

Manual **Datalogger**

Revision V12 (05/2006)

Datalogger TSE

Datalogger THI

Datalogger TCE

Datalogger TPR

Datalogger THC

Datalogger TIC



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1 General

The datalogger family Txx is a new development, which stands out from the field due to its excellent price / performance ratio.

The compact design and modular technology enables the datalogger to be used for a lot of various and different applications. The large display allows the measurement values to be read from a distance of several metres.

Due to its extremely low energy consumption and large memory, the product is definitely appropriate for long term measurements in both mobile and stationary applications.

The new-comers into the datalogger family are :

Datalogger THI = temperature / humidity internal

Datalogger TSE = temperature / humidity external

Datalogger TCE = thermocouples

Datalogger TPR = temperature / air pressure

Datalogger THC = temperature / humidity compact (without display)

Datalogger TIC = temperature / compact (without Display)

The Datalogger THI is an electronic mini thermo-hygrograph with internal sensors.

The Datalogger TSE has two channels, to which either two temperature sensors or one combined temperature/humidity sensor can be connected.

The Datalogger TCE is a 2 channel datalogger for thermocouples(J,K,N,E,R,S,T).

The Datalogger TPR enables the measurement of the air pressure as well as of the temperature.

The Datalogger THC is a pricely affordable datalogger for temperature and humidity without display and the Datalogger TIC a single channel datalogger for temperature without display.

The SmartGraph 2 software, which is delivered along with the instrument, allows the user to visualize the data on the PC screen and to record them.

The professional version SmartGraph 2 enables the values for temperature and dew-point to be shown on the display optionally in °C or °F and the humidity in % (relative humidity) or in g/m³ (absolute humidity).

2 Display module

The datalogger usually consists of two modules: the main body or display module and the module including the sensor(s)

The memory, real time clock and the microprocessor controller are located in the display module.

