Operating Manual

STS®

Datalogger, Program and Accessories

Operating Manual

STS *- feel the Difference*

Operating Manual

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1. Introduction

The datalogger DL/N is suitable for continuous monitoring of ground- and surface water. Three measuring systems are integrated (some as option) to monitor conductivity, temperature and pressure or level. The conductivity gives you information about the solved salt content of the water (pollution of water). This system helps you to minimize risks in projects like water management.

The datalogger with a diameter of only 24 mm fits in a 1" borehole and can be used autonomous with integrated battery over a long time period.

1.1. Getting started

Before using the datalogger or the program, read this operating manual carefully. The guarantee is invalid in respect of damage resulting from non-observing the instructions, incorrect handling or inappropriate use. We accept no responsibility for consequential damages resulting from any of the above. The device must be installed and dismantled only by qualified personnel. The relevant country-specific safety regulations must be observed. The customer must ensure compliance with device specific requirements relating to the protection standard. In addition be aware of the information in the datasheet. They can be requested from us at any time.

1.1.1. Unpacking

The sensors are delivered in product-specific packaging that offers excellent protection under normal transport conditions. Please check the packaging for any signs of damage. Remove the sensor carefully from the packaging without applying force.

1.1.2. Installation

Do not install in the immediate vicinity of motors, pumps, valves, sources of heat or other potential sources of interference. Excessive vibrations or pressure peaks can corrupt the measured values or even destroy the sensor. The device must be installed and dismantled only by qualified personnel.

Please pay attention to the minimal bending radius of the cable when installing the Datalogger DL/N:
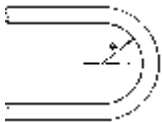
PUR, PE: R >   90 mm / 3.5"
FEP (Teflon) :   R > 100 mm / 3.9"

2. Program Installation

2.1. System Requirements

Hardware requirements:

- IBM compatible PC or Laptop
  Processor min. 200 MHz, available harddisc space min. 50 MByte, memory (RAM) min. 64 MByte

- Operating system
  Windows 98 / 98SE / Me / NT from version 4 (min. Service Pack 6 and Internet Explorer from Version 6.0) / 2000 / XP

- available serial interface (9-pin or 25-pin with adapter)

  or

- USB 1.1 port for operation with optionally available USB - RS232 adapter (VART260)
  USB 1.1 port for operation with optionally available USB - RS485 adapter (VART381)

- CD-ROM drive to install the program

- Data transfer cable D-SUB9 – M12x1, 4-pin (VART009)
  Data transfer cable D-SUB9 – M12x1, 8-pin (VART333) for DL/N, series 70

- Interface converter RS485/RS232 (VART336) for DL/N, series 70

2.2. Program Installation

Please uninstall any datalogger program on your PC before installing a new program. Insert the datalogger CD into the CD-ROM drive. If the installation program does not start automatically, enter the following in "Run" in the Start Menu: D:\setup.exe (where D is the drive letter of your CD drive) and confirm your selection with OK. The installation program will start now.

If the .NET Framework V 1.1 from Microsoft is not installed, the installation wizard of .NET will start first. Please follow the instructions and confirm the requests.

After successful installation of .NET, the wizard for the datalogger program starts:

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The InstallShield Wizard starts:
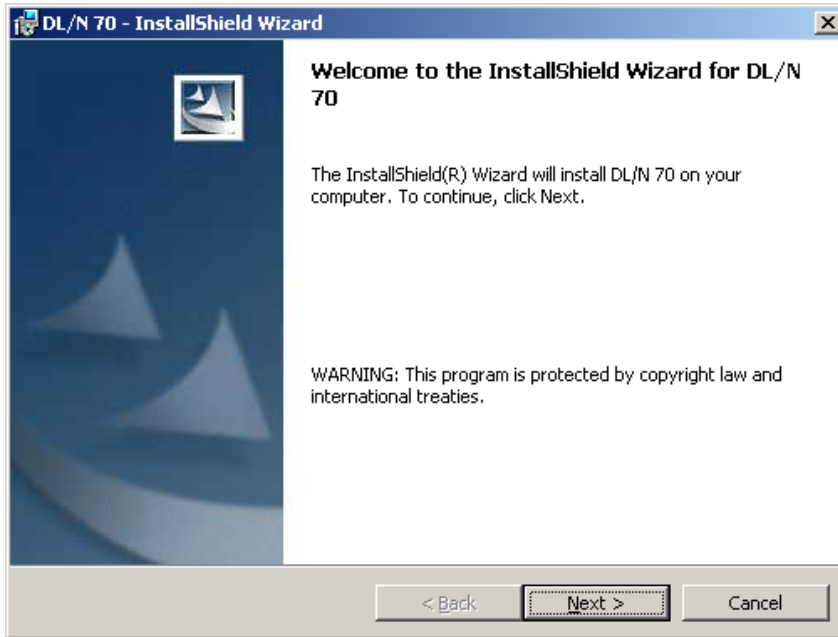
Choose destination folder for the installation:
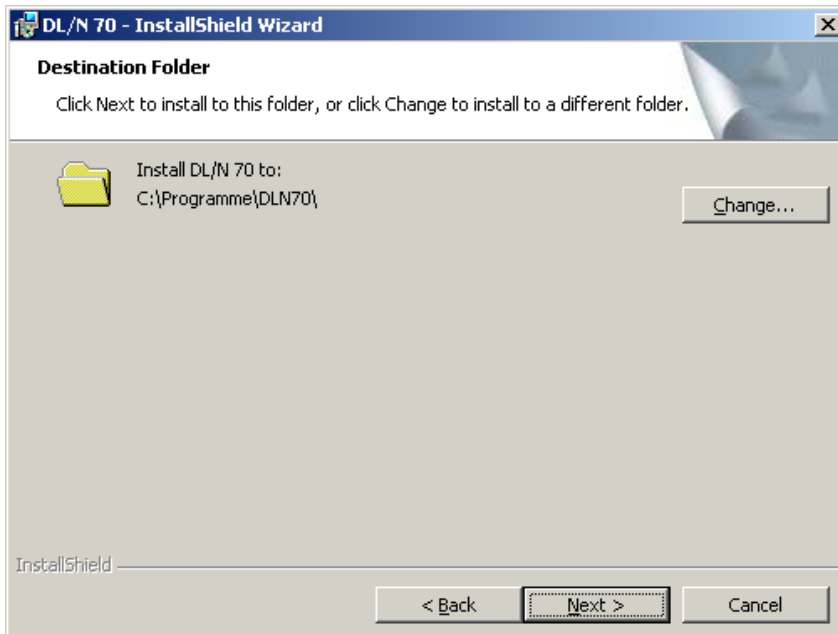
Specify the destination paths for user-data, configuration-data and measured-data:

Ready to install the program:

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Mark "Launch DL/N 70" and click on "Finish" to start the program immediately:

The program can also be started via the Start Menu:
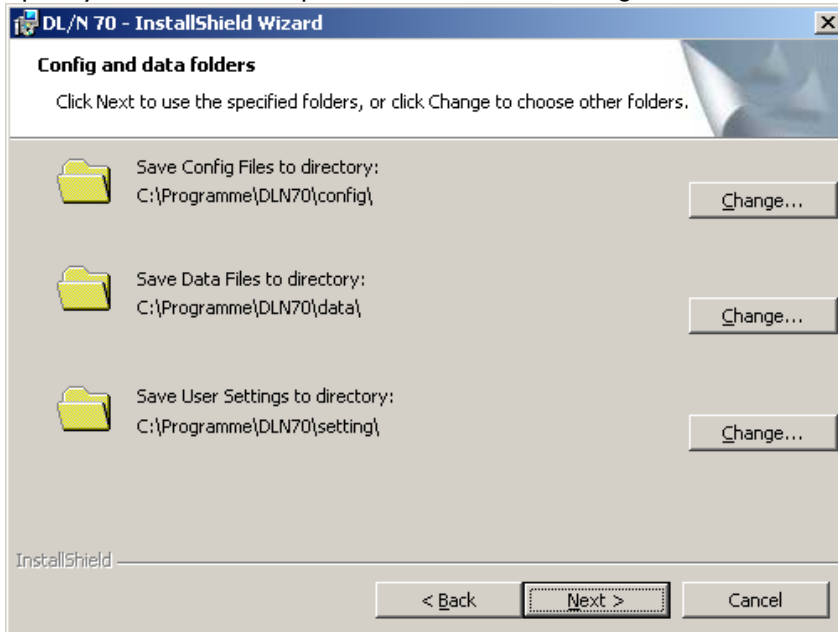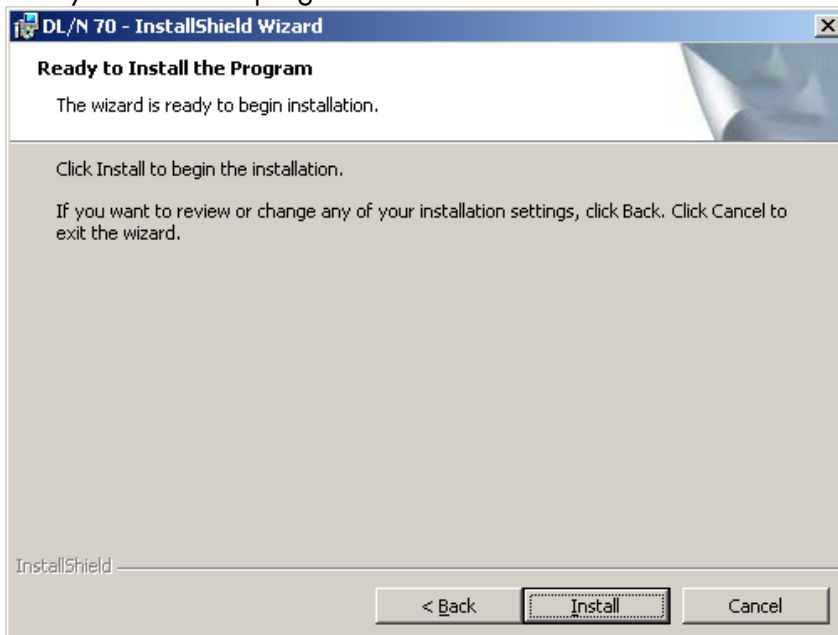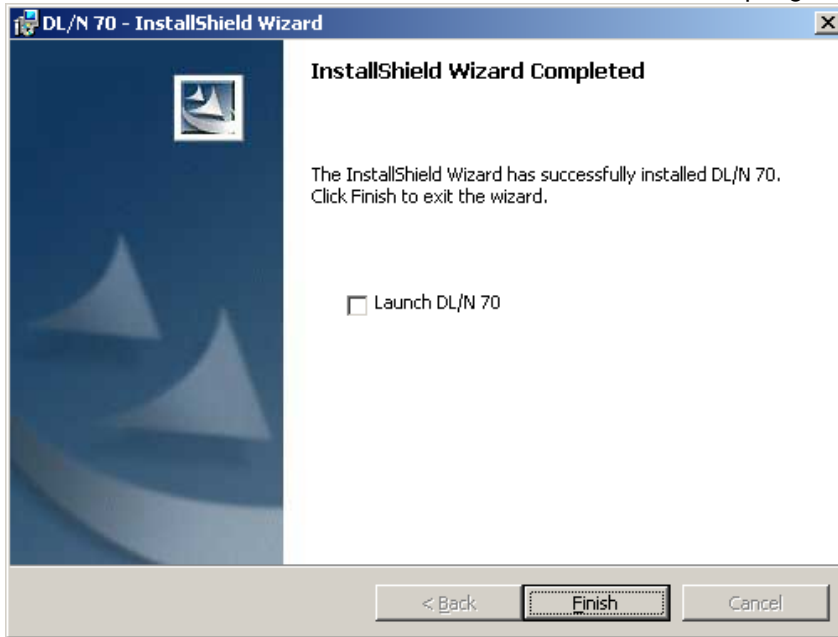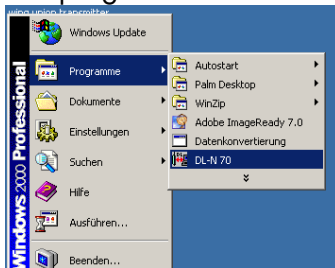
2.3. Connecting Datalogger, DL/N series 64

- Remove the cover / screw-on cap from the Datalogger.
- Connect the interface cable to an available port on your PC.
- Cable connection:
  Connect the interface cable to the Datalogger.
- IR-interface connection:
  Turn on the display by pressing the "On/Mode" button. Press the "On/Mode" button again until the letter combination "Pc" appears on the display. Attach the IR interface onto the display case. If the Datalogger program is unable to connect to the Datalogger within 30 seconds, the display will be deactivated (see also the Operating Manual for the Datalogger with display).
- Start the Datalogger program.

Note: If the datalogger is connected to the PC and the program is running, the battery consumption of the datalogger is increased.

2.4. Connecting Datalogger, DL/N series 70

- Open the srew-on cap of the datalogger and connect the data transfer cable.
- Connect the data transfer cable to the interface (labeled RS422/485)
- Connect the interface (labeled RS232) to an available RS232 port of the PC/Laptop.
- Start the datalogger program.

Note: If the datalogger is connected to the PC and the program is running, the battery consumption of the datalogger is increased.

3. General Software Functions

3.1. General Notes

Additional information appears by positioning the mouse pointer over a button.
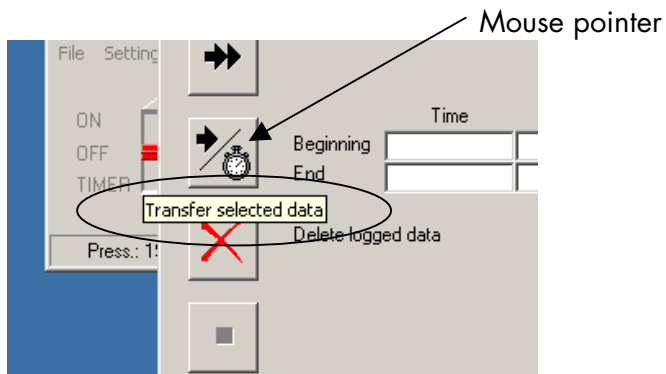
3.2. Connection Window

Starting the datalogger program, the connection window to select the port (COM1 to COM8), the baudrate (default: 38400 bps, only for DL/N, series 70) and the language appears.
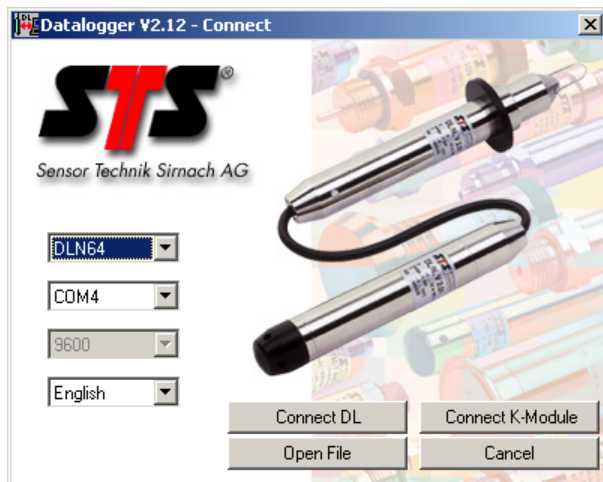
Language selection:

Quit the program by selecting "Cancel".

3.2.1. Offline Operation

"File open" (Offline-Mode) opens the window "load data". You can load a previous saved data file from the PC. The data can be viewed by clicking the graphic button (see chapter 4.2).

3.2.2. Connect
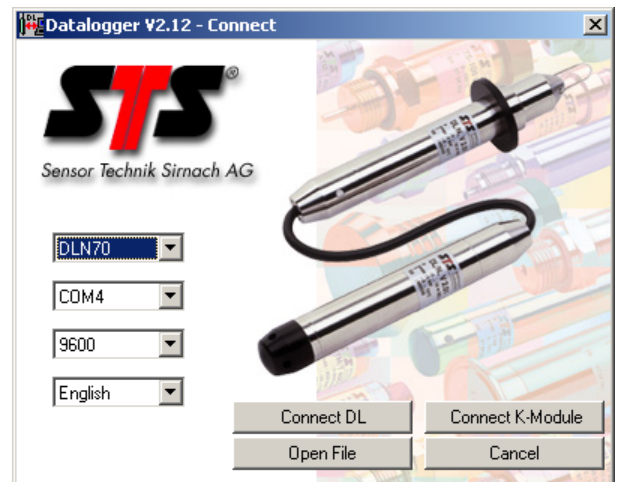
"Connect" starts the main window. If a communication error occurs, following message appears:
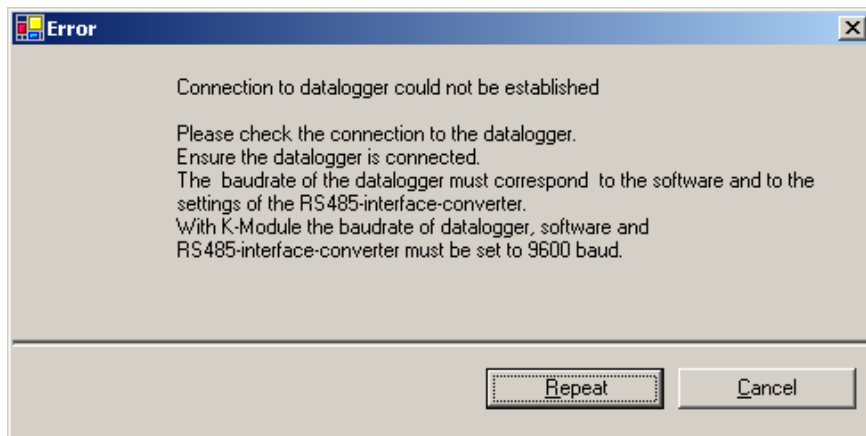
By clicking "Repeat", another attempt to connect will be made, clicking „Cancel" quits the program. If the connection fails, please check following:
- All cables connected correctly?
- Is the battery empty? (change the battery and try again)

3.3. Menu

3.3.1.   File
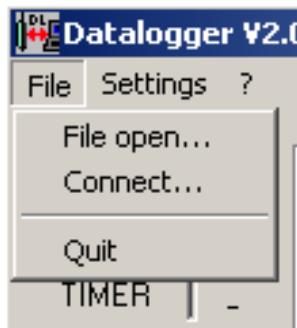
3.3.1.1.   Read in Data

The "File open" menu item is only active if the Datalogger program is in "Offline" - mode.
Entering the "Offline" – mode:
1. Start the software. The connection window appears. Press the "File Open" – button.
2. If the software is already running, choose the menu "File" -> "Connect" -> "File Open".
3. Or directly "File" -> "File Open".

3.3.1.2.   Close

Quit the program by selecting "Close".
If the connected Datalogger is turned off the following message appears:
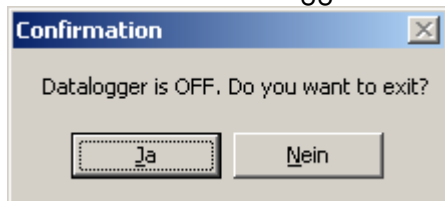
If data have been read out but not yet saved the following message appears:
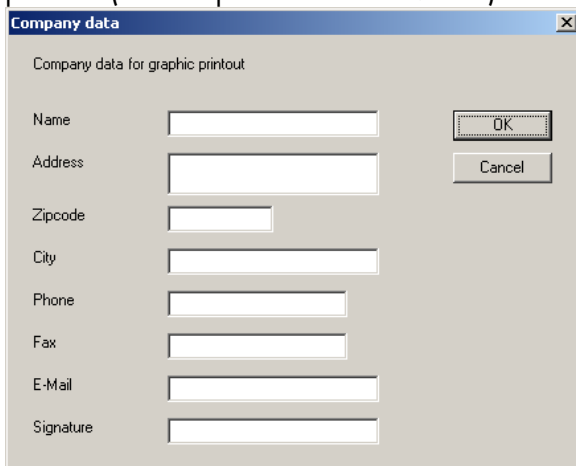
3.3.2.   Settings
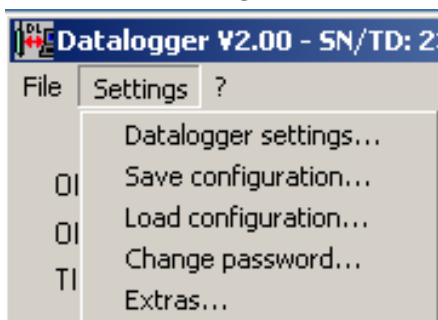
3.3.2.1. Datalogger settings

The menu item "Company data" shows the following window. The entered data appears in the printout (see chapter 4.2 "Data View").

3.3.2.2. Save configuration
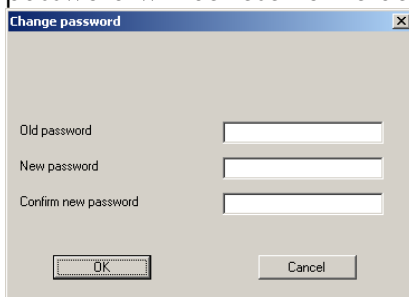
With this function all important settings (see chapter 3.3.2.3) can be stored into a file. With this file the identical settings can be loaded into another Datalogger.

3.3.2.3. Load configuration

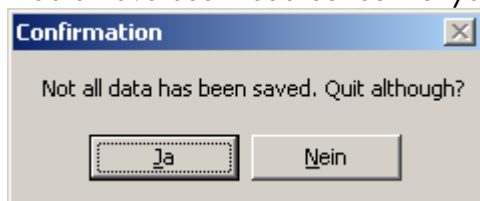With this function a configuration file which has been stored previously (see chapter 3.3.2.2, "Save configuration") can be loaded. The configuration file contains settings like storage-/sampling rate, tare- and depth to water values, scale and density, threshold values, limit values and log state.

3.3.2.4. Password

Deleting data in the Datalogger is password-protected. The default password is "1234".
It can be changed in the password dialog. If the Datalogger program is being re-installed, the password will be reset to the default.
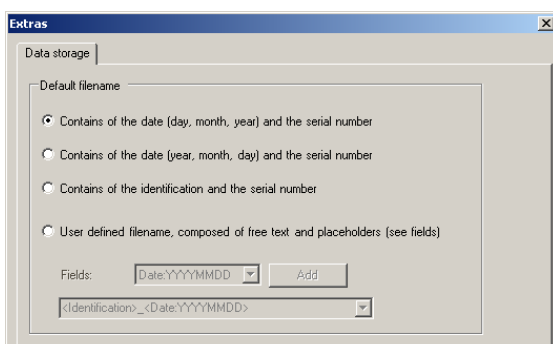
3.3.2.5. Extras

In the menu „Extras…", different variations of the filename can be created. This arrangement of different file names appears automatically in the save dialog.

