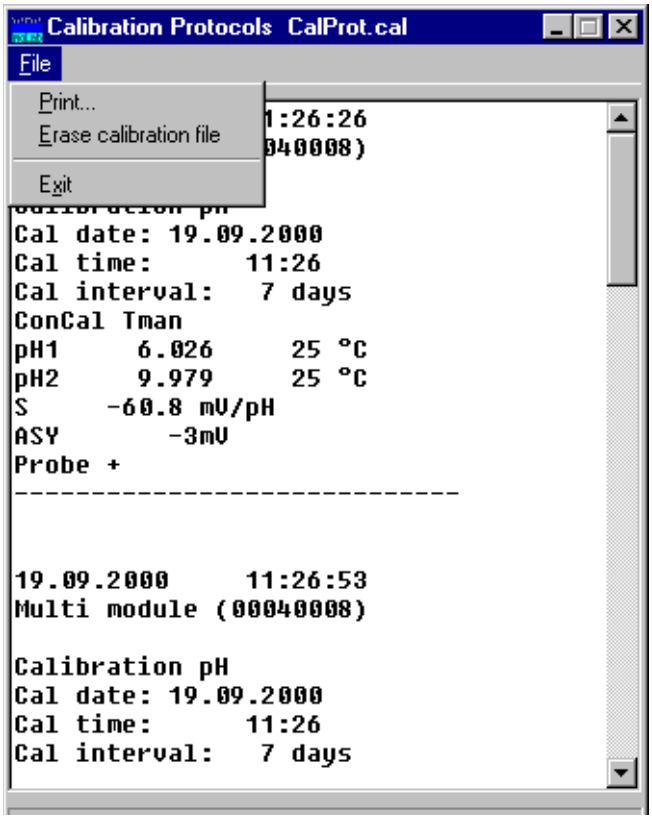
Note
The file to store the measured data records or calibration records is permanently open in the background. Data are automatically stored in it after calibrating.

6.7.2 Opening a file for calibration records

Note
The functions described in this section are only available for meters that can be operated by remote control.

You can select the file for saving your calibration data yourself. Files for calibration records have the file extension "*.cal". After each calibration, data is automatically stored in this file.

1	Change to the MultiLab® pilot program window.
2	Use *Memory* Memory/Calibration storage/Open... *Calibration memory Open...* to select a file ("*.cal") and open it in order to store future calibration records.



3	Use *File* / *Print...* to print out the calibration data.

Note
Erasing calibration data may be required if too much calibration data is stored in the file. In this case, you can either start a new file to store calibration data or erase the data of the existing file.

Note
The file to store the measured data records or calibration records is permanently open in the background. Data are automatically stored in it after calibrating.

6.7.3 Displaying stored calibration protocols

Displaying all calibration records

All calibration protocols are displayed in the MultiLab® pilot program window.

1	Change to the MultiLab® pilot program window.
2	Use *Memory* / *Calibration memory* / *Display ...* to select a file with calibration records ("*.cal"). The *Calibration records* window opens.
3	Print out the calibration data with *File* / *Print...*.

Displaying the current calibration record for a probe

You will find the current calibration record for a measuring instrumente and a probe in the respective probe window.



Note
This function is only available for meters that can be operated by remote control.

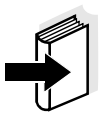
1	Switch to a probe window.
2	Use *Calibration* / *Calibration record...* to display the current calibration record. A window with the current calibration record opens.
3	Use *File* / *Print...* to print out the calibration data.

6.7.4 Calibration protocols received by measuring instruments



Note
The functions described in this section are only available for meters that cannot be operated by remote control.

Calibration protocols can be sent to the serial interface from the connected measuring instrument.



Note
How to send the calibration protocol to the serial interface is described in the operating manual of your measuring instrument.

If a calibration protocol is sent to the serial interface, the *Calibration records* window with the calibration protocol that was sent opens automatically.

As soon as a calibration protocol is sent, the *Calibration records* window opens automatically.

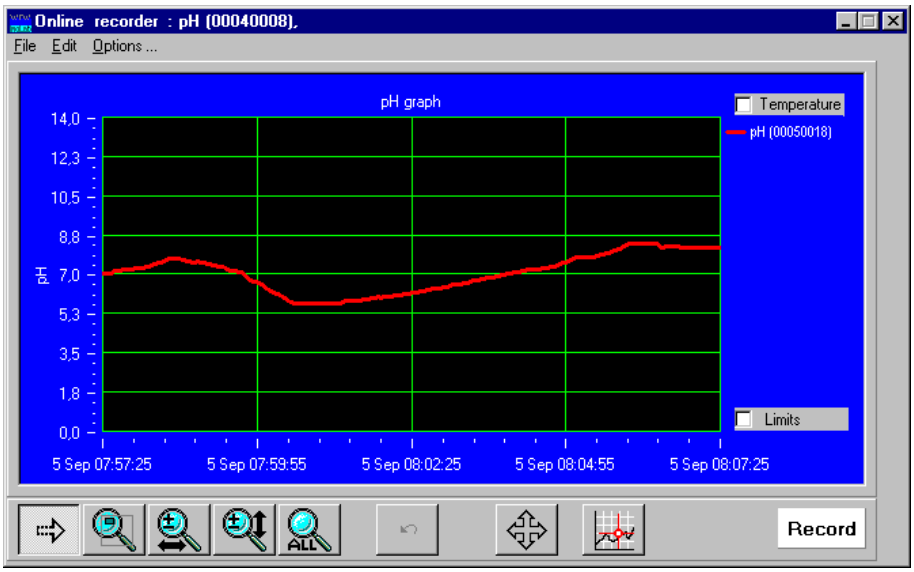
The data can be stored and printed out.

1	Change to the MultiLab® pilot program window.
2	Sending the calibration protocol from the measuring instrument via the serial interface (see the operating manual of the measuring instrument). The *Calibration records* window opens with the calibration data that was sent.
3	Print out the calibration data with *File* / *Print...*. or Store the calibration data in text format ("*.txt") with *File* / *Save as ...*.

7 Recorder

The recorder offers many functions to clearly display measured values in a system of coordinates.

The recorder can display a running measurement (online recorder) or a stored measurement (offline recorder).



The following editing functions are available.

- Displaying or hiding the measured temperature (see section 7.2)
- Changing the displayed section (zoom and scroll functions) (see section 7.3)
- Displaying a precise measured value at a specific location (see section 7.4)
- Setting up signaling to indicate that limits are being exceeded (see section 7.6)
- Copying (see section 7.7) or printing (see section 7.10) displayed screen contents
- Setting up the basic settings of the recorder (see section 7.5)

7.1 Calling up the recorder

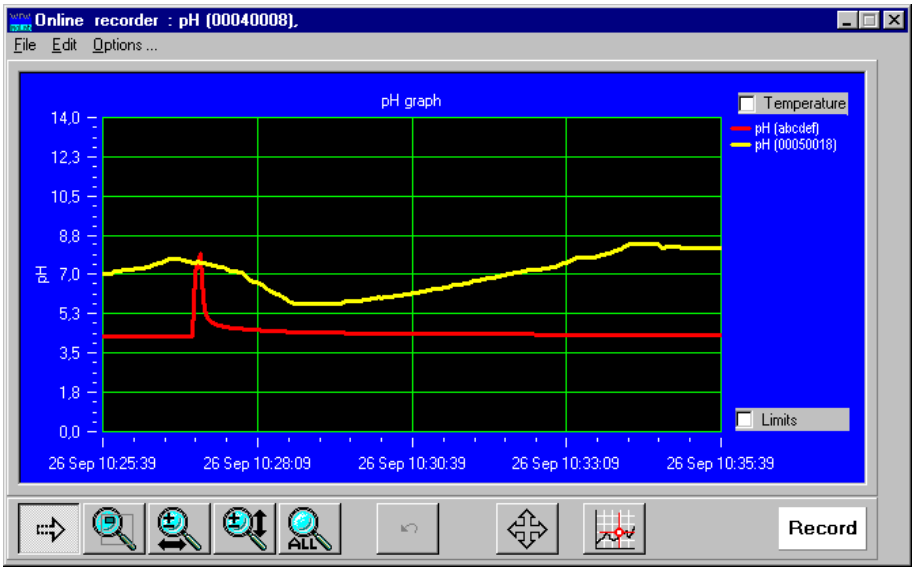
The recorder records the course of the measured values curve and the course of the temperature curve.

7.1.1 Calling up the online recorder

1	Switch to a probe window.
2	Use  to open the online recorder. The online recorder appears and records the measured value that is being displayed in the probe window.

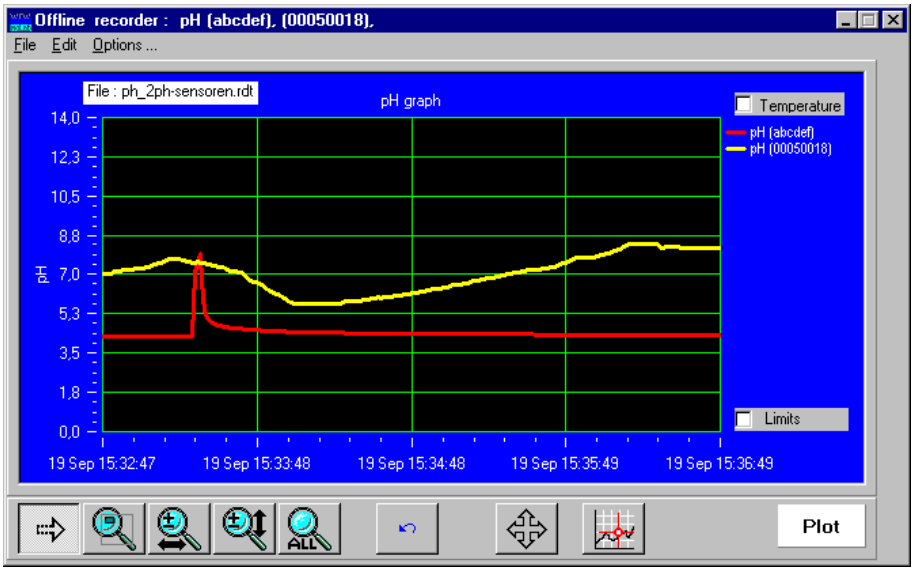
Note
While the online recorder is recording measured data, those functions of the relevant measuring instruments that could interfere with the data integrity are blocked.
To use these functions, close the online recorder.

Note
If the online recorders for two similar electrodes (of two different measuring instruments) are activated, both measured value curves and both temperature curves are displayed in one window.



7.1.2 Calling up the offline recorder

1	Change to the MultiLab® pilot program window.
2	Use  to open the offline recorder. The offline recorder appears.
3	Use *File* / *Open ...* to load a file. The stored measured values are displayed.



7.2 Temperature value

In addition to the required measured parameter, the corresponding temperature is always registered.

You can select whether or not the course of the temperature is to be displayed.

1	Switch to the recorder window.
2	Click on the *Temperature* selection field. The temperature recorder is displayed or hidden.

Note
The selection only affects the displayed recorder window. Even when the temperatures are not displayed, they are stored with the graphic of the online recorder.

7.3 Changing the displayed section (zooming)

Several zoom functions are available in order to have a close look at individual sections of the recorder window. Zoom functions in the tool bar can be recognized by the magnifying glass symbol.

Record



The *Record* function enables you to view the course of the current measured values.

1	Use *Record* to activate the function. *Record* appears in the status field. The current measured values appear on the display.

Zoom window



The *Zoom window* function enables you to simply select an area in the x and y direction with the mouse.

1	Use *Zoom window* to activate the function. *Zoom* appears in the status field.
2	Move the mouse into the system of coordinates and press the left mouse button. Keep the mouse button depressed and move the mouse down to the right. A rectangle marks the zooming section.
3	Release the mouse button. The marked section is displayed in the *Recorder* window.

Zoom-X/Zoom-Y





The *Zoom-X* or *Zoom-Y* function enables you to select the scaling in the x or y direction using the mouse until you can view the required values.

1	Use *Zoom-X* or *Zoom-Y* to activate the function. *Zoom X* or *Zoom Y* appears in the status field.
2	Move the mouse into the system of coordinates and press the left mouse button. Keep the mouse button depressed and move the mouse to the left/right or up/down. The scaling in the x or y direction changes.

Show all



The *Show all* function enables you to return to the display where all values are contained in the time (x) axis. The y axis maintains the current scaling.

1	Use *Show all* to display all values of the time (x) axis.

Scroll-XY/Scroll-Y



The *Scroll-Y* function (only in the temperature recorder) or the *Scroll-XY* function (only in the measured value recorder) enables the selected section to be moved upwards/downwards (*Scroll-Y*) and left/right (*Scroll-XY*).

1	Use *Scroll-XY* or *Scroll-Y* to activate the function.
2	Move the mouse into the system of coordinates and press the left mouse button. Keep the mouse button depressed and move the section to the left/to the right or upwards/downwards. The scaling in the x or y direction changes.

Undo zooming/scrolling



You can undo the last zoom/scroll function.

1	The status before the last zoom/scroll function can be restored with *Undo zooming/scrolling* or with the *Edit* / *Undo zooming/scrolling* menu item.

Reset scale

The *Reset scale* function returns you to the standard settings of both axes selected under *Options.../Y-Axis*.

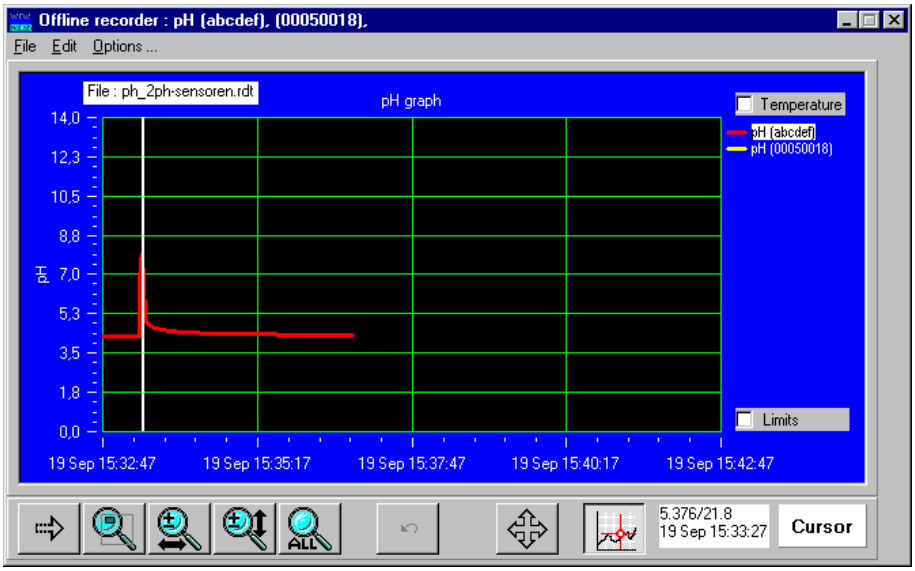
1	*Edit* / *Reset scale* is used to reset all values of the time (x) and measured value (y) axis to the standard settings selected under *Options.../Y-Axis*.

7.4 Displaying the measured value at the cursor position

The cursor function enables you to display the measured value that belongs to a certain point of the graph.

1	Use the *Cursor* key to activate the function. A cursor and another status field with the measured value that belongs to the cursor position appear.
2	Move the cursor using the mouse or the arrow keys. The measured value that corresponds to the current cursor position appears in the status field.

Note
If, for the same measured parameter, two measured value curves have been recorded, only one curve is displayed by using *Cursor*.



3	In the legend that contains the color allocation of the graph to the measuring instrumente  , use the mouse to select the required graph. The selected curve is displayed and highlighted in the allocation.

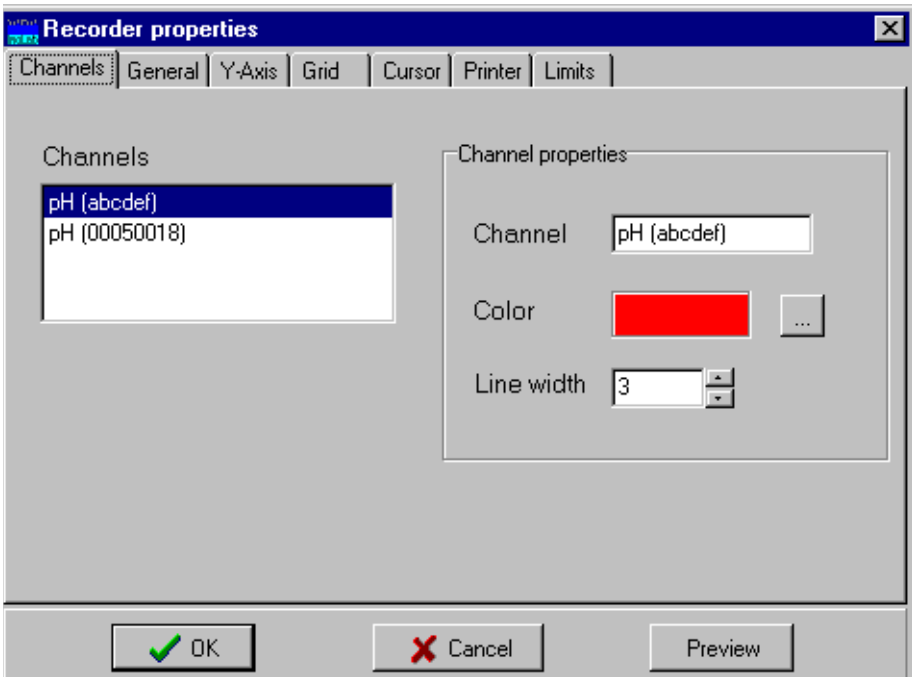
7.5 Basic settings of the recorder

You specify the appearance of your recordings.

- Characteristics of the graphs (*Channels* tab)
  - Selection of the measuring instrumente
  - Color of the measured value curve
  - Line thickness of the measured value curve
- Characteristics of the recorder representation (*General* tab)
  - Labeling of the measured value recorder and temperature recorder above the system of coordinates
  - Background color outside the system of coordinates
- Characteristics of the grid (*Grid* tab)
  - Grid color of the system of coordinates
  - Background color of the system of coordinates
  - Line type of the system of coordinates: continuous, interrupted, dots or a combination of dots and lines
- Characteristics of the cursor (*Cursor* tab)
  - Color of the cursor
- Characteristics of the y axis (*Y-Axis* tab)
  - Minimum and maximum value of the y axis of the measured value recorder and temperature recorder
- Printer settings (*Printer* tab)
  - Portrait format or landscape format
- Limit settings (*Grenzwerte* settings)
  - Minimum and maximum limit value for the measured value and temperature value
  - Way of signaling if a limit value is exceeded or undercut; name of the record file

Setting the recorder properties

1	Switch to the recorder window.
2	Click the *Options...* menu. The *Recorder properties* window opens.



3	Select a channel (only with several remotely controllable meters with the same probe).
4	Select a tab sheet.
5	Set the properties.
6	Use *Preview* to test the new settings. The new settings take effect. The *Recorder properties* window stays open.
7	Use *OK* to accept the new settings and close the dialog box, *Recorder properties*. The new settings take effect.

7.6 Limit values

The Limits function enables you to determine measured values to be limits. When these limits are exceeded, a signal can occur.

The signaling can take place either acoustically, as a Windows message or as an entry in a log file (see section 7.6.3).



Note
If the signaling is carried out as a Windows message, you can receive and further process the Windows message sent by MultiLab® pilot using a self-written program each time a limit is exceeded. Sample files for programmers are given in the "specials" subdirectory of the MultiLab® pilot program directory.

The limit values can be determined in the *Options...* menu of the Recorder window (see section 7.6.1).

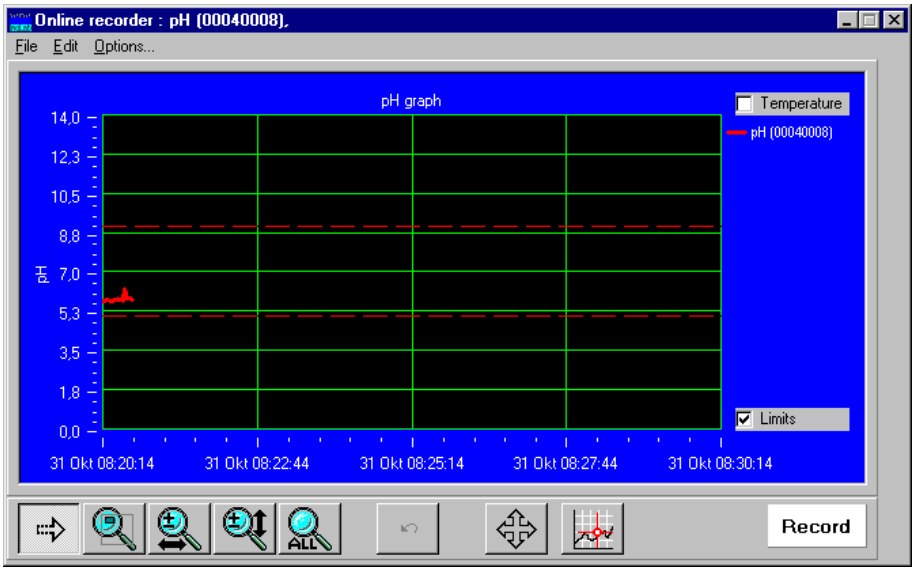
Activate or deactivate the signaling and display of the selected limit values in the recorder window in the *Limits* selection field (see section 7.6.2).