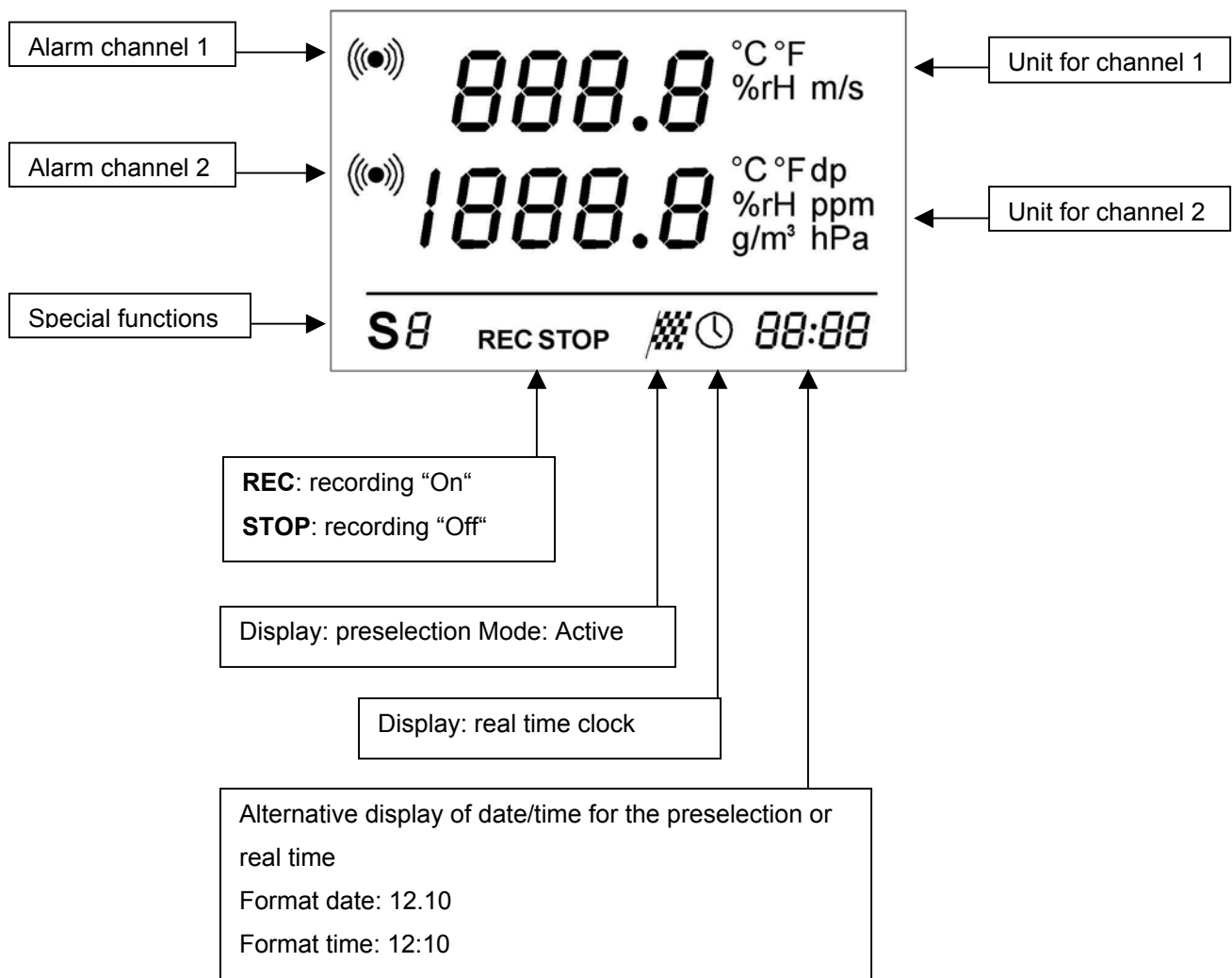


Figure: Datalogger Display Elements

Explanations concerning the display operation:

When a pre-set limit has been exceeded the alarm symbol of the corresponding channel flashes. Once an alarm has been recognized, the alarm symbol remains visible on screen in static form even if the limit is no longer exceeded. The alarm message can only be eliminated by selecting "Memory Readout" on the PC.

If the Pre-selection mode (start flag) was selected, the start-date and start-time for data recording are shown on the Date/Time display. Once the pre-set date/time has been reached the start flag is eliminated, the real time clock display becomes active and data recording begins.

3 Module with internal sensors

The sensors for temperature and relative humidity, the corresponding sensor adapters, and the serial interface (RS232) are located on this module.



Figure: Module with internal sensors

Necessary calibration intervals depend on the environmental conditions and the requirements of the permissible tolerance deviations.

A single point calibration of the internal sensors can be carried out using a comparison standard. The captured offset values can be entered in the SmartGraph software under: *Instrument / Configuration Of Instruments / Sensors / Settings*.

Two point calibrations can only be carried out in the factory.

4 Datalogger TSE with external sensors

The connectors for the external sensors, the corresponding sensor adapters and the serial interface (RS232) are located on this module.



Figure: module with external sensors

Either one or two temperature sensors or one to two combined temperature/humidity sensors can be connected. (Two sensors are only to be used in combination with the Professional version SmartGraph 2). If only one external sensor is used, it will be connected to the left hand sensor socket.

Important: the datalogger is a mere two channel datalogger. By connecting a combined temp./hum. sensor both channels are occupied and further sensors will be ignored.

In order that the instrument may correctly recognise to which channels the sensors are connected, both sensor socket positions must first be free. If a sensor is connected to one of the two sockets, the indication **UPLG** (Unplug) appears in the corresponding line (Line 1= left hand socket, Line 2= right hand socket).

If both socket positions are free, the indication **SENS** appears in the upper line, and the first sensor can be connected to the left hand socket position.

10 seconds are left yet (countdown on the display) to connect an optional second sensor to the right hand socket position.

Important: As long as SENS is shown on the display, the datalogger will not respond on the serial interface. It is therefore not possible to read out data or change the configuration.

The extension cable can be used with both external sensors.

Important: a maximum of 3 extensions can be connected to one temperature/humidity sensor and a maximum of 4 extensions to one temperature sensor.

Extensions can affect the accuracy!

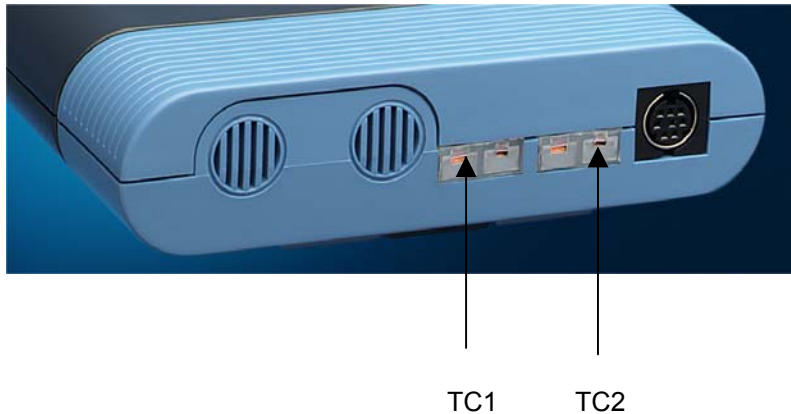
Necessary calibration intervals are dependent on the environmental conditions and the requirements of the permissible tolerance deviations.

A single point calibration of the sensors can be carried out using a comparison standard. The captured Offset values can be entered in the SmartGraph software under: *Instrument / Configuration Of Instruments / Sensors / Settings*.

Two point calibrations can only be carried out in the factory.

5 Datalogger TCE with thermocouples

The datalogger TCE supports the following thermocouple types (TC) : K, N, J, E, R, S and T at both outputs TC1 and TC2.



Important: the same TC type has to be used for both outputs (TC1 and TC2) ; make sure that the rotary switch is set in the position corresponding to the TC type (see table below).