Three fixed or one customer specific filename are selectable. The user defined filename can be composed from different information like free text but also from code like date, identification or serial number. Make your choice from the list „Fields" and add the information by clicking "Add".
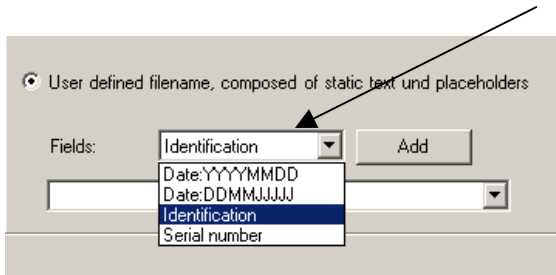
You can mix free text and code information. Enter the free text information (A…Z, 0…9) directly in the lower field. The following characters are NOT allowed: **\ / : * ? " < > |**
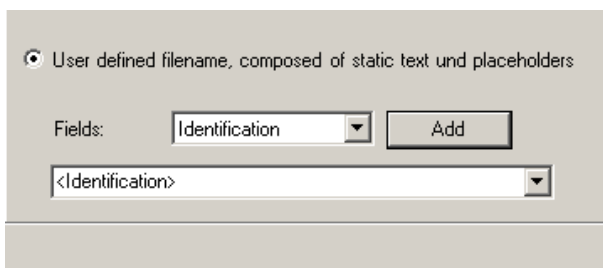
Herewith any composition of the file name can be generated.
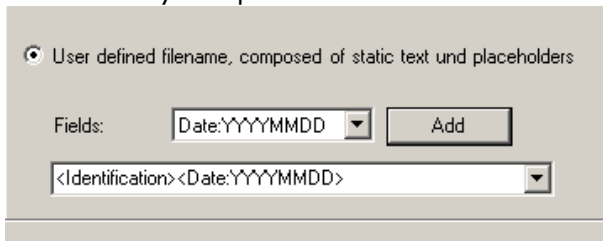
3.3.3.   Menu ?

Clicking the "?" menu item shows the firmware version of the Datalogger.

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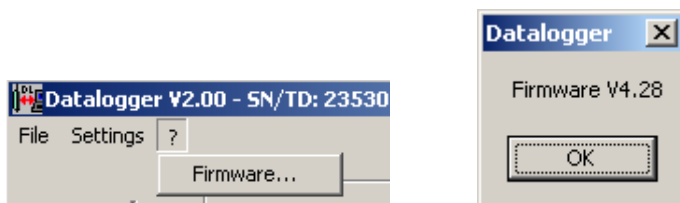
3.4. Main Window

All important functions can be selected in the main window. The latest relevant data is being displayed in the statusbar.
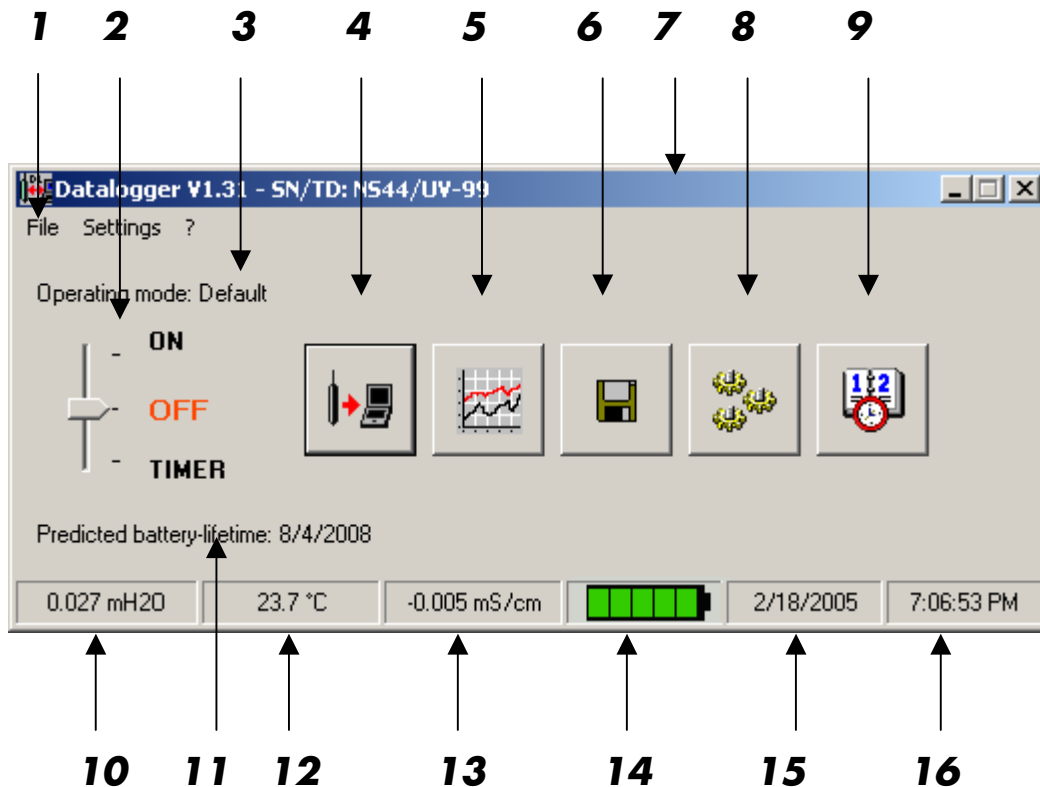
1	Menu	9	Clock/date adjustment
2	Operating switch	10	Pressure indicator
3	Display operating mode	11	Estimated battery lifetime
4	Data transfer	12	Temperature indicator (Option)
5	Data view	13	Conductivity indicator (Option)
6	Data save	14	Battery indicator
7	Info bar	15	Date
8	Configuration	16	Time

3.5. Operating Switch

ON	DL is switched on
OFF	DL is switched off
TIMER	DL is switched on in a predefined time window (see timer)

The position of the switch shows the actual status of the datalogger.

TIMER:

Logging starts at the time "Start" and stops only when the operating switch is manually switched off.
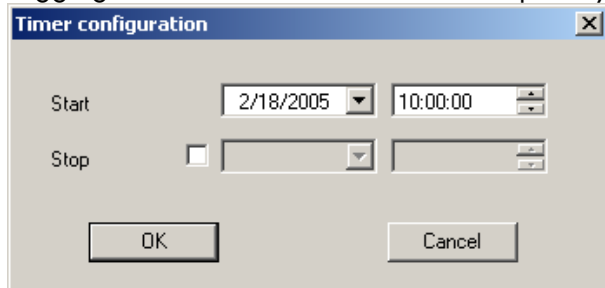
If the checkbox "Stop" is activated, the datalogger starts at the time "Start" and stops at the time "Stop" automatically.
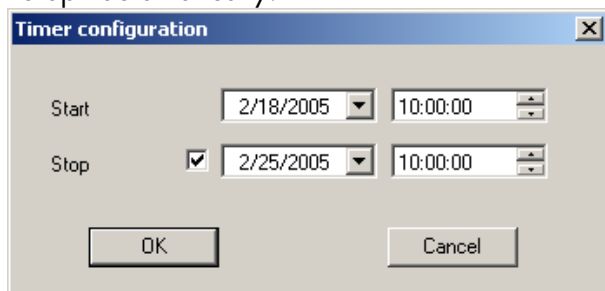
For timer operation, the switch must be in position „TIMER" when you quit the program. The main window shows you in which time period the datalogger will be activ.
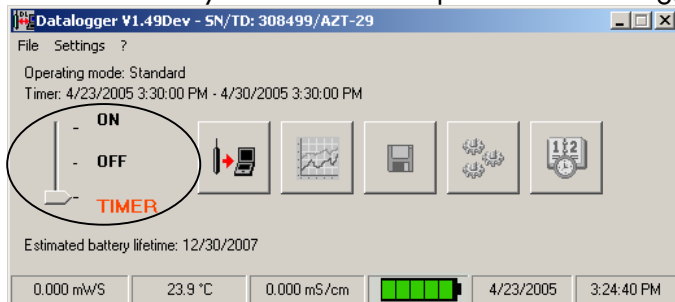
During data recording in timer mode, the main window looks as follows:
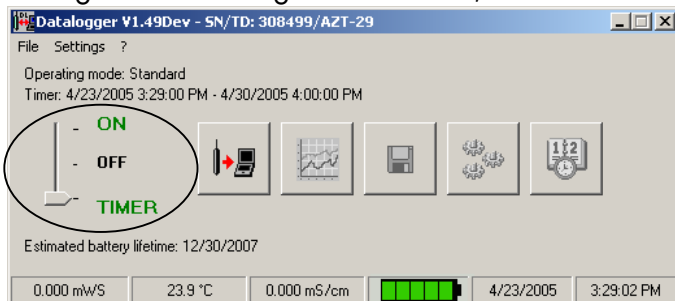
4. Further Software Functions DL/N, series 64

4.1. Data Transfer

In the "Data Transfer" window data can be uploaded to the PC from the Datalogger. The upper portion of the window displays status information.

If no measured value was outside the predefined limit values (set in "Configure Datalogger"-dialog chapter 4.4) during the last measurement series, the message "The limit values were not exceeded" appears. After data read out has been finished, the starting time and date of the latest measurement series as well as the number of taken measurements will be shown.

1

Reading out the data from the last measurement series (i.e. since the data recording function was last started). Press the button again, the datalogger will read out the second-last measurement series **in addition** etc. The data transfer will stop once the data has been successfully transferred, a connection error occurs or the stop-button has been pressed.

2

All the data stored in the Datalogger will be read out. The data transfer will stop once the data has been successfully transferred, a connection error occurs or the stop-button has been pressed.

3

If neither a start nor an end time and date is being set, all the stored data will be read out. If only the start time and date is being set, the program will read out all the data starting at the start time and date until the present. If only the end time and date is being entered, the program will read out all the data until the end time and date.

4

This function allows to delete ALL the recorded data in the Datalogger. To do this, a password has to be entered (see also chapter 3.3.2.4). As long as the program has not been closed and re-started, you will be able to delete the data in the Datalogger without entering the password again.

5
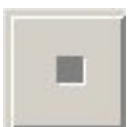
Stops / interrupts the data transfer. All the data read out until this button was pressed will be imported.

ATTENTION: Read out and save all important data before deleting the datalogger memory. All data will be erased and cannot be restored!
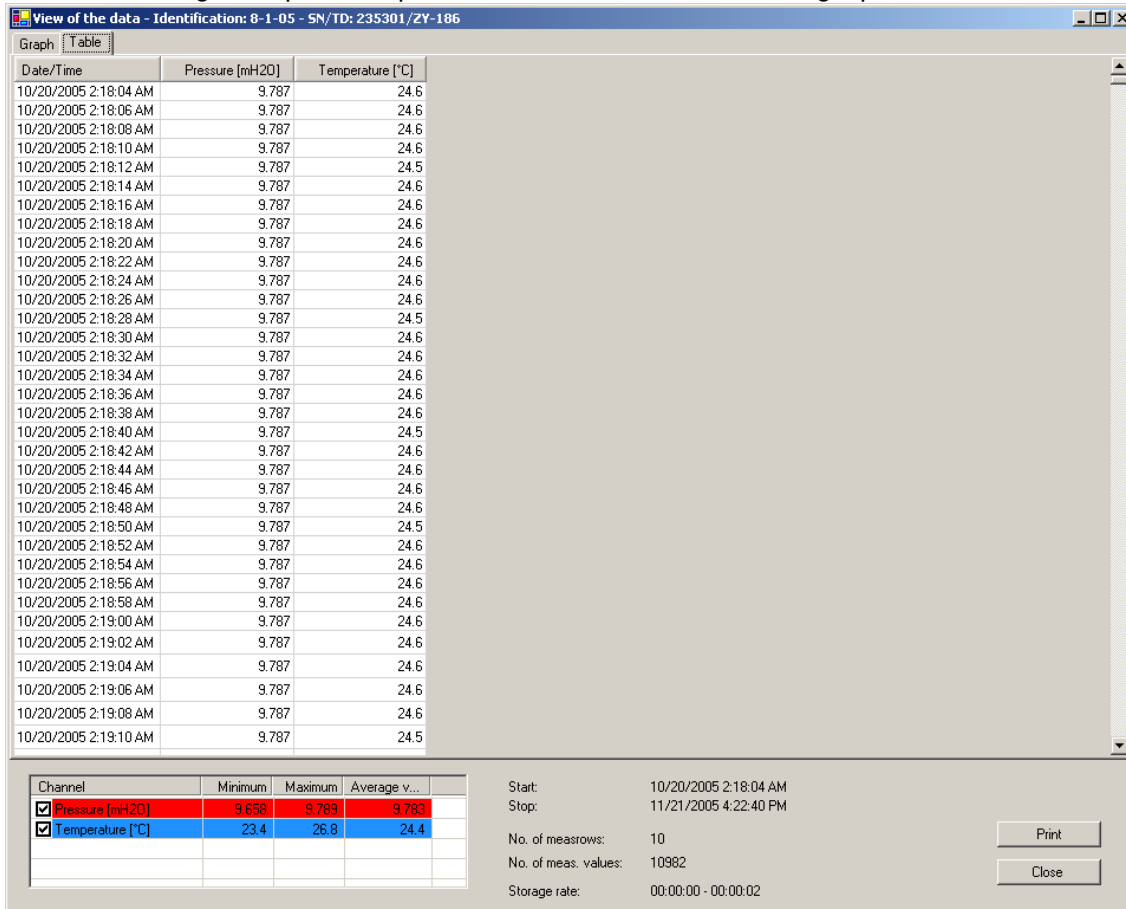
4.2. Data View

The Data View allows to analyse and print out the measured data which has been read out.
The Info bar shows the name (see chapter 4.4), the serial and transducer numbers of the DL.
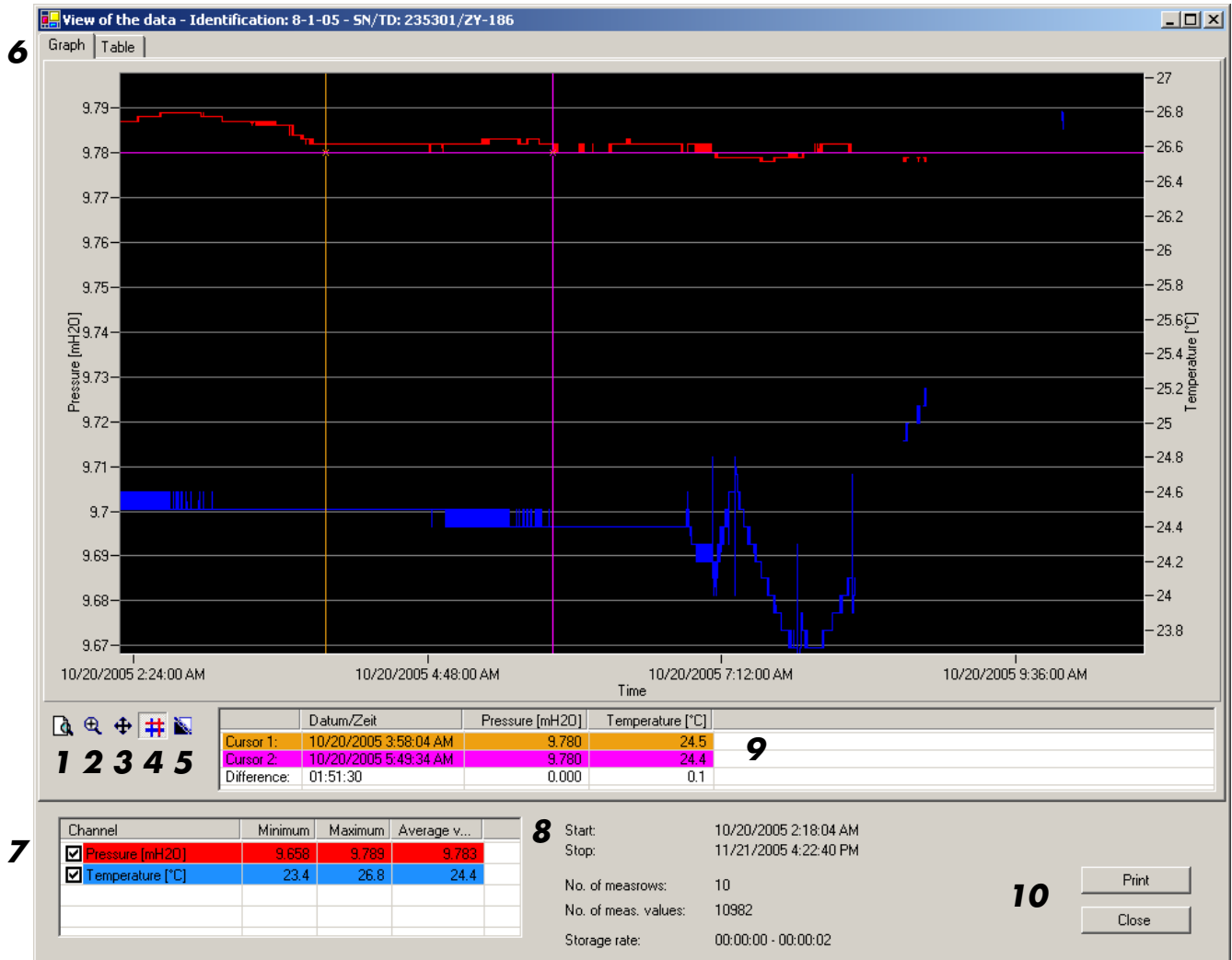
1   Changes back to the normal view (1:1) after the zoom view.

2   Zoom: By selecting a section with the mouse pointer, this section of the curve will be zoomed.

3   Move: After zooming the displayed section can be moved along the curve. The curve can only be moved between the first and the last measurement.

4   Set cursor: Two cursors are being set on the curve. They can be moved along the curve by clicking and dragging. This way pressure, time and date where the cursor is located can be displayed. Also the pressure difference between the two cursors is being showed.

5   Change colour: To enhance the quality of the printout on a black and white printer, the image can be changed to black and white.

6 Enabling "Graphic" resp. "Table" switches between the graphical and the tabular display.

Date/Time	Pressure [mH2O]	Temperature [°C]
10/20/2005 2:18:04 AM	9.787	24.6
10/20/2005 2:18:06 AM	9.787	24.6
10/20/2005 2:18:08 AM	9.787	24.6
10/20/2005 2:18:10 AM	9.787	24.6
10/20/2005 2:18:12 AM	9.787	24.5
10/20/2005 2:18:14 AM	9.787	24.6
10/20/2005 2:18:16 AM	9.787	24.6
10/20/2005 2:18:18 AM	9.787	24.6
10/20/2005 2:18:20 AM	9.787	24.6
10/20/2005 2:18:22 AM	9.787	24.6
10/20/2005 2:18:24 AM	9.787	24.6
10/20/2005 2:18:26 AM	9.787	24.6
10/20/2005 2:18:28 AM	9.787	24.5
10/20/2005 2:18:30 AM	9.787	24.6
10/20/2005 2:18:32 AM	9.787	24.6
10/20/2005 2:18:34 AM	9.787	24.6
10/20/2005 2:18:36 AM	9.787	24.6
10/20/2005 2:18:38 AM	9.787	24.6
10/20/2005 2:18:40 AM	9.787	24.5
10/20/2005 2:18:42 AM	9.787	24.6
10/20/2005 2:18:44 AM	9.787	24.6
10/20/2005 2:18:46 AM	9.787	24.6
10/20/2005 2:18:48 AM	9.787	24.6
10/20/2005 2:18:50 AM	9.787	24.5
10/20/2005 2:18:52 AM	9.787	24.6
10/20/2005 2:18:54 AM	9.787	24.6
10/20/2005 2:18:56 AM	9.787	24.6
10/20/2005 2:18:58 AM	9.787	24.6
10/20/2005 2:19:00 AM	9.787	24.6
10/20/2005 2:19:02 AM	9.787	24.6
10/20/2005 2:19:04 AM	9.787	24.6
10/20/2005 2:19:06 AM	9.787	24.6
10/20/2005 2:19:08 AM	9.787	24.6
10/20/2005 2:19:10 AM	9.787	24.5

View of the data - Identification: 8-1-05 - SN/TD: 235301/ZY-186

Graph | Table

Channel	Minimum	Maximum	Average v...
☑ Pressure [mH2O]	9.658	9.789	9.783
☑ Temperature [°C]	23.4	26.8	24.4

Start: 10/20/2005 2:18:04 AM
Stop: 11/21/2005 4:22:40 PM
No. of measrows: 10
No. of meas. values: 10982
Storage rate: 00:00:00 - 00:00:02
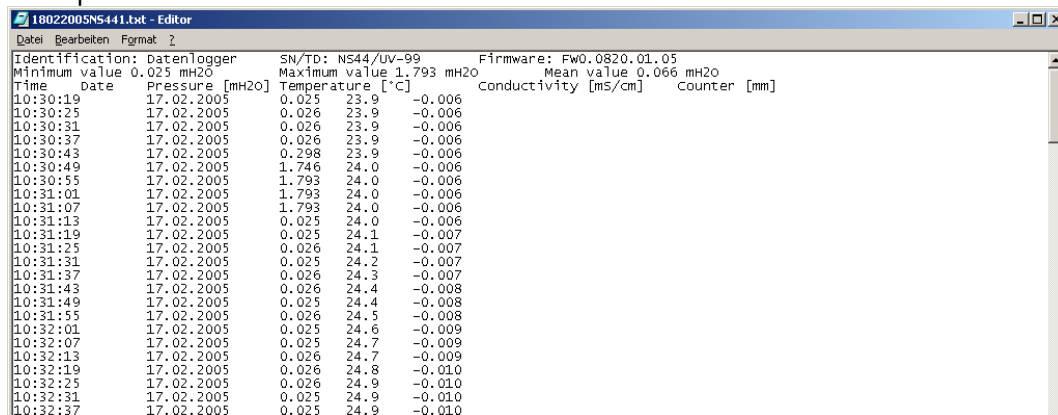
Print
Close

7 Turns the "Print" or "Temperature" or "Counter" charts on or off in the image.

8 Date and time of the first and last measurement values read out. Also the total quantity of measurement data read out is being shown. This reveals whether several data sets were read out and which storage interval has been set for the measurement data.