7.6.1 Determining limit values

1	Switch to the recorder window.
2	Click the *Options...* menu. The *Recorder properties* window opens.
3	Select the *Limits* tab sheet.
4	Enter the upper and/or lower limit value.
5	Use *Preview* to test the new settings. The new settings take effect. The *Recorder properties* window stays open.
6	Use *OK* to accept the new settings and close the *Recorder properties* dialog box. The new settings take effect.

7.6.2 Activating/deactivating limit values

1	Switch to the recorder window.
2	Click on the *Limits* selection field. The settings specified in the *Options...* menu are activated. Specified limit values are shown in the Recorder window.



7.6.3 Record of when limit values are exceeded

Creating a record file

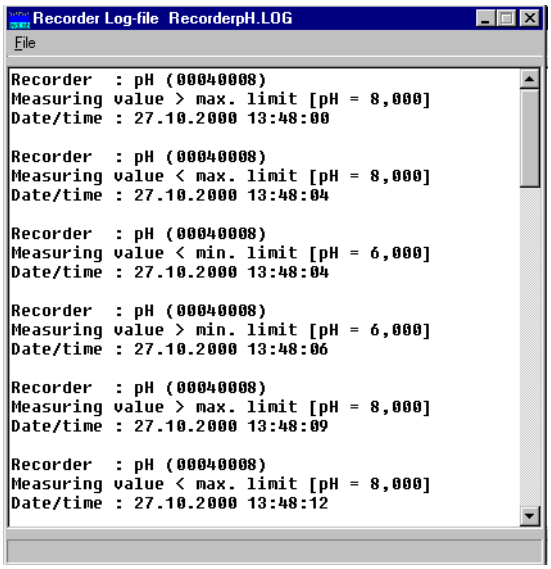
The use of a log file for detecting when limit values are exceeded is specified in the Recorder window in the *Log file* selection field of the *Options...* menu.

If the use of a log file is activated, the name of the log file and the button appears. You can select or create another log file with .

Log files end with "log".

Viewing a recorder file

1	Change to the MultiLab® pilot program window.
2	Select a language in the *Memory* / *Log file (recorder)* / *Display ...* menu. A file selection window opens.
3	Select a log file ("*.log") in the selection window. A window showing the log file opens.



7.7 Copying a graphic

Besides saving the curve as a file, you can copy the current section of the curve to the Windows clipboard and then paste it into other applications as a diagram.

1	Select the *Edit* / *Copy to clipboard* and *Measured parameter* or *Temperature* menu item. A copy of the current section is held in the clipboard as a diagram.

Note
The measured temperature value can only be copied to the clipboard when the measured value is also displayed in the recorder.

7.8 Storing a graphic

First, the online recorder displays the current measured values in the recorder window only. If you want to keep the series of measurements for later processing, store the file.

You can open the stored file with the online recorder at any time.

1	Select the *File* / *Save as ...* menu item. The Windows Save dialog opens.

Note
When you close the online recorder, a message automatically reminds you to save.

7.9 Exporting a graphic

First, the online recorder displays the current measured values in the recorder window only. If you want to keep the diagram of the series of measurements together with the current zoom settings for later processing, export the file as a metafile.

Metafiles have the file extension "*.emf".

You can open the stored file using a picture processing program or, for example, import it into a word-processing program.

1	Select the *Edit* / *Export to metafile...* menu item. The Windows Save dialog opens. Metafiles have the file extension "*.emf".

7.10 Printing a graphic

You can also print the current section of the graphic. The graphic section is printed as a picture with all color settings.

1	Select the *File* / *Print...* menu item. The *Print* dialog box opens.

8 pH

Note
The functions described in this chapter are only available for meters with pH measurement function that can be operated by remote control, e. g. inoLab 740 pH, pH/ION, pH/Cond, Multi, inoLab pH/ION/Cond 750.

8.1 Settings for pH measurements

Before measuring, we recommend to check the current settings or to load a stored configuration (see section 5.6.3).

8.1.1 Measured value resolution of voltage display

Using the *Autorange* function, you can select the resolution of the voltage measurement:

- If the *Autorange* function is switched off, the voltage is measured in a range from -1999 mV to +1999 mV with a resolution of 1 mV.
- If the *Autorange* function is switched on, the voltage is measured in a range from +999.9 mV to -999.9- mV with a resolution of 0.1 mV. The remaining measuring range stays unchanged.

Measured value resolution, *U*

1	Switch to the *pH* window.
2	Select the *Autorange* menu item in the *Setup* menu. The *Autorange* is active. Voltages in the range between -999.9 mV and +999.9 mV are displayed with a resolution of 0.1 mV.

8.1.2 Measured value resolution of pH display

You can select the resolution for the pH value:

- If the high resolution is switched on, the system measures with a resolution of 0.001 over the entire pH range.
- If the high resolution is switched off, the system measures with a resolution of 0.01 over the entire pH range.

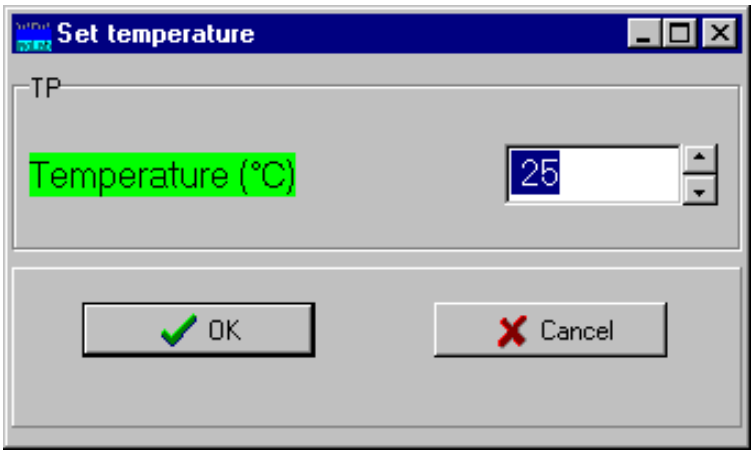
Measured value resolution, *pH*

1	Switch to the *pH* window.
2	Select the *High pH resolution* menu item in the *Setup* menu. The 0.001 resolution is active.

8.1.3 Entering the temperature value manually

If you want to enter the temperature manually instead of measuring it automatically, proceed as follows:

1	Measure the current temperature of the test sample.
2	Switch to the probe window.
3	Click on the display range with the right mouse button and select *Set temperature...*, or select the *Set temperature...* menu item in the *Setup* menu. The *Set temperature* window appears.



4	Enter the measured temperature value.
5	Click *OK* to confirm the temperature value. The window is closed. The entered temperature value appears in the display range.

8.1.4 Resetting to default settings

You can reset (initialize) the settings for the pH measurement to the default settings.

During a reset, the following functions for the pH measurement are reset to their default settings:

Measured parameter	pH
Asymmetry U_{Asy} in mV	0 mV
Slope S (k') in mV	-59.16 mV
Calibration procedures	AutoCal TEC
Manual temperature	25 °C

All settings for pH measurements are reset to their default values with the *Reset pH* function.

1	Switch to the *pH* window.
2	Select the *Reset pH* menu item in the *Setup* menu. The default settings for pH measurements have been restored.



Note
During a reset, calibration data are reset to the default values. Recalibrate after performing a reset.

8.2 Calibrating for pH measurements

Why calibrate?

pH electrodes age. This changes the asymmetry and slope of the pH electrode. This may cause the measuring system to ignore the limits of a calibrated system. Calibration determines the current values of the asymmetry and slope and stores them in the measuring instrument. Calibration must be performed 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 two calibration procedures: *AutoCal* and *ConCal*:

AutoCal

is a fully automatic calibration using the datasets selected for buffer solutions in the *Type of pH-calibration* menu.
The buffer solutions are automatically recognized by the measuring instrument. Depending on the instrument setting (see page 83), the instrument displays the relevant buffer nominal value or the current electrode voltage in mV. The calibration can be terminated after the first buffer solution. This corresponds to a single-point calibration.

ConCal

is the conventional two-point calibration method using two buffer solutions (pH 7.0 ± 0.5 and any other buffer solution) or a single-point calibration using any buffer solution that is used as a high-speed method.

AutoRead

When calibrating with AutoCal, the AutoRead function is automatically activated.
The current AutoRead measurement can be terminated at any time (accepting the current value).

Calibration record

After calibration, a calibration record is displayed in a separate window, e. g.:

```
29.08.2000     13:04:42
Multi measuring instrumente
(00040008)

Calibration pH
Cal date: 29.08.2000
Cal time:      13:04
Cal interval:   7 days
ConCal Tman
pH1     8.074     25 °C
pH2     8.077     25 °C
S     -59.2 mV/pH
ASY        0mV
Probe +++
```

You can display or print calibration records at any time (section 6.7).

Calibration evaluation

After calibrating, the current system condition is evaluated. The asymmetry and slope are evaluated separately. The probe symbol shows the worse case evaluation of both.

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	Eliminate the error (see operating manual of your meter)	< -30 or > > 30	< -62 or > -50

8.2.1 Buffer sets

You can use the buffer sets given in the table for an automatic calibration. The pH values are valid for the specified temperature values. The temperature dependence of the pH values is taken into consideration during the calibration.

Buffer set	Menu designation	pH values	at temp
WTW technical buffer solutions	*TEC*	2.00 4.01 7.00 10.01(1)	25 °C
Standard buffer solutions according to DIN 19266	*DIN*	1.679 4.006 6.865 9.180 12.454	25 °C
Merck titration and buffer solutions Riedel de Haen titration and buffer solutions	*Merck1*	2.00 4.00 7.00 9.00 12.00	20 °C
Merck titration and buffer solutions Riedel de Haen titration and buffer solutions	*Merck2*	1.00 3.00 6.00 8.00 10.00 13.00	20 °C
Merck ready to use buffer solutions	*Merck3*	4.66 6.88 9.22	20 °C

(1) The calibration for pH 10.01 is optimized for the WTW technical buffer solution TEP 10 Trace or TPL 10 Trace. Other buffer solutions can lead to an erroneous calibration. The correct buffer solutions are given in the WTW catalog or in the Internet.

8.2.2 Calibration settings

Selecting the calibration procedure

The following calibration procedures can be selected:

- *AutoCal*
  - *AutoCal*
    displays the current electrode voltage in mV during calibration
  - *AutoCal Win]*
    displays the respective nominal buffer value during calibration
- *ConCal*

Note
Before calibrating, always check the selected calibration procedure and the selected buffer sets.

1	Switch to the *pH* window.
2	Select the *Type of pH-calibration* menu item in the *Calibration* menu.
3	Select the calibration procedure The selected calibration procedure is active.

Selecting the buffer data record

For the AutoCal calibration procedure, select one of the *TEC*, *DIN* or *Merck1 ... Merck3* buffer sets:

1	Select the *Buffer sets* menu item in the *Calibration* / *Type of pH-calibration* menu.
2	Select the buffer data record. The selected setting is active.

Specifying the calibration interval

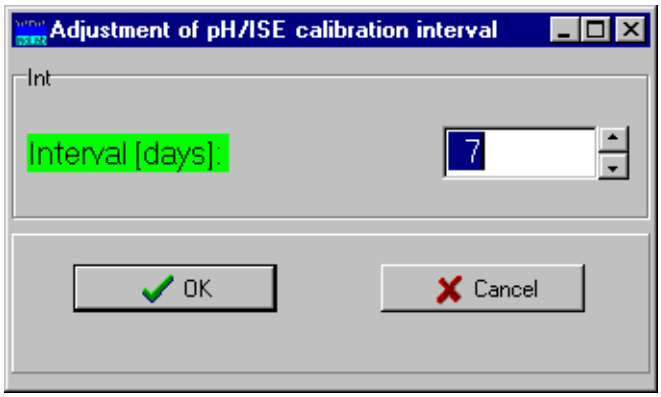
The calibration interval specifies the time interval between regular system calibrations.

The program reminds you to calibrate regularly by the red probe symbol in the probe window.

The pH calibration interval is set to 7 days in the factory. You can change the interval (1-999 days).

For most applications, we recommend a shorter calibration interval.

1	Switch to the *pH* window.
2	Select the *Calibration interval...* menu item in the *Calibration* menu. The dialog box for the calibration interval appears.



3	Enter the value for the calibration interval.
4	Click *OK* to confirm the value. The calibration interval is set.

Selecting the unit for the slope

The slope determined during calibration can be displayed in the unit, mV/pH or %.
The display in % refers to the Nernst slope, 59.2 mV/pH (100 x the slope determined/Nernst slope).

1	Switch to the *pH* window.
2	Select the *Type of pH-calibration* menu item in the *Calibration* menu.
3	Select the *Slope in [%]* menu item. The display of the slope in % is active.

8.2.3 Calibrating with AutoCal

Note
Before calibrating, always check the selected calibration procedure and the selected buffer sets.

Preparatory activities

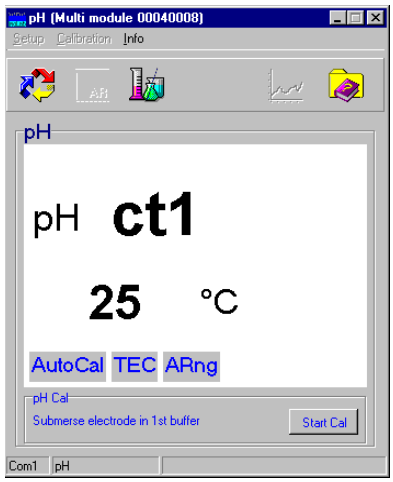
1	Switch to the *pH* window.
2	Connect the pH electrode to the measuring instrument.
3	Keep the buffer solutions ready (up to 5 solutions, depending on the calibration procedure selected).
4	Adjust the temperature of the solutions and measure the temperature if the measurement is made without a temperature probe.

Note
When you calibrate without temperature probe, enter the temperature value of the relevant buffer solution (see section 5.4.1).

Calibrating with AutoCal

For this procedure, use buffer solutions according to the buffer table (see section 8.2.1).

During the calibration, you will be given short notes about the calibration procedure and the number of the next buffer solution. The display indication, e.g. **ct1**, means:



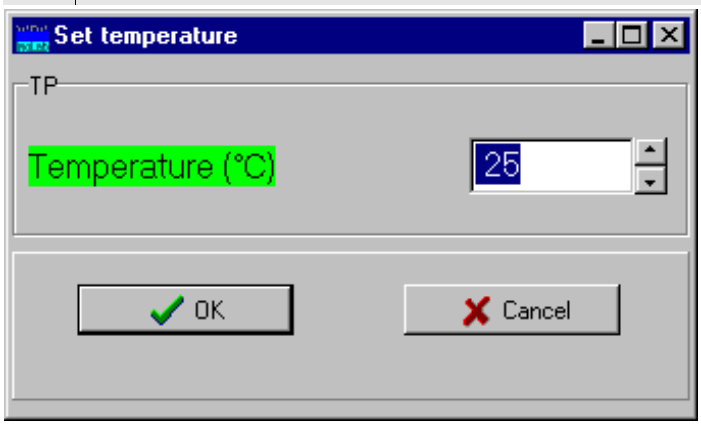
c: The calibration has been started.

t: Selected buffer data record
t = Technical buffers or
d = DIN buffers or
m = Merck buffers

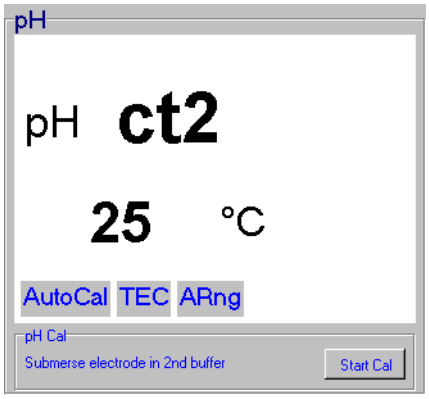
1: Number of the next buffer solution
1 = 1st buffer solution
:
5 = 5th buffer solution.

The following example depicts the automatic calibration procedure with WTW technical buffer solutions. If you use other buffer solutions, e. g. DIN buffers or buffer solutions of the Merck company, the displays before using the next buffer will be different.

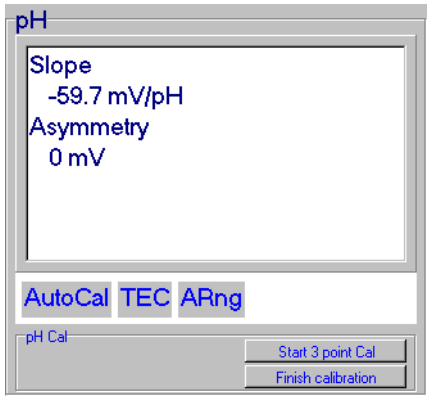
1	Select the *AutoCal* calibration procedure (see section 8.2.1).
2	Select the buffer data record (see section 8.2.1).
3	Perform the preparatory activities (see section 8.2.3).
4	Use  to start the calibration procedure. *ct1* appears on the display.
5	If necessary, set the temperature of the first buffer solution (see section 5.4.2).



6	Immerse the electrode and the temperature probe in the first buffer solution.
7	Click *Start Cal* to start measuring. The *AR* status indicator appears and the electromotive force U (mV) of the electrode is displayed. As soon as a stable value is recognized, *ct2* appears.



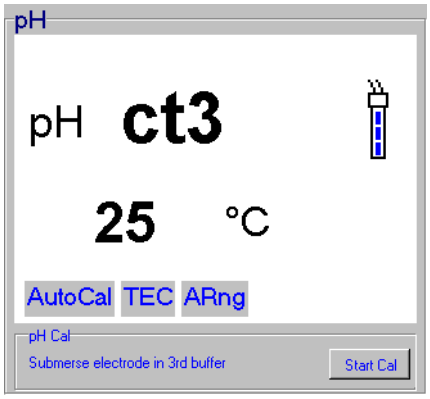
8	Thoroughly rinse the electrode with deionized water.
9	If necessary, set the temperature of the second buffer solution (see section 5.4.1).
10	Immerse the electrode and the temperature probe in the second buffer solution.
11	Start the measurement with *Start Cal*. The *AR* status indicator and the electromotive force of the electrode U (mV) are displayed. As soon as a stable value is recognized, the slope value (mV/pH) and the asymmetry value (mV) after the two-point calibration are calculated and displayed.



12	Use *Start 3 point Cal* to go on to the 3-point calibration. or use *Finish calibration* to finish the calibration after the 2-point calibration.

Three-point calibration

13	Thoroughly rinse the electrode with deionized water.
14	If necessary, set the temperature of the third buffer solution (see section 5.4.1).
15	Immerse the electrode and the temperature probe in the third buffer solution.



16	Press *Start Cal*. The *AR* status indicator and the electromotive force of the electrode U (mV) are displayed. As soon as a stable value is recognized, the slope value (mV/pH) and the asymmetry value (mV) after the three-point calibration are calculated and displayed.
17	Use *Start 4 point Cal* to go on to the 4-point calibration, or use *Finish calibration* to finish the calibration after the 3-point calibration.

Four-point calibration and five-point calibration

18	Thoroughly rinse the electrode with deionized water.
19	If necessary, set the temperature of the fourth buffer solution (see section 5.4.1).
20	Immerse the electrode and the temperature probe in the fourth buffer solution.
21	Press *Start Cal*. The *AR* status indicator and the electromotive force of the electrode U (mV) are displayed. As soon as a stable value is recognized, the slope value (mV/pH) and the asymmetry value (mV) are calculated and displayed after the four-point or five-point calibration.
22	Use *Start 5 point Cal* to go on to the 5-point calibration, or use *Finish calibration* to finish the calibration after the 4-point calibration. The procedure of the five-point calibration corresponds to the procedure of the four-point calibration.

Note
After the calibration is finished, the calibration record is automatically displayed and stored.