The TC is set up via a rotary switch on the plug-in side of the sensor module. The set up value appears on the left side at the bottom of the display (switch position: S0...S9).



Rotary switch to set up TC

The sensor module should be removed to set up the TC (see § Changing the module).

A maximum of 7 TC (**type: K, J, N, E, R, S, T**) can be selected via the rotary switch.

A selection via the software is not possible.

Table: correspondance rotary switch position and thermocouple type

POSITION ROTARY SWITCH	THERMOCOUPLE TYPE
0	logger off
1	K
2	J
3	N
4	E
5	R
6	S
7	T
8	logger off
9	logger off

The channel which remains free (no connection with a TC) will show the cold junction temperature.

The TC are connected via SMP connectors.

Important: make sure to only use connectors with a blade ; stamped connectors are not allowed since they can irreversibly damage the TC connection plug.

Overview thermocouples

Datalogger-TC

Type-Code and ANSI colors	Switch position	Thermo- couple type	Material of the connecting plug		Measuring range °C
			+	-	
K	1	chromel/alumel	chromel	alumel	-200 ... +1200
T	7	copper-constantan	copper	constantan	-270 ... +400
J	2	iron-constantan	iron	constantan	-200 ... +1200
E	4	chromel-constantan	chromel	constantan	-270 ... +1000
R	5	Pt/13%platinum-rhodium	copper	alloy	-50 ... +1770
S	6	Pt/10%platinum-rdodium	copper	alloy	-50 ... +1770
N	3	nicrosil-nisil	nicrosil	nisil	-200 ... +1200

Important: check on the polarity when connecting a TC.

6 Datalogger TPR with temperature and air pressure

There is no special instruction to follow concerning this model.

The altitude of the place you are staying in can be set in the software SmartGraph2 which is delivered along with the datalogger. You will then obtain an air pressure value based on the sea level (1013,25 hPa).

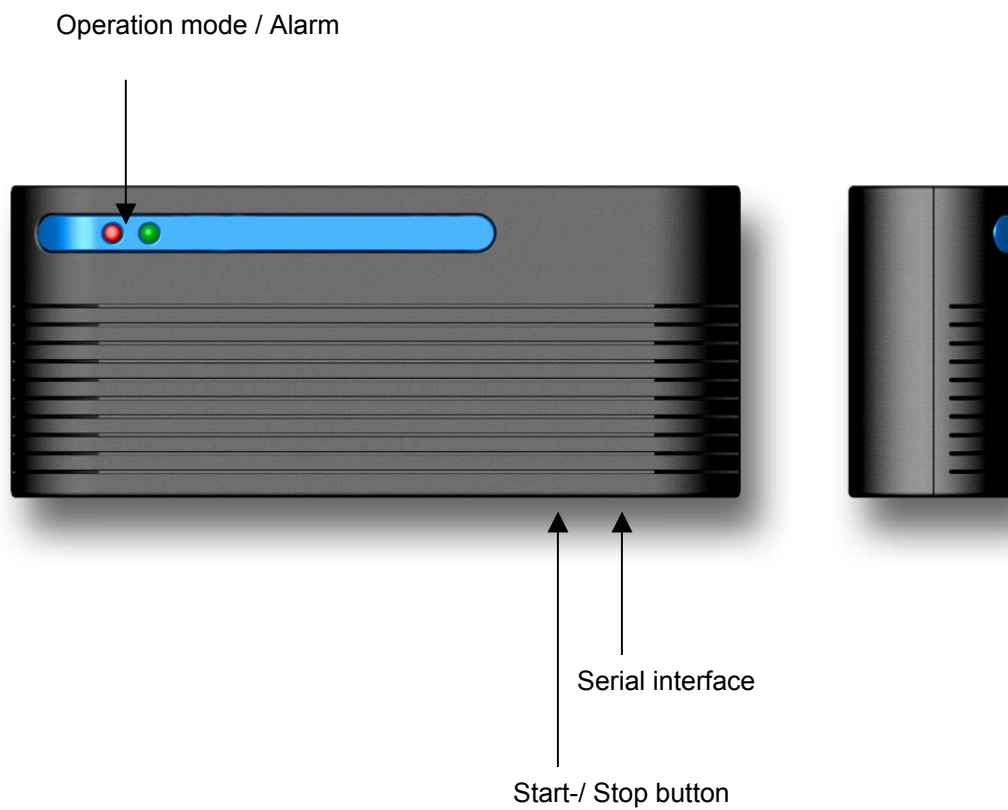
Table: referenced atmosphere

Altitude/m	Average air pressure/hPa
0	1013,25
100	1001,3
200	989,5
300	977,7
400	966,1
500	954,6
600	943,2
700	931,9
800	920,8
900	909,7
1000	898,8
1100	887,9
1200	877,2

7 Datalogger TCI / THC (T°, T°/H without display)

General: the hardware of the datalogger compact is almost identical to the hardware of the datalogger with display. Two LEDs (a red and a green one) are used as a substitute for the display to indicate the operation mode and the alarm.