9 Difference between the values of the measurement points that have been selected with the two cursors.

10 Prints the chart, including all the entries made as "Company Data" (see chapter 3.3.2.1).

4.3. Save Dialog Box

This function is only active if data were transferred from the datalogger.
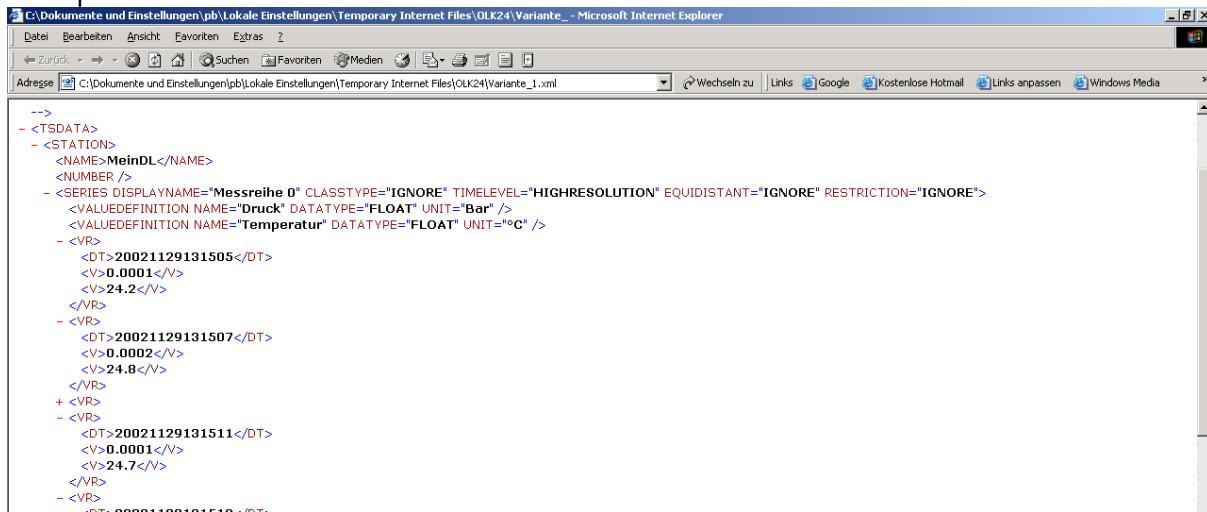
The data can be stored as ASCII- or XML files. The default file name is according to the settings made in the menu "Extras", see chapter 3.3.2.5.

Example of ASCII file:

Example of XML file:

4.4. Datalogger Configuration

Menu for the datalogger configuration.

1   Recording of: pressure, temperature, counter, pressure and temperature or pressure and counter

2   Storage rate: specifies the rhythm in which the data is being stored. The storage rate must be an integer multiple of the sample rate.

3   Storage mode:
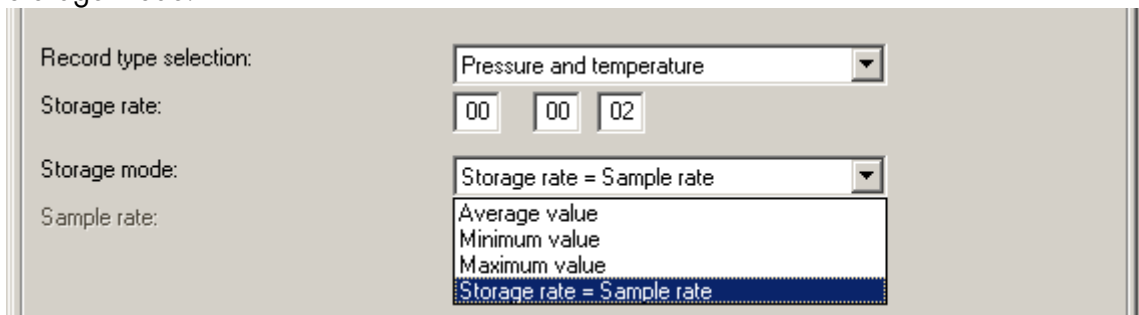
Storage rate = Sample rate: Storage rate is equal to sample rate
Mean value: The arithmetical mean value will be stored
Minimum value: The lowest value of the measrow will be stored
Maximum value: The highest value of the measrow will be stored

4   Sample rate: defines the rhythm in which the pressure (and temperature, if activated) is being measured.
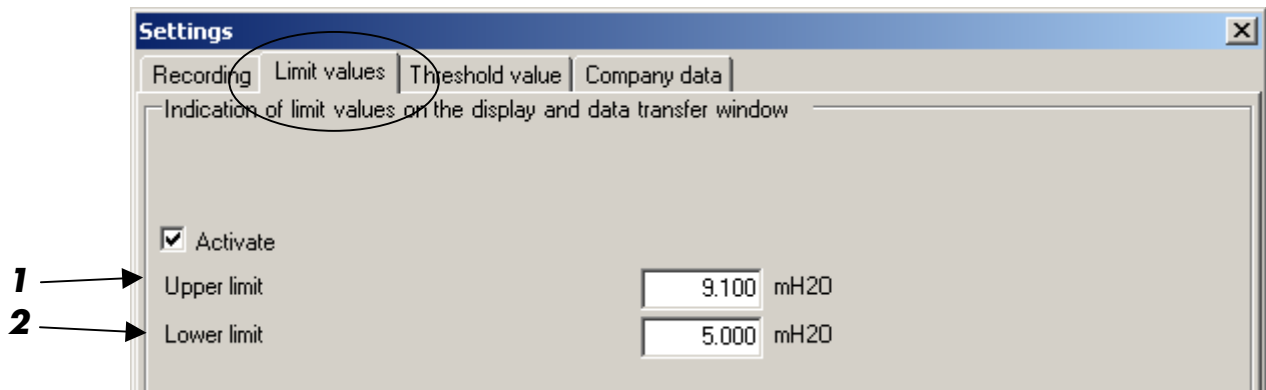
1   Upper limit value
2   Lower limit value

Activating the display of limit values: The DL uses symbols to display whether the pressure measured in the last measurement series has underrun or overrun the predefined range. The range is defined by the upper and lower limit value. The "Data Transfer" window will also display if a limit value has been exceeded.

Note: These limit values do not affect the saving of recorded data at all.
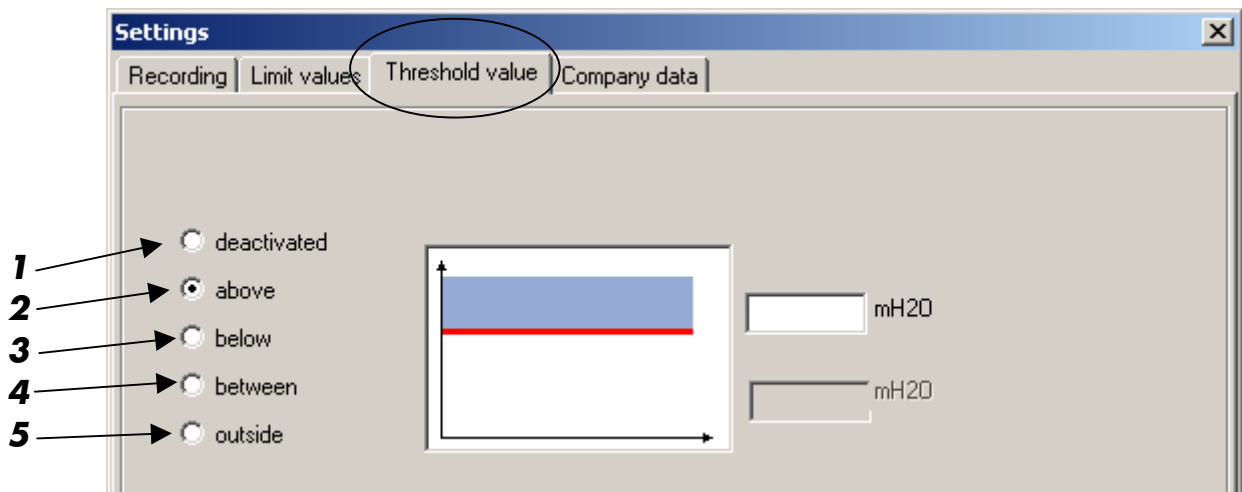
Threshold values: Only available if this option has been activated.

1   Deactivated: The function is deactivated.

2   Above: The DL does not start recording data until the pressure exceeds the specified value. Recording will stop if the pressure drops below the specified value and does not exceed it again during the time it takes for the memory page to be filled. The DL does not start recording data again until the pressure exceeds the specified value.

3 Below: The DL does not start recording data until the pressure drops below the specified value. Recording will stop if the pressure exceeds the specified value and does not drop below it again during the time it takes for the memory page to be filled. The DL does not start recording data again until the pressure drops below the specified value.

4 Within: The DL does not start recording data until the pressure is between the specified values. Recording will stop if the pressure is outside the specified range and does not return during the time it takes for the memory page to be filled. The DL does not start recording data again until the pressure returns to the specified range.

5 Outside: The DL does not start recording data until the pressure leaves the specified range. Recording will stop if the pressure returns to the specified range and does not leave it again during the time it takes for the memory page to be filled. The DL does not start recording data again until the pressure leaves the specified range.
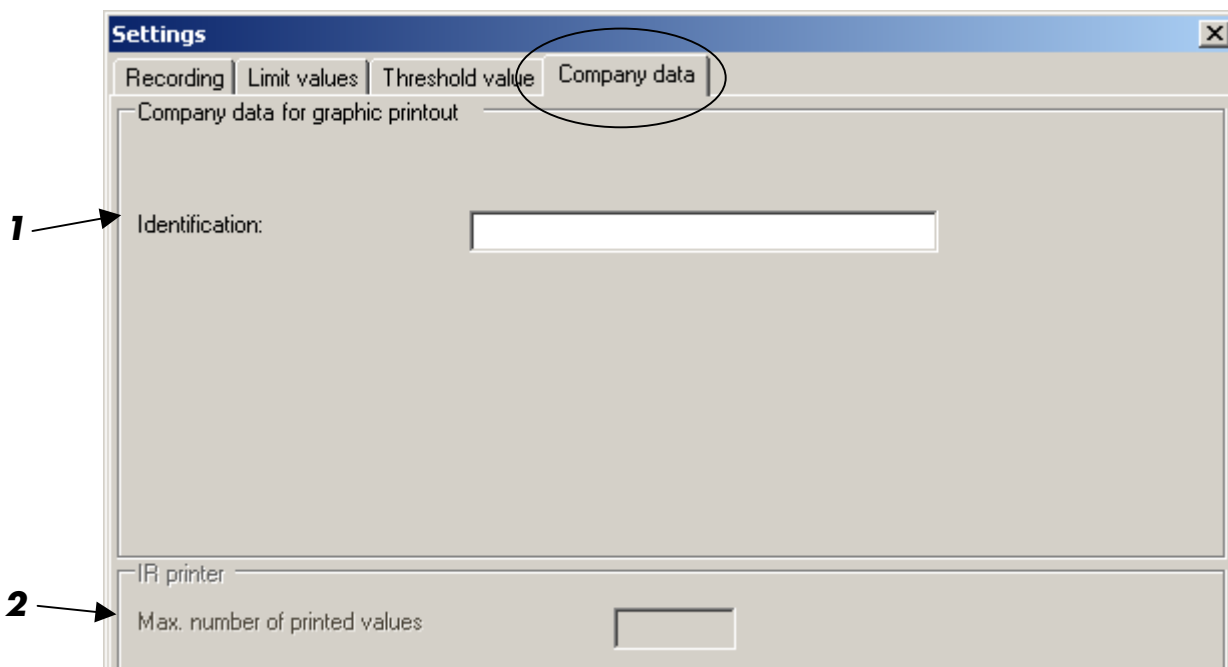
1 Identification: This text (max. 19 characters) is stored in the datalogger. It can be used to identify the datalogger, e.g. the location of it.
The entry of this field appears in various locations:
- Data file (ASCII- or XML- file)
- Info-bar of the window „View of the data"
- Printout of the data view
- As part of the customer specific file name (see chapter 3.3.2.5)
- Printout (IR printer)

2 Defines the number of values to be printed on the IR printer (optionally available). If the measurement series contains fewer values, only these will be printed.

Note: The Datalogger stores the values of a measurement series in sequential memory pages. Each memory page holds up to 128 values.

4.5. Taring
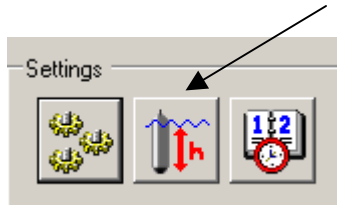
4.5.1. Level Measurement
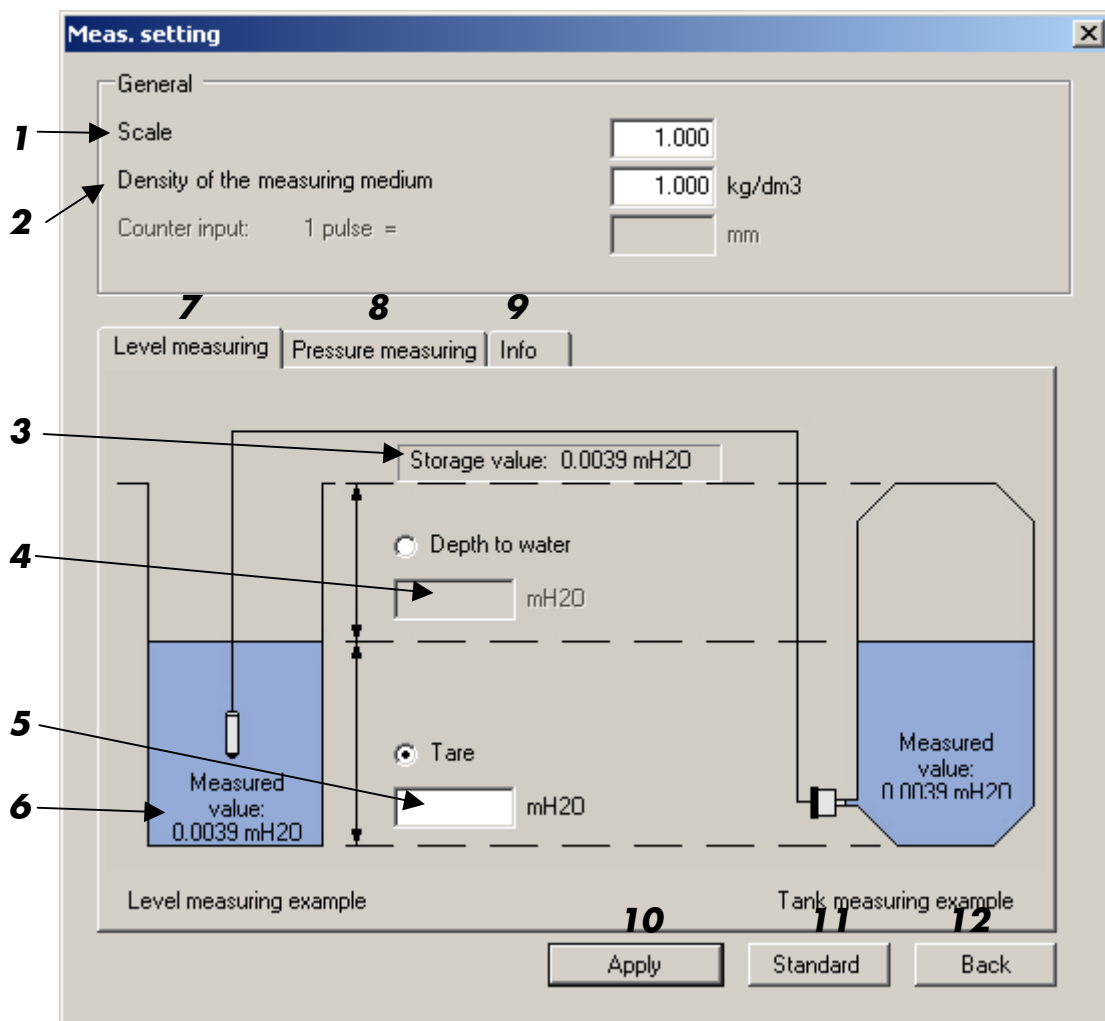
1   The measured value is multiplied by the scaling factor. This factor must be between 0.3 and 2.0.

2   Value for the density of the measuring medium. This box is only active if the DL has been synchronized in a "length unit" (e.g. metres water scale, mH2O). The value must be between 0.5 and 2.0. kg/dm3. The software adjusts the measured level using the specified density factor. It only makes sense to set the density for level measurement if the calibrated unit is no pressure unit (e.g. bar or mbar).

3   Displays the stored value (adjusted by the scaling or density factor as well as the taring or the depth to water value).

4   Depth to water value: Distance between ground and water surface. This value has to be entered in the calibrated unit of the Datalogger. This value can be up to +/- 3200 with the number of decimal places with which the Datalogger has been calibrated (evidently in the main window). If the measuring is artesian (medium plane above the borehole), the entered value has to be negative.

5   If the measured depth (location of the sensor membrane) is not equal to the effective depth, the measured value can be corrected to the effective value in the calibrated unit of the Datalogger. The taring can be up to +/- 3200 with the number of decimal places with which the Datalogger has been calibrated (evidently in the main window).

6   Measured value: This is the effectively measured value, without consideration of taring, depth to water, scaling or density.

7   "Level measuring" register to configure the DL for level applications

8   "Pressure measuring" register to configure the DL for standard applications (see chapter 4.5.2).

9   "Info" register to explain the difference between "measured value" and "stored value" (see chapter 4.5.3).

10   Apply current settings.

11   Reset all values in this window to the default settings.

12   Return to the main window.

Note: The taring or the depth to water value will affect all data stored in the Datalogger.

4.5.2. Pressure Measurement
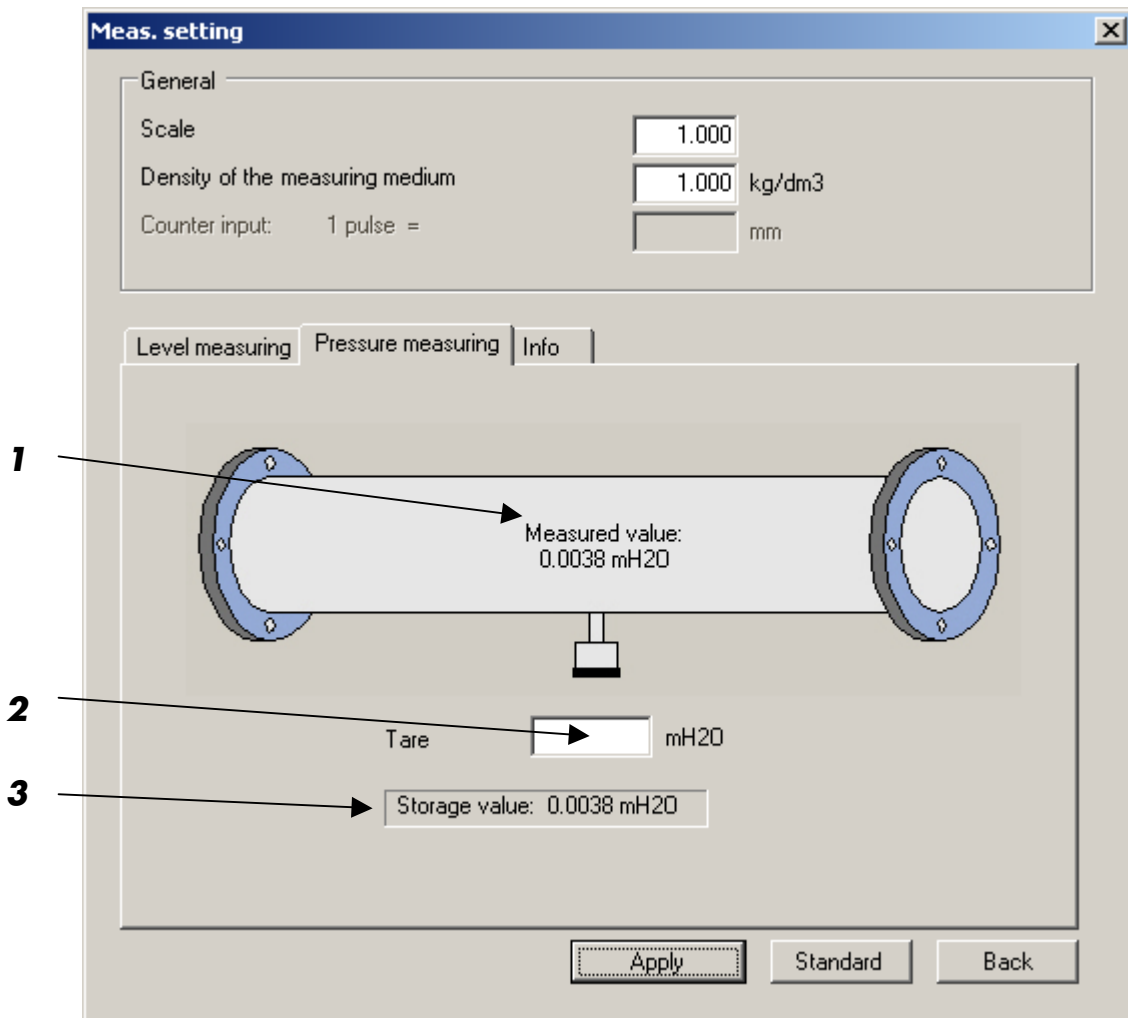
1   Measured value: This is the effectively measured value, without consideration of taring, depth to water, scaling or density.

2   If the measured depth (location of the sensor membrane) is not equal to the effective depth, the measured value can be corrected to the effective value in the calibrated unit of the Datalogger. The taring can be up to +/- 3200 with the number of decimal places with which the Data-logger has been calibrated (evidently in the main window).

3   Displays the stored value (adjusted by the scaling or density factor as well as the taring or the depth to water value).

Note: The taring value will affect all data stored in the Datalogger.