Note
The calibration line is determined by linear regression.

8.2.4 Calibrating with ConCal

Single-point calibration with ConCal

Only one buffer solution is required for single-point calibration. The pH value should lie as close as possible to the expected measured value. Only the electrode asymmetry is then newly determined. The slope of the last two-point calibration is retained.

Note
The ConCal calibration procedure has no temperature compensation. The buffer solutions must have the correct temperature. The slope value cannot be determined during a single-point calibration. The slope value of the last valid two-point calibration remains stored.

1	Select the *ConCal* calibration procedure (section 8.2.1).
2	Perform the preparatory activities (see section 8.2.3).
3	Use  to start the calibration procedure.
4	Immerse the electrode and the temperature probe in the buffer solution.
5	If necessary, select the temperature of the buffer solution.
6	Use the *Asymmetry* key to call up the *Setting of 1st buffer value* window for the nominal pH value of the buffer solution.
7	Enter the nominal pH value of the buffer solution (at the current temperature).
8	Use *OK* to confirm the nominal pH value. The calibration record is displayed after the single-point calibration.
9	Use *Finish 1 point Cal* to terminate the calibration.

Two-point calibration with ConCal

Use the following buffer solutions:

- pH 7.0 ± 0.5
- Any other buffer solution so that the measuring range is covered as well as possible

Note
The ConCal calibration procedure has no temperature compensation for the buffer solutions that are used. The buffer solutions must have the correct temperature.

If you use a temperature probe, it is not necessary to enter the temperature manually.

1	Select the *ConCal* calibration procedure (section 8.2.1).

2	Perform the preparatory activities (see section 8.2.3).
3	Use  to start the calibration procedure.
4	Immerse the electrode and the temperature probe in the pH 7.0 ± 0.5 buffer solution.
5	If necessary, select the temperature value of the first buffer solution.
6	Use *1st buffer value* to call up the input field for the nominal pH value of the buffer solution.
7	Enter the nominal pH value of the buffer solution (at the current temperature).
8	Use *OK* to confirm the nominal pH value. The *Setting of 1st buffer value* window is closed. The calibration record is displayed after the single-point calibration.
9	Use *Start 2 point Cal* to go on to the 2-point calibration, or use *Finish 1 point Cal* to terminate the calibration after the 1-point calibration.
10	Thoroughly rinse the electrode with deionized water.
11	Immerse the electrode and the temperature probe in the second buffer solution.
12	If necessary, select the temperature value of the second buffer solution.
13	Use *2nd buffer value* to call up the input field for the nominal pH value of the buffer solution.
14	Enter the nominal pH value of the buffer solution (at the current temperature).
15	Use *OK* to confirm the nominal pH value. The calibration record after the two-point calibration is displayed.
16	Use *Finish 2 point Cal* to terminate the calibration.

8.3 Measuring the pH value/electromotive force of the electrode

Using a pH electrode, the measuring system can display the pH value of a solution and the corresponding electromotive force of the electrode.

The measuring system can measure the voltage of a solution in conjunction with an ORP electrode, e.g. SenTix ORP.

8.3.1 Preparatory activities

Perform the following preparatory activities when you want to measure:

1	Adjust the temperature of the solutions and measure the current temperature if the measurement is made without a temperature probe.
2	Connect the electrode to the measuring instrument.
3	Switch to the *pH* window.
4	With manual temperature input: Call up the manual temperature input with *SetupSetup* / *Set temperature...* or with the right mouse button.
5	Enter the measured temperature value and confirm it with *OK*.
6	Calibrate or check the measuring system with the electrode.



Note
Incorrect calibration of pH electrodes leads to incorrect measured values. Calibrate regularly. The measuring system has to be calibrated before measuring.

Temperature probe

You can measure with or without a temperature probe. The *TP* display indicator appears when a temperature probe is connected.



Note
If you use a pH electrode without temperature probe at a multiparameter measuring instrument, you can also use the temperature probe of a D. O. probe or a conductivity measuring cell (see section 5.4.2 MEASURING THE TEMPERATURE). In this case, the *O2TP* or *CondTP* display indicator appears.



Note
When you measure the electromotive force, please note that it may take some time until the measured value is stable.



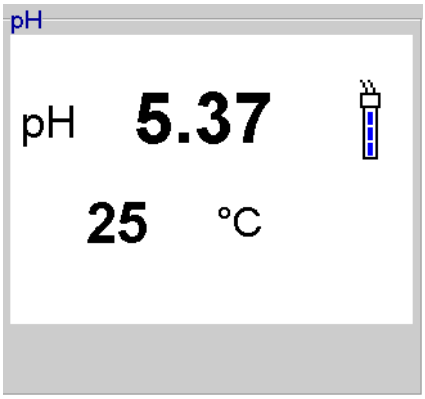
Note
ORP electrodes are not calibrated. However, you can check ORP electrodes using a test solution.

8.3.2 Measuring

1	Perform the preparatory activities.
2	Immerse the pH electrode in the test sample. A measured value is displayed.

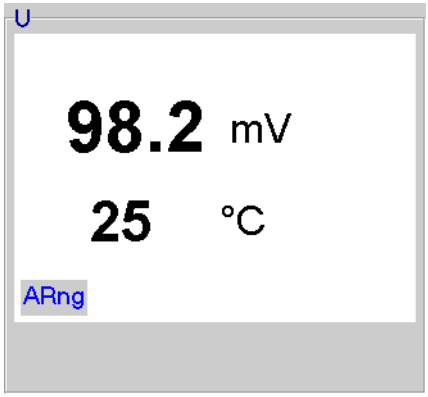
pH value

3	Use  to switch to *pH*.



Electromotive force

4	Use  to switch to *U*.



5	Wait for a stable measured value.
6	Save the measuring data (see section 6.1). Print the measuring data (see section 5.7).

Measuring with AutoRead

The AutoRead function (drift control) checks the stability of the measurement signal. The stability affects the reproducibility of a measured value. With identical measuring conditions, the deviation should be a maximum of 0.02.

1	Switch to the *pH* window.
2	Use *AR*  in the *pH* window to freeze the current measured value (Hold function).
3	Use *Start AR* in the *pH* window to start the measurement with AutoRead. *Stop AR* appears in the *pH* window and the background of the *AR* status indicator turns yellow.
4	Wait for a stable measured value. The measuring data are stored (see section 6.1) and the Hold function is activated again.
5	Use *AR*  in the *pH* window to terminate AutoRead.



Note
To accept a measured value without waiting until it is stable, press *Stop AR* in the probe window.

9 Ion concentration

Note
The functions described in this chapter are only available for meters with ISE measurement function that can be operated by remote control, e. g. inoLab 740 pH, pH/ION, pH/Cond, Multi,
inoLab pH/ION/Cond 750.

9.1 Settings for ISE measurements

Before measuring, we recommend to check the current settings or to load a stored configuration (see section 5.6.3).

9.1.1 Setting up the ISE display

Ion-selective electrodes are connected to the pH/U connector of the measuring instrument.
The selection of the measured variable *ISE* or *pH* is made in the main *Setup* menu. The active *pH* or *ISE* setting is marked.

1	Switch to the *pH* window.
2	In the *Setup* menu, select the *ISE* menu item. The ion concentration appears on the display (mg/l).

9.1.2 Resetting to default settings

No default settings are specified for ion-selective measurements.

9.1.3 Measured value resolution of voltage display

Using the *Autorange* function, you can select the resolution of the voltage measurement:

- If the *Autorange* function is switched off, the voltage is measured in a range from -1999 mV to +1999 mV with a resolution of 1 mV.
- If the *Autorange* function is switched on, the voltage is measured in a range from +999.9 mV to -999.9- mV with a resolution of 0.1 mV. The remaining measuring range stays unchanged.

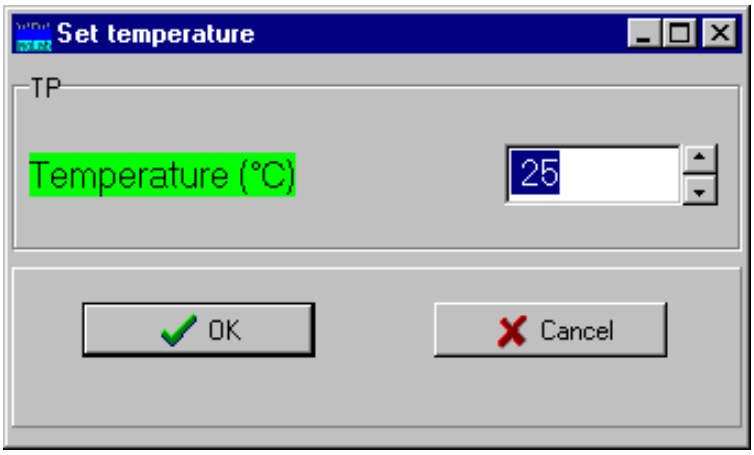
Measured value resolution, *U*

1	Switch to the *pH* window.
2	Select the *Autorange* menu item in the *Setup* menu. The *Autorange* is active. Voltages in the range between -999.9 mV and +999.9 mV are displayed with a resolution of 0.1 mV.

9.1.4 Entering the temperature value manually

If you want to enter the temperature manually instead of measuring it automatically, proceed as follows:

1	Measure the current temperature of the test sample.
2	Switch to the probe window.
3	Click on the display range with the right mouse button and select *Set temperature...*, or select the *Set temperature...* menu item in the *Setup* menu. The *Set temperature* window appears.



4	Enter the measured temperature value.
5	Click *OK* to confirm the temperature value. The window is closed. The entered temperature value appears in the display range.

9.2 Advanced settings for ISE

For the inoLab 740 pH/ION measuring instrument.

9.2.1 Units of the ISE display

You can select the units of the measured value:

1	Switch to the *pH* window.
2	Select the *ISE setup* menu item in the *Setup* menu.
3	Select the *Units* menu item in the *ISE setup* menu.
4	In the *Units* menu, select one of the (*mg/l*, *mol/l*, *mg/kg*, *ppm*, *%*) units. With *mol/l*, *mg/kg*, *ppm* and *%*, the *ISE unit* group field appears in the sensor window to input a conversion factor. Unit *mol/l*:  Unit *mg/kg*:  Unit *ppm*, %: 
5	Input the conversion factor. The displayed measured value contains the conversion factor.

9.2.2 *Blank value correction*

The *Blank value correction* is used if

- the ion concentration in the test sample is very low
- the ISA/TISAB solution used increases the ion concentration of the test sample

The displayed measured value is the difference between the actual measured value and the determined blank value.

1	Switch to the *pH* window.
2	Select the *ISE setup* menu item in the *Setup* menu.
3	Select the *Blank value correction* menu item in the *ISE setup* menu. *ISE BL* appears on the measured value display.
4	Perform a calibration (see section 9.3). After the calibration is completed, the *Perform blank value correction?* query opens.
5	Confirm with *yes*.
6	Thoroughly rinse the electrode with deionized water.
7	Immerse the electrode in the blank value solution.
8	Start the measurement of the blank value solution with *Start measurement* in the sensor window.
9	Wait for a stable value. The determined blank value is displayed.
10	Complete the blank value measurement with *Finish calibration*. The displayed measured value is reduced by the measured blank value. The blank value correction is active until the activation of the blank value is switched off in the *Setup*/*ISE setup*/*Blank value correction*.

9.2.3 *Reference measurement*

A *Reference measurement* enables you to assign the voltage value 0 mV to the calibration curve of your electrode for a specific ion concentration (reference concentration).

Prerequisite:

- The measured value display must show the voltage.
- A valid calibration must be available.

1	Switch to the *pH* window.
2	Only if no valid calibration is available (no sensor symbol on the measured value display): Perform a calibration (see section 9.3).
3	Use  to switch to the display of the voltage (*U*).
4	Select the *ISE setup* menu item in the *Setup* menu.
5	Select the *Reference measurement* menu item in the *ISE setup* menu. The *ISE Ref* symbol appears on the measured value display. The input field for the reference concentration appears in the measuring window.
6	Input the reference concentration. The displayed measured value is corrected immediately.

Note

If the reference concentration entered is outside the limits of the standard solutions used for the last calibration, the reference concentration is not used.

7	If necessary, use the right mouse button to open the input field for temperature.
8	Enter the temperature.
9	Confirm the entry with *OK*. The measured voltage value is referred to the new reference concentration.

9.2.4 Criterion for AutoRead (*AutoRead*)

The AutoRead criteria affect the reproducibility of the measured values. The following criteria can be adjusted:

- *High*: highest reproducibility
- *Medium*: medium reproducibility
- *Low*: lowest reproducibility

Note
Increasing reproducibility also causes the response time to increase until a measured value is evaluated as stable.

1	Switch to the *pH* window.
2	Select the *ISE setup* menu item in the *Setup* menu.
3	Select the *Autoread* menu item in the *ISE setup* menu.
4	In the *Autoread* menu, select a menu item, *High*, *Medium*, *Low*. The active setting is marked by a dot.

9.3 Calibration for ion-selective measurements

Why calibrate?

Electrodes age and are temperature-dependent. This changes the slope. Calibration determines the current value of the slope of the electrode and stores it in the measuring system.

Thus, you should calibrate before each measurement and at regular intervals.

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

When to calibrate?

- Before any concentration measurement if possible
- After connecting another electrode
- When the probe symbol on the display is red

ISECal

The ISECal calibration procedure enables a conventional two-point or three-point calibration with 2 or 3 freely selectable standard solutions. The concentration expected in the measurement determines the concentration of the calibration standards.

AutoRead

During calibration, the *Autoread* function is automatically activated. In order to accept the current measured value without waiting for the end of the AutoRead function, simply press *Stop AR* or RUN ENTER on the measuring instrument.

TP Error display

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

Cal Error display

The calibration standards are too close to each other.

Calibration record

After calibration, a calibration record is displayed in a separate window, e. g.:

```
11.12.2002     06:56:59
ISE 740  (02170006)
User: Administrator

Calibration ISE
Cal date: 11.12.2002
Cal time: 06:56:59
ISECal  Tman
Std 1   0.010mg/l
Std 2   0.020mg/l
C1     -0.0 mV    25°C
C2      9.0 mV    25 °C
S   29.5 mV
Probe +++
-----------------------------
```

You can display or print calibration records at any time (section 6.7).

Calibration evaluation

After calibrating, the current system condition is evaluated. At the same time, the slope S (in mV) is evaluated. The probe symbol shows the evaluation.

Display	Slope [mV]
	50.0 ... 70.0 25.0 ... 35.0
E3	Perform error elimination according to chapter 6 WHAT TO DO IF...

Preparatory activities

1	Connect the electrode to the measuring instrument.
2	Connect a temperature probe to the measuring system so that any temperature differences that are too high will be indicated while calibrating.
3	Keep the standard solutions ready.
4	Adjust the temperature of the standard solutions.
5	Switch to the *pH* window.
6	Select the *ISE* menu item in the *SetupCalibration* menu. The measured variable, *ISE*, appears in the *pH* window.



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

Calibration

Use two or three different standard solutions. For the three-point calibration, the standard solutions have to be selected in either increasing or decreasing order.

Standard solution	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	

For a two-point calibration, the calculated slope is used for the whole measuring range of the electrode. For a three-point calibration, the measuring range of the electrode is divided into two partial ranges, I and II.
A calibration line is determined for each partial range.

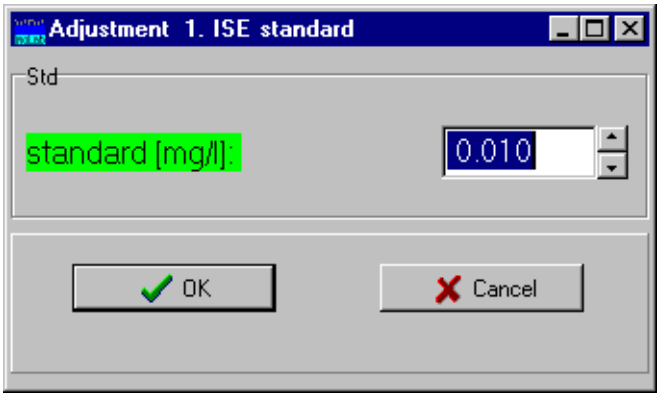
Note
The measuring accuracy depends on the selected standard solutions. Therefore, the selected standard solutions should cover the value range expected of the subsequent concentration measurement.

Note
If the concentration values of the selected calibration standards are too close together, the error message *CalError* appears (see operating manual of your meter).

9.3.1 Two-point and three-point calibration

Two-point calibration

1	Perform the preparatory activities.
2	Press the key. The *Setting of X. ISE standard* window appears.



3	Immerse the electrode in the first standard solution.
4	Enter the concentration of standard solution 1, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
5	If necessary, set the temperature of the standard solution (see section 5.4.2).
6	As soon as a stable value is achieved, the dialog box appears for entering the concentration of the second standard solution. The *Setting of X. ISE standard* window appears.
7	Immerse the electrode in the second standard solution.
8	Enter the concentration of standard solution 2, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.

9	If necessary, set the temperature of the standard solution (see section 5.4.2).
10	Wait for a stable value. The calibration record after the two-point calibration is displayed.
11	Use *Finish 2 point Cal* to finish the calibration after the 2-point calibration, or

Three-point calibration

12	Use *Start 3 point Cal* to go on to the 3-point calibration. The *Setting of X. ISE standard* window appears.
13	Thoroughly rinse the electrode with deionized water.
14	Immerse the electrode in the third standard solution.
15	Enter the concentration of standard solution 3, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
16	If necessary, set the temperature of the standard solution (see section 5.4.2).
17	Wait for a stable value. The calibration record after the three-point calibration is displayed.
18	Use *Finish calibration* to finish the calibration. or In the case of the pH/ION measuring instrument: Continue to the four-point to six-point calibration with *Start 4 point Cal* (see section 9.3.2).

Note
You can terminate the three-point calibration by pressing . At the same time, the two-point calibration remains stored.

Note
The calibration curve is determined by a spline interpolation.

9.3.2 Four-point to six-point calibration

For the inoLab 740 pH/ION measuring instrument.

Beyond the three-point calibration, a four-point, five-point or six-point calibration is also possible in the pH/ION measuring instrument.

Use different standard solutions for this. The standard solutions have to be selected in either increasing or decreasing order.

Standard solution	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 3-6 must be > Std 2 If Std 2 < Std 1, Std 3-6 must be < Std 2
Std 2	
Std 3	
Std 4	
Std 5	
Std 6	

Note
The measurement precision is also dependent on the selected standard solutions. Therefore, the selected standard solutions should cover the value range expected of the subsequent concentration measurement.

1	Perform a three-point calibration (see section 9.3).
2	Continue to the four-point to six-point calibration with *Start 4 point Cal*. The *Setting of X. ISE standard* window appears.
3	Enter the concentration of standard solution 4, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
4	If necessary, set the temperature of the standard solution (see section 5.4.2).
5	Wait for a stable value. The calibration record is displayed after the four-point calibration.

6	Use *Finish calibration* to finish the calibration. or Continue to the five-point and six-point calibration with *Start 5 point Cal*. The *Setting of X. ISE standard* window appears.
7	Enter the concentration of standard solution 5, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
8	If necessary, set the temperature of the standard solution (see section 5.4.2).
9	Wait for a stable value. The calibration record is displayed after the five-point calibration.
10	Use *Finish calibration* to finish the calibration. or Use *Start 6 point cal* to go on to the six-point calibration. The *Setting of X. ISE standard* window appears.
11	Enter the concentration of standard solution 6, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
12	If necessary, set the temperature of the standard solution (see section 5.4.2).
13	Wait for a stable value. The calibration record is displayed after the six-point calibration.
14	Use *Finish calibration* to finish the calibration.

Note
You can prematurely terminate the calibration by pressing . The values of the previous calibration then remain stored.
The calibration curve is determined by a spline interpolation.

9.4 Measuring the ion concentration

Using an ion-sensitive electrode, the measuring system can measure the concentration of an ion type in a solution.

Preparatory activities

Perform the following preparatory activities when you want to measure the concentration with ion-sensitive electrodes:

1	Connect the electrode to the measuring instrument.
2	Start the MultiLab® pilot.
3	Adjust the temperature of the solutions or measure the temperature if the measurement is made without a temperature probe.
4	Switch to the *pH* window.
5	Select the *ISE* menu item in the *Setup* menu. The measured variable, *ISE*, appears in the *pH*.
6	Calibrate or check the measuring system with the ion-sensitive electrode.



Note
Incorrect calibration of ion-sensitive electrodes will result in incorrect measured values. Calibrate regularly before measuring.