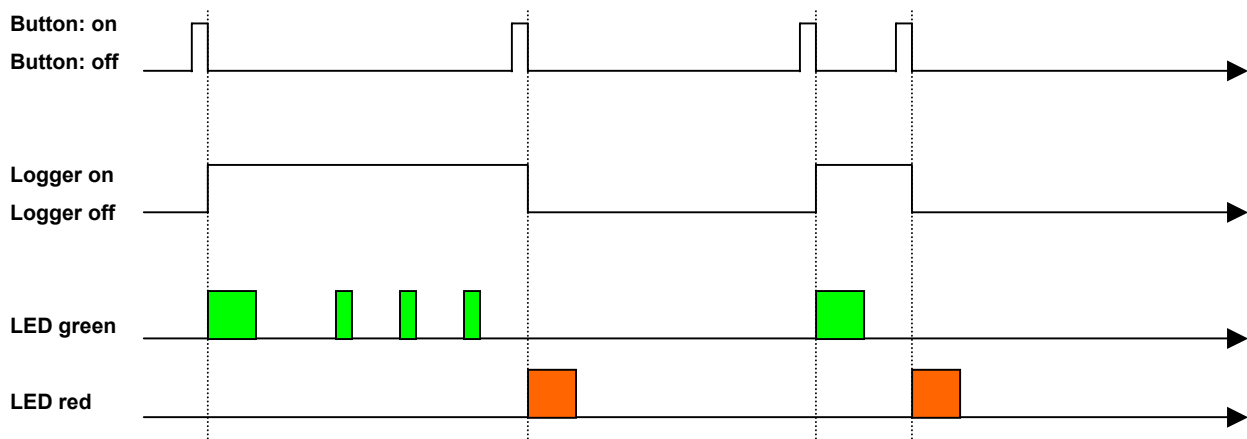
In addition, you will find close to the serial interface a start / stop button to switch on / off the datalogger.



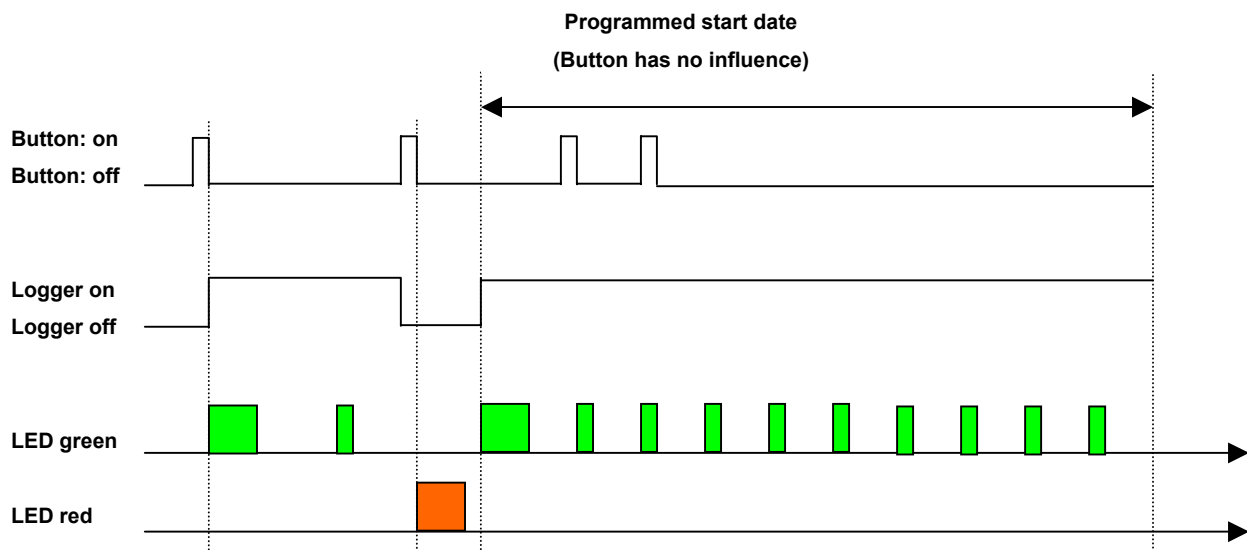
Start/Stop function: the off / on button enables the datalogger to start and stop recording. The manual activation / deactivation of the datalogger and the configuration in start/stop or in ring mode are independent.. By pressing the off / on button, the datalogger will start recording ; by pressing it again, the datalogger will stop etc..

Important: In the start / stop mode, the datalogger will start recording from the start date on (provided that this date is set in the datalogger) no matter if the start / stop button is being pressed during this time.

Before the datalogger starts recording, it can be activated or deactivated too via the on / off button (s. timing diagram).



Timing diagram: Datalogger THC/TIC in ring mode



Timing diagram: Datalogger THC/TIC in start/stop-mode

The button should be kept pressed for approx. 1 sec. to start / stop the datalogger.