4.5.3. Info
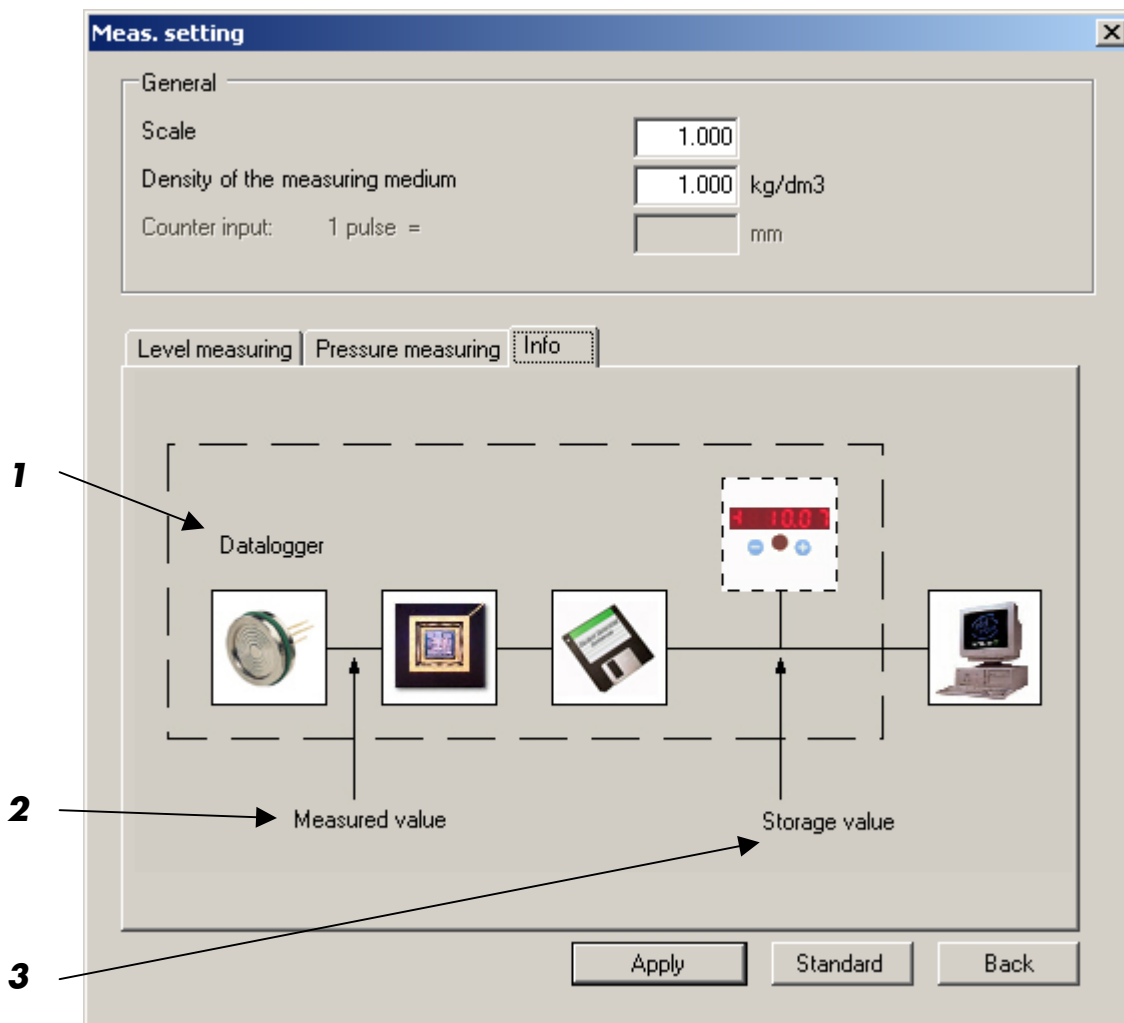
1   Symbolic block diagram of the Datalogger.

2   Measured value: This is the effectively measured value, without consideration of taring, depth to water, scaling or density.

3   Displays the stored value (adjusted by the scaling or density factor as well as the taring or the depth to water value).

4.6. Synchronize Time
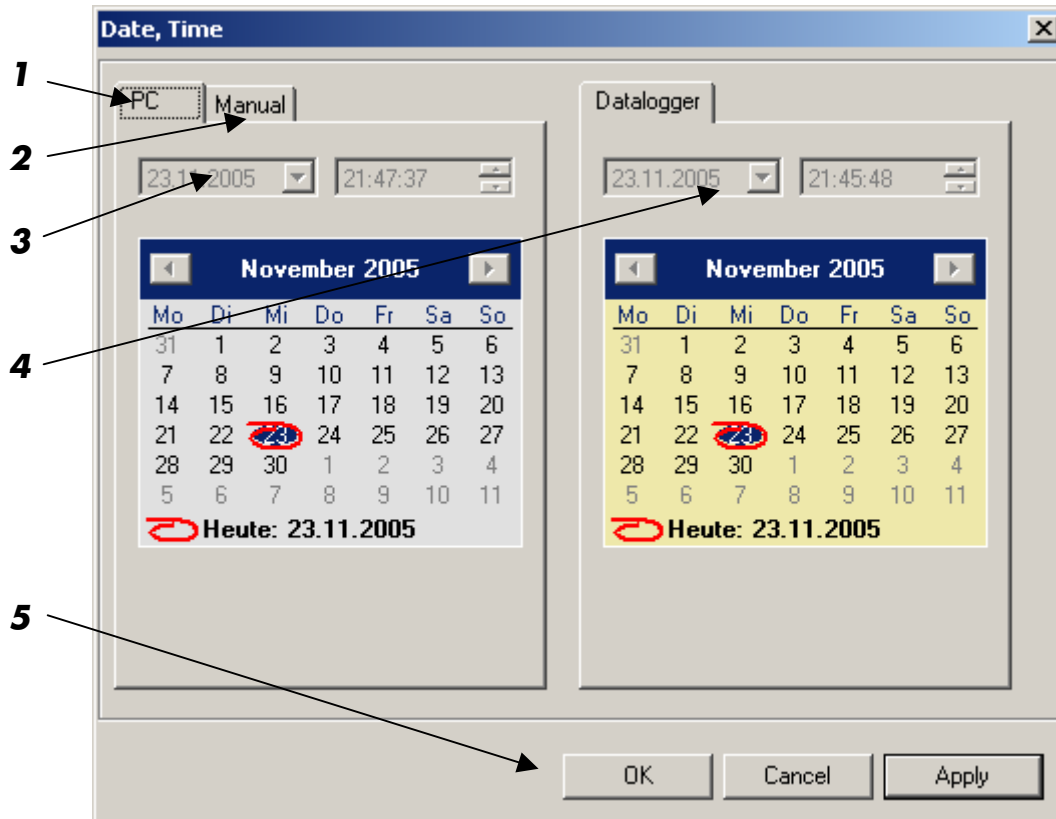
1   PC – register: shows the actual PC- time and date.

2   Manual – register: Fields to enter time and date manually.

3   Current PC – time

4   Current Datalogger - time

5   Apply the PC – time/date or the manually entered time/date to the Datalogger.

4.7. Battery Indicator

The battery indicator shows the calculated capacity of the battery. The less green fields appear, the lower the battery capacity is. It is advisable to change the battery before it is discharged completely. If the capacity of the battery falls below a certain level, the datalogger switches off automatically. The data remains in the datalogger memory and can be read out after the battery has been changed, see chapter 7.1.

You can order batteries as spare parts with the article numbers VART270 (DL/N) and VART271 (DL, DL/Ex and Datalogger with display).

5. Further Software Functions DL/N, series 70

5.1. Menu "File"
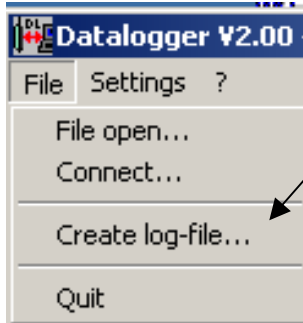
This function allows to create a log-file which contains information about the internal setup of the datalogger. The file created by this function can help to analyse the situation in case of problems. It is not a file which is useful directly for the datalogger user.

Further description of menu see chapter 3.3

5.2. Menu "Settings"
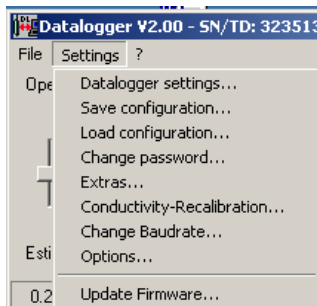
5.2.1.   Datalogger settings...
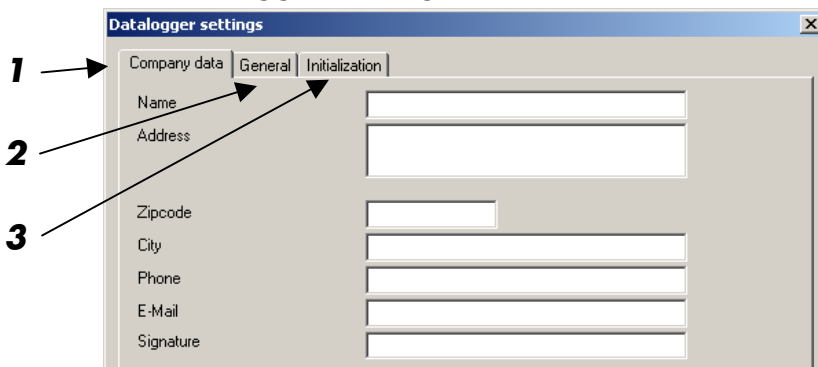
1   "Company data" shows the above window. The entered data appears in the printout (see chapter 5.2.7 "View Data").

2   In the tab "General" the battery indicator (energy counter), which is visible in the main window, can be switch on and off. This function can be used if the datalogger has an external power supply.

3   In the tab "Initialization" all settings of the datalogger can be reseted to the factory setting. Existing measured values will not be lost.

5.2.2. Conductivity Recalibration...

The cleaning and recalibration process of the conductivity module is described in chapter 7.3.

5.2.3. Change Baudrate...

The baudrate is set on 38400 bps ex works. To communicate later over a communication module, the baudrate must be changed to 9600 bps.

5.2.4. Options...

This window shows all available channels and options. The ones which has been ordered are marked in the checkbox. To unlock disabled channels or options later, a special key (code) can be ordered from the supplier. Enter this key to the appropriate field and press the button "Unlock" to enable them.
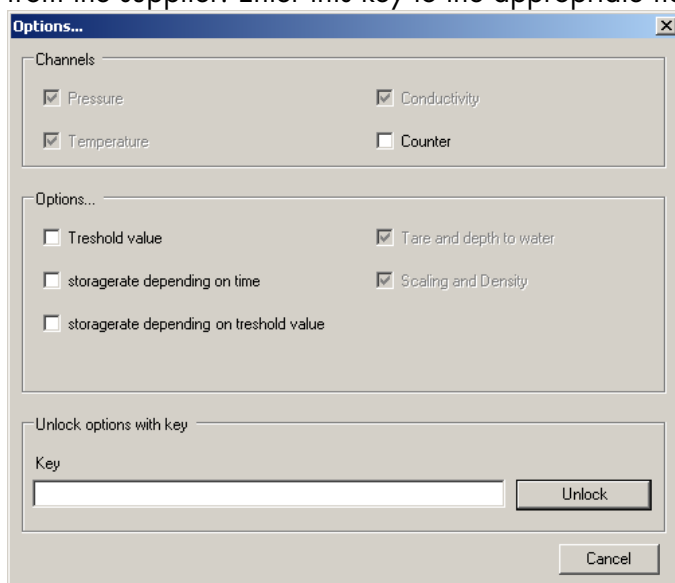
5.2.5. Update Firmware...

This function allows to upgrade the firmware in the datalogger.

Further description of menu see chapter 3.3

5.2.6.   Data Transfer

With „Transfer of the measuring data", the data can be read out of the datalogger into the PC. The actual read out status is shown in the upper field. These are the recorded measured data, date and time of the first and last measuring value and the number of read out values.

1

Reading out the data from the last measurement series (i.e. since the data recording function was last started). Press the button again, the datalogger will read out the second-last measurement series **in addition** etc. The data transfer will stop once the data has been successfully transferred, a connection error occurs or the stop-button has been pressed.

2

All the data stored in the datalogger will be read out. The data transfer will stop once the data has been successfully transferred, a connection error occurs or the stop-button has been pressed.

3

If neither a start nor an end time and date is being set, all the stored data will be read out. If only the start time and date is being set, the program will read out all the data starting at the start time and date until the present. If only the end time and date is being entered, the program will read out all the data until the end time and date.

4

To read out a specific measurement series open up the list to choose the required series. Only the choosen measurement series will be read out. With the button "…" the complete configuration of that measurement series will be shown.

5

Stops / interrupts the data transfer. All the data read out until this button was pressed will be transferred.

6

This function allows to delete ALL the recorded data in the datalogger. To do this, a password must be entered (see also chapter 3.3). As long as the program hasn't been closed and re-started, you will be able to delete the data in the datalogger without entering the password again.

ATTENTION: Read out and save all important data before deleting the datalogger memory. All data will be erased and cannot be restored!

5.2.7. View Data
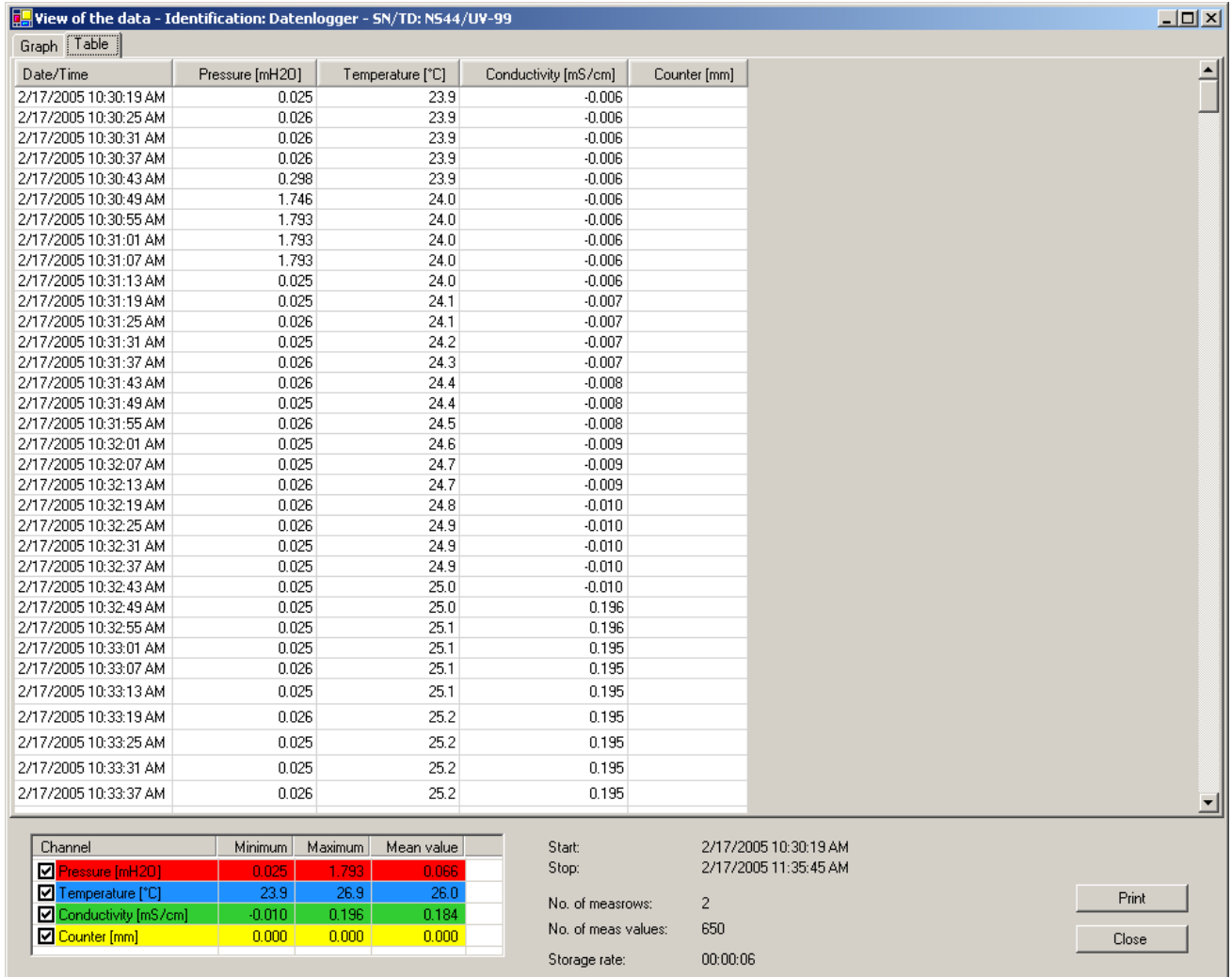
"Data View" allows to analyse and print out the measured data which has been read out.

The info bar shows the name (see chapter 5.2.9.1), the serial and transducer numbers of the DL.
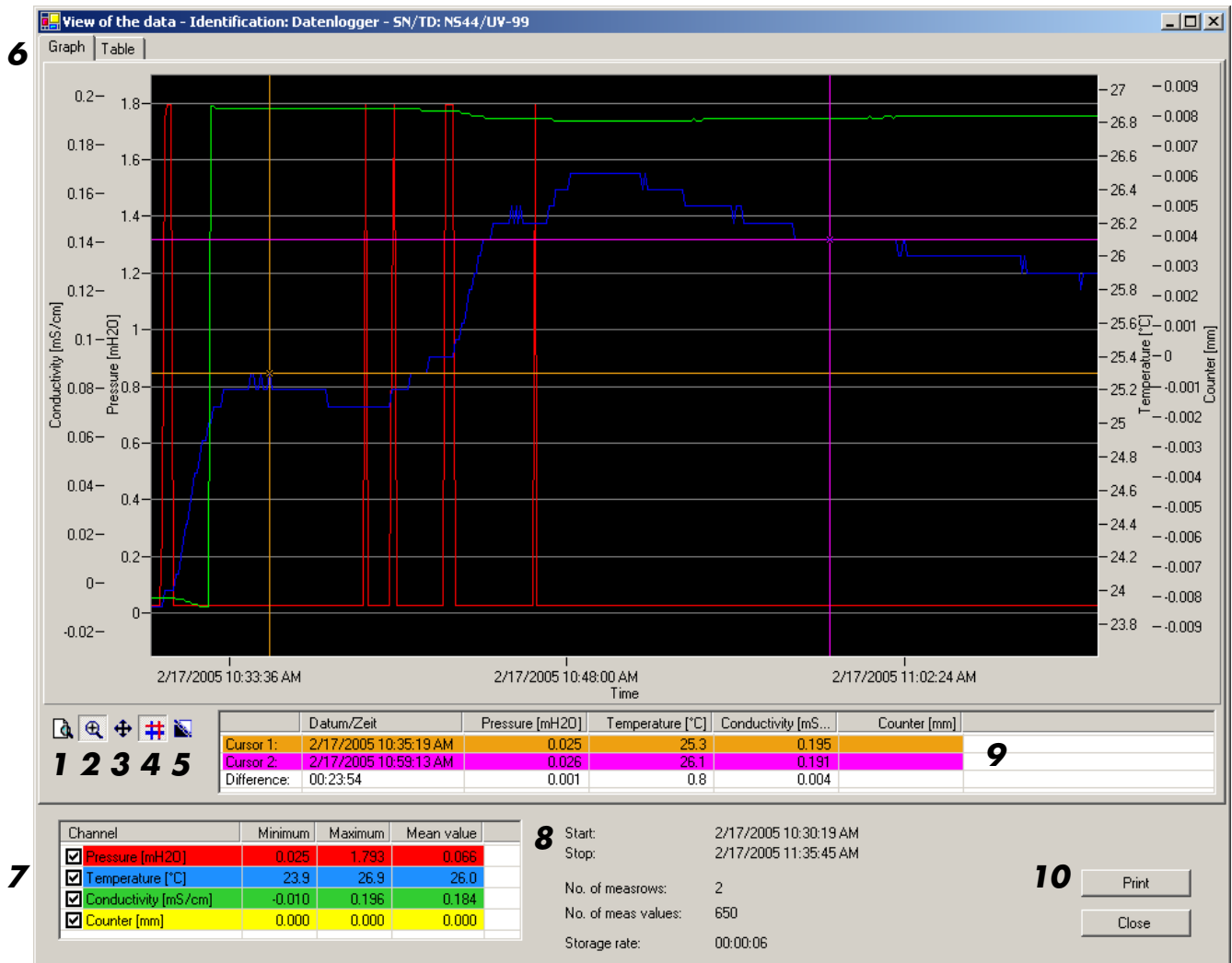
6

	Datum/Zeit	Pressure [mH2O]	Temperature [°C]	Conductivity [mS...	Counter [mm]	
Cursor 1:	2/17/2005 10:35:19 AM	0.025	25.3	0.195		**9**
Cursor 2:	2/17/2005 10:59:13 AM	0.026	26.1	0.191		
Difference:	00:23:54	0.001	0.8	0.004		

1 2 3 4 5

7

Channel	Minimum	Maximum	Mean value
Pressure [mH2O]	0.025	1.793	0.066
Temperature [°C]	23.9	26.9	26.0
Conductivity [mS/cm]	-0.010	0.196	0.184
Counter [mm]	0.000	0.000	0.000

8 Start: 2/17/2005 10:30:19 AM
Stop: 2/17/2005 11:35:45 AM

No. of measrows: 2
No. of meas values: 650
Storage rate: 00:00:06

10 Print
Close

1   Changes back to the normal view (1:1) after the zoom view.

2   Zoom: By selecting a section with the mouse pointer, this section of the curve will be zoomed.

3   Move: After zooming the displayed section can be moved along the curve. The curve can only be moved between the first and the last measurement value.

4   Set cursor: Two cursor can be set on the curve. They can be moved along the curve by clicking and dragging. Pressure, time and date where the cursor is being located will be displayed. Also the pressure difference between the two cursors is being showed.

5 Change colour: To enhance the quality of the printout on a black and white printer, the image can be changed to black and white.

6 One tab is to show the data in graphical form, the tab "Table" shows the values in a table form.

7 The checkbox allows to enable/disable the graph of the respective channel. The table shows also the minimum, maximum and the mean value.