Temperature probe

The temperature measurement is absolutely essential for a reproducible measurement. You can perform concentration measurements using an external NTC30 or Pt1000 temperature probe, using the integrated temperature sensor of another probe, or without a temperature probe. The temperature probe that is used is indicated in the display by *TP*, *O2TP* or *CondTP*.



Note
The measuring system automatically recognizes the type of temperature probe used. If the measurement is made without a temperature probe, proceed as follows:

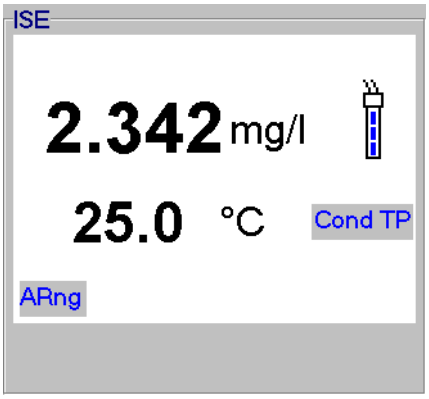
1	Measure the current temperature of the test sample.
2	Adjust the temperature of the test sample and the calibration standards until they are the same temperature (maximum deviation: ± 2 °C).

9.4.1 Measuring

Measuring

Measure the concentration as follows:

1	Perform the preparatory activities according to section 9.4.
2	Immerse the electrode in the test sample.
3	Select the *ISE* menu item in the *Setup* menu in the *pH* window. The concentration value appears.



4	Save the current measuring data (see section 6.1) or print them (see section 5.7).
5	Change the unit of the displayed measured value section 9.2.1).

Measuring with AutoRead

The *Autoread* function (drift control) checks the stability of the measurement signal. The stability affects the reproducibility of a measured value. With identical measuring conditions, the deviation of the electromotive force of the electrode should be a maximum of ± 0.05 mV.

1	Switch to the *pH* window.
2	Use *AR* in the *pH* window to freeze the current measured value (Hold function).
3	Use *Start AR* in the *pH* window to start the measurement with AutoRead. *Stop AR* appears in the *pH* window and the background of the *AR* status indicator turns yellow.
4	Wait for a stable measured value. The measuring data are stored (see section 6.1) and the Hold function is activated again.
5	Use *AR* in the *pH* window to terminate AutoRead.

Note
Before accepting a measured value, make sure that it is stable for a longer period of time. To accept a measured value without waiting until it is stable, press *Stop AR* in the probe window.

9.5 Measuring with measuring methods

Note
The functions described in this chapter are only available for meters with ISE measurement function that can be operated by remote control, e. g. inoLab pH/ION 740, inoLab pH/ION/Cond 750.

The following methods are supported:

- *Standard addition ...*
- *Double standard addition ...*
- *Standard subtraction ...*
- *Sample addition ...*
- *Sample subtraction ...*
- *Blank value addition ...*

9.5.1 General course

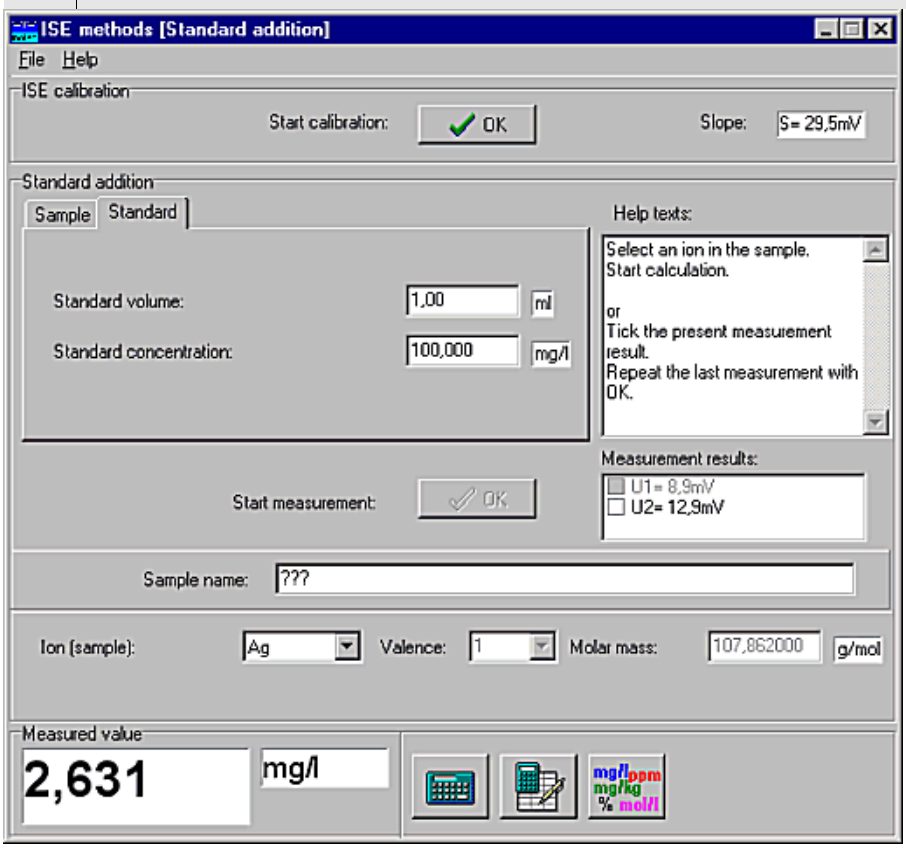
1	Perform the preparatory activities according to section 9.4.
2	Start the MultiLab® pilot.
3	Connect a temperature probe to the measuring system so that any temperature differences that are too high will be indicated during calibration.
4	Keep the standard solutions ready.
5	Adjust the temperature of the standard solutions.
6	Switch to the *pH* window.
7	Select the *ISE* menu item in the *Setup* menu. The ion concentration appears on the display.

Selecting a method

8	Select the *ISE methods* menu item in the *Setup* menu. The menu with the measuring methods opens.
9	Select a method. The *ISE methods* window for the selected methods opens.

Performing the measurement

10	Perform the measurement with the selected method (see section 9.5.2 to section 9.5.7). The *ISE methods* window appears to perform the measurement, here e.g. *Standard addition*.



11	Carry out all measurements of the measuring method according to the instructions in the *Help texts* field. The results of the individual measurements are taken over in the *Measurement results* field.

Note
After marking a measurement result with a tick, this measurement can be repeated. Measurement results with gray fields cannot be repeated because the relevant solutions were already changed.

Calculating and displaying measurement results

12	In the *ISE methods* window, with  carry out the calculation of the measurement result.
13	Use  to display the measuring record.
14	Use  to set the unit of the indication. Depending on the selected unit, a field for the *Molar mass* of the ion or the *Density* of the solution appears.
15	If necessary, enter the *Density* of the solution.

Note
If the *???* element is selected in the list of ions, the values for the required ion can be entered in the *Molar mass* or *Density* field, depending on the selected unit.

Starting a further measurement with the same method

16	Start the same method for a new sample with *File* / *Restart method*. The previously performed calibration for the method is retained.

Terminating the method

17	Terminate the method with *File* / *Exit*.

9.5.2 *Standard addition*

In the *Standard addition* procedure, a known amount of standard solution is added to the sample.

The ion concentration in the sample is calculated from the change in potential.

1	Select the measuring method (see section 9.5). The *ISE methods* (*Standard addition*) window opens.

Calibration

2	Prepare two standard calibration solutions.
3	Carry out the two-point calibration according to the user guidance with *Start calibration OK* (see section 9.3.1). The *Setting of X. ISE standard* window appears.
4	Immerse the electrode in the first standard solution.
5	Enter the concentration of standard solution 1, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
6	As soon as a stable value is achieved, the dialog box appears for entering the concentration of the second standard solution.
7	Immerse the electrode in the second standard solution.
8	Enter the concentration of standard solution 2, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
9	Wait for a stable value. The calibration record after the two-point calibration is displayed.
10	Use *Finish 2 point Cal* to finish the calibration. In the *ISE methods* (*Standard addition*) window, the *Sample* tab and the *Sample name* input field appear.

Measuring

11	Enter the actual volume in the *Sample volume* field.
12	Enter the actual volume in the *ISA/TISAB volume* field.
13	Enter a name for the sample in the *Sample name* field.
14	Thoroughly rinse the electrode with deionized water.
15	Immerse the electrode in the sample.

16	Add the specified amount of ISA/TISAB solution to the sample.
17	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
18	Wait for a stable value. The *Standard* tab sheet appears in the *ISE methods* (*Standard addition*) window. The measured value is taken over in the *Measurement results* field.
19	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
20	Enter the volume of the standard to be added in the *Standard volume* field.
21	Enter the concentration of the standard in the *Standard concentration* field.
22	Add the specified amount of standard solution to the sample.
23	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
24	Wait for a stable value. The measured value is taken over in the *Measurement results* field. A list appears to select the ion type in the sample.
25	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
26	In the *Ion (sample)* list, select the required ion.

Note
If an ion known by the program is selected from the list, the other input fields are blocked. If the *???* element is selected from the list, the values for the required ion can be entered in the *Molar mass* and *Valence* fields.

27	Calculate and display the measurement result (see section 9.5).

9.5.3 *Double standard addition*

In the *Double standard addition* procedure, a known amount of standard solution is added to the sample in two steps.

The ion concentration in the sample is calculated from the change in potential between the first and second addition of standard solution.

To ensure reproducibility, the second addition of standard solution must use a volume that is twice as big as the volume used in the first addition.

1	Select the measuring method (see section 9.5). The *ISE methods* (*Double standard addition*) window with the *Sample* tab and the input field *Sample name* opens.

Measuring

2	Enter the actual volume in the *Sample volume* field.
3	Enter the actual volume in the *ISA/TISAB volume* field.
4	Enter a name for the sample in the *Sample name* field.
5	Select the required ion in the *Ion (sample)* list.
6	Thoroughly rinse the electrode with deionized water.
7	Immerse the electrode in the sample.
8	Add the specified amount of ISA/TISAB solution to the sample.
9	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
10	Wait for a stable value. The *Standard* tab appears in the *ISE methods* (*Double standard addition*) window. The measured value is taken over in the *Measurement results* field.
11	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
12	Enter the concentration of the standard in the *Standard concentration* field.
13	Add the specified amount of standard solution to the sample.

14	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
15	Wait for a stable value. The measured value is taken over in the *Measurement results* field.
16	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
17	Enter the concentration of the standard in the *Standard concentration* field.
18	Add the specified amount of standard solution to the sample.
19	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
20	Wait for a stable value. The measured value is taken over in the *Measurement results* field. A list appears to select the ion type in the sample.
21	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
22	Select the required ion in the *Ion (sample)* list.

Note
If an ion known to the program is selected from the list, the other input fields are blocked. If the *???* element is selected from the list, the values for the required ion can be entered in the *Molar mass* and *Valence* fields.

23	Calculate and display the measurement result (see section 9.5).

9.5.4 *Standard subtraction*

In the *Standard subtraction* procedure, a known amount of standard solution is added to the sample (as complexing agent or precipitating agent) and, thus, the ion concentration lowered.

The ion concentration in the sample is calculated from the change in potential.

1	Select the measuring method (see section 9.5). The *ISE methods* (*Standard subtraction*) window opens.

Calibration

2	Prepare two standard calibration solutions.
3	Carry out the two-point calibration according to the user guidance with *Start calibration OK* (see section 9.3.1). The *Setting of X. ISE standard* window appears.
4	Thoroughly rinse the electrode with deionized water.
5	Immerse the electrode in the first standard solution.
6	Enter the concentration of standard solution 1, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
7	As soon as a stable value is achieved, the dialog box appears for entering the concentration of the second standard solution.
8	Thoroughly rinse the electrode with deionized water.
9	Immerse the electrode in the second standard solution.
10	Enter the concentration of standard solution 2, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
11	Wait for a stable value. The calibration record after the two-point calibration is displayed.
12	Use *Finish 2 point Cal* to finish the calibration. In the *ISE methods* (*Standard subtraction*) window, the *Sample* tab and the *Sample name* input field appear.

Measuring

13	Enter the volume of the test sample in the *Sample volume* field.
14	Enter the volume of the ISA/TISAB solution in the *ISA/TISAB volume* field.

15	Enter a name for the sample in the *Sample name* field.
16	Thoroughly rinse the electrode with deionized water.
17	Immerse the electrode in the sample.
18	Add the specified amount of ISA/TISAB solution to the sample.
19	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
20	Wait for a stable value. In the *ISE methods* (*Standard subtraction*) window, the *Standard* tab appears. The measured value is taken over in the *Measurement results* field.
21	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
22	Enter the volume of the standard to be added in the *Standard volume* field.
23	Enter the concentration of the standard in the *Standard concentration* field.
24	Add the specified amount of standard solution to the sample.
25	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
26	Wait for a stable value. The measured value is taken over in the *Measurement results* field. Lists appear to select the ion types in sample and standard.
27	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
28	Select the required ion in the *Ion (sample)* list.
29	Select the required ion in the *Ion (standard)* list.



Note
If an ion known by the program is selected from the list, the other input fields are blocked. If the *???* element is selected from the list, the values for the required ion can be entered in the *Molar mass* and *Valence* fields.

30	Calculate and display the measurement result (see section 9.5).

9.5.5 *Sample addition*

In the *Sample addition* procedure, a known amount of test sample is added to the standard solution.

The ion concentration in the sample is calculated from the change in potential.

1	Select the measuring method (see section 9.5). The *ISE methods* (*Sample addition*) window opens.

Calibration

2	Prepare two standard calibration solutions.
3	Carry out the two-point calibration according to the user guidance with *Start calibration OK* (see section 9.3.1). The *Setting of X. ISE standard* window appears.
4	Immerse the electrode in the first standard solution.
5	Enter the concentration of standard solution 1, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
6	As soon as a stable value is achieved, the dialog box appears for entering the concentration of the second standard solution.
7	Immerse the electrode in the second standard solution.
8	Enter the concentration of standard solution 2, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
9	Use *Finish 2 point Cal* to finish the calibration. In the *ISE methods* (*Sample addition*) window, the *Standard* tab and the *Sample name* input field appear.
10	Wait for a stable value. The calibration record after the two-point calibration is displayed.

Measuring

11	Enter the volume of the standard in the *Standard volume* field.
12	Enter the concentration of the standard in the *Standard concentration* field.
13	Enter the volume of the ISA/TISAB solution in the *ISA/TISAB volume* field.
14	Enter a name for the sample in the *Sample name* field.
15	Thoroughly rinse the electrode with deionized water.
16	Immerse the electrode in the standard.
17	Add the specified amount of ISA/TISAB solution to the sample.
18	Start the measurement of the standard with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
19	Wait for a stable value. The *Sample* tab appears in the *ISE methods* (*Sample addition*) window. The measured value is taken over in the *Measurement results* field.
20	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
21	Enter the volume of the test sample to be added in the *Sample volume* field.
22	Add the specified amount of sample to the standard solution.
23	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
24	Wait for a stable value. The measured value is taken over in the *Measurement results* field. A list appears to select the ion type in the sample.
25	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
26	In the *Ion (sample)* list, select the required ion.

Note
If an ion known by the program is selected from the list, the other input fields are blocked. If the *???* element is selected from the list, the values for the required ion can be entered in the *Molar mass* and *Valence* fields.

27	Calculate and display the measurement result (see section 9.5).

9.5.6 *Sample subtraction*

In the *Sample subtraction* procedure, a known amount of test sample is added to the standard solution.

The ion concentration in the sample is calculated from the change in potential.

The *Sample subtraction* is one method for the indirect determination of ions. It is used for the determination of ions for which no direct determination is possible.

A sample addition of 1% of the volume of the standard solution prevents the sample matrix having an interfering influence on the measurement.

1	Select the measuring method (see section 9.5). The *ISE methods* (*Sample subtraction*) window opens.

Calibration

2	Prepare two standard calibration solutions.
3	Carry out the two-point calibration according to the user guidance with *Start calibration OK* (see section 9.3.1). The *Setting of X. ISE standard* window appears.
4	Thoroughly rinse the electrode with deionized water.
5	Immerse the electrode in the first standard solution.
6	Enter the concentration of standard solution 1, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
7	As soon as a stable value is achieved, the dialog box appears for entering the concentration of the second standard solution.
8	Thoroughly rinse the electrode with deionized water.
9	Immerse the electrode in the second standard solution.

10	Enter the concentration of standard solution 2, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
11	Wait for a stable value. The calibration record after the two-point calibration is displayed.
12	Use *Finish 2 point Cal* to finish the calibration. In the *ISE methods* (*Sample subtraction*) window, the *Standard* tab and the *Sample name* input field appear.

Measuring

13	Enter the volume of the standard in the *Standard volume* field.
14	Enter the concentration of the standard in the *Standard concentration* field.
15	Enter the volume of the ISA/TISAB solution in the *ISA/TISAB volume* field.
16	Enter a name for the sample in the *Sample name* field.
17	Thoroughly rinse the electrode with deionized water.
18	Immerse the electrode in the standard.
19	Add the specified amount of ISA/TISAB solution to the sample.
20	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
21	Wait for a stable value. In the *ISE methods* (*Sample subtraction*) window, the *Sample* tab appears. The measured value is taken over in the *Measurement results* field.
22	If necessary, repeat the measurement. To do so: - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
23	Enter the volume of the test sample in the *Sample volume* field.
24	Add the specified amount of sample solution standard.
25	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.

26	Wait for a stable value. The measured value is taken over in the *Measurement results* field. Lists appear to select the ions in sample and standard.
27	If necessary, repeat the measurement. - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
28	In the *Ion (sample)* list, select the required ion.
29	In the *Ion (standard)* list, select the required ion.

Note
If an ion known by the program is selected from the list, the other input fields are blocked. If the *???* element is selected from the list, the values for the required ion can be entered in the *Molar mass* and *Valence* fields.

30	Calculate and display the measurement result (see section 9.5).

9.5.7 *Blank value addition* (Standard addition with blank value correction)

In the *Blank value addition* procedure, a known amount of standard solution is added to the sample in two steps.

The ion concentration in the linear range of the electrode characteristic curve is increased with the first addition.

The second addition is equivalent to the standard addition.

The ion concentration in the sample is calculated from the change in potential.

1	Select the measuring method (see section 9.5). The *ISE methods* (*Blank value addition*) window opens.

Calibration

2	Prepare two standard calibration solutions.
3	Carry out the two-point calibration according to the user guidance with *Start calibration OK* (see section 9.3.1). The *Setting of X. ISE standard* window appears.
4	Immerse the electrode in the first standard solution.

5	Enter the concentration of standard solution 1, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
6	As soon as a stable value is achieved, the dialog box appears for entering the concentration of the second standard solution.
7	Immerse the electrode in the second standard solution.
8	Enter the concentration of standard solution 2, and confirm with *OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
9	Wait for a stable value. The calibration record after the two-point calibration is displayed.
10	Use *Finish 2 point Cal* to finish the calibration. In the *ISE methods* (*Blank value addition*) window, the *Sample* tab and the *Sample name* input field appear.

Measuring

11	Enter the actual volume in the *Sample volume* field.
12	Enter the actual volume in the *ISA/TISAB volume* field.
13	Enter the volume of the blank value solution in the *Volume of the blank value solution* field.
14	Enter the concentration of the blank value solution in the *Concentration of the blank value solution* field.
15	Enter a name for the sample in the *Sample name* field.
16	Thoroughly rinse the electrode with deionized water.
17	Immerse the electrode in the sample.
18	Add the specified amount of ISA/TISAB solution to the sample.
19	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
20	Wait for a stable value. The measured value is taken over in the *Measurement results* field. The *Standard* tab appears in the *ISE methods* (*Blank value addition*) window.

21	If necessary, repeat the measurement. To do so: - Mark the measurement result with a tick. - Repeat the measurement with *Start measurement OK*.
22	Enter the volume of the standard to be added in the *Standard volume* field.
23	Enter the concentration of the standard in the *Standard concentration* field.
24	Add the specified amount of standard solution to the sample.
25	Start the measurement of the sample with *Start measurement OK*. The electromotive force of the electrode U (in mV) and the status indicator *AR* are displayed during the measurement.
26	Wait for a stable value. The measured value is taken over in the *Measurement results* field. A list appears to select the ion type in the sample.
27	In the *Ion (sample)* list, select the required ion.

Note
If an ion known by the program is selected from the list, the other input fields are blocked. If the *???* element is selected from the list, the values for the required ion can be entered in the *Molar mass* and *Valence* fields.

28	Calculate and display the measurement result (see section 9.5).

10 Dissolved oxygen (D. O.)

Note
The functions described in this chapter are only available for meters with D. O. measurement function that can be operated by remote control, e. g. inoLab 740 Oxi, BSB/BOD, Multi.