When activating the datalogger, the green LED remains on during 3 sec. The red LED remains on during 3 sec. when deactivating the datalogger.

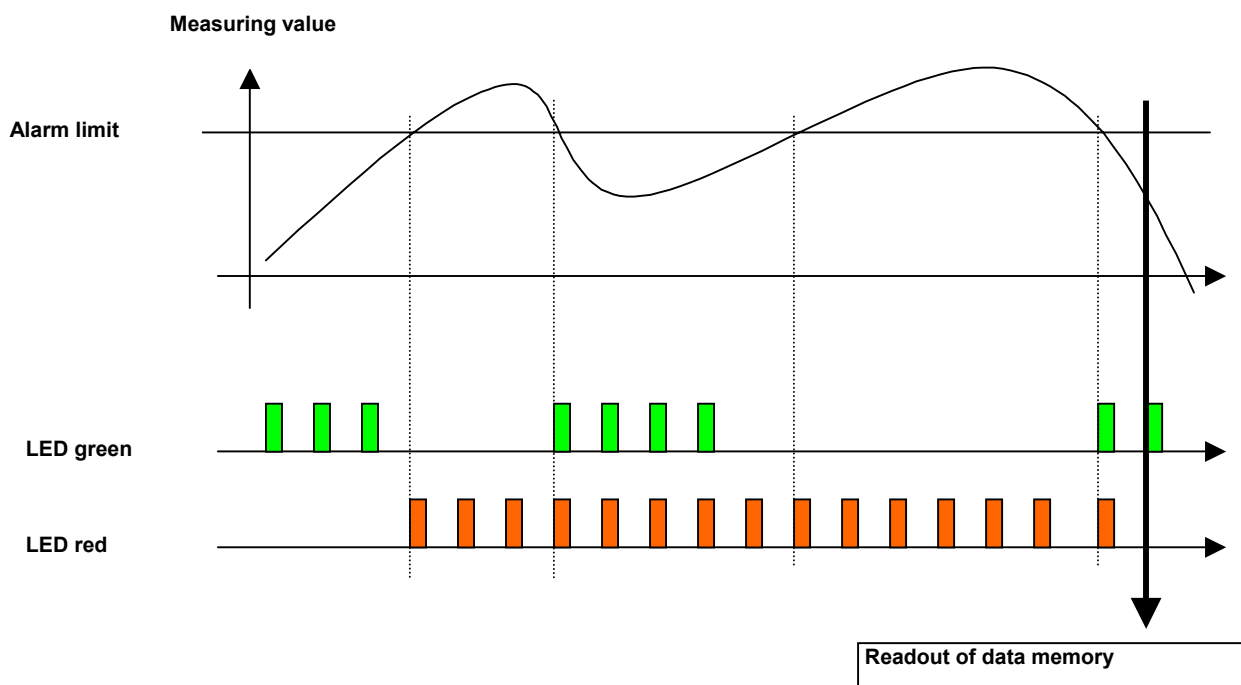
While recording, both LEDs on the datalogger or just one of them will flash at 10 sec interval. This time interval is completely independent of the recording and storage intervals set by the user in the datalogger.

Alarm function: the datalogger is equipped with an alarm function on both channels (temperature and humidity) which enables the user to set minimum as well as maximum limit values.

The red LED will flash in case of an alarm.

If an alarm occurs while the datalogger is recording, the green LED will switch off and the red LED will start flashing.

As soon as the measured values have become normal again, both LEDs will flash to signal that an alarm came up. This can be reset by reading out the memory.



Timing diagram: Datalogger THC/TIC alarm

8 Changing the sensor module

To change the sensor module, carefully remove the datalogger back-plate with a screwdriver. The sensor module can now be separated from the main body.

Place the new sensor module on the guide rail of the main body and assemble the two modules by pushing them together until they embed.

Important: The module must be connected only when the instrument displays "FAIL".

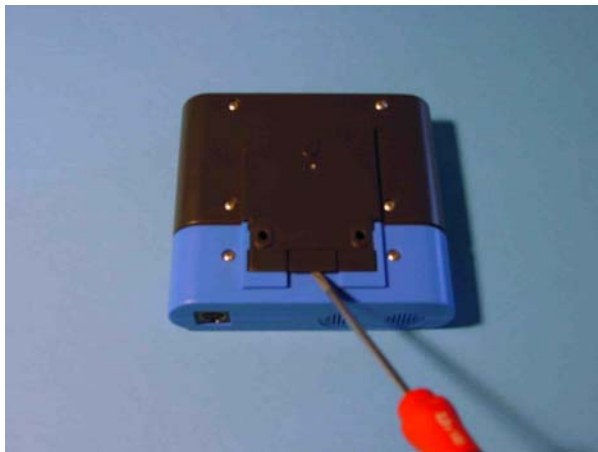


Figure: removing the back plate



Figure: assembly of the modules

9 Changing the battery

If the temperature value in the upper display line is displaced by the word bAtt, the battery has to be changed.