8 Shows the date and time of the first and last measured value which are represented in the graphic. Also the total quantity of measured values and measrows which had been read out is being shown. Furthermore you see in which storage interval the read out data has been stored

9 Difference between the measured values which have been selected with the two cursors.

10 Prints the chart, including all the entries made as "Company Data" (see chapter 3.3).
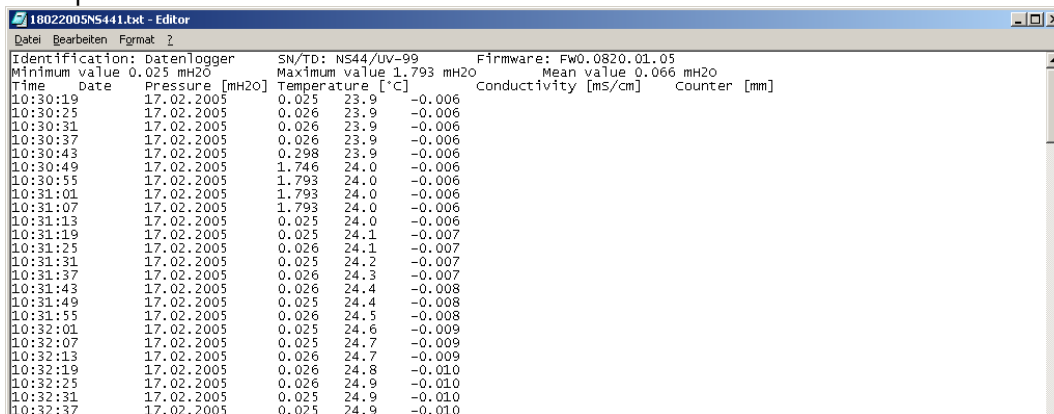
5.2.8. Save Dialog Box

This function is active only if data were transferred from the datalogger.
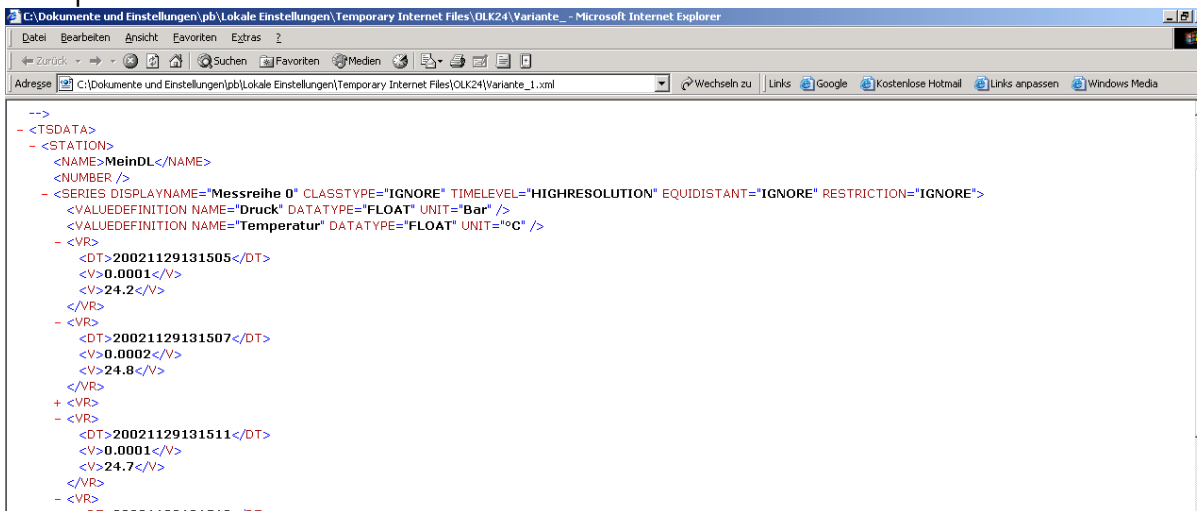
The data can be stored as ASCII- or XML files. The default file name is according to the settings made in the menu "Extras", see chapter 3.3.

Example of ASCII file:

Example of XML file:

5.2.9. Datalogger Configuration

Menu for the datalogger configuration.

5.2.9.1. Tab „Record"
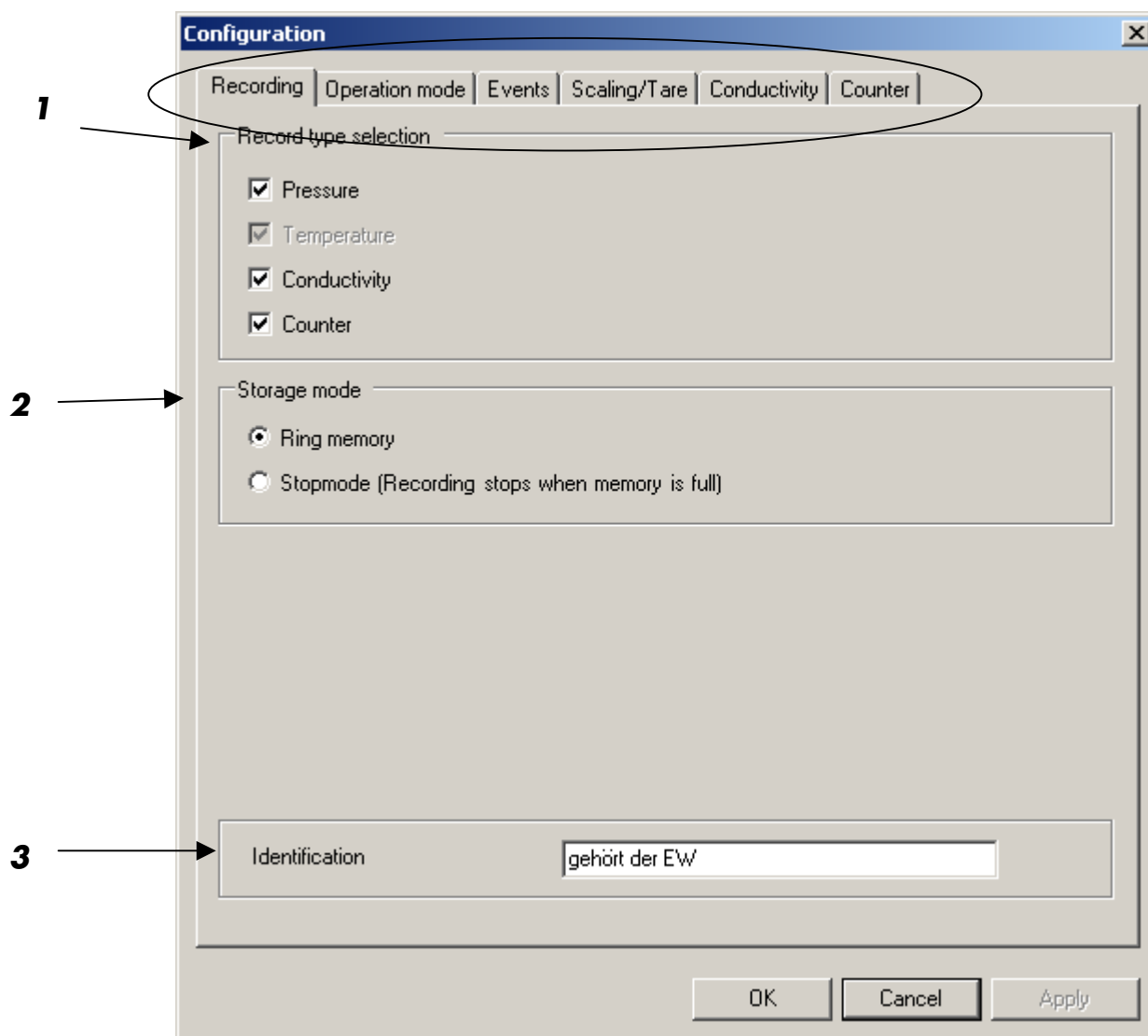
1 Record type selection:
These checkboxes are to select the recording measurands. "Temperature", "Conductivity" and "Counter" are only available if the respective option in the datalogger is activated. With "Conductivity" the "Temperature" is included.

2   Storage mode:
Ring memory: As soon as the datalogger memory is full, the oldest data will be overwritten by the new data.
Stopmode: As soon as the datalogger memory is full, recording stops.

If the memory is already full when starting the datalogger, following message appears:
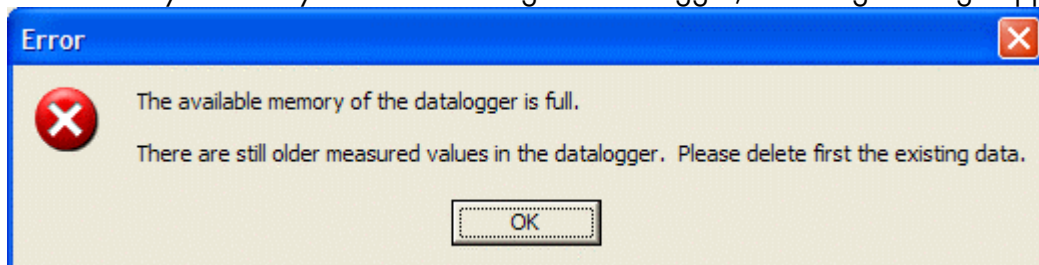
The datalogger can be restarted only if the memory is erased according to chapter 5.2.6.

ATTENTION: Read out and save all important data before deleting the datalogger memory. All data will be erased and cannot be restored!

3   Identification: This text (max. 19 characters) is stored in the datalogger. It can be used to identify the datalogger, e.g. the location of it.
The entry of this field appears in various locations:
- Data file (ASCII- or XML- file)
- Info-bar of the window „View of the data"
- Printout of the data view
- As part of the customer specific file name (see chapter 3.3)

5.2.9.2. Tab „Operating Mode"

Mode:
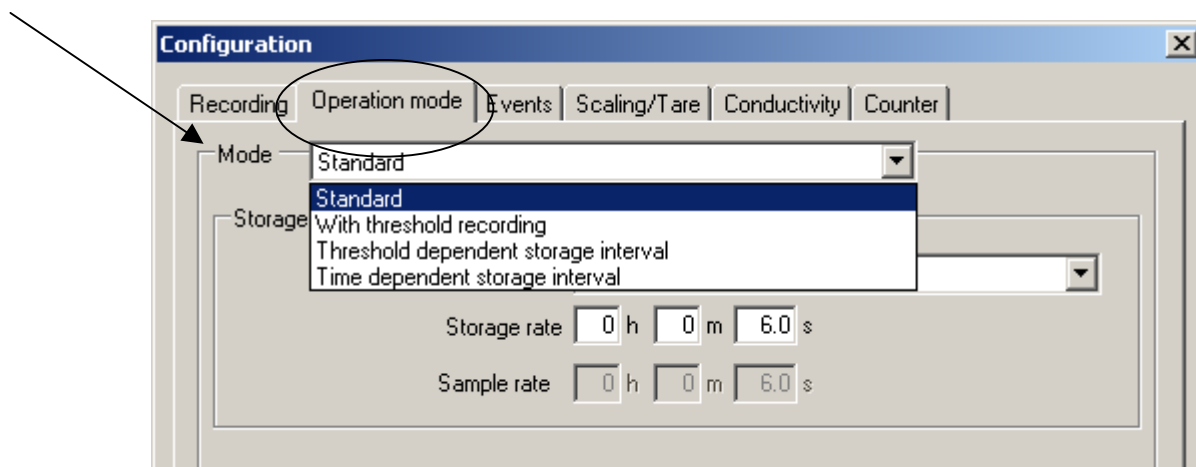
Selectable operating mode:

A   **Standard**
B   **With threshold recording (Option)**
C   **Threshold dependent storage interval (Option)**
D   **Time dependent storage interval (Option)**

The lower window area depends on the selected mode (see following description).

Mode „Standard" (A)
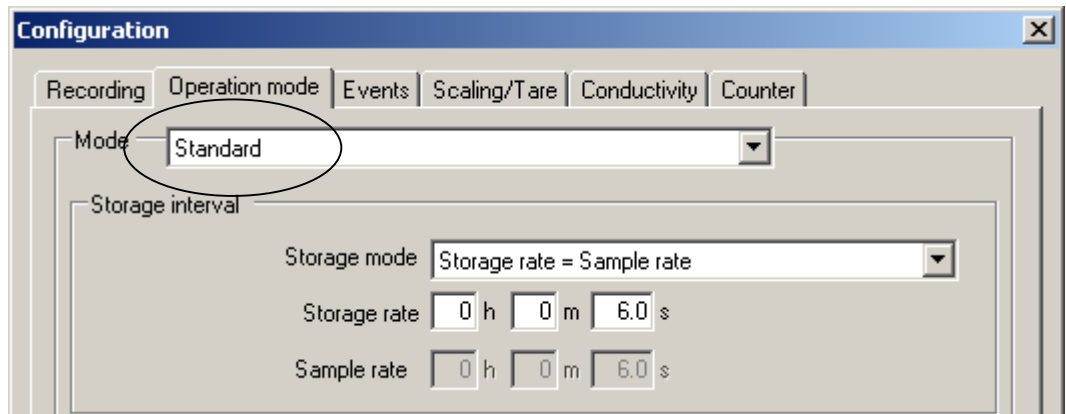
Storage interval
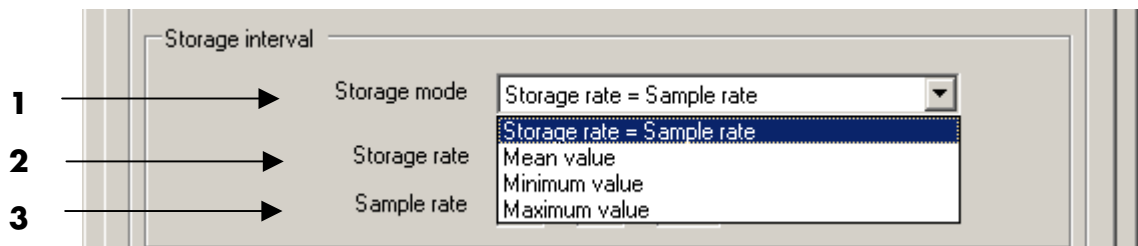
1 Storage mode:

      Storage rate = Sample rate: Storage rate is equal to sample rate

      Mean value: The arithmetical mean value will be stored

      Minimum value: The lowest value of the measrow will be stored

      Maximum value: The highest value of the measrow will be stored

2 Storage rate: This is the interval the measurements are stored

3 Sample rate: This is the interval of taking the measurement
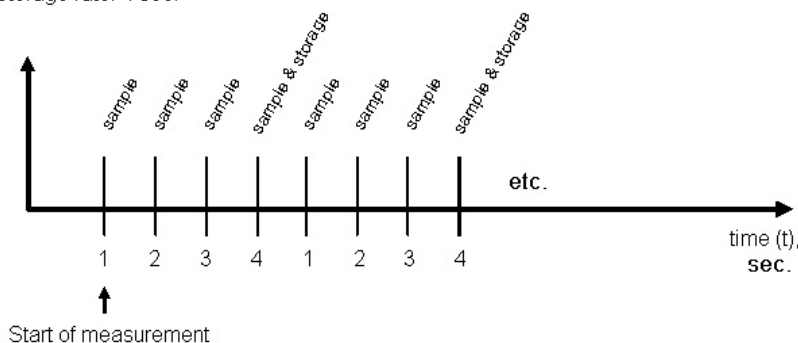
Mode „With threshold recording" (B)
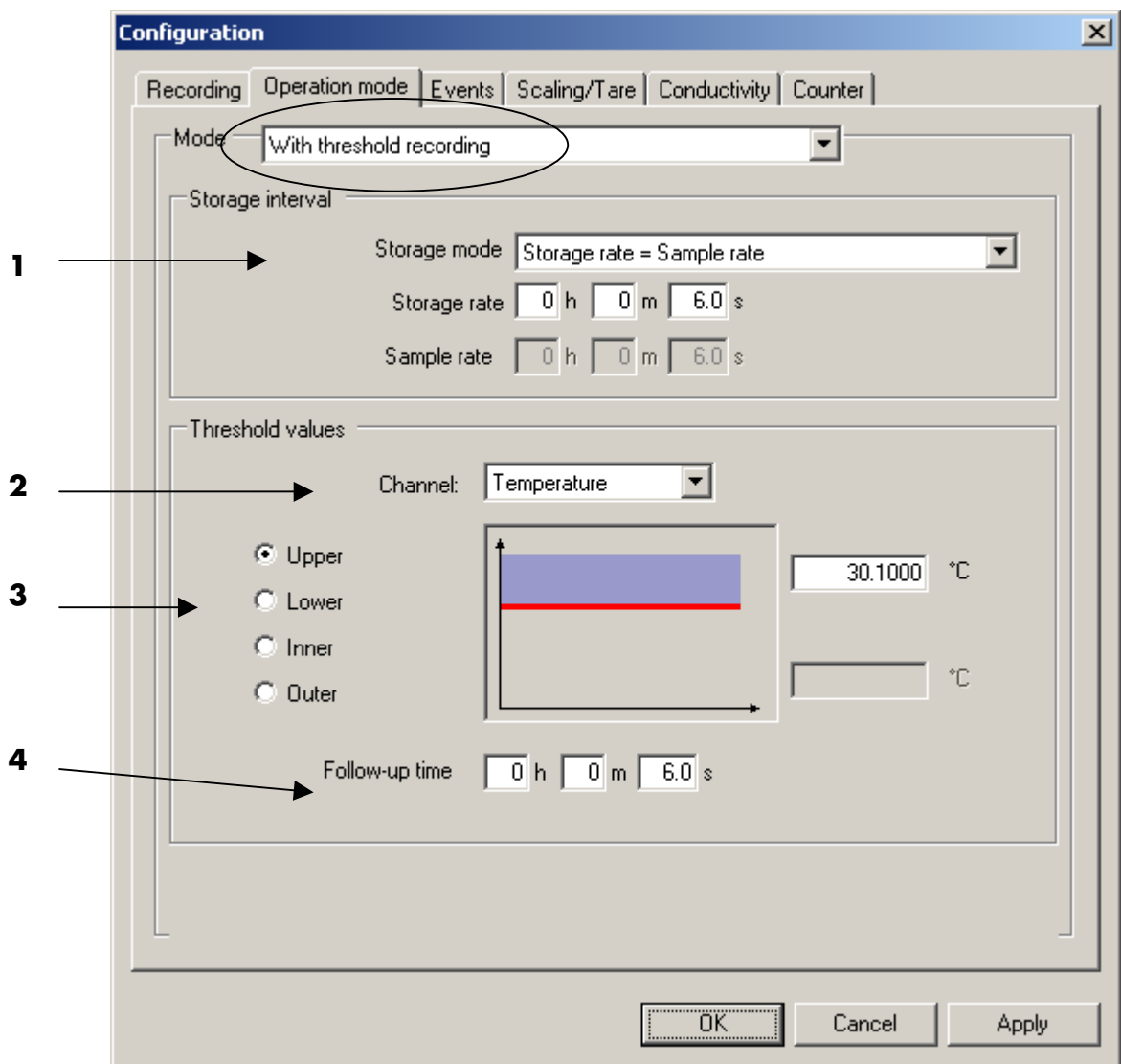
1 Storage interval: see mode „Standard"

2 Threshold values for channel: Pressure: The values of pressure are considered
                                         Temperature: The values of the temperature are considered

3 Upper:
      The DL does not start recording data until the pressure exceeds the specified value.
      Recording will stop if the pressure drops below the specified value. The DL starts recording
      again if the pressure exceeds the specified value.

3 Lower:
      The DL does not start recording data until the pressure drops below the specified value.
      Recording will stop if the pressure exceeds the specified value. The DL starts recording again
      if the pressure drops below the specified value.

3 Inner:

> The DL does not start recording data until the pressure is between the specified values. Recording will stop if the pressure is outside the specified range. The DL starts recording again if the pressure returns to the specified values.

3 Outer:

> The DL does not start recording data until the pressure leaves the specified range. Recording will stop if the pressure returns to the specified range. The DL starts recording again if the pressure leaves the specified range.

The examination whether threshold value(s) become exceeded is accomplished in the clock of the sample rate.

4 Follow-up time:

> During this time the datalogger keeps recording after the measured value has left the range for recording data.

Mode „Threshold dependent storage interval" (C)
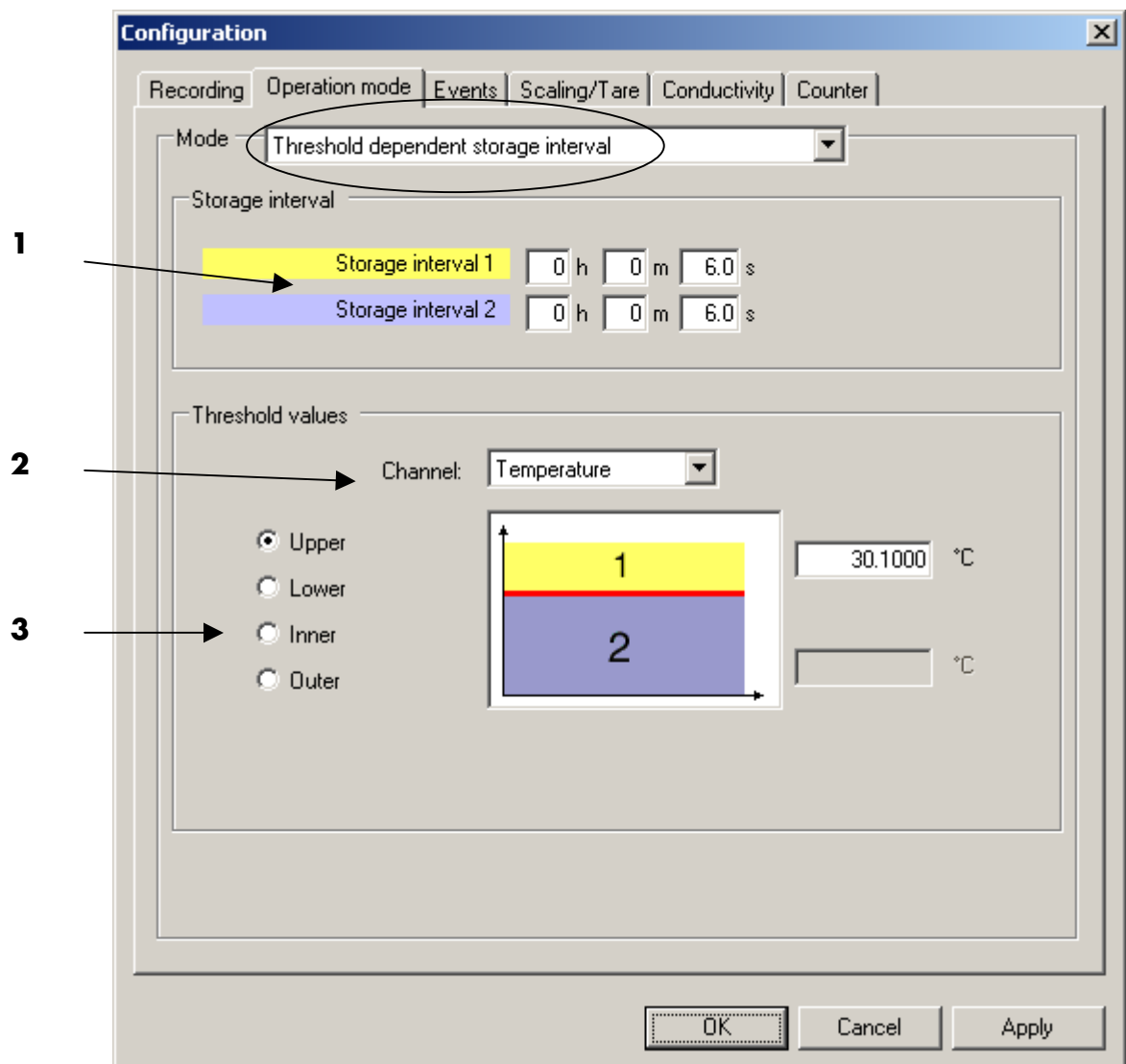
This mode changes the storage interval depending on the actual pressure or temperature. In this mode, the sample interval is equal to the storage interval.