10.1 Settings for D. O. measurements

In order to achieve comparable and reproducible measuring results, we recommend checking the current settings before measuring.

10.1.1 Determining the measuring range

Two measuring ranges with different resolutions are available for D. O. measurements.

- Range 0 ... 19.99 mg/l oxygen.
  Standard range for all aqueous samples.
- Range 0 ... 90.0 mg/l oxygen.
  This may be necessary for non-aqueous samples (for measuring ranges: see operating manual of your meter).

Automatic selection of the measuring range

1	Switch to the *O2* window.
2	Select the *Autorange* menu item in the *Setup* menu. The *ARng* status indicator appears.

10.1.2 Displaying the air pressure

You can display the current air pressure in mbar.

Note
The value always shows the absolute air pressure. It does not refer to the altitude above sea level.

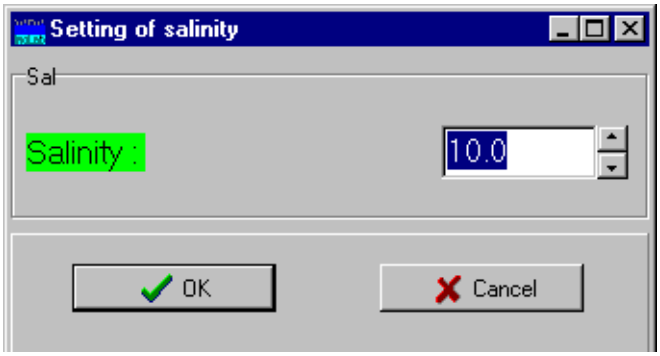
1	Switch to the *O2* window.
2	Select the *Air pressure...* menu item in the *Setup* menu. An *Info* window with the current air pressure value appears.
3	Use *OK to close the Info* window.

10.1.3 Salinity correction

When measuring the concentration of test samples with a salt content of more than 1 g/l, a salinity correction is required. For this, you have to enter the salinity equivalent of the test sample (range 0.0 - 70.0) and to switch on the salinity correction.

Entering the salinity

1	Switch to the *O2* window.
2	Select the *Salinity setting...* menu item in the *Setup* menu. The dialog box for the salinity appears.



3	Enter the salinity value.
4	Use *OK* to confirm the value and terminate the input. The value that was entered for the salinity correction is used. The salinity correction is active.

Switching the salinity correction on/off

You can switch the salinity correction on/off depending on whether it is to be taken into account or not. If the salinity correction is switched on, the *Sal* display appears in the *O2* window.

1	Switch to the *O2* window.
2	Select the *Salinity correction* menu item in the *Setup* menu. The salinity correction is active. The *Sal* display appears in the *O2* window.

Switching the reference factor on/off

You can switch the reference factor on/off depending on whether it is to be taken into account or not. If the salinity correction is switched on, the *Ref* display appears in the *O2* window.

1	Switch to the *O2* window.
2	Select the *Reference factor* menu item in the *Setup* menu. The Reference factor is active. The *Ref* display appears in the *O2* window.

10.1.4 Resetting to default settings

You can reset (initialize) the settings for the D. O. measurement to the default settings.

The following functions are reset:

Measured parameter	D. O. concentration
Relative slope (S_{Rel})	1.00
Salinity (value)	0.0
Salinity (function)	Off

Reset O2

Reset O2 resets all settings for D. O. measurements to the default values.

1	Switch to the *O2* window.
2	Select the *Reset O2* menu item in the *Setup* menu. The default settings for D. O. measurements are restored.



Note
In a reset, the calibration data are reset to the default values. Recalibrate after performing a reset.

10.2 Calibrating for D. O. measurements

Why calibrate?

D. O. probes age. This changes the slope of the D. O. probe. As a result, an inexact measured value is displayed. Calibration determines the current slope of the probe and stores this value in the measuring instrument.

After calibrating the D. O. probe in the air calibration vessel, the measuring system displays a value of approx. 102% oxygen saturation. If the value of the oxygen saturation from checking the probe in the air calibration vessel is different from this, it is necessary to calibrate or clean the probe.

If possible, check the probe signal in the air calibration vessel before each series of measurements.

When to calibrate?

- At regular intervals (14 days)
- After connecting another D. O. probe

Calibration procedures

The following calibration procedures are provided:

- Calibration in water vapor-saturated air.
  To calibrate the CellOx 325, use the OxiCal®-SL air calibration vessel (accessory), to calibrate the DurOx 325, use the OxiCal®-D air calibration vessel (contained in the scope of delivery of the sensor).
- Calibration via a comparison measurement(1) (e. g. Winkler titration according to DIN EN 25813 or ISO 5813).
  At the same time, the relative slope is adapted to the comparison measurement by a correction factor.

AutoRead

During calibration, the AutoRead function is automatically activated. The *AR* status indicator appears.

Calibration record

After calibration, a calibration record is displayed in a separate window, e. g.:

```
Calibration O2
Cal date: 05.12.1999
Cal time: 22:46
Cal interval: 14 days
OxiCal
Relative slope 0.73
Probe ++
```

You can display or print calibration records at any time (section 6.7).

Calibration evaluation

After the calibration, the measuring instrument evaluates the current status of the system. The evaluation is made according to the relative slope. Low values indicate that the electrolytic solution will soon be depleted and the probe will have to be regenerated.

(1) for the inoLab Oxi 740 and BSB/BOD 740 measuring instruments

Display		Relative slope
		S = 0.8 ... 1.25
		S = 0.7 ... 0.8
		S = 0.6 ... 0.7
E3	Eliminate the error (see operating manual of your meter)	S < 0.6 or S > 1.25

10.2.1 Settings

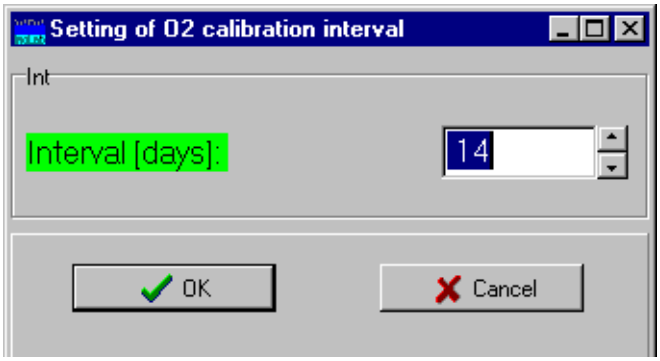
Specifying the calibration interval

The calibration interval determines the time interval between regular system calibrations.

The program reminds you to calibrate regularly by the red probe symbol in the probe window.

The calibration interval is set to 14 days in the factory. You can change the interval (1-999 days).

1	Switch to the *O2* window.
2	Select the *Calibration interval...* menu item in the *Calibration* menu. The dialog box for the calibration interval appears.



3	Input the required interval (days).
4	Use *OK* to confirm the calibration interval entered.

Select calibration procedure (1)

The following calibration procedures can be selected:

- *OxiCal*
  Calibration with the air calibration vessel
- *OxiCal Ref*(1)
  Calibrating via a comparison measurement

1	Switch to the *O2* window.
2	Select the *Type of O2 calibration* menu item in the *Calibration* menu.
3	Select the calibration procedure. The selected calibration procedure is active.

(1) for the inoLab Oxi 740 and BSB/BOD 740 measuring instruments

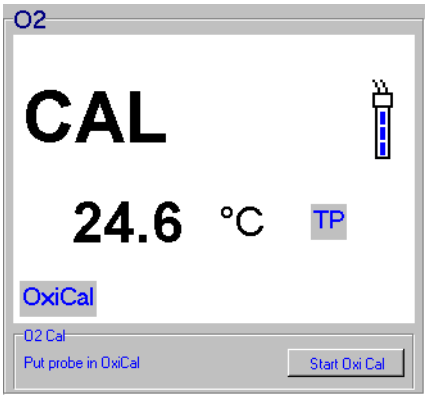
10.2.2 Calibration with the air calibration vessel

Proceed as follows to calibrate the measuring system:

1	Connect the D. O. probe to the measuring instrument.
2	Select the *OxiCal* calibration procedure (page 130).
3	Keep the OxiCal®-SL air calibration vessel ready.

Note
The sponge in the air calibration vessel must be moist (not wet).
Observe the instructions in the OxiCal®-SL operating manual.

4	Insert the D. O. probe into the air calibration vessel.
5	Press the key.

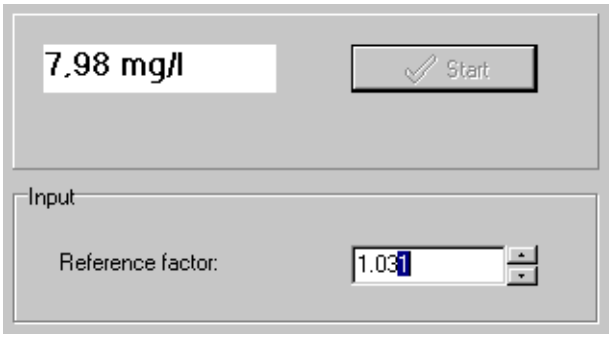


6	Use *Start Oxi Cal* in the sensor window or the key on the StirrOx G probe to start the measurement with AutoRead. The *AR* display indicator has a yellow background during the measurement.
7	Wait for a stable value. The calibration record is displayed.
8	Use *Finish Oxi Cal* to finish the calibration.

Note
The oxygen saturation value measured in the air calibration vessel should be approx. 102%.

10.2.3 Calibrating via a comparison measurement (1)

1	Connect the D. O. probe to the measuring instrument.
2	Select the *OxiCal Ref* calibration procedure (page 130).
3	Press the key. The *OxiCal Ref* window appears.
4	Immerse the D. O. probe in the calibrating solution.
5	Use *Start* in the *OxiCal Ref* window to start the measurement with AutoRead..
6	Wait for the end of the AutoRead function.



7	Perform a comparison measurement, e. g. Winkler titration, with the calibrating solution (determine the nominal value). Leave the measuring instrument switched on until the nominal value is determined.
8	Increase/reduce the correction factor until the displayed measured value corresponds to the nominal value.
9	Use *Exit* in the *OxiCal Ref* window to finish the calibration.
10	Remove the D. O. probe from the calibrating solution.

(1) for the inoLab Oxi 740 and BSB/BOD 740 measuring instruments

10.3 Measuring the D. O. content

Using a single D. O. probe, the measuring system can display the D. O. concentration, D. O. saturation and the D. O. partial pressure of a solution.

10.3.1 Preparatory activities

1	Connect the D. O. probe to the measuring instrument. The measuring system recognizes the probe and displays a D. O. measured value in the *O2* window.
2	Calibrate or check the measuring system with the probe (see section 10.2).

Note
An incorrect calibration of the measuring system with D. O. probes will cause incorrect measured values. Calibrate at regular intervals.

Temperature probe
The D. O. probe has an integrated temperature sensor that always measures the current temperature of the test sample.

Probe with stirrer
The StirrOx G D. O. probe has an integrated temperature sensor and stirrer. Using the key on the probe, you can switch the stirrer on and off. If the stirrer is on, the status indicator *StirrerOn* appears in the *O2 window.*

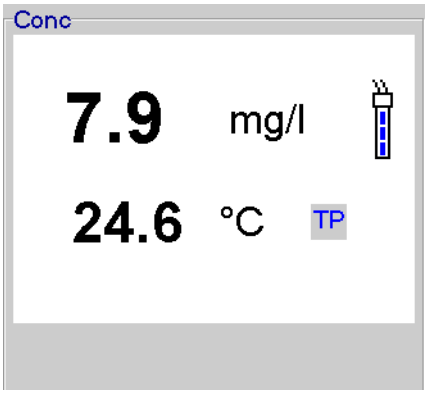
Salinity correction
When measuring the concentration in test samples with a salt content of more than 1 g/l, a salinity correction is required.

10.3.2 Measuring

1	Perform the preparatory activities.
2	Immerse the D. O. probe in the test sample. A measured D. O. value appears in the *O2* window.

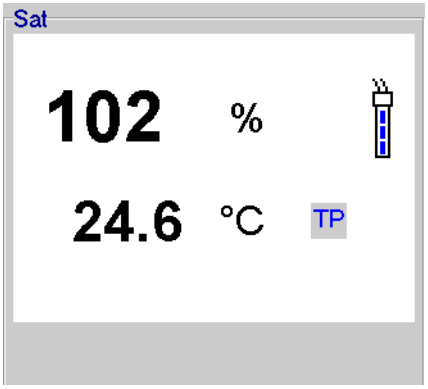
D. O. concentration

3	Use to switch to *Conc*.



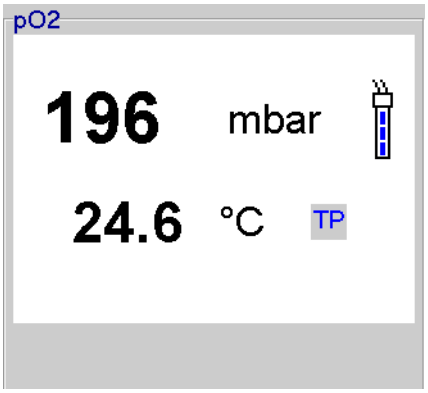
D. O. saturation

4	Use to switch to *Sat*.



D. O. partial pressure

5	Use to switch to *pO2*.



6	Save the measured data (see section 6.1). Print the measured data (see section 5.7).

Measuring with AutoRead

The AutoRead function checks the stability of the measurement signal.

1	Switch to the *O2* window.
2	Use *AR* in the *O2* window to freeze the current measured value (Hold function).
3	Use *Start AR* in the *O2* window or the key on the StirrOx G probe to start the measurement with AutoRead. *Stop AR* appears in the *O2* window and the background of the *AR* status indicator turns yellow. When the StirrOx G probe with integrated stirrer is used, the *Stirrer On* display indicator also appears.
4	Wait for a stable measured value. The measured data are stored (see section 6.1) and the Hold function is activated again.
5	Use *AR* in the *O2* window to terminate AutoRead.

Note
Before accepting a measured value, make sure that it is stable for a longer period of time. To accept a measured value without waiting until it is stable, press *Stop AR* in the probe window.

Reproducibility criteria

With identical measurement conditions, the following applies:

Measured parameter	Repro-ducibility	Setting time
D. O. concentration	Better than 0.05 mg/l	> 10 sec
D. O. saturation index	Better than 0.6 %	> 10 sec
Oxygen partial pressure	Better than 0.6 mbar	> 10 sec

11 BOD

Note
The functions described in this chapter are only available for meters with BOD measurement function that can be operated by remote control, e. g.inoLab 740 BSB/BOD.

11.1 General information

The following functions and settings are possible for BOD measurements:

- BOD measurement according to EN 1899-1 or EN 1899-2
- Administration of any number of samples
- The use of a maximum of 32 sample dilutions per sample.
- The use of a maximum of 32 dilution waters (blank solutions)
- The setting of the incubation time (1 to 32 days).
- The assignment of names to the dilution waters, samples, sample dilutions and routines (max. xx characters for each name).
- Automation by using BOD routines (see section 11.6);
- Automation by using the StirrOx G oxygen probe with integrated stirrer;
  This enables measurement routines to be carried out simply with the key on the probe.
- Automation through the use of a barcode reader (see section 11.1.2);
  This makes the entry of the names of samples, sample dilutions and blank value solutions unnecessary.
- The editing and printout of the BOD record (see section 11.4).

Preparatory activities

Preparatory activities before the measurement:

1	For measurements according to EN 1899-1 only: Prepare dilution waters and sample dilutions.
2	For measurements according to EN 1899-1 only: If the sample is prediluted, calculate the predilution factor and have it ready for entering.

Note
The samples are not diluted with the procedure for determination of the BOD according to EN 1899-2.

With predilution, a certain amount of sample is diluted to a certain total volume.

The factor of the predilution correspond to the ratio, volume of the diluted sample / volume of the analysis sample.

Example:
400 ml sample is diluted to a total volume of 1000 ml.
The dilution factor is: 1000/400 = 2.5.

3	Calibrate or check the measuring system with the probe (see section 10.2).

Note
An incorrect calibration of the measuring system with D. O. probes will cause incorrect measured values. Perform a calibration at regular time intervals (see section 10.2).

Note
The drift control (AutoRead) function corresponds to the AutoRead function in section 10.3.2 MEASURING. BOD measurements are automatic AutoRead measurements.

11.1.1 Operation with the StirrOx G oxygen probe

Use the key on the StirrOx G to switch on the stirrer and start a measurement with AutoRead at the same time.

This enables the automation of the BOD measurements.

11.1.2 Operation with a barcode reader

Using a barcode reader makes it possible to fill out name fields in the windows automatically using the barcode reader.

In addition, it is possible to start a measurement automatically after reading in a name field with the barcode by activating the *Scanner function*.

11.1.3 Operation with *Scanner function*

It is possible to start a measurement automatically after reading the barcode by activating the *Scanner function*.

Note
If the *Scanner function* is active, always check all displayed data and finish the input by reading in the name in the name field before

measuring. After reading in the barcode, the BOD measurement is automatically started.

If the *Barcode reader* function is switched on (see section 5.5), *Scanner function* appears in the status line of the *BOD Start measurement* and *BOD end measurement* window.

11.2 Measuring BOD (EN 1899-1)

11.2.1 Procedure

BOD measurements run according to the following sequence:

- Start measurement at the beginning of the incubation period
  - Measurement of the dilution waters
  - Measurement of the sample dilutions
- End measurement after expiry of the incubation period
  - Measurement of the dilution waters
  - Measurement of the sample dilutions
- Editing and outputting the BOD record

It is possible to input names of samples, sample dilutions and dilution waters via a barcode reader (see section 11.1.2).

11.2.2 Start measurement according to EN 1899-1

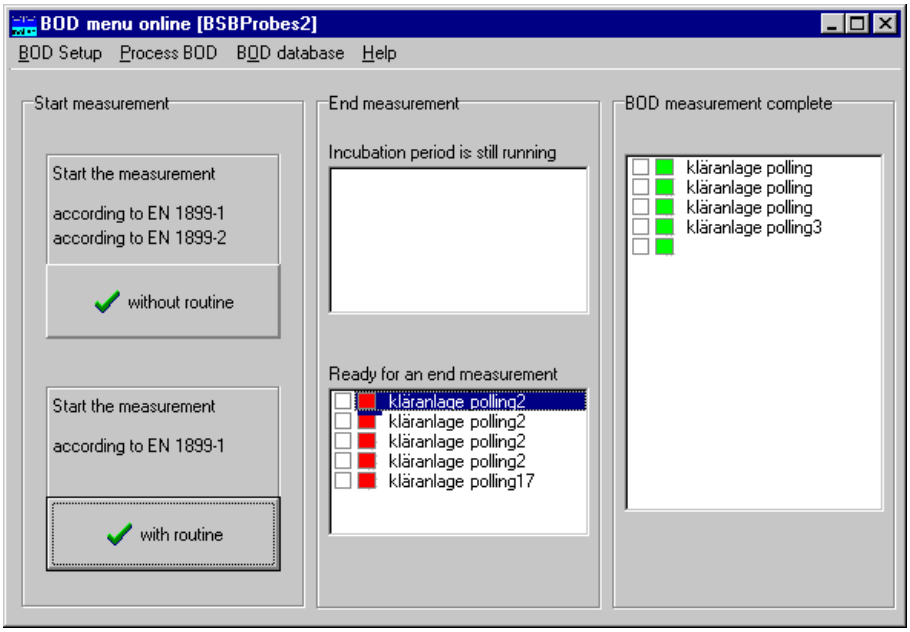
Have the following data ready before the measurement:

- Number of dilution waters (max. 32)
- Number of sample dilutions (max. 32)
- Amount of sample (in ml) and total volume (in ml) of each sample dilution
- Incubation period (5 to 30 days)
- Names for dilution waters, samples, sample dilutions and routines (each with a max. of 250 characters)



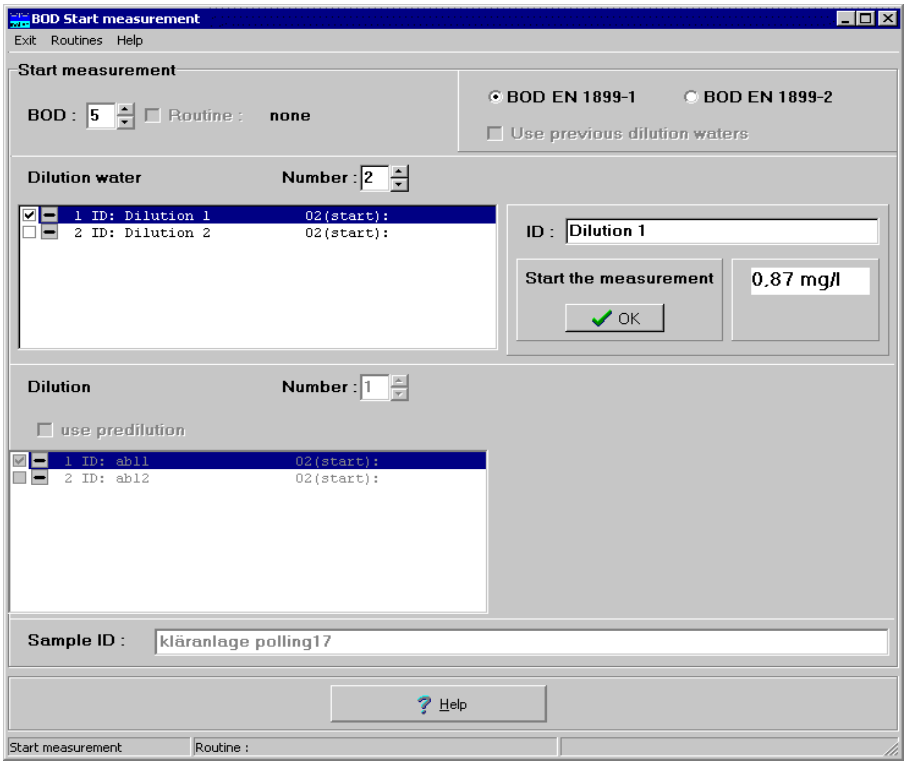
Note
The expiry of a start measurement with routine corresponds to the start measurement without routine. Entry fields are filled out with the default values of the routine.