In order to do this, first remove the sensor module (see above “changing the sensor module”).

Then remove the four screws on the rear of the display module with a suitable screwdriver.

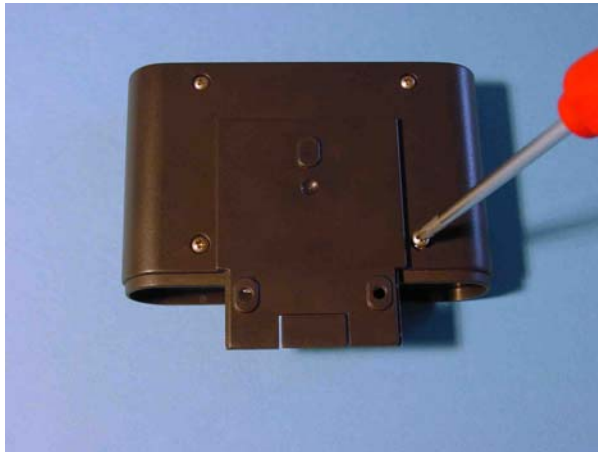


Figure: Opening the datalogger to change the battery

Lay the display module on a flat surface, with the display facing upwards, and carefully remove the upper part of the plastic cover.

Now remove the old battery and insert the new battery (Type: LS14500/Saft, 3.6V) into the holder.

Important: Use battery type LS14500/Saft exclusively. Batteries other than this type are not permitted and can disturb the correct functioning of the instrument. Observe the correct polarity of the battery and read the safety tips on the battery. Please do not touch the battery contacts (grease on your skin may cause oxidation!).

The **BAT** indication now disappears and the measurement values are shown again on the display.

Please check the time and adjust these if necessary again.

The battery should be changed annually. Frequent data transfer with the PC reduces battery lifespan.



Figure: changing the battery

10 Mounting the Datalogger

The datalogger can be used either as mobile or stationary data acquisition system. For stationary applications the datalogger may only be mounted on a flat surface. In order to do this, first remove the sensor module (see above “changing the sensor module”).

Two holes for wall mounting are provided in the guide rail of the main body. Use these to mount the main body. Then carefully join the two modules together until they embed.



Figure: mounting the datalogger

An anti-theft device made from aluminium is now available alternatively to the mounting system. This device additionally enables datalogger to be dismantled and the data to be downloaded much easier.

From 2003 on all datalogger will be delivered with an additional wall mounting bracket which can be used optionally. For mounting it on an datalogger with display unscrew the lower screws from the housing and fix the mounting bracket with the additional longer screws (see fig.)

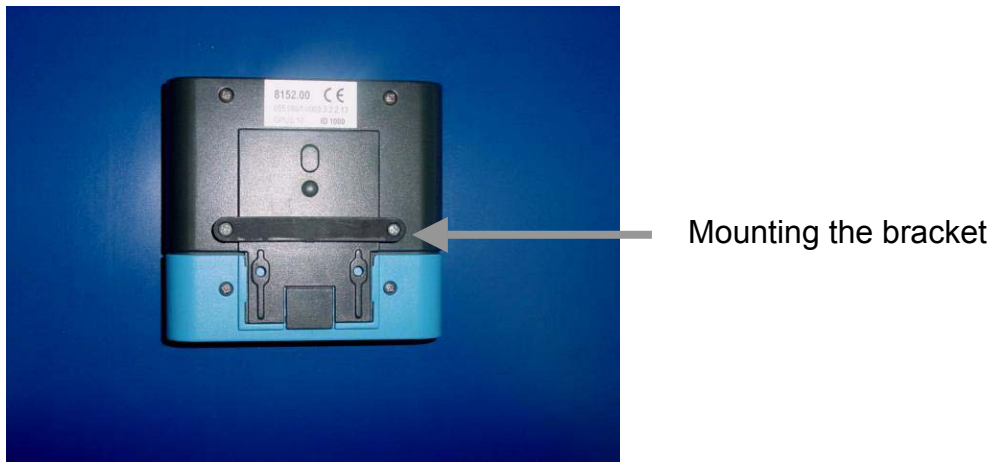


Fig.: Mounting the bracket

Now fix the angle to the wall and push the datalogger over it with the bracket.



Fig.: Hanging in the datalogger on the angle

For the datalogger without display only the angle has to be fixed to the wall and the datalogger be pushed over it.