1 Storage interval 1/2:   Setting the storage interval 1 and 2

2 Threshold value(s) for channel: Pressure: The values of pressure are considered
                                         Temperature: The values of the temperature are considered

3 See previous chapter

Mode „Time dependent storage interval" (D)
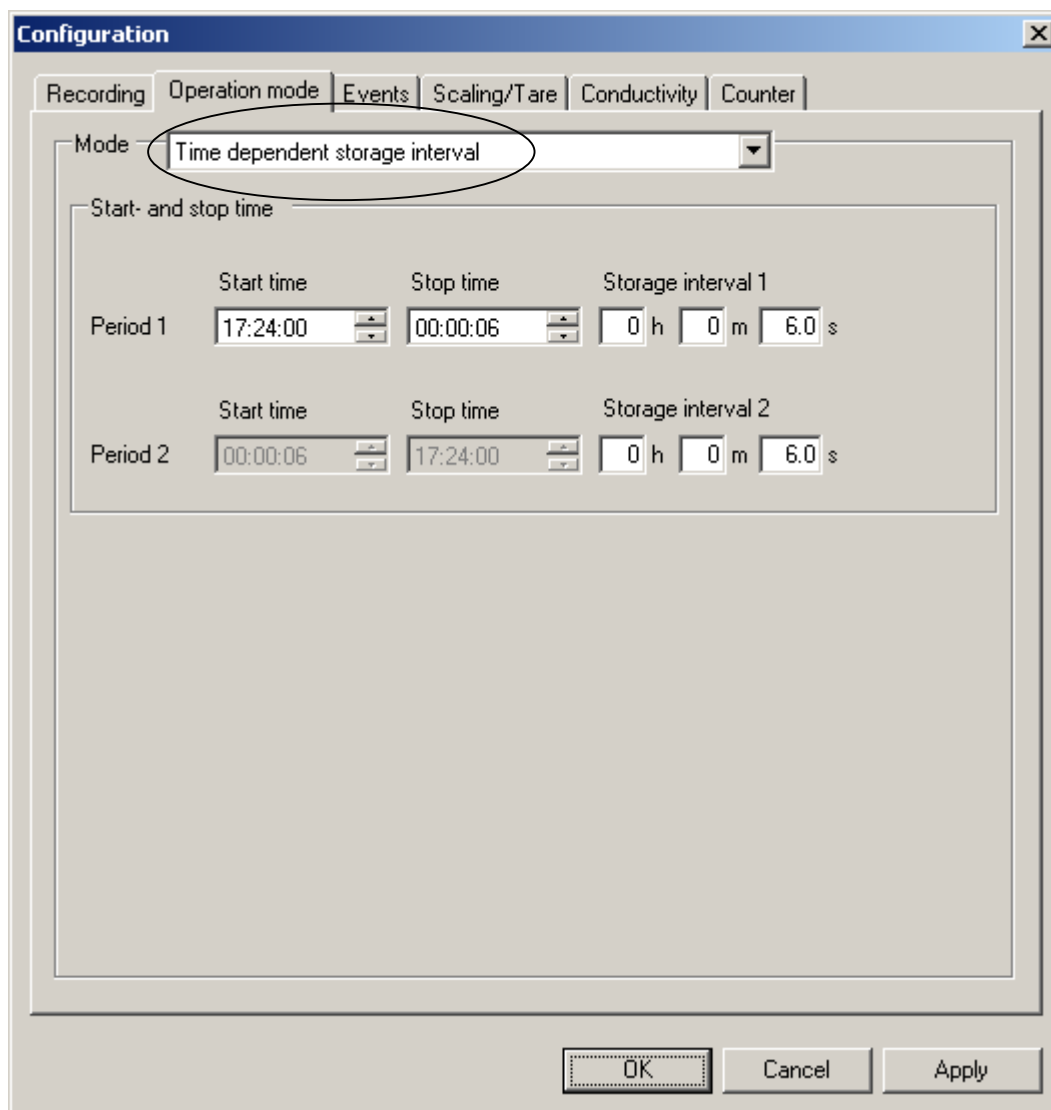
This mode records data within a specific time window in two different storage intervals. The sample interval is equal to the storage interval.

Period 1:   During this time window, the "storage interval 1" will be used.

Period 2:   This time window will complete automatically the period 1 to a 24 h time period. The "storage interval 2" will be used.

5.2.9.3. Tab „Events"

Only active when the option event is activated in the datalogger
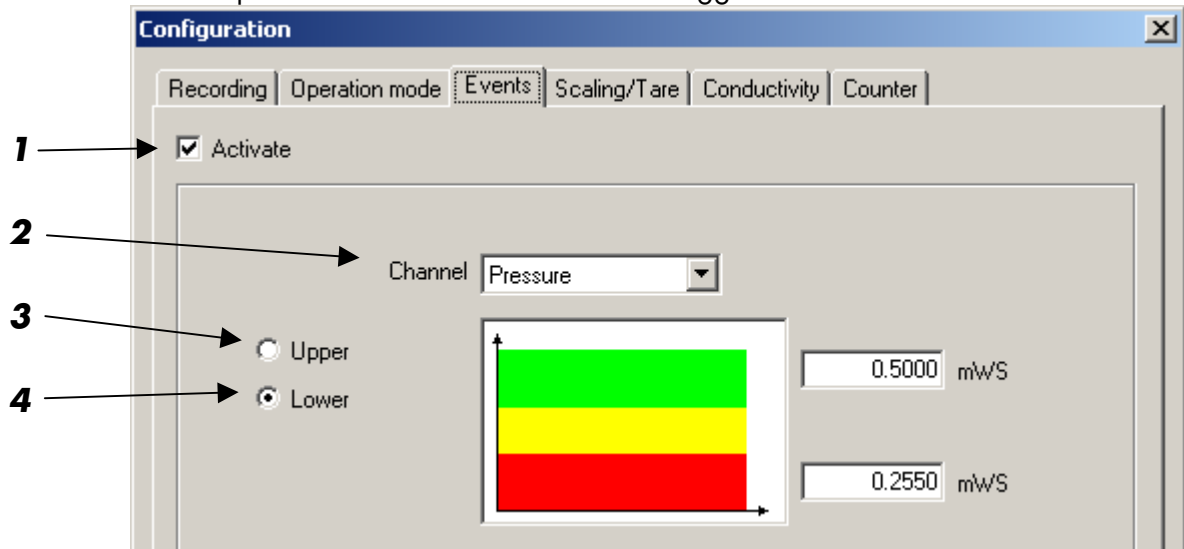
1   Setting this flag activates the option "Events" if the datalogger is switch on. This function can be used if the datalogger is connected with a communication module and events have to be transmitted automatically.

2   Event for channel: Pressure: The event is considered for pressure
                              Temperature: The event is considered for temperature

3   Upper:
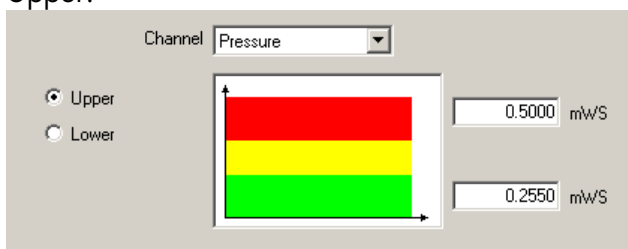
The DL does not give an event until the pressure exceeds the specified upper value. The upper and the lower value which can be entered correspond to the yellow marked field. A new event is only given if the event has been confimed by the datalogger software and if the pressure /temperature has fallen below the lower value.

4   Lower:
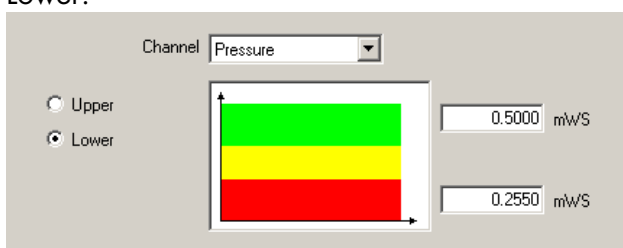
The DL does not give an event until the pressure falls below the specified lower value. The upper and the lower value which can be entered correspond to the yellow marked field. A new event is only given if the event has been confimed by the datalogger software and if the pressure /temperature has exceeded the upper value.

5.2.9.4. Tab „Scaling/Tare"

Level measuring
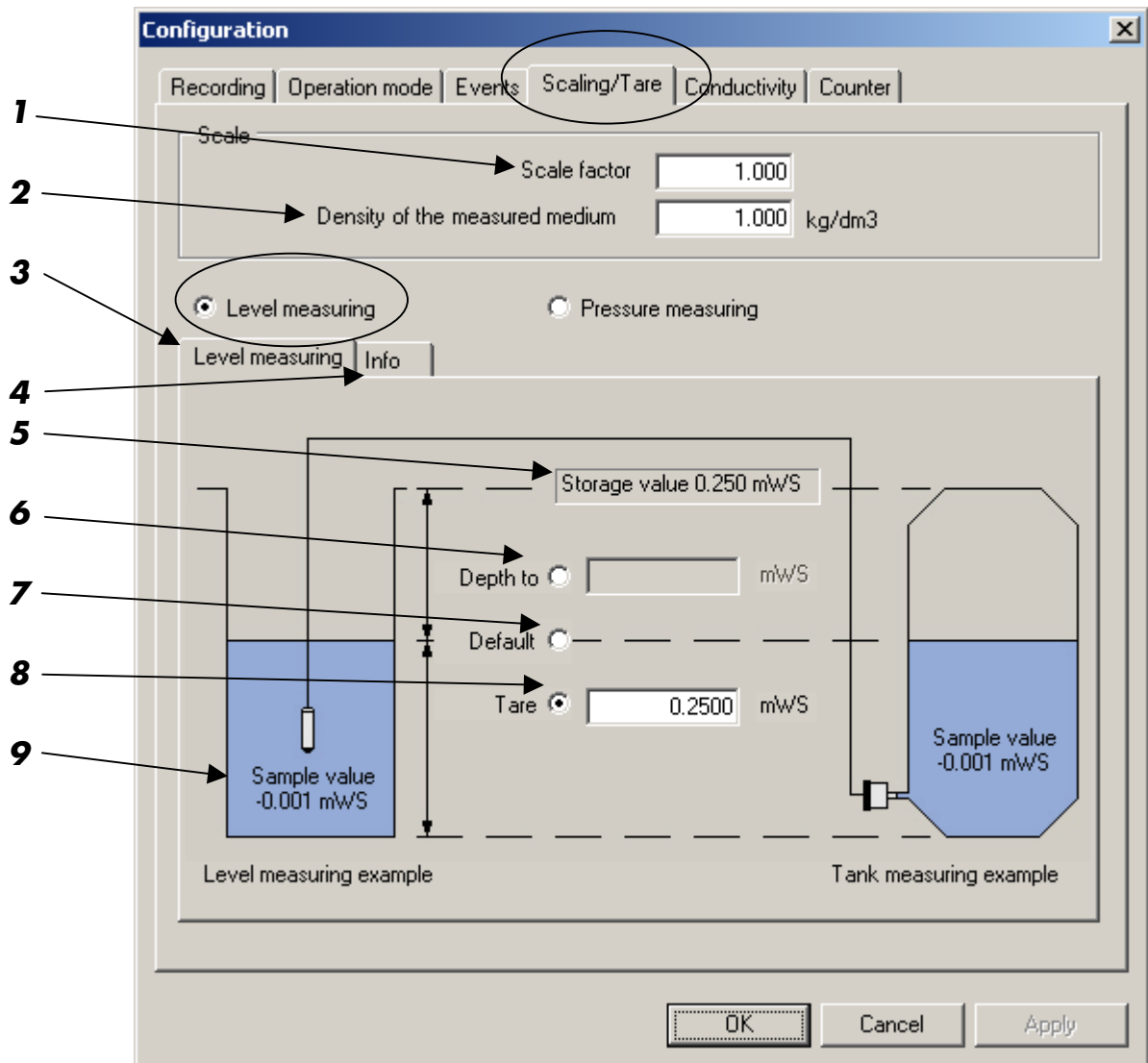
1 The measured value is multiplied by the scale factor. This factor must be between 0.3 and 2.0.

2 Value for the density of the measuring medium. This box is only active if the DL has been synchronized in a "length unit" (e.g. meters water scale, mH2O etc). The value must be between 0.5 and 2.0. kg/dm3. The program adjusts the measured level using the specified density factor. It only makes sense to set the density for level measurement if the calibrated unit is not a pressure unit (e.g. bar or mbar).

3   "Level measuring" to use the DL in a level application
"Pressure measuring", to use the DL in another application, see following chapter

4   Tab „Info" explains the difference between "measured value" and "stored value".

5   Displays the stored value (adjusted by the scale or density factor as well as the taring or the depth to water value).

6   Depth to water value: Distance between ground and water surface. This value has to be entered in the calibrated unit of the datalogger. This value can be up to +/- 10'000 with 4 decimal places in the unit the datalogger has been calibrated (evidently in the main window). If the measuring principle is artesian (medium plane above the borehole), the entered value has to be negative.

-> An increasing water level results in a decreasing storage value

7   Resets the values for scale/tare to the default settings.

8   If the measured depth (location of the sensor membrane) is not equal to the effective depth, the measured value can be corrected to the effective value in the calibrated unit of the datalogger. The tare can be up to +/- 10'000 with 4 decimal places in the unit the datalogger has been calibrated (evidently in the main window).

-> An increasing water level results in an increasing storage value

9   Measured value: This is the effective measured value, without consideration of tare, depth to water, scale or density.

Pressure measuring
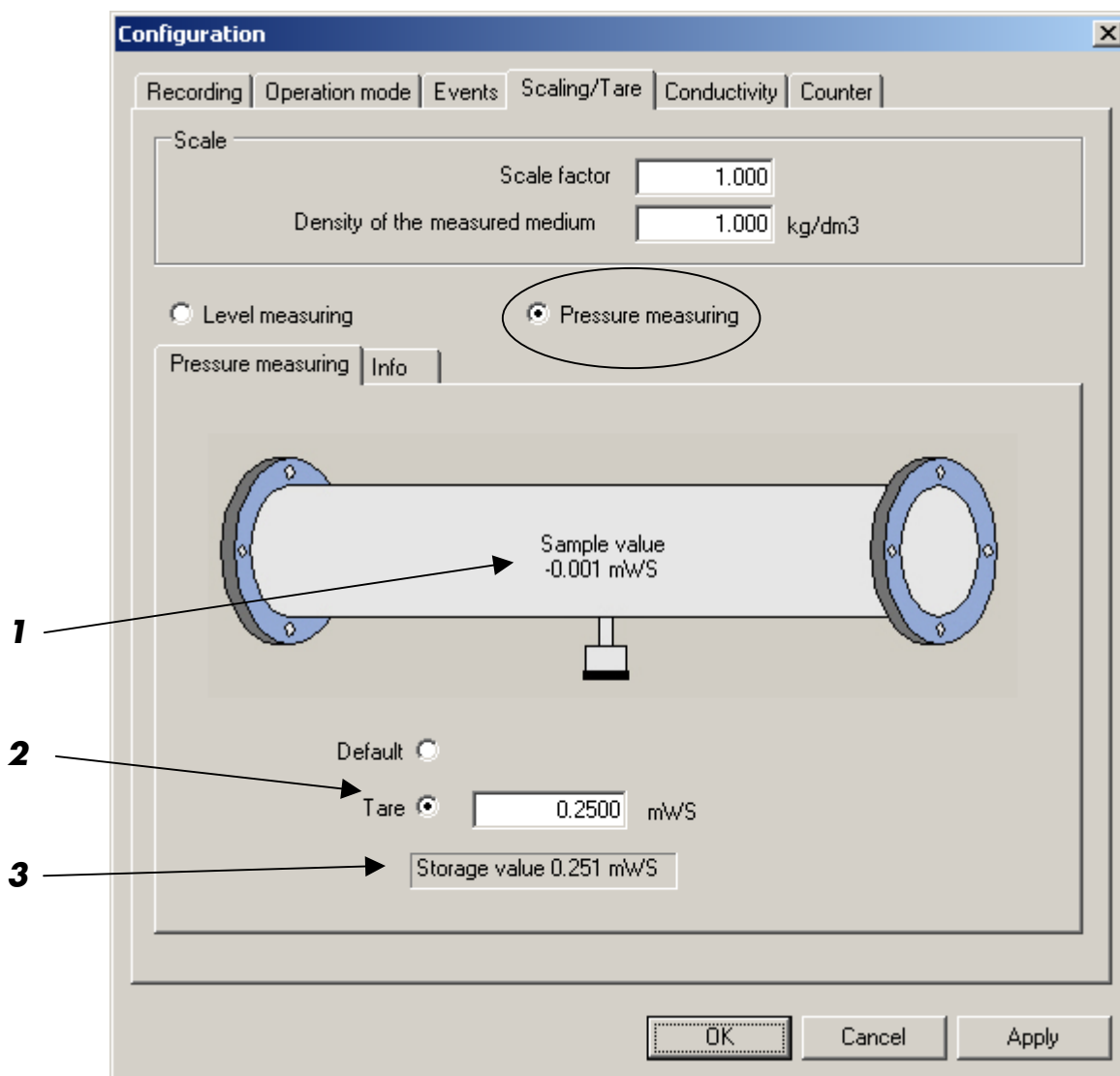
1   Measured value: This is the effective measured value, without consideration of tare, depth to water, scale or density.

2   Default: Tare is deactivated
Tare: Enter the actual desired value, click "Apply"

3   Displays the stored value, adjusted by the scale or density factor as well as the tare.

Info
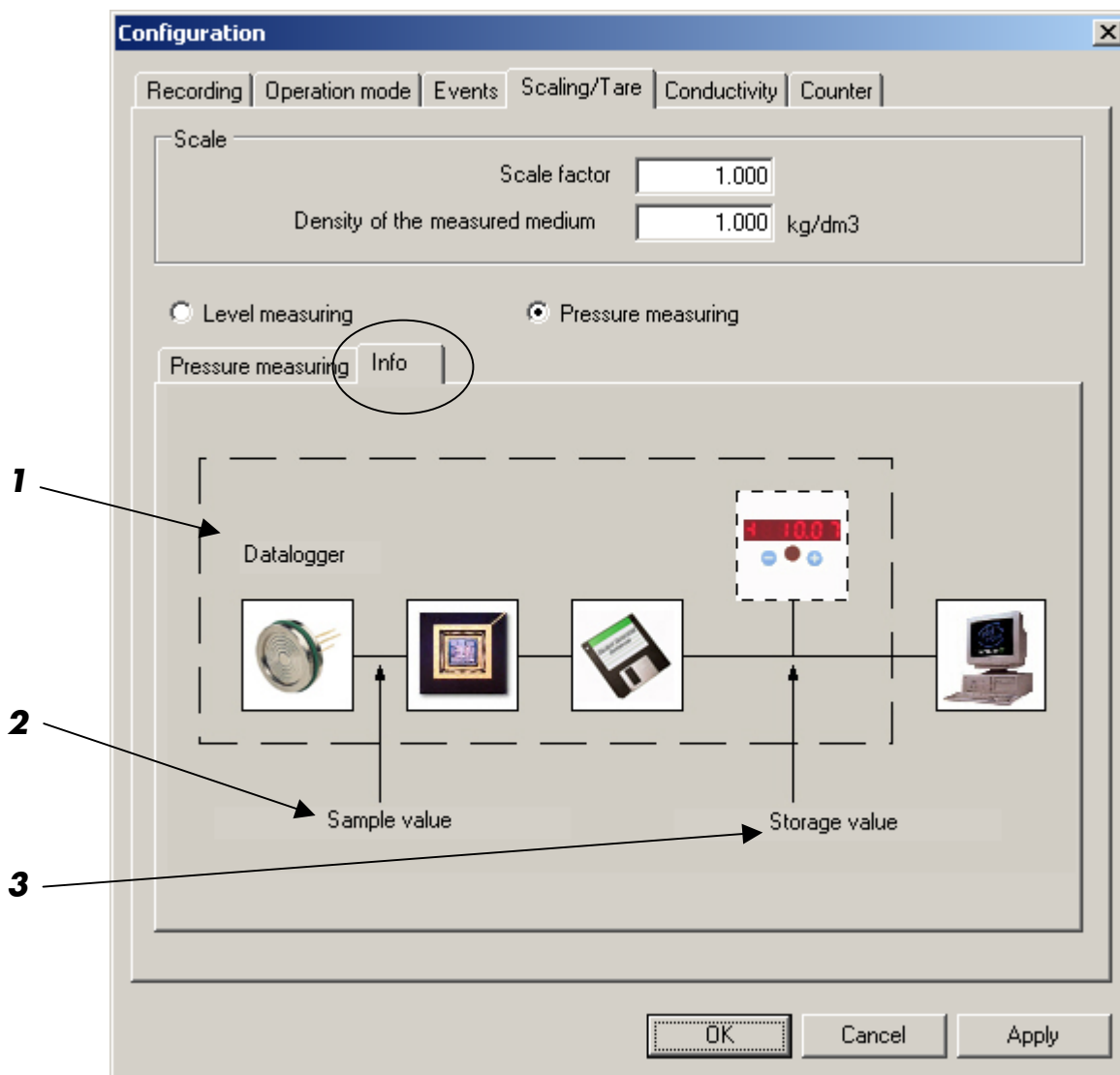
The info window explains the meaning of "Sample value" and "Storage value".

1   Symbolic block diagram of the datalogger.

2   Measured value: This is the effective measured value, without consideration of tare, depth to water, scale or density.