1	Switch to the *O2(BSB/BOD)* window.
2	Using *BOD Setup/Process ...*, open the *BOD menu online* window.
3	If necessary, select another database in the *BOD database* menu (see section 11.5). The active database is displayed next to the window name.



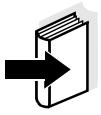
4 Select *Start the measurement without routine* or *Start the measurement with routine* (creating/saving routines, see section 11.6.1 SETTING UP ROUTINES).

- Select *Start the measurement without routine*:
  The *BOD Start measurement* window opens.
- Select *Start the measurement with routine*:
  After a stored routine has been selected, the *BOD Start measurement* window opens.



5	Select the standard, *BOD EN 1899-1*.
6	Only when measuring using a routine: Switch using the selected routine on or off in the *Routine* field.
7	If dilution waters that have already been measured will be used to determine the blank value for this test sample: Activate *Take over previous dilution waters ?*.
8	Set the number of days for the BOD measurement in the *BOD* field.
9	Set the number of dilution waters (1-32) in the *Dilution water Number* field.
10	Tick a dilution water in the *Dilution water* list.
11	Enter a name in the *ID* field.
12	Submerse the probe in the dilution water.
13	Start the measurement with *OK* in the *Start the measurement* field. The AutoRead measurement starts. As soon as a stable value is recognized, the next dilution water is automatically marked with a tick. When all dilution waters have been measured, the first entry in the *Dilution water* list is automatically marked.
14	Repeat from step 10 to step 13 until all dilution waters are measured.
15	Enter a name for the samples in the *Sample ID* field.
16	Set the number of dilutions (1-32) in the *Dilution Number* field.
17	When using samples with predilution: Tick the *use predilution* field and enter the dilution factor.
18	Tick a dilution in the *Dilution* list.
19	Enter the volume (ml) of the dilution in the *Volume of the dilution* field.
20	Enter the volume (ml) of the test sample in the *Volume of the sample* field.
21	Enter a name in the *ID* field.

22	Immerse the probe in the sample.
23	Start the measurement with *OK* in the *Start the measurement* field. The AutoRead measurement starts. As soon as a stable value is recognized, the next dilution is automatically marked with a tick. When all dilutions have been measured, the first entry in the *Dilution* list is automatically marked.
24	Repeat from step 19 to step 23 until all dilutions are measured.



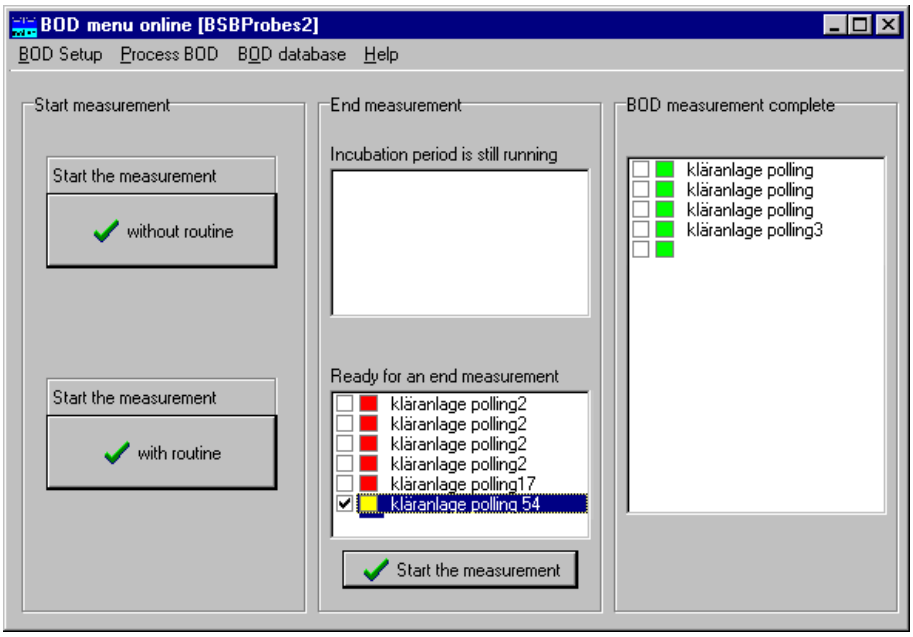
Note
To reuse the settings of this measurement for later measurements, you can save the settings as a routine (see section 11.6).

11.2.3 End measurement according to EN 1899-1

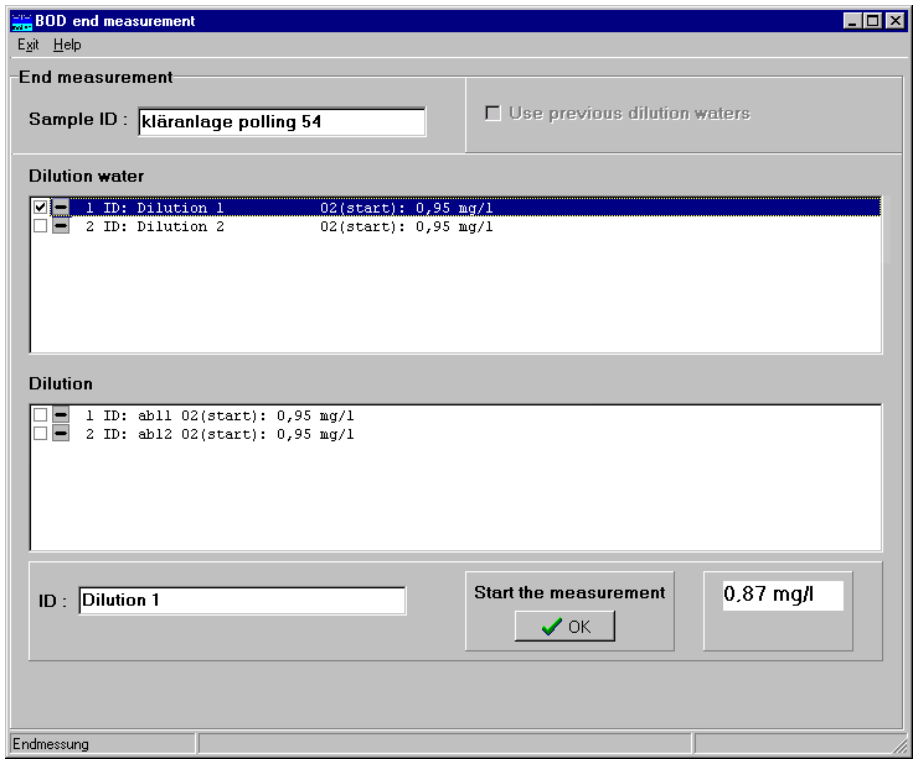
The end measurement is carried out after the incubation period expires.

Note
In the case of an end measurement, any order of the measurement of dilution waters and sample dilutions is acceptable. The identification causes the correct assignment of the start measurement to the measured value.

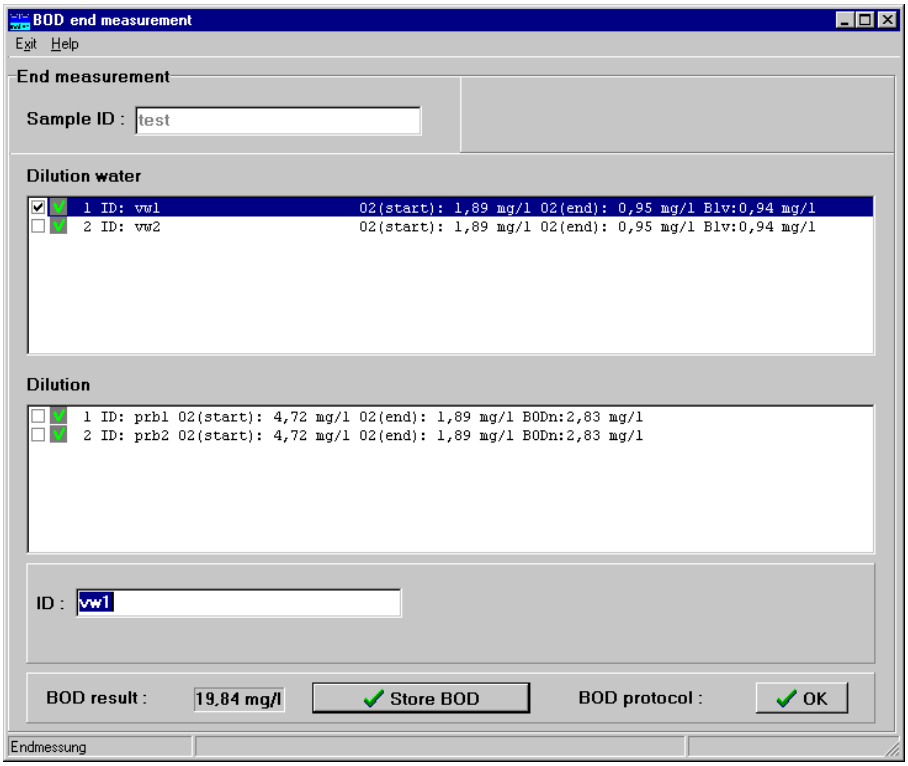
1	Switch to the *O2(BSB/BOD)* window.
2	Using *BOD Setup/Process ...*, open the *BOD menu online* window.



3	If necessary, select another database in the *BOD database* menu (see section 11.5). The active database is displayed next to the window name.
4	Tick a test sample in the *Ready for an end measurement* list. The *Start the measurement* button appears. yellow: Time for end measurement reached red: Time for end measurement exceeded
5	Open the *BOD end measurement* window with *Start the measurement*.



6	Tick a dilution water in the *Dilution water* list.
7	Submerse the probe in the dilution water.
8	Start the measurement with *OK* in the *Start the measurement* field. The AutoRead measurement starts. As soon as a stable value is recognized, the next dilution water is automatically marked with a tick. When all dilution waters have been measured, the first entry in the *Dilution* list is automatically marked.
9	Repeat from step 10 to step 13 until all dilution waters are measured.
10	Tick a dilution in the *Dilution* list.
11	Immerse the probe in the sample.
12	Start the measurement with *OK* in the *Start the measurement* field. The AutoRead measurement starts. As soon as a stable value is recognized, the next dilution is automatically marked with a tick.
13	Repeat from step 19 to step 23 until all dilutions are measured. The *Store BOD* button appears.



14	If necessary, display the record. To do so, call up the BOD record of the current end measurement with *OK* in the *BOD protocol* field. The *BOD protocol* window opens. If necessary, save or print the record.
15	If necessary, edit the record. You can exclude from the BOD calculation individual dilution waters or dilutions. These values appear in the record but are not used to calculate the BOD. To do so, mark a dilution water or a dilution in the *BOD end measurement* window and click it with the secondary mouse button. A menu with the *Remove* or *Add* functions appears. Samples that have been removed in the *BOD end measurement* window are canceled red.
16	If necessary, display the edited record. To do so, call up the record of the current end measurement with *OK* in the *BOD protocol* field. If necessary, save or print the record.
17	Save the BOD record with *Store BOD*.

18	Close the filter window with *Terminate/Terminate*. A security prompt appears
19	Confirm the safety query with *Yes*. The window is closed. If the current BOD record has not yet been saved, a safety query to save the BOD record appears.
20	Confirm the safety query with *Yes*. The record is saved. The window is closed.

11.2.4 Stopping the BOD measurement

You can stop the measurement process at any time during a start measurement or end measurement.

1	Close the window with *Terminate/Terminate*. A security prompt appears
2	Confirm the safety query with *Yes*. The window is closed. The entries and measurements made up to now are deleted.

Note
The data of the start measurement are retained when an end measurement is stopped.

11.3 Measuring BOD (EN 1899-2)

11.3.1 Procedure

BOD measurements run according to the following sequence:

- Start measurement at the beginning of the incubation period
- End measurement after expiry of the incubation period
- Editing and outputting the BOD record

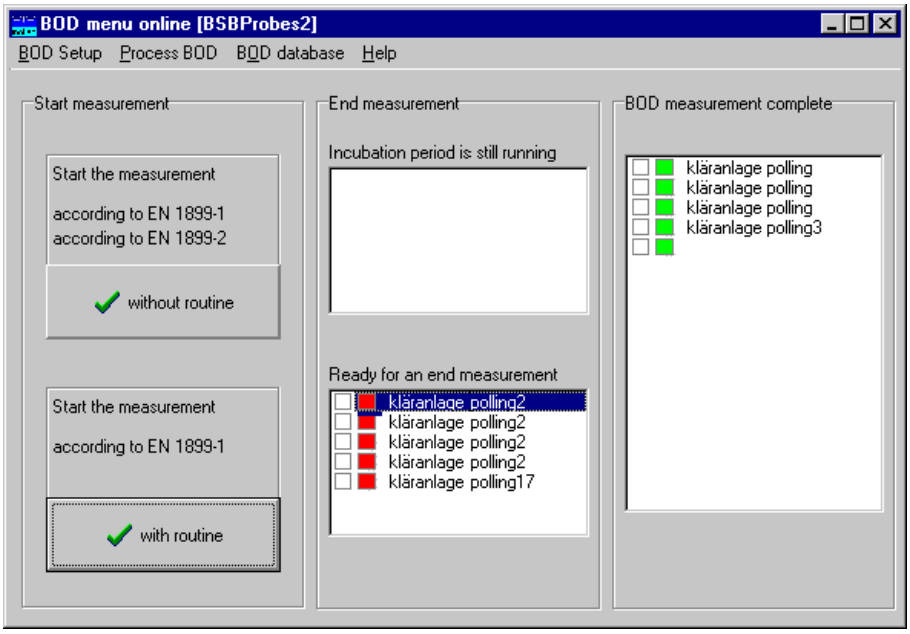
It is possible to input names of samples, sample dilutions and dilution waters via a barcode reader (see section 11.1.2).

11.3.2 Start measurement according to EN 1899-2

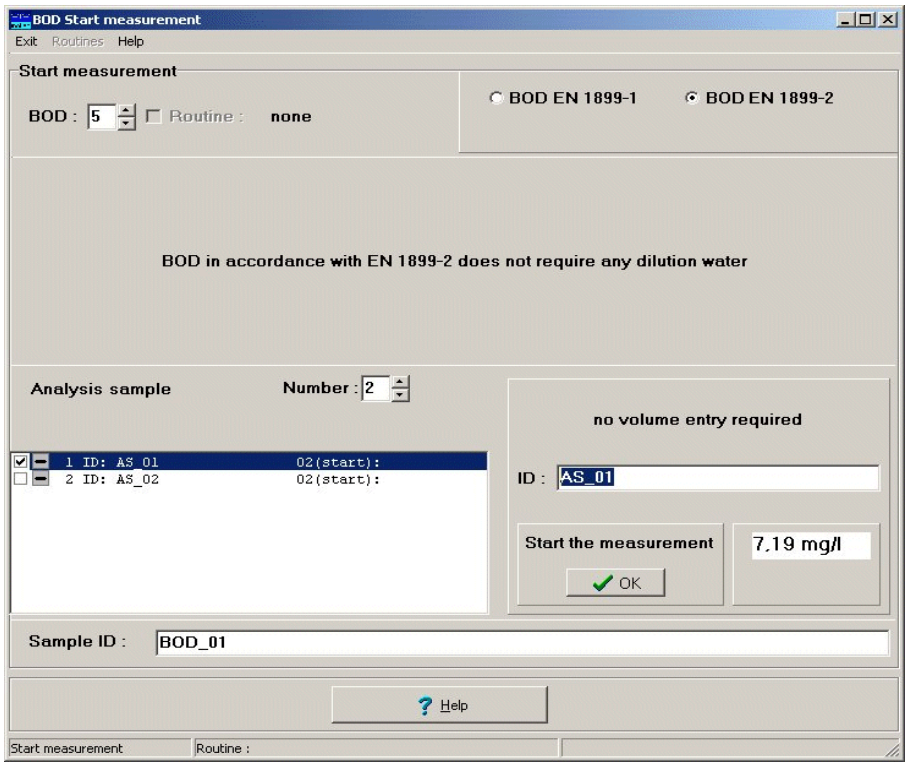
Have the following data ready before the measurement:

- Number of analysis samples (max. 32)
- Incubation period (5 to 30 days)
- Names analysis samples (each with a max. of 250 characters)

1	Switch to the *O2(BSB/BOD)* window.
2	Using *BOD Setup/Process ...*, open the *BOD menu online* window.
3	If necessary, select another database in the *BOD database* menu (see section 11.5). The active database is displayed next to the window name.



4	Select *Start the measurement without routine*: The *BOD Start measurement* window opens.
5	Select the standard, *BOD EN 1899-2*.



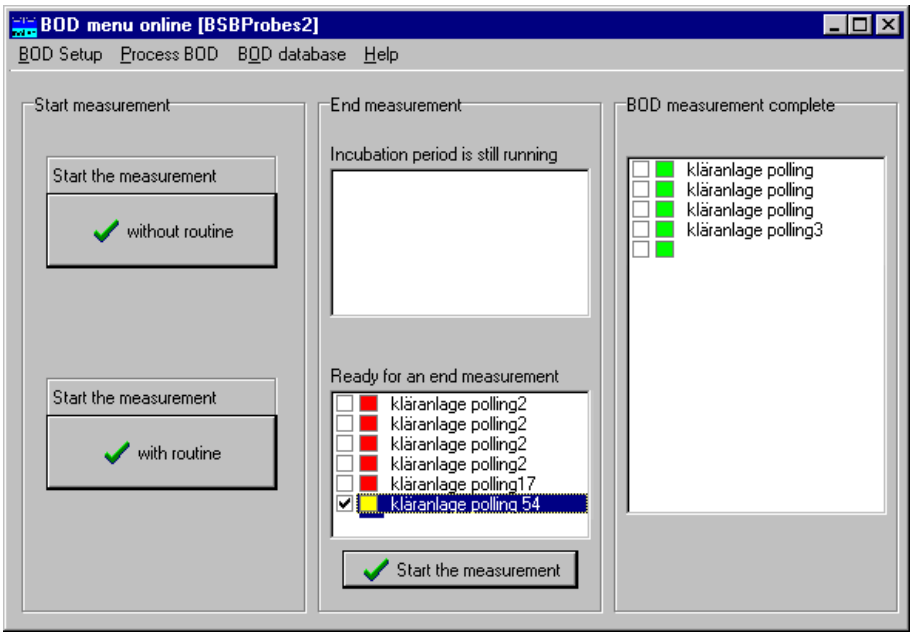
6	Set the number of days for the BOD measurement in the *BOD* field.
7	Enter a name for the samples in the *Sample ID* field.
8	Enter a name in the *ID* field.
9	Immerse the probe in the analysis sample.
10	Start measurement in the *Start the measurement* field with *OK*. The AutoRead measurement starts. As soon as a stable value is recognized, the next analysis sample is automatically marked with a tick. When all analysis samples have been measured, the first entry in the *Dilution* list is automatically marked.
11	Repeat from step 8 to step 23 until all analysis samples are measured.