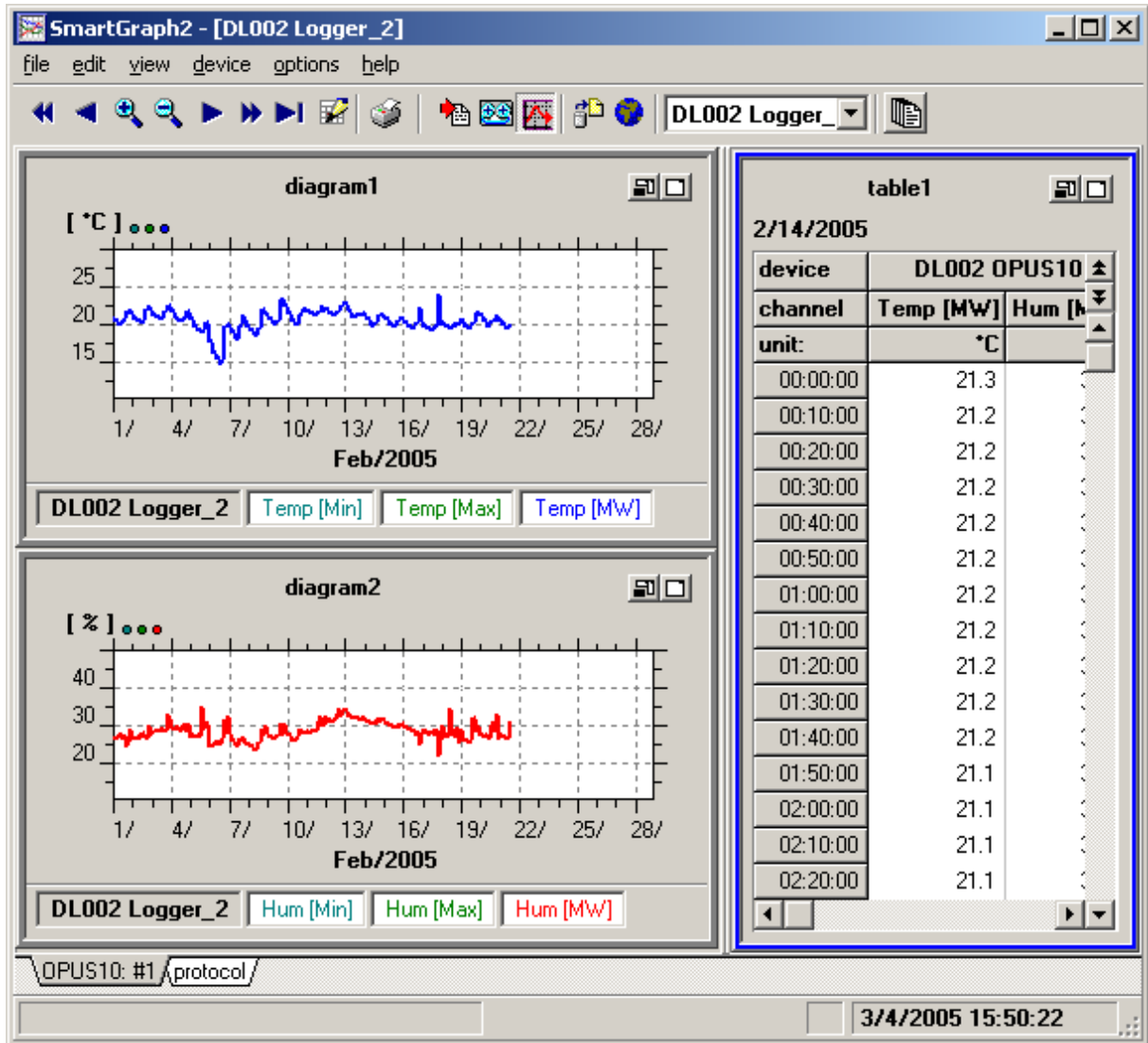
Fig.: Mounting of a datalogger without display

Tips and Tricks

- The battery should be changed annually (Type: LS14500/Saft, 3.6V).
- Frequent communication with the PC reduces battery lifespan.
- For the data transfer to the PC, only use the cable supplied.
- Please avoid condensation on the datalogger and its sensors.
- Recommendations for measuring interval: 1 minute; storage interval 10 minutes

Measuring rates < 1 minute will cause higher energy consumption and thus reduce battery life considerably.

Manual SmartGraph2



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1 Introduction to SmartGraph

1.1 *Manage, Configure*

SmartGraph enables the flexible management of several data logger devices by means of identifiers. Devices can be added at any time. A unique description can be assigned to every device.

The measurement data is archived in files organized on a “calendar week” basis, stored in a separate folder (within the folder where SmartGraph was installed) for each device, named DIXXX, where XXX is a unique number assigned to each device.

Access to the data stored for each device is provided via the name of the device. A device can be selected via the File Menu item “selected device” or via the device list box in the toolbar.

For protection against data loss, e.g. because of a hard disk error, it is recommended to back up the data files (all DLXXX folders in the installation folder of SmartGraph) on a regular basis.

See also: [2.4.2 configure devices](#)

1.2 *The program interface*

The program interface provides display and management of the information and data for a device, in particular the measurement data.

Measurement data can be viewed as diagrams or in a table. The program creates diagrams and tables for the selected device. Please see section [3.5.2 Auto Monitor](#) for information on how to select the device/data to be displayed and how to configure/customize the display.