3   Displays the stored value, adjusted by the scale or density factor as well as the tare or depth to water value.

5.2.9.5. Tab „Conductivity"

Only active when the channel conductivity is activated in the datalogger (option)
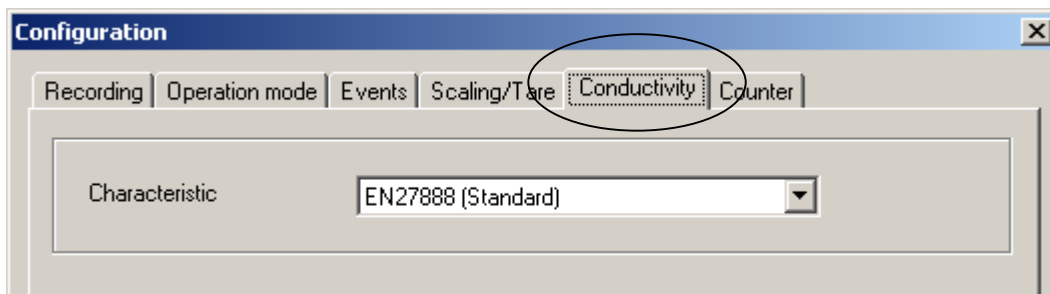
The conductivity is very strongly temperature-dependent. The conductivity increases with increasing temperature (approx. 2 % per °K) at natural waters. It is therefore necessary to correct the measurements on a reference temperature (25 degrees celsius). Depending on the application, different correction methods can be meaningful.

No correction
No correction of the measured values

EN27888 (Standard)
The measured values are corrected according to EN 27888 (ISO 7888)

2% per Kelvin
The measured values are corrected by 2 % per °K

5.2.9.6. Tab „Counter"

Only active when the channel counter is activated in the datalogger (option).
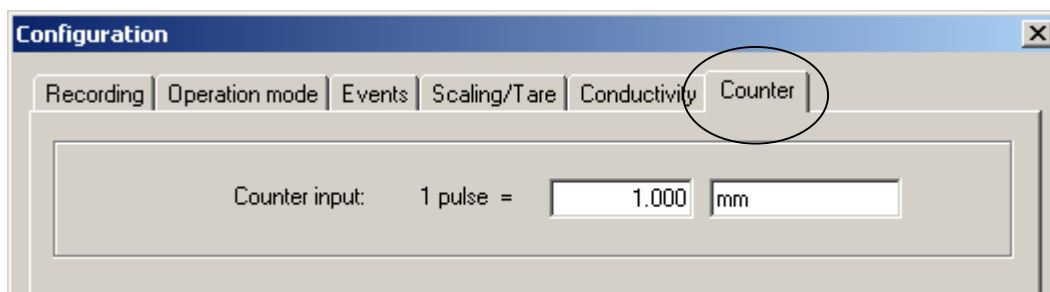
The value for a pulse and its unit can be defined

Example:
A rain counter gives 2 pulses per 1 mm rain -> 1 pulse corresponds to 0.5 mm
-> Enter: 0.5 mm

Allowed range :   0.001 to 10'000
Unit of pulse: max. 10 characters text or numbers

5.2.10.   Synchronize Time
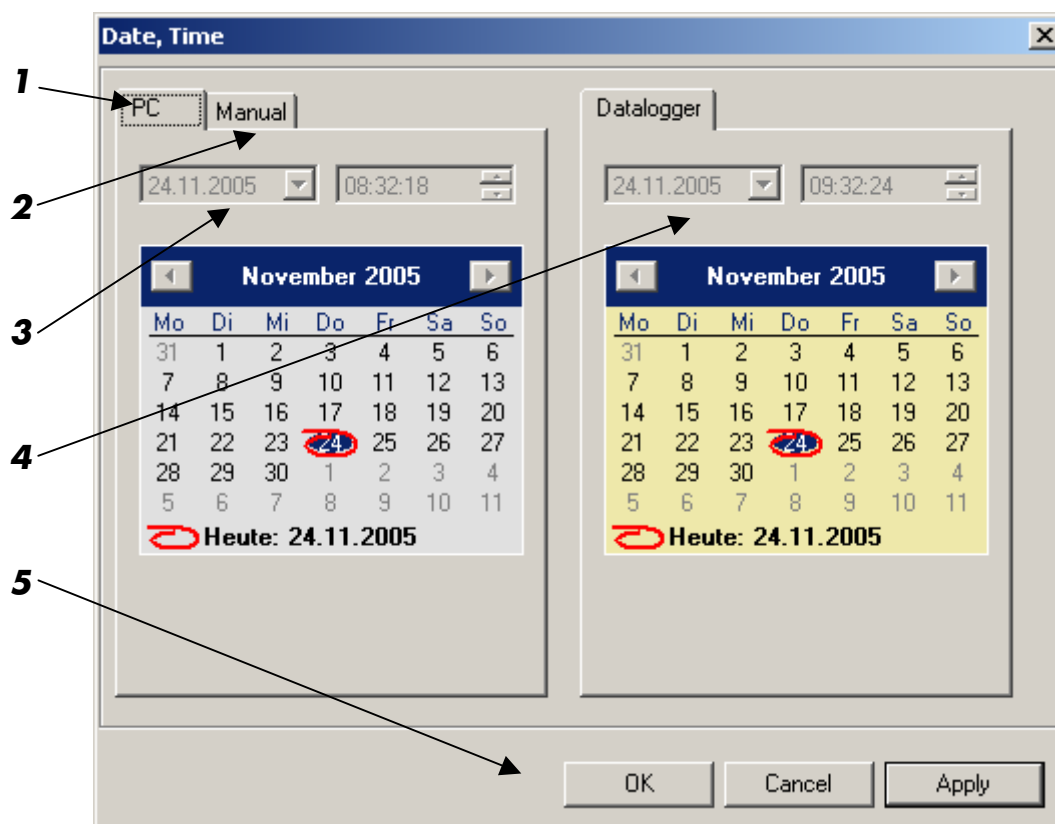
1   PC – register: shows the actual PC- time and date.

2   Manual – register: Fields to enter time and date manually.

3   Current PC – time

4   Current datalogger - time

5   Apply the PC – time/date or the manually entered time/date to the datalogger.

5.2.11. Battery Indicator

The battery indicator shows the calculated capacity of the battery. The less green fields appear, the lower the battery capacity is. It is advisable to change the battery before it is discharged completely. If the capacity of the battery falls below a certain level, the datalogger switches off automatically and following message appears:
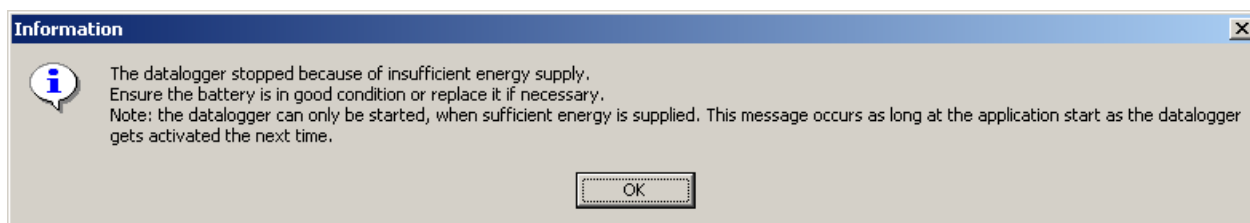
Information

The datalogger stopped because of insufficient energy supply.
Ensure the battery is in good condition or replace it if necessary.
Note: the datalogger can only be started, when sufficient energy is supplied. This message occurs as long at the application start as the datalogger gets activated the next time.

OK

The data remains in the datalogger memory and can be read out after the battery has been changed. You can order batteries as spare parts with the article number ART01962.

Was the battery removed for a longer time (e.g. during battery change) the datalogger will realize that and following message appears:

Information

The clock has not been initialized. Please synchronize the clock in the datalogger.

OK
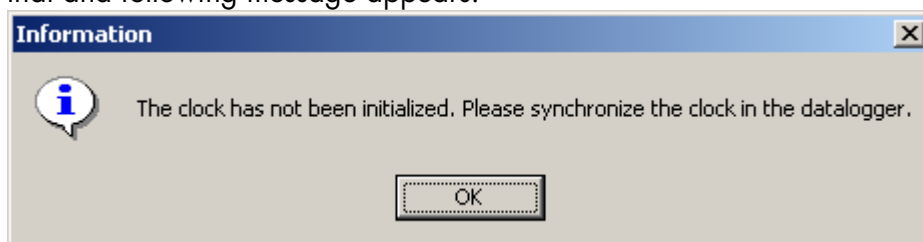
6. Theoretical calculation of the battery life time

6.1. DL/N, series 64

Precondition/acceptance for the calculation

- The calculation is not valid for the display battery
- For the calculation the storage interval and the sampling interval is equal
- The battery life time had been calculated for pressure and temperature measuring at an ambient temperature of 20°C

		storage interval = sampling interval				
		2 sec.	1 min.	15 min.	1 hour	24 hours
Data retrieval rate	1 day	10 d	6 mts.	1 yr. 4 mts.	1 yr. 5 mts.	1 yr. 6 mts.
	7 days	10 d*	8 mts.	3 yrs.	3 yrs. 8 mts.	3 yrs. 11 mts.
	14 days	☒*	8 mts.	3 yrs. 4 mts.	4 yrs. 2 mts.	4 yrs. 6 mts.
	30 days	☒*	8 mts.	3 yrs. 7 mts.	4 yrs. 7 mts.	5 yrs.
	180 days	☒*	8 mts.*	3 yrs. 9 mts.	4 yrs. 10 mts.	5 yrs. 4 mts.

	Memory capacity (theoretical)				
p or ϑ	3 d	90 d	3 yrs. 8 mts.	14 yrs.10 mts.	256 yrs.
p and ϑ	1.5 d	45 d	1 yr. 10 mts.	7 yrs. 5 mts.	178 yrs.

p: Pressure ϑ: Temperature
☒:   The battery is empty before reading out the memory *****: The memory is full before reading out

Further information

- If only pressure or only temperature will be recorded the battery life time is not considerably longer
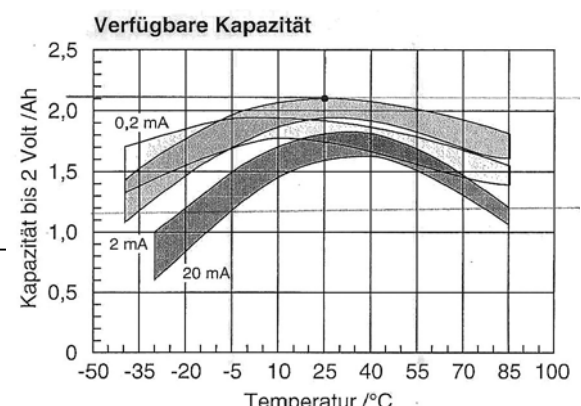
- The stored data will not get lost during battery change
- The self-discharge of the battery is approximately 4% per year at 25°C
- The ambient temperature has a significant influence on the battery life time(see chart)
- Standby current DL approx. 60μA

approx. 4 mA

6.2. DL/N, series 70

Precondition/acceptance for the calculation
- For the calculation the storage interval and the sampling interval is equal
- Ambient temperature: 20°C, Baudrate 38'400 bps

		Storage interval (= sampling interval)				
		0.5 Sec.	10 Sec.	1 Min.	1 Hour	24 Hours
Battery lifetime at readout interval ≥ 1 day[1]	p	35 d[2]	14 M	2.5 Y	3 Y	3 Y
	p / ϑ	34 d[2]	14 M	2.5 Y	3 Y	3 Y
	p / ϑ / LF	[4]	36 d	6 M	2.8 Y	3 Y
max. Memory capacity (approx. 500'000 values)[5]	p	66 h	57 d	340 d	55 Y [3]	1300 Y [3]
	p / ϑ	34 h	29 d	170 d	28 Y [3]	650 Y [3]
	p / ϑ / LF	23 h	19 d	110 d	18 Y [3]	430 Y [3]

p	Pressure	[1]	The readout interval does affect the battery lifetime insignificantly
ϑ	Temperature		
LF	Conductivity	[2]	take notice of the max. memory capacity
h	Hours	[3]	The battery is empty before the memory is full
d	Days	[4]	Shortest sampling interval with conductivity: 6 Sec.
M	Months	[5]	Available memory depending on the number and the length of the measurement series
Y	Years		

Information

- The stored data will not get lost during

LS 14500 - Restored Capacity versus Current and Temperature (2.0V cut off)
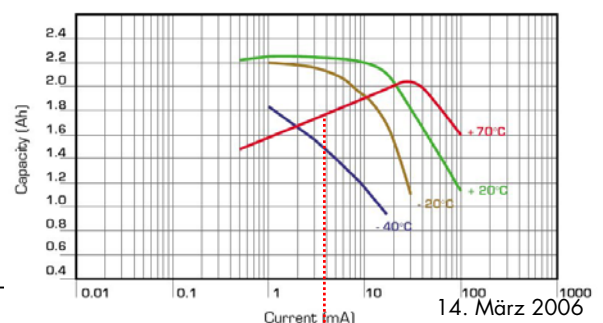
battery change
- The self-discharge of the battery is approx. 1% per year at 20°C
- The ambient temperature has a significant influence on the battery life time (see chart)
- Current consumption DL (during measuring) approx. 3 – 5 mA
- Standby current DL approx. 60µA

ca. 4 mA

7. Maintenance

The dataloggers are mainly maintenance-free. The diaphragm may not be touched with hard or sharp tools or high pressure jet of water. Even small, nearly invisible damages can cause measuring errors. To clean the datalogger, don't use hard or sharp tools or aggressive cleaning liquids. If the diaphragm shows calcification, use a standard household lime-cleaner.

7.1. Battery Replacement DL/N, series 64

Pict. 1   Pict. 2a   Pict. 2b   Pict. 3

PLEASE NOTE: After changing the battery it is necessary to reconfigure the DL/N.
Make sure that neither dirt nor moisture are able to penetrate the device. Remove the black screw cap. Release the rear section by twisting the knurled nut until it is possible to retract the male connector containing the battery. Carefully retract the battery from the casing.
2a) Disconnect the battery at both ends.
2b) Remove the yellow transport plugs from the new battery. Disconnect the reset plug attached to the new battery and connect it to the data logger side of the battery terminal for 2 seconds. The reset plug is no longer required now. Now connect the new battery at both ends.
Slide the battery into the DL casing as far as it will go. Tighten the knurled nut by hand as far as mechanically possible (tightness of plug and protection against twisting).

The datalogger recognizes when the battery is removed or disconnected for more than 2 seconds. After reconnecting the battery, the battery indicator is set automatically to „full", independent of the actual battery capacity. That means even if a nearly empty battery is reconnected, the battery indicator shows "full". Reason: The characteristics of the lithium batteries allow no conclusion concerning the (remaining) capacity (e.g. by measuring the battery voltage).

We recommend to mark the replaced batteries to make sure not using "old batteries" as new batteries by mistake.

After replace the battery please set date and time of the datalogger again.

7.2. Battery Replacement DL/N, series 70

Open or close the datalogger
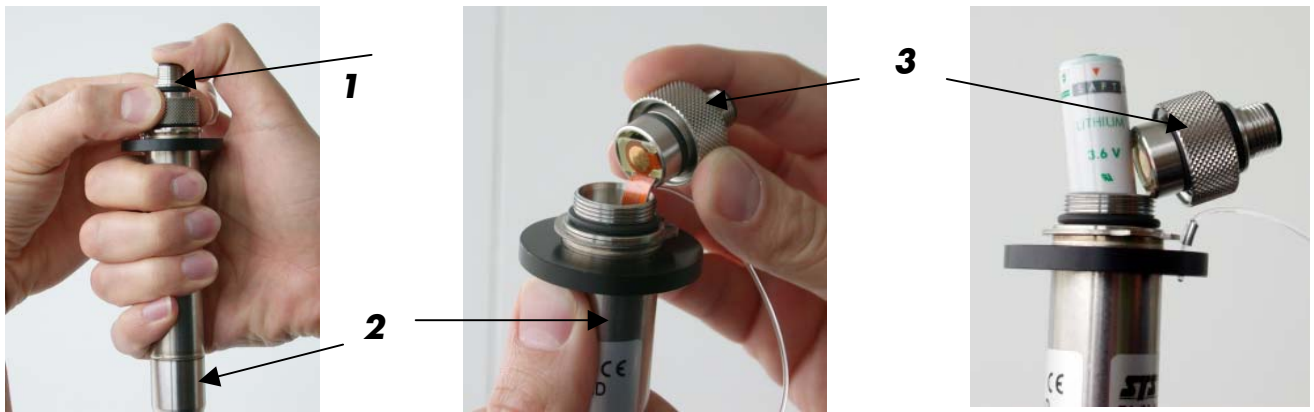
The upper connector part with the thread (1) may not be turned against the lower part (2) when opening or closing the datalogger. Please pull the upper connector part **carefully** from the tube, otherwise, the flex pcb can get damaged. Please make sure no dirt or humidity is coming into the datalogger.

The datalogger recognizes when the battery is removed or disconnected for more than 2 seconds. After reconnecting the battery, the battery indicator is set automatically to „full", independent of the actual battery capacity. That means even if a nearly empty battery is reconnected, the battery indicator shows "full". Reason: The characteristics of the lithium batteries allow no conclusion concerning the (remaining) capacity (e.g. by measuring the battery voltage).

We recommend to mark the replaced batteries to make sure not using "old batteries" as new batteries by mistake.

The used battery is a lithium, type Saft LS14500, 3.6V, 2.25Ah, size AA
(Attention: Type Saft LS14500 **C** may NOT be used).

Other lithium batteries than listed above may NOT be used because of different characteristics (even if the voltage and capacity is the same).

After replace the battery please set date and time of the datalogger again.

7.3. Maintenance of the Conductivity module

7.3.1.   Cleaning of the Conductivity module

The necessary cleaning cycle depends on the quality of the medium the datalogger is used in. When using the datalogger in freshwater applications with good water quality checking and cleaning of the conductivity module is reduced to a minimum (seasonal or even annual checking). If the datalogger is used in polluted or muddy water, checking is necessary fairly often.

To clean the module, do not use hard or sharp tools or aggressive cleaning liquids. Clean the datalogger under flowing water. If necessary, remove the protection cap (counterclockwise by hand). Make sure the diaphragm will not be touched or damaged.

7.3.2.   Recalibration of the Conductivity module

In the menu „Settings", click „Conductivity-Recalibration".

Before start the recalibration process a password is requested. The default password is „1234" (see chapter 3.3.2.4).
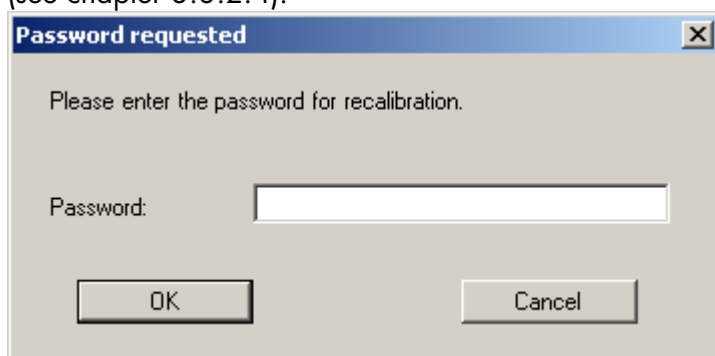
After entering the password you can choose between recalibration and reset to factory settings.
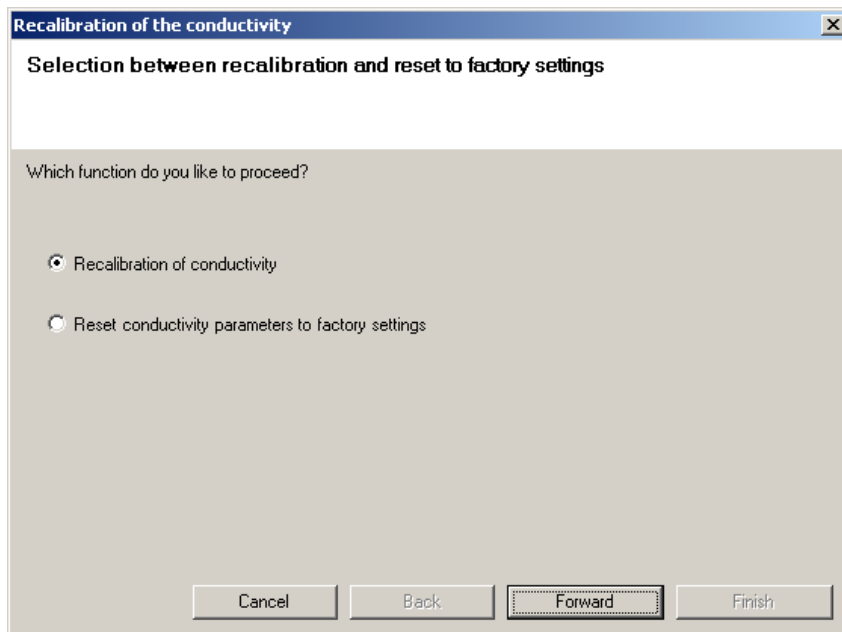
7.3.3. Recalibration of the Conductivity

Please make sure to keep the datalogger AND the calibration liquid at least 6 hours in a room with approximately 20°C ambient temperature.
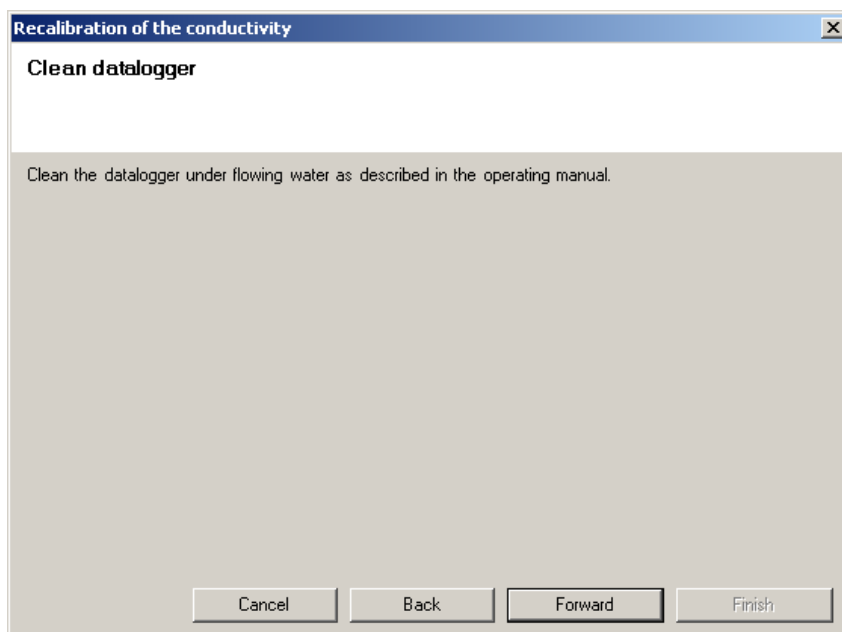
The cleaning cycle of the conductivity module depends strongly on the quality of the medium, in which the DL is used. Do not use hard or sharp tools to remove dirt or sludge. Make sure that neither sludge nor dirt is placed under the protective cap. If the protective cap is removed from the datalogger (counterclockwise by hand), do not damage the diaphragm. First of all clean the conductivity module under flowing water.