11.3.3 End measurement according to EN 1899-2

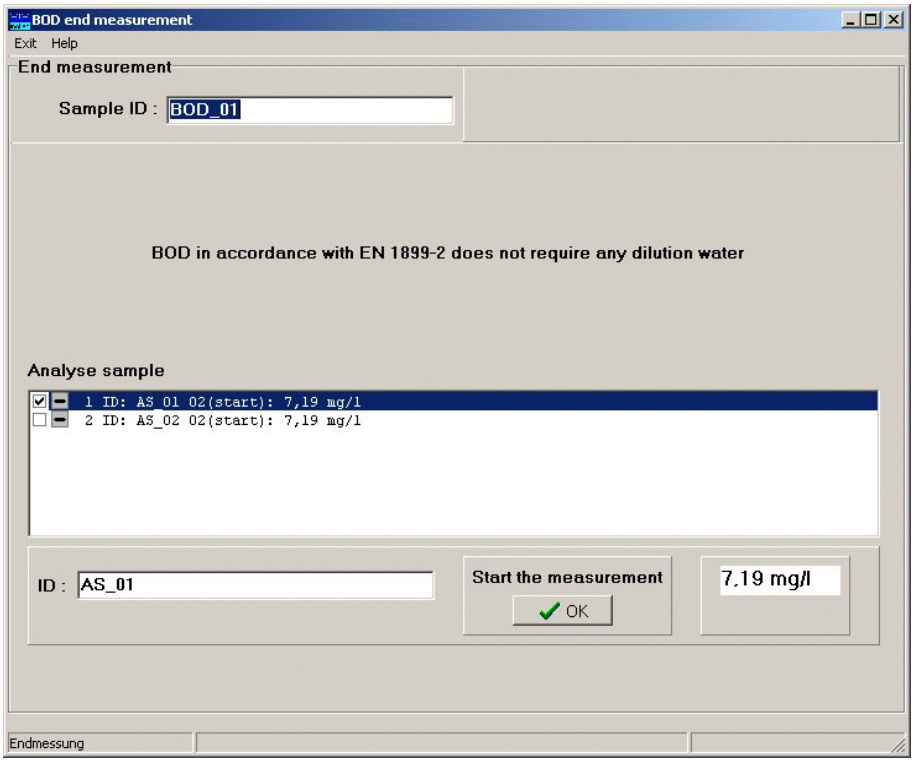
The end measurement is carried out after the incubation period expires.

Note
In the case of an end measurement, any order of the measurement of dilution waters and sample dilutions is acceptable. The identification causes the correct assignment of the start measurement to the measured value.

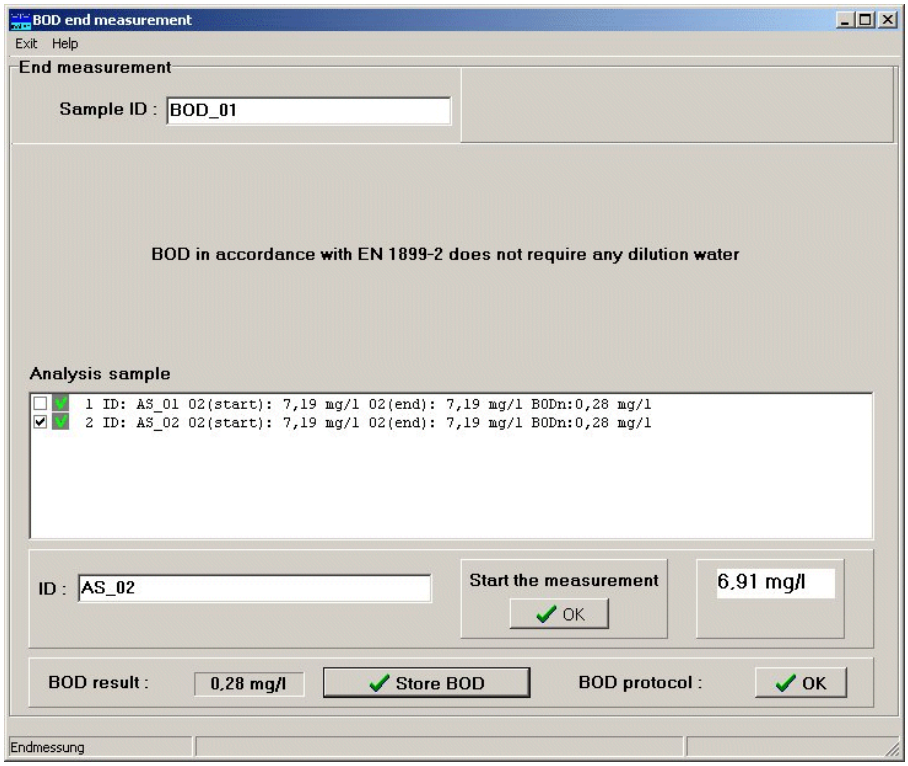
1	Switch to the *O2(BSB/BOD)* window.
2	Using *BOD Setup/Process ...*, open the *BOD menu online* window.



3	If necessary, select another database in the *BOD database* menu (see section 11.5). The active database is displayed next to the window name.
4	Tick a test sample in the *Ready for an end measurement* list. The *Start the measurement* button appears. yellow: Time for end measurement reached red: Time for end measurement exceeded
5	Open the *BOD end measurement* window with *Start the measurement*.



6	Tick an analysis sample in the *Analysis sample* list.
7	Immerse the probe in the analysis sample.
8	Start measurement in the *Start the measurement* field with *OK*. The AutoRead measurement starts. As soon as a stable value is recognized, the next analysis sample is automatically marked with a tick.
9	Repeat from step 6 to step 8 until all analysis samples are measured. The *Store BOD* button appears.



10	If necessary, display the record. To do so, call up the BOD record of the current end measurement in the *BOD protocol* field with*OK*. The *BOD protocol* window opens. If necessary, save or print the record.
11	If necessary, edit the record. Individual analysis samples can be excluded from the BOD calculation. These values appear in the record but are not used to calculate the BOD. To do so, highlight an analysis sample in the *BOD end measurement* window and click it with the right mouse button. A menu with the *Remove* or *Add* functions appears. Samples that have been removed are canceled red in the *BOD end measurement* window.
12	If necessary, display the edited record. To do so, call up the BOD record of the current end measurement in the *BOD protocol* field with *OK*. If necessary, save or print the record.
13	Save the BOD record with *Store BOD*.

14	Close the window with *Terminate/Terminate*. A security prompt appears.
15	Confirm the security prompt with *Yes*. The window is closed. If the current BOD record has not yet been saved, a security prompt to save the BOD record appears.
16	Confirm the security prompt with *Yes*. The record is saved. The window is closed.

11.3.4 Stopping the BOD measurement

You can stop the measurement process at any time during a start measurement or end measurement.

1	Close the window with *Terminate/Terminate*. A security prompt appears
2	Confirm the safety query with *Yes*. The window is closed. The entries and measurements made up to now are deleted.



Note
The data of the start measurement are retained when an end measurement is stopped.

11.4 BOD record

After the end measurement is completed, the BOD record can be

- displayed (see section 11.4.1)
- edited (see section 11.4.2)
- saved (see section 11.4.3)
- printed (see section 11.4.4)
- erased (see section 11.4.5).

11.4.1 Displaying the BOD record

1	In the *O2(BSB/BOD)* window, open the *BOD menu online* window with *BOD Setup/Process ....* or In the offline mode, switch to the *MultiLab pilot* program window and open the *BOD menu offline* window with *Extra* /*BOD ....*
2	Open the *Process BOD samples* window with *Process BOD*. An overview of all samples appears for which a start measurement was performed. The condition of the samples is marked by colors. • green: End measurement performed. BOD record available. • yellow: Time for end measurement reached. • red: Time for end measurement exceeded.
3	Mark the sample with a tick. The BOD record is displayed in the right-hand part of the window.

Note
You can also display the record in the *BOD end measurement* window directly after an end measurement.

11.4.2 Editing the BOD record

You can exclude from the BOD calculation individual dilution waters or dilutions. These values appear in the record but are not used to calculate the BOD value.

1	Display the BOD record (see section 11.4.1).
2	Using *Evaluation* or *Edit* / *Evaluation*, open the *BOD end measurement* window for the selected sample.

3	Edit the record. To do so, mark a dilution water or a dilution in the *BOD end measurement* window and click it with the secondary mouse button. A pop-up menu with the *Remove* or *Add* functions appears. Removed samples are marked by a red line in the *BOD end measurement* window.
4	If necessary, display the edited record. To do so, display the record that was edited with *OK* in the *BOD protocol* field. The *BOD protocol* window opens.
5	If necessary, save the protocol that was edited with *Store BOD*.
6	Close the *BOD end measurement* window. The *Process BOD samples* window is active again.



Note
You can also edit the record in the *BOD end measurement* window directly after an end measurement.

11.4.3 Saving the BOD record

1	Display the BOD record (see section 11.4.1).
2	Save the record of the selected sample as a *.txt file with *File* / *Save as*.

Note
You can also display and save the record in the *BOD end measurement* window directly after an end measurement.

11.4.4 Printing the BOD record

1	Display the BOD record (see section 11.4.1).
2	Print the record of the selected sample with *File* / *Print*.

Note
You can also display and print the record in the *BOD end measurement* window directly after an end measurement.

11.4.5 Erasing a BOD record

1	Display the BOD record (see section 11.4.1).
2	Erase the record of the marked BOD sample with *Delete* or *Edit* / *Delete*.

11.5 BOD database

The BOD database contains the data of all BOD records in a form that allows various database formats (see section 6.3).

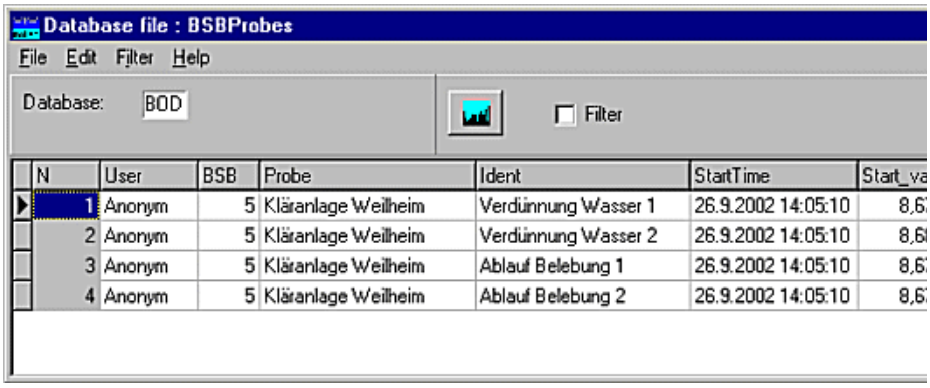
For clear archiving, you can save your BOD measurements in freely selectable database files.

The selection of an existing database or the creation of a new database is made before the start or end measurement.

New BOD results are added to the selected database file.

The function of the database corresponds to that of the general database (see section 6.2).

1	In the *O2(BSB/BOD)* window, open the *BOD menu online* window with *BOD Setup/Process ....* or In the offline mode, switch to the *MultiLab pilot* program window and open the *BOD menu offline* window with *Extra* / *BOD ....*
2	If necessary, open an existing database with *BOD database* / *Display*. The active database is displayed next to the window name.
3	If necessary, create a new database with *BOD database* / *Select file*. The active database is displayed next to the window name.



11.5.1 Filtering data records

Filters help you to select specific data records from a large quantity of data.

The database offers a variety of filtering possibilities. All filter settings can be combined.

The following filter settings are possible:

- *User*
- *Sample*
- *Identification*
- *Start time*
- *End time*

As soon as the filter settings are activated, a tick appears in the *Filter* field of the database window.

Standard filter settings

Standard filter settings are filter settings that can be reached via the *Filter* menu.



Note
These filter settings deactivate any and all other filter settings. The active filter is marked by a dot in the *Filter* menu.

Menu	Description
Display user only	Displays the data of the specified *User* only.
Display sample only	Displays the data of the specified *Sample* only.
Display identification (ID) only	Displays the data of the specified *Identification* only.

Activating combined filter settings

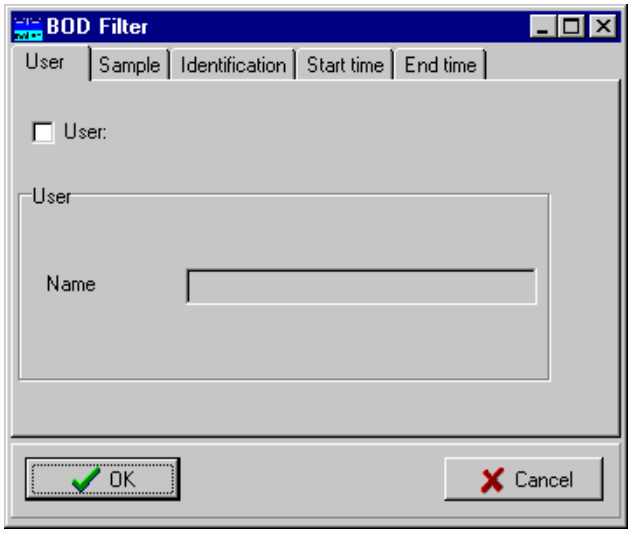
The last combination of filter settings in the *BOD Filter* window can simply be activated via the *Display database* button.

1 Use to activate the last combination of filter settings. Only the data records with the selected filter settings can be seen in the database window.

Combining standard filter settings

Filter settings can be combined in the *Filter* window in the tab sheets, *User*, *Sample*, *Identification*, *Start time* and *End time*.

1	Open the *BOD Filter* window with *Filter / Filter ...* .
2	Select one of the tab sheets *User*, *Sample*, *Identification*, *Start time*, or *End time*.



3	Activate or deactivate tab sheet settings with a tick.
4	Carry out filter settings in the individual tab sheets.
5	Close the *BOD Filter* window with *OK*. The filter settings are activated. Only the data records with the selected filter settings can be seen in the database window.

Note
For the tab entries in the *BOD Filter* window it is also possible to take over database entries.

Importing database entries in the *Filter* window

1	Switch to the database window.
2	Using the right mouse button, click an entry in the *User*, *Sample*, *Identification*, *Start time* or *End time* column. A popup menu appears.

3	Select the *Filter...* menu. The *BOD Filter* window opens with the tab that corresponds to the selected column. The entry from the database window is already imported. Already existing filter settings in other tabs remain active as well.
4	Activate the selected filter criteria with *OK*. Only the data records with the selected characteristics can be seen in the database window.

Deleting filter settings

You can deactivate and delete all filter settings.

1	Delete all filters with *Filter* / *Erase filter*. All entries in the *BOD Filter* window are deleted. All data records can be seen in the database window.

11.6 Routines

Routines facilitate the performance of BOD measurements with similar procedures.

Routines define constantly recurring measurement procedures. This includes the number and name of dilution waters and sample dilutions as well as the dilution ratios.

11.6.1 Setting up routines

Routines are set up

- online (with the BSB/BOD measuring instrumente connected) here you can save settings as a routine before, during and after a start measurement
- offline (without a BSB/BOD measuring instrumente connected) here you can save the settings as a routine

Have the following data ready before setting up a routine:

- Number of dilution waters (max. 32)
- Number of sample dilutions per sample (max. 32)
- Amount of sample (in ml) and total volume (in ml) of each sample dilution
- Incubation period (1 to 32 days)
- Names for dilution waters, samples, sample dilutions and routines

online

1	Switch to the *O2(BSB/BOD)* window.
2	Using *BOD Setup/Process ...*, open the *BOD menu online* window.
3	Select *Start the measurement without routine* or *Start the measurement with routine*. The *BOD Start measurement* window opens. The *Routines* menu contains all functions to deal with routines.
4	Using *BOD Setup/Create routine ...*, open the *Edit BOD routine* window (continue with step 6).

offline

1	Close all probe windows (offline mode).

2	Change to the *MultiLab pilot* program window.
3	Using *Extra* /*BOD ...*, open the *BOD menu offline* window.
4	Using *BOD Setup/Create routine ...*, open the *Edit BOD routine* window (continue with step 6).

online and offline

5	If necessary, open a routine for editing with *Routines*/*Open ...*.
6	If necessary, switch to the *Edit BOD routine* window with *Routines*/*Process*.
7	If necessary, switch to the *BOD Start measurement* window with *Routines* / *Terminate Processing*.
8	Save the current settings as a routine with *Routines*/*Save ...*.

The *Routines* menu	Function
New	Erases all current entries.
Open ...	Opens the dialog box to select a file with a stored routine.
Save ...	Opens the dialog box to save a routine as a file. All current settings are stored.
Process	Switches from the *BOD Start measurement* window to the *Edit BOD routine* window. All current settings are retained. It is not possible to start a measurement.
Terminate Processing	Switches from the *BOD Start measurement* window to the *Edit BOD routine* window. All current settings are retained. It is possible to start a measurement.

Note
When defining new routines, the same windows appear as in the start measurement. However, the measurement of samples is not shown.

Note
Also, an existing routine can be used as a template when defining new routines.

11.6.2 Starting a measurement with routine

When using the routines for measurement, the fields are already filled out with the data from the routine. This reduces the operating steps required for measuring to starting the measurements.

11.6.3 Deleting routines

Every routine is saved as a file. The saving location is the MultiLab® pilot directory. You can erase individual routines there. Files containing routines have the file extension "*.rou".

12 Conductivity

Note
The functions described in this chapter are only available for meters with conductivity measurement function that can be operated by remote control, e. g. inoLab 740 Cond, pH/Cond, Multi, inoLab pH/ION/Cond 750.

This chapter contains instructions concerning the settings and functions for conductivity measuring cells.

12.1 Settings for conductivity measurements

In order to achieve comparable and reproducible measuring results, we recommend checking and, if necessary, correcting the current settings before measuring.

12.1.1 Determining the measuring range

You can select the measuring range manually, or have it selected automatically.
You can determine the measuring range for measuring the conductivity as follows:

- Automatic selection of the measuring range
- Manual selection of the conductivity range / resolution:
  0.001 µS (if you use *LR001*),
  0.01 µS (if you use *LR01*),
  0.1 µS/cm, 1 µS/cm, 0.01 mS/cm, 0.1 mS/cm, 1 mS/cm
- Measurement of the salinity (Sal) and the total dissolved solids (TDS)

Automatic switchover of the measuring range

1	Switch to the *Cond* window.
2	Select the *Autorange* menu item in the *Setup* menu. The *ARng* status indicator appears.

Manual selection of the measuring range

For the manual selection of the measuring range, the automatic switchover of the AutoRng measuring range has to be switched off.

1	Switch to the *Cond* window.
2	Use  to select the required conductivity range or *Sal* or *TDS*.

12.1.2 Entering the reference temperature

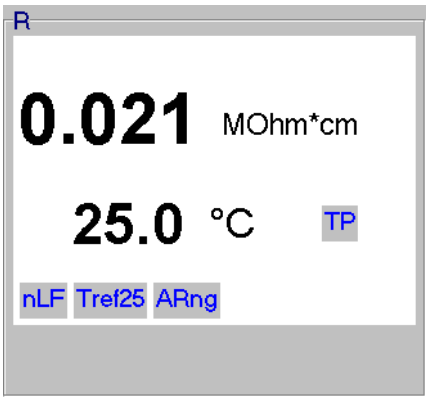
You can select the reference temperature, T_{Ref} = 25°C (*Tref25*) or T_{Ref} = 20°C (*Tref20*).

1	Switch to the *Cond* window.
2	Select the *Setup* or *Tref25* menu item in the *Tref20* menu. If conductivity is the measured parameter to be displayed, the *Tref25* or *Tref20* display indicator appears on the display.

12.1.3 Displaying the conductivity or the specific resistance

You can select either the conductivity (in mS/cm) or the specific resistance (in MΩ∗cm).

1	Switch to the *Cond* window.
2	Select the *Cond[MOhm*cm]* menu item in the *Setup* menu. The specific resistance is displayed in MΩ∗cm.



12.1.4 Selecting the temperature compensation

The calculation of the temperature compensation is based on the preset reference temperature, *Tref20* or *Tref25* (see chapter 12.2 DETERMINING/SETTING UP THE CELL CONSTANT).