Recalibration of the conductivity

Clean datalogger

Clean the datalogger with destillated water.

| Cancel | Back | Forward | Finish |
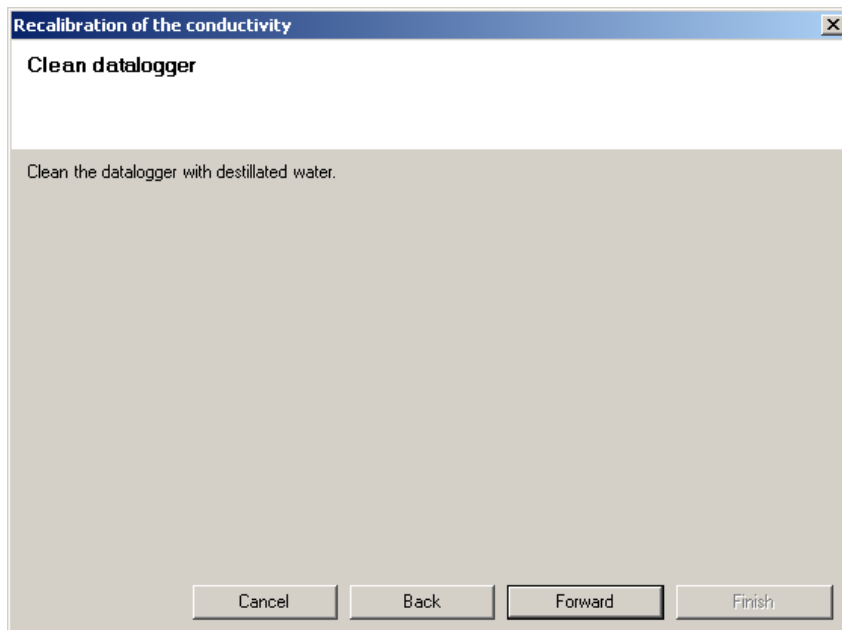
After cleaning the module under flowing water, clean it with destillated water.

Recalibration of the conductivity

Dip the datalogger into a calibration liquid.

Dip the datalogger into the calibration liquid which has a conductivity of 1413uS/cm.
The calibration liquid must have a temperature of 15 to 30°C.

| Cancel | Back | Recalibrate | Finish |
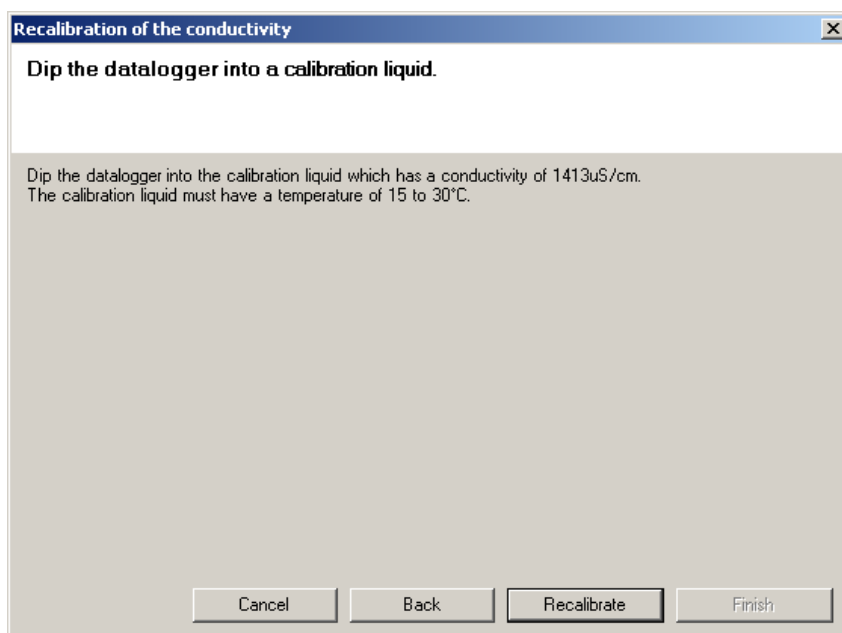
After cleaning with destillated water, dip the module into the recalibration liquid (standard of 1413 µS/cm). This liquid can be ordered from the supplier. Make sure to use always a standard liquid with 1413 µS/cm. During the recalibration process, the temperature of the recalibration liquid has to be between 15 and 30°C.
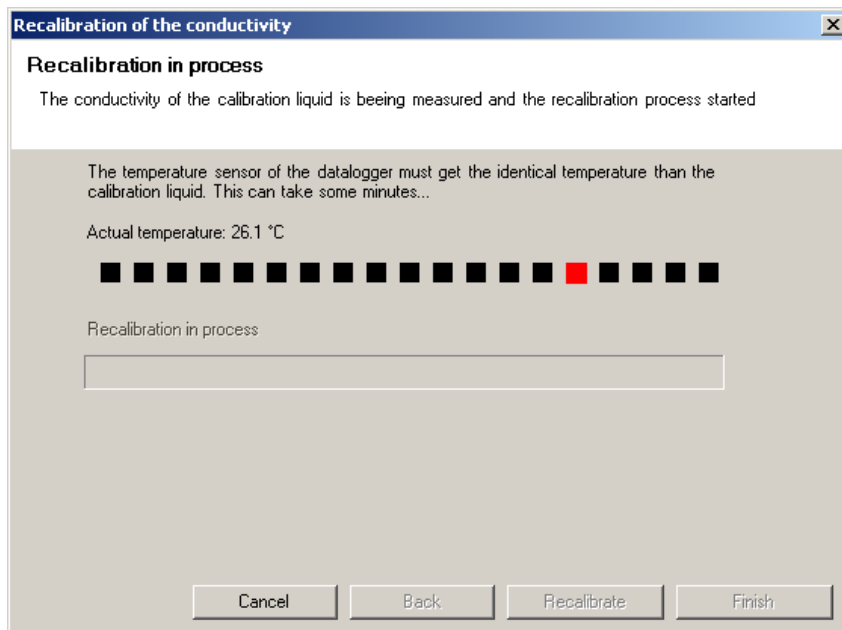
If the temperature change is bigger than 0.1°C/min. the recalibration process will be interrupted after 10 minutes even if the temperature is within 15 - 30°C.
Only if the temperature change is ≤ 0.1°C/min. the recalibration process will proceed.

Following message appears:

Recalibration of the conductivity

Recalibration in process

The conductivity of the calibration liquid is beeing measured and the recalibration process started

✓ The temperature sensor of the datalogger must get the identical temperature than the calibration liquid. This can take some minutes...

Actual temperature: 24.5 °C

✓ Recalibration in process

The recalibration was successful

| Cancel | Back | Recalibrate | Close |

Possible errors during the recalibration:

If the temperature change is higher than 0.1°C/min:

Information

Following error occured during the recalibration and therefore gets aborted:
The maximum adaptation time ran off
The datalogger must be set back to the inital settings before the assistant can get closed.

OK
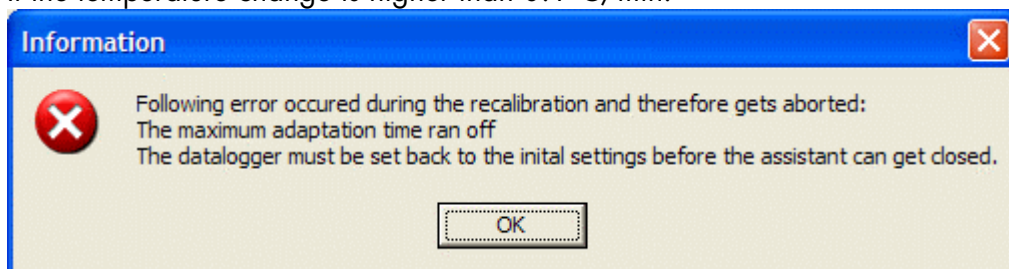
If the temperature of the calibration liquid is not within 15 to 30°C:

Information

Following error occured during the recalibration and therefore gets aborted:
The temperature of the calibration liquid is outside from 15 to 30°C
The datalogger must be set back to the inital settings before the assistant can get closed.

OK
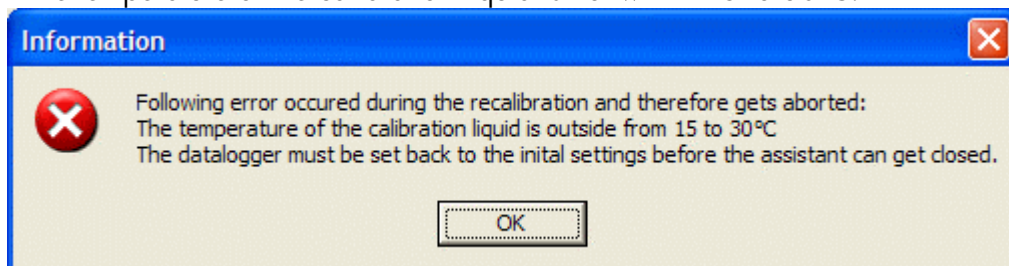
If the conductivity module has not been cleaned properly, is damaged, or the calibration liquid is not clean anymore the calibration process will be interrupted:

Information

Following error occured during the recalibration and therefore gets aborted:
The calculated new cell constant is outside of the expected value
The datalogger must be set back to the inital settings before the assistant can be closed.

OK
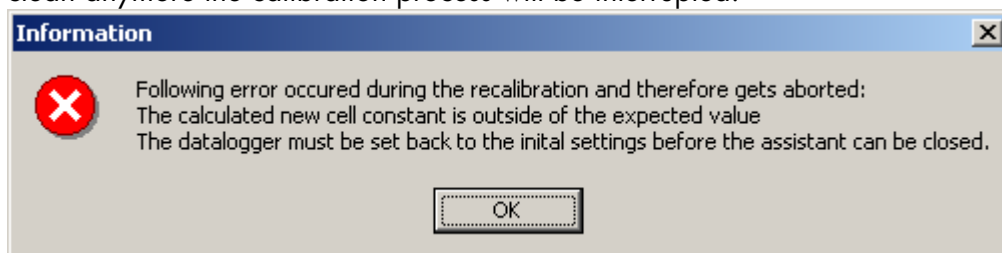
Interruption of the recalibration process by the user:

Information	☒
ⓘ The recalibration get aborted. The datalogger must be set back to the inital settings before the assistant can get closed.	
OK	
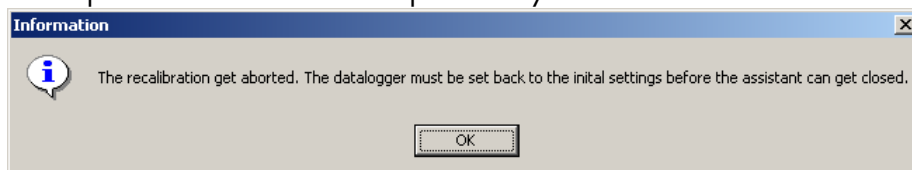
After interrupting the recalibration process, the calibration values will not be lost, but will be set back to the factory settings automatically.

Recalibration of the conductivity   ☒

Initial settings of the datalogger gets reactivated

✔ Saved old measurement parameters gets written back to the datalogger.

✔ Saved old conductivity characteristics gets activated.

Cancel	Back	Recalibrate	Close
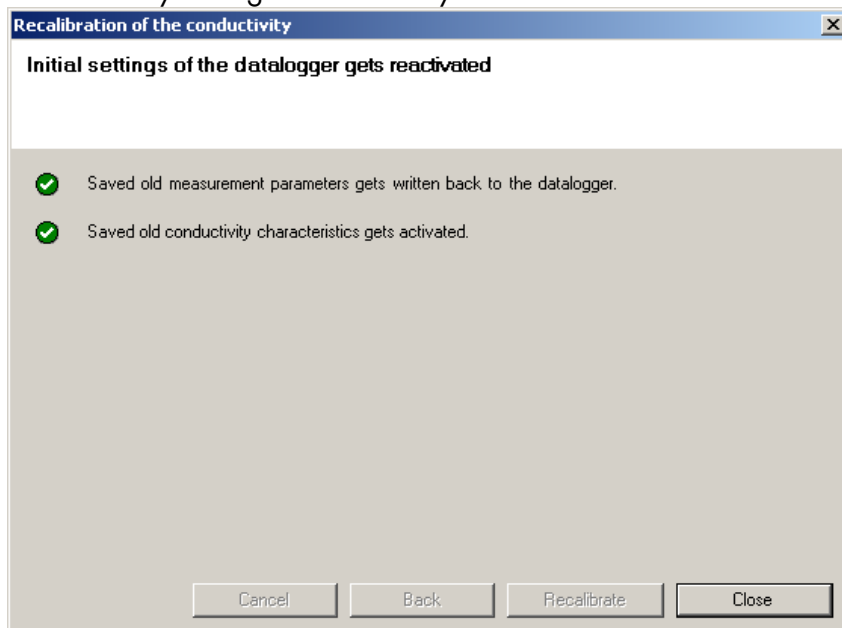
If necessary restart the recalibration process.

7.3.4. Reset Conductivity Parameters to Factory Settings
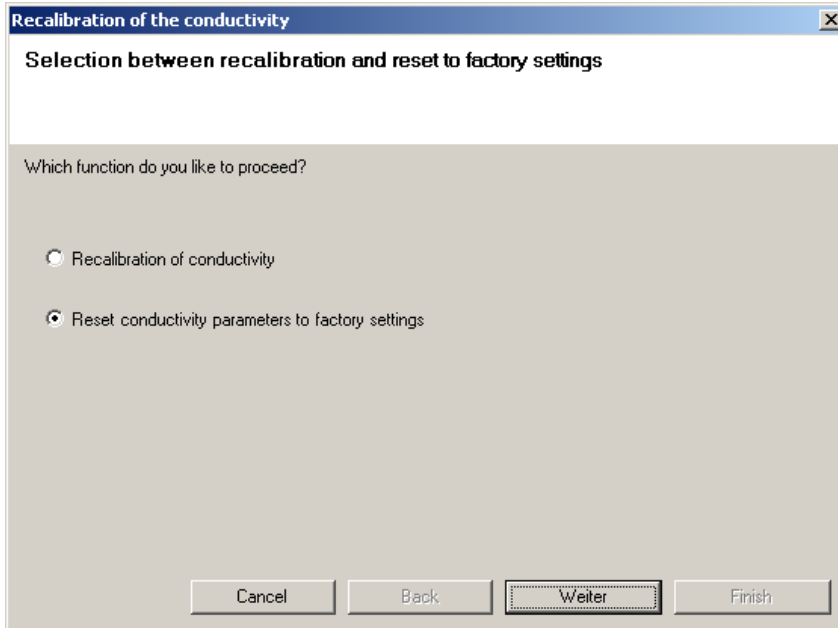
The conductivity parameters can be reseted to factory settings.

After reseting:

8. Dataconversion Program

The data conversion program is installed with the datalogger program and can be started via "Start\Program\Dataconversion".
With this program the order of the data columns "Date, Time, Data (pressure+temperature)" can be changed. It is also possible to remove or add data columns again.

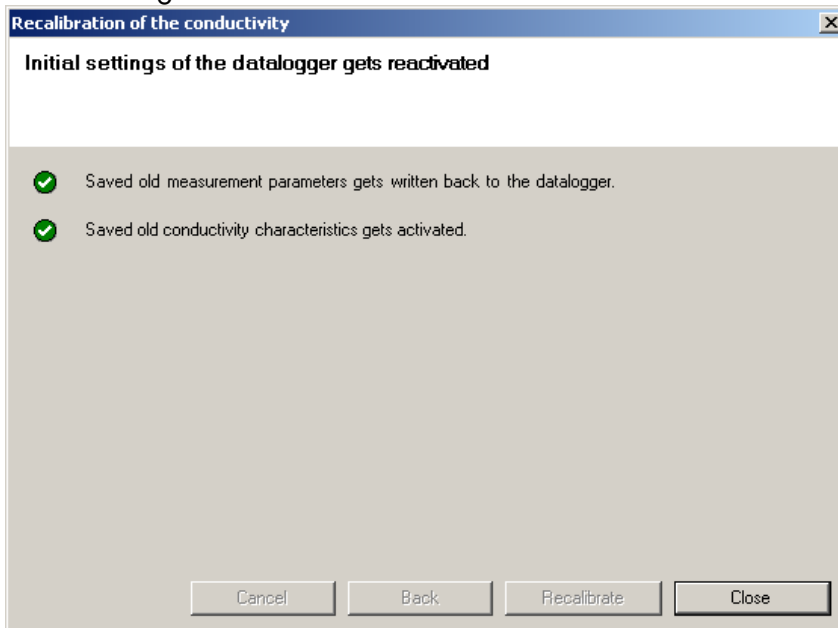Large data files can be splitted automatically into smaller ones which can be imported into Excel™.
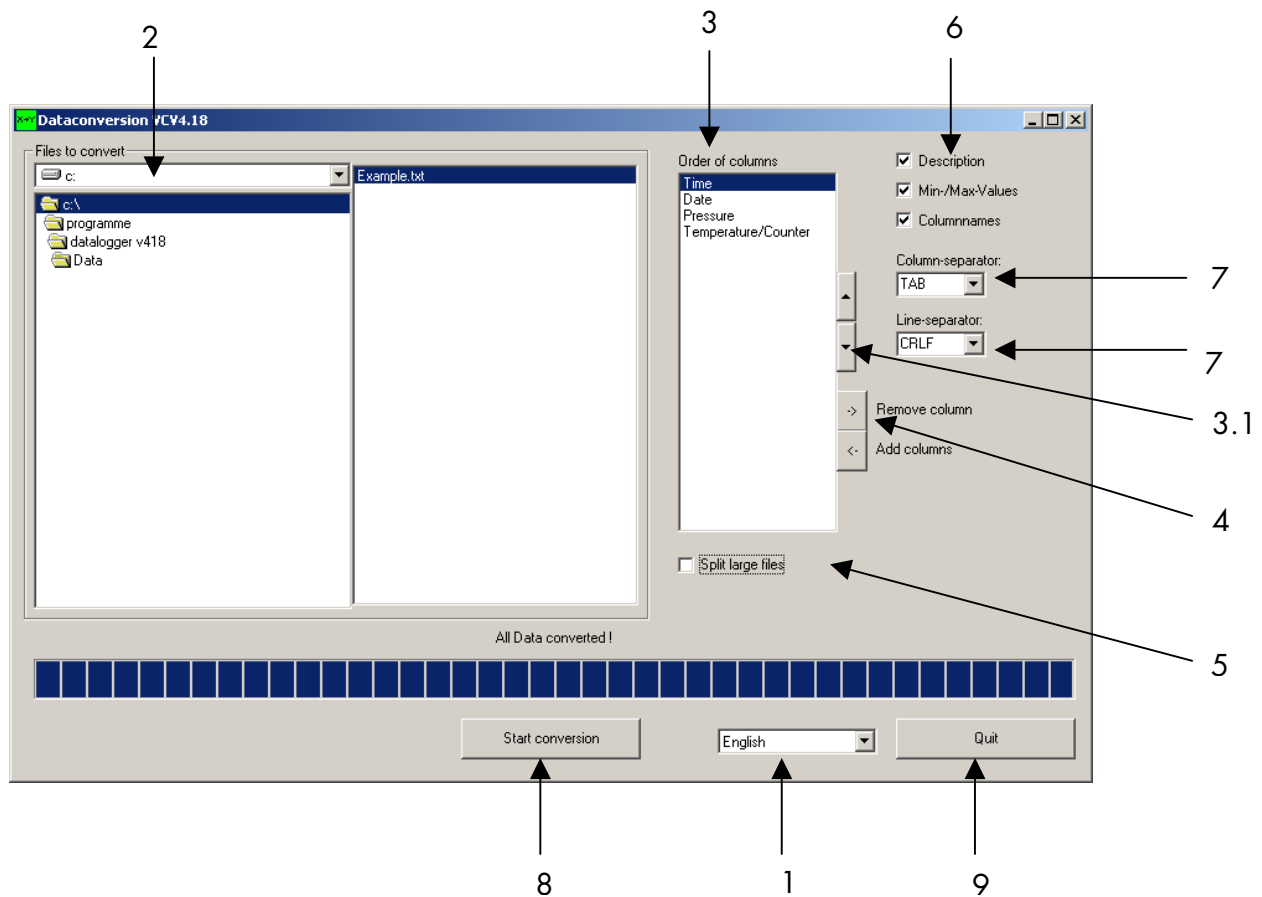
1.   Choose the language.

2.   Choose one or several data files which shall be converted
     If no files are selected the program suggests to select all.

3.   The order of the data columns can be changed as follows:
     Mark the name of the data column and choose the required position with the buttons (3.1).

4.   With the buttons "->" resp. "<-" data columns can be removed or added again from the list.

5. If the flag "split large files" is activated, files will be split in max. 3 files with approximately 60'000 measurement values to import it into Excel™. The filenames will be numbered as follows: e.g. example_1.con.txt, resp. example_2.con.txt or example_3.con.txt

6. With the buttons "Description", "Min-/Max-values" and "Column names" you can choose which information is going to be stored in the converted data file.

7. Column separators "; / TAB / SPACE" and line separators "; /CRLF" can be chosen. Other separator-characters can be entered too.

8. Press the button "Start conversion" to start the data conversion.

9. Press the button "Quit" to exit the program.

9. Notes

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10. General Information

10.1. Requirements / Fundamentals

Fundamental knowledge of Windows™ is presupposed. For convenience and readability purposes, this operating manual does not explain basic functions.

10.2. Abbreviations

ASCII	American Standard Code for Information Interchange
COM	Communications port
DL	Datalogger
DL/N	Datalogger, submersible type
IR	Infrared
PC	Personal Computer
TD	Transducer
USB	Universal Serial Bus
Vxx	Version xx

10.3. STS Companies

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Fax. +41 (0)71 969 49 20
e-mail: sales@sts-ag.ch
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e-mail: info@sts-italia.it
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