You can select the following temperature compensations for the temperature functions:

- **Nonlinear temperature compensation, "TC nLF",** according to EN 27 888
- **Linear temperature compensation, "TC lin"**, with the adjustable coefficient from 0.001 to 3.000 %/K
- **No temperature compensation, "TC off"**

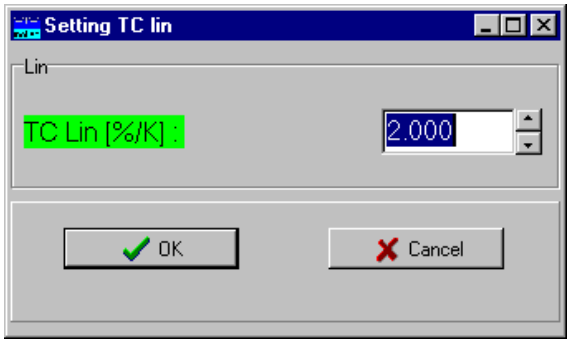
Note
Select the following temperature compensations to work with the test samples given in the table:

Application notes

Test sample	Temperature compensation	Display indicator
Natural water (ground water, surface water, drinking water)	nLF EN 27 888	*nLF*
Ultrapure water	nLF EN 27 888	*nLF*
Other aqueous solutions	Select a linear temperature compensation of 0.001 ... 3.000 %/K	*Lin*
Salinity (seawater)	Automatic nLF according to IOT	*Sal*, *nlF*

Selecting the temperature compensation

1	Switch to the *Cond* window.
2	Select the *Temperature coefficient* menu item in the *Setup* menu.
3	Select the required temperature compensation. The selected temperature compensation is active. If TC lin is selected, the dialog box for the temperature compensation appears.



4	Enter the value for the linear temperature coefficient and confirm with *OK*. The linear temperature compensation is active with the specified factor.

12.1.5 Reset

You can reset (initialize) the settings for the conductivity measurement to the default settings.

During a reset, the following functions for the conductivity measurement are reset to the default settings:

Measured parameter	Conductivity
Cell constant (c)	0.475 cm^{-1} (calibrated) 0.475 cm^{-1} (selected)
Temperature compensation	nLF
Reference temperature	TRef25
Temperature coefficient (TC) of the linear temperature compensation	2.000 %/K
TDS factor	1.00

1	Switch to the *Cond* window.
2	Select the *Reset Cond* menu item in the *Setup* menu. The default settings for conductivity measurements are restored.

Note
During a reset, the calibration data are reset to the default values. Recalibrate after performing a reset.

12.2 Determining/setting up the cell constant

Why determine/set up the cell constant?

Aging slightly changes the characteristics of the cell, e. g. by coatings. As a result, an inexact measured value is displayed. The original characteristics of the cell can often be restored by cleaning the cell. Calibration determines the current cell constant and stores it in the instrument. Thus, you should calibrate at regular intervals (we recommend: every 6 months).

You can determine the actual cell constant of the conductivity measuring cell by calibrating in the 0.01 mol/l KCl control standard in the following ranges:

- 0.450 ... 0.500 cm^{-1}
  (e.g. TetraCon, nominal cell constant 0.475)
- 0.800 ... 1.200 cm^{-1}
  (cells with a nominal cell constant of approx. 1)

For the two fixed cell constants, 0.1 cm^{-1} and 0.01 cm^{-1}, calibration is not required.

Cell constants outside the above-mentioned ranges can be set, but not calibrated.

12.2.1 Calibration (determining the cell constant)

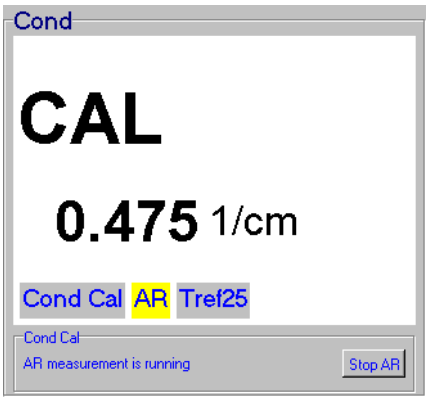
Note
This method of automatically determining the cell constant by calibration in the 0.01 mol/l KCL standard solution can only be used for measuring cells with cell constants in the ranges, 0.450 ... 0.500 cm^{-1} or 0.800 ... 1.200 cm^{-1}.

Note
If the *E3* error message appears, see operating manual of your meter.

Calibration procedure

To determine the cell constant, you require a 0.01 mol/l KCl calibration solution.

1	Immerse the measuring cell in the prepared calibration solution.
2	Use  to start the determination of the cell constant.



3	Use *Start Cond Cal* in the sensor window to start the measurement with AutoRead. The *AR* display indicator has a yellow background during the measurement.
4	Wait for a stable value. The calibration record is displayed.
5	Use *Finish Cond Cal* to finish the calibration.

Calibration evaluation

After the calibration, the measuring instrument automatically evaluates the calibration. The evaluation appears on the display.

Display		Cell constant [cm^{-1}]
		0.450 ... 0.500 cm^{-1} 0.800 ... 1.200 cm^{-1}
E3	Eliminate the error (see operating manual of your meter)	Outside the ranges 0.450 ... 0.500 cm^{-1} or 0.800 ... 1.200 cm^{-1}

Calibration record

After the calibration, a calibration record is displayed in a separate window, e. g.:

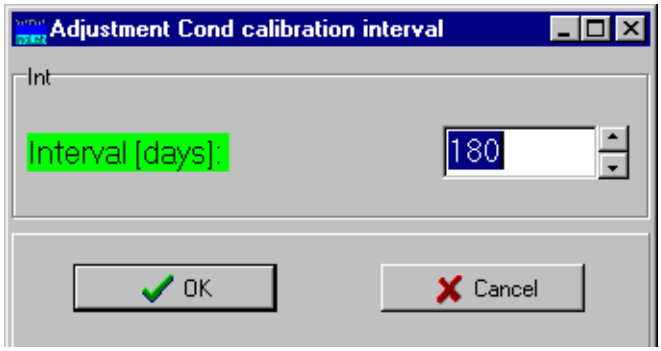
```
Calibration Conductivity
Cal date: 05.12.1999
Cal time: 22:46
Cal interval: 180 days
Cal standard: 0.01 mol/l KCl
Conductivity/Tref25:
1413 µS/cm  24.6°C
Cell Const: 0.987 1/cm
Probe +++
```

You can display or print calibration records at any time (section 6.7).

Specifying the calibration interval

The calibration interval can be used to determine after how many days you want to be reminded that a conductivity calibration is due.

1	Switch to the *Cond* window.
2	Select the *Calibration interval...* menu item in the *Calibration* menu. The dialog box for the calibration interval appears.



3	Enter the calibration interval and use *OK* to confirm the calibration interval entered. The dialog box is closed.

12.2.2 Selecting the cell constant

Note
The cell constant to be set must either be taken from the operating manual of the measuring cell or is printed on the measuring cell.

MultiLab® pilot offers the following possibilities of selecting the cell constant:

- Accepting the cell constant from the last calibration (*Calibrated cell constant*)
- Selecting any cell constant in the range of 0.250 to 2.500 cm^{-1} (*Adjustable cell constant...*)
- Selecting any cell constant in the range of 0.090 to 0.110 cm^{-1} (1) or selecting the fixed cell constant 0.1 cm^{-1} (*C = 0.01 1/cm*) (2)
- Selecting the fixed cell constant 0.01 cm^{-1} (*C = 0.001 1/cm*)

Accepting the cell constant of the last calibration

Accept the cell constant of the last calibration record as follows:

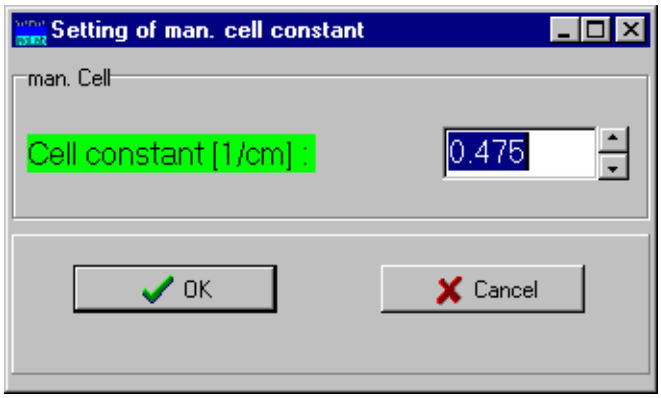
1	Switch to the *Cond* window.
2	Select the *Cell constant* menu item in the *Setup* menu.
3	Select the *Calibrated cell constant* menu item. The cell constant of the last calibration is accepted. The *Calibrated cell constant* is active.

Selecting any cell constant

You can select the cell constant manually in the range 0.250 ... 2.500 cm^{-1} or 0.090 ... 0.110 cm^{-1}section (1) as follows:

1	Switch to the *Cond* window.
2	Select the *Cell constant* menu item in the *Setup* menu.
3	Select the *Adjustable cell constant...* (range 0.250 ... 2.500 cm^{-1}) or *Adjustable LR01 ...* (range 0.090 ... 0.110 cm^{-1})(1) menu item. The dialog box for the cell constant opens. The current value is displayed.

(1) for the inoLabCond 740 measuring instrument
(2) for the inoLabCond Level 3 measuring instrument



4	Enter the new value and confirm it with *OK*. The dialog box is closed. The cell constant is saved. *Adjustable cell constant...* is active.

Selecting the cell constant 0.01 cm^{-1}

Set the cell constant to the fixed value of 0.01 cm^{-1} as follows:

1	Switch to the *Cond* window.
2	Select the *Cell constant* menu item in the *Setup* menu.
3	Select the required cell constant, *C = 0.01 1/cm*. The selected cell constant is active.

12.3 Measuring the conductivity

The measuring system can use a single conductivity measuring cell to display the conductivity, total dissolved solids and salinity of a solution.

12.3.1 Preparatory activities

Perform the following preparatory activities when you want to measure:

1	Connect a conductivity measuring cell with a temperature probe to the measuring instrument. The program recognizes the measuring cell and displays the Cond window with the measured parameter that was last selected.
2	Check the selected cell constant or calibrate the measuring instrument with the measuring cell. How to calibrate is described in section 12.2.1.

12.3.2 Measuring

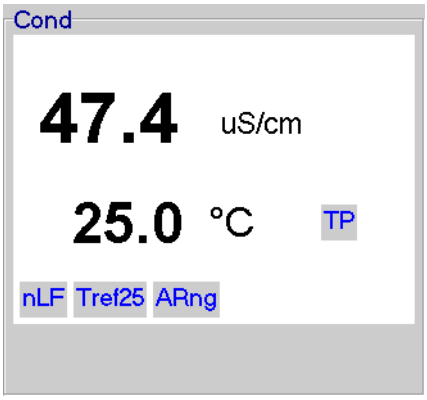
You can display the following measured parameters:

- Conductivity/specific resistance
  (for details of how to switch over, see chapter 12.1 SETTINGS FOR CONDUCTIVITY MEASUREMENTS)
- Salinity (Sal)
- Total dissolved solids (TDS)

1	Perform the preparatory activities (see section 12.3.1).
2	Immerse the measuring cell in the test sample. A measured value for the conductivity is displayed.

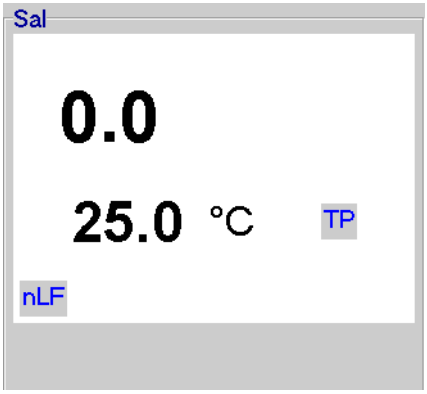
Conductivity

3	Use  to switch to the measured parameter, conductivity (Cond). The conductivity value appears in the *Cond* window.



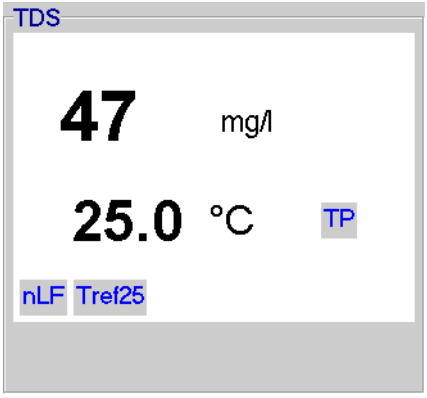
Salt content

4	Use to switch to the *Sal* measured parameter. The salinity value appears in the *Cond* window.



Total dissolved solids

5	Use to switch to the *TDS* measured parameter. The TDS value appears in the *Cond* window.



6	Save the measured data (see section 6.1). Print the measured data (see section 5.7).

Measuring with the AutoRead function

The AutoRead function (drift control) checks the stability of the measured temperature value. The stability affects the reproducibility of a measured value.

1	Switch to the *Cond* window.
2	Use *AR*  in the *Cond* window to freeze the current measured value (Hold function).
3	Use *Start AR* to start the measurement with AutoRead. The *AR* display indicator has a yellow background during the measurement.
4	Wait for a stable measured value. The measured data are stored (see section 6.1) and the Hold function is activated again.
5	Use *AR*  in the *Cond* window to terminate AutoRead.

Note
To accept the current measured value without waiting until the AutoRead function is finished, press *Stop AR* in the probe window.

13 Lists

This chapter provides additional information and orientation aids.

Abbreviations The list of abbreviations explains display indicators and abbreviations used.

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 to find the topics that you are looking for.

Abbreviations

$\mathcal{X}$	Conductivity value (international g)
AR	AutoRead (drift control)
ARng	Automatic range switching. Measuring instrument measures with highest resolution
ASY	Asymmetry
AutoCal DIN	Automatic pH calibration with buffer solutions prepared according to DIN 19 266
AutoCal TEC	Automatic pH calibration with WTW technical buffer solutions according to DIN 19267
C	Cell constant [cm^{-1}] (internat. k)
°C	Temperature unit, degrees Celsius
Cal	Calibration
Cd...	Display indicator during calibration for pH measurements. Indicates the selection of the buffer data record for buffer solutions prepared according to DIN 19 266
Cm...	Display indicator during calibration for pH measurements. Indicates the selection of buffer data records for buffer solutions of the Merck company
ConCal	Conventional single-point or two-point calibration for pH measurements
Ct...	Display indicator during calibration for pH measurements. Indicates the selection of the buffer data records for WTW technical buffer solutions
E3	Error message
°F	Temperature unit, degrees Fahrenheit
ISECal	Calibration for ion-sensitive measurements
Lin	Linear temperature compensation
mV	Voltage unit
mV/pH	Unit of the electrode slope (internat. mV)
nLF	Nonlinear temperature compensation

OFL	Display range exceeded (overflow)
OxiCal	Automatic calibration for D. O. measurements
pH	pH value
S	Slope (internat. k)
SAL	Salinity
SELV	Safety Extra Low Voltage
SLO	Slope setting on calibration
TC	Temperature coefficient (internat. α)
TDS	Total Dissolved Solids
TP	Temperature measurement active (Temperature Probe)
T_{Ref} 20/T20	Reference temperature of 20 °C
T_{Ref} 25/T25	Reference temperature of 25 °C
U_{ASY}	Asymmetry

Glossary

Activity The activity corresponds to the effective concentration. Due to a mutual influence, the effect of ions differs from the value which is theoretically to be expected, e. g. in electrochemical processes. With small to medium concentrations (< 1 mol/kg), the ion activity is smaller than the ion concentration. The connection between the activity a and the concentration c is expressed by the equation: $a_i = f_i \times c_i$.

Adjusting To manipulate a measuring system so that the relevant value (e. g. the displayed value) differs as little as possible from the correct value or a value that is regarded as correct, or that the difference remains within the tolerance.

Amperometry Name of a measuring technique. The signal (depending on the measured parameter) of the probe used is the electric current. The electrical voltage remains constant.

Asymmetry Designation for the offset potential of a pH electrode. It is the measurable potential of a symmetrical electrode, the membrane of which is immersed in a solution with the pH of the nominal electrode zero point (WTW electrodes:
pH = 7).

AutoRange Name of the automatic selection of the measuring range.

AutoRead WTW name for a function to check the stability of the measured value.

Calibration Comparing the value from a measuring system (e. g. the displayed value) to the correct value or a value that is regarded as correct. Often, this expression is also used when the measuring system is adjusted at the same time (see adjusting).

Cell constant k Characteristic quantity of a conductivity measuring cell, depending on the geometry.

Conductivity Short form of the expression, specific electrical conductivity. It is a measured value of the ability of a substance to conduct the electric current. In water analysis, the electrical conductivity is a dimension for the ionized substances in a solution.

Conductometry Name of the conductivity measuring technique.

Electrode zero point The zero point of a pH electrode is the pH value at which the electromotive force of the pH electrode at a specified temperature is zero. Normally, this is at 25 °C.

Electromotive force of an electrode The electromotive force U of the electrode is the measurable electromotive force of an electrode in a solution. It equals the sum of all galvanic voltages of the electrode. Its dependency on the pH results in the electrode function, which is characterized by the parameters, slope and zero point.

Firmware	Software installed at an instrument that is fixed and cannot be changed.
Junction	The Junction is a porous body in the housing wall of reference electrodes or electrolyte bridges. It arranges the electrical contact between two solutions and makes the electrolyte exchange more difficult. The expression, junction, is also used for ground or junction-less transitions.
Measured parameter	The measured parameter is the physical dimension determined by measuring, e. g. pH, conductivity or D. O. concentration.
Measured value	The measured value is the special value of a measured parameter to be determined. It is given as a product from numerical value and unit (e. g. 3 m; 0.5 s; 5.2 A; 373.15 K).
Measuring system	The measuring system comprises all the devices used for measuring, e. g. measuring instrument and probe. Additionally, there are the cable and possibly an amplifier, terminal strip and armature.
Molality	Molality is the quantity (in Mol) of a dissolved substance in 1000 g solvent.
MultiCal®	WTW name stating that a measuring instrument provides several calibration procedures.
Offset potential	The measurable potential of a symmetrical electrode, the membrane of which is immersed in a solution with the pH of the nominal electrode zero point. The asymmetry is part of the offset potential.
ORP voltage	The ORP is caused by oxidizing or reducing substances dissolved in water if these substances become effective at an electrode surface (e. g. a gold or platinum surface).
OxiCal®	WTW name for a procedure to calibrate D. O. measuring systems in water vapor-saturated air.
Oxygen partial pressure	Pressure caused by the oxygen in a gas mixture or liquid.
Oxygen saturation	Short name for the relative D. O. saturation. Note: The D. O. saturation value of air-saturated water and the D. O. saturation value of oxygen-saturated water are different.
pH value	The pH is a dimension for the acidic or basic effect of an aqueous solution. It corresponds to the negative decadic logarithm of the molal hydrogen ions activity divided by the unit of the molality. The practical pH value is the value of a pH measurement.
Potentiometry	Name of a measuring technique. The signal (depending on the measured parameter) of the electrode that is used is the electrical potential. The electrical current remains constant.

Reference temperature	Fixed temperature value to compare temperature-dependent measured values. For conductivity measurements, the measured value is converted to a conductivity value at a reference temperature of 20 °C or 25 °C.
Reset	Restoring the original condition of all settings of a measuring system.
Resistance	Short name for the specific electrolytic resistance. It corresponds to the reciprocal value of the electrical conductivity.
Resolution	Smallest difference between two measured values that can be displayed by a measuring instrument.
Salinity	The absolute salinity S_A of a seawater corresponds to the relation of the mass of dissolved salts to the mass of the solution (in g/Kg). In practice, this dimension cannot be measured directly. Therefore, the practical salinity is used for oceanographic monitoring. It is determined by measuring the electrical conductivity.
Salt content	General designation for the quantity of salt dissolved in water.
Slope	The slope of a linear calibration function.
Slope (relative)	Designation used by WTW in D. O. measuring technique. It expresses the relation of the slope value to the value of a theoretical reference probe of the same construction type.
Standard solution	The standard solution is a solution the measured value of which is known through definition. It is used to calibrate a measuring system.
TDS	Total dissolved solids
Temperature coefficient	Value of the slope of a linear temperature function.
Temperature compensation	Name of a function that considers the temperature influence on the measurement and converts it accordingly. Depending on the measured parameter to be determined, the temperature compensation functions in different ways. For conductimetric measurements, the measured value is converted to a defined reference temperature. For potentiometric measurements, the slope value is adjusted to the temperature of the test sample but the measured value is not converted.
Temperature function	Name of a mathematical function expressing the temperature behavior of a test sample, a probe or part of a probe.
Test sample	Designation for the sample ready to be measured. Normally, a test sample is made by preparing the original sample. The test sample and original sample are identical if the test sample was not prepared.

Total dissolved solids (TDS) Mass that remains of the substances dissolved in an aqueous solution after a fixed filtering and drying procedure, as far as these substances are not volatile under the conditions of this procedure.

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