In order to be able to present a large number of measurement channels and devices the interface is sub-divided where necessary into pages lying on top of each another. These pages are called monitor pages. Switching between different monitor pages takes place by selecting the label of the monitor page to be displayed from the label list on the lower frame. The list disappears if only one monitor page is in use.

Basically, there are two different monitor page types:

- Protocol Monitor: displays log entries, depending on protocol settings (see [2.5.1 Protocol](#)).
- Monitor pages for tables and diagrams

1.2.1 Diagrams

Diagrams display the measurement data as curves on a date/time based x-axis. Up to 12 curves with measurement values from different sources, i.e. channels of a device can be displayed.

In order to present measurement values in different units on a single diagram (like temperature and humidity), 2 Y-axes are used (left and right). The dots in the colors of the curves plotted beside the unit of the relevant Y-Axis show the mapping between curves and y-axis.

Every channel of a device is always represented as 3 curves (for min/max/average values) – even if only one of these values is configured for the device.

In order to display all channels of a device in a single diagram (if not more than 2 different units are reported by the device), the “maximum count of curves per diagram” settings in “options/auto-monitor” has to be set to 6 (for devices with 2 channels) or 12 (for devices with 4 channels).

This way one can show e.g. the dewpoint (instead of humidity) and temperature curves of a 4 channel device in a single diagram.

Navigation within the Date/Time Range

These buttons in the toolbar control the selected Date/Time range (X-axis).



You can move short or long distances forward or backward in time, or zoom in /zoom out the screen section along the X-axis. Zoom in/out can also be done by double-clicking with the mouse in the area of the diagrams. The mouse pointer appears as a magnifying glass here. Double-clicking with the left mouse button stretches the time range to the mouse position (zoom in), double-clicking with the right mouse button switches from the current time period to the next larger time range (zoom out).

Context Menu

For quick and easy changes to diagram contents and settings, a context menu is available.



This menu pops up when the right mouse button is activated on the diagram. The same menu items are available under the Edit and View menus (under item Yt-Diagram), when a diagram is selected (the blue border around the diagram or table indicates the selected object).

The following items can be selected here:

Edit title, see [2.2.9.1 edit title](#)

Edit curve, see [2.2.9.3 edit curve](#)


Range of left/right Y-Axis, see [2.2.9.4 range of left/right Y-Axis](#)

Grid for left/right Y-Axis

reference:

If the reference for the diagram is not required this can be un-selected in order to provide more space for the diagram.

Print Yt diagram

Print diagram on one page. This can also be selected via menu "File -> Print -> Yt-diagram" or by clicking the print button  from the toolbar.

The professional version of SmartGraph (see [1.7 Upgrade to Extended Functions](#)) supports extended printing functions like printing of up to 4 diagrams from a device on a single page, or printing all/selected diagrams from all/selected devices with a single command.

1.2.2 Table

The table displays the measurement values of one day. The time is presented in the right column. Measurement values that exceed the alarm limits are highlighted in bold and in red text.



To preserve space on the display, the short description for the device and channel names are used to label the columns.

The long description is shown in a pop-up help window when the mouse moves over the appropriate column label.

Navigation within the Time Range:

The vertical scroll bar is used to navigate within the data of the displayed day. The same can be done via the Cursor Keys (Cursor up, Cursor down, Page up, Page down) (See chapter [3.1 Keyboard Shortcuts](#)).

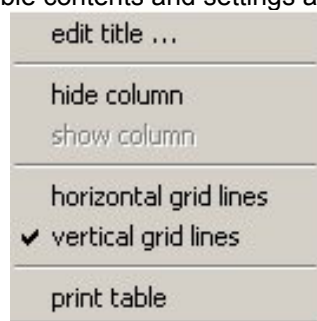
Navigation within the Date Range:

The buttons  and  switch to the previous or next day. This can also be done via the key combination Ctrl Cursor Up or Ctrl Cursor Down.

The time ranges of the tables and the diagrams are synchronized. The day presented in the Table is always within the time range selected for the diagrams.

Context Menu:

For quick and easy changes to the table contents and settings a context menu is available.



This menu pops up when the right mouse button is pressed while the mouse cursor is above the table. The same menu items are also available via the menu item "table" of the Edit Menu and View Menu, if the table has been selected.

The following settings can be changed here:


Edit title: change the title of the table

hide column: hide a column

show column: show a column

horizontal grid lines: show/hide horizontal grid

vertical grid lines: show/hide vertical grid

print table: The table is printed with the data of the selected day. This can also be done via the button  in the tools panel and via the menu item file -> print -> print table.

See also:

[3.1 Keyboard](#)

1.2.3 Auto Monitor

Data for every device is displayed on one or more monitor pages (depending on the auto monitor settings for the device) within the "auto monitor".

Select the device:

The device for which data is displayed can be selected in two ways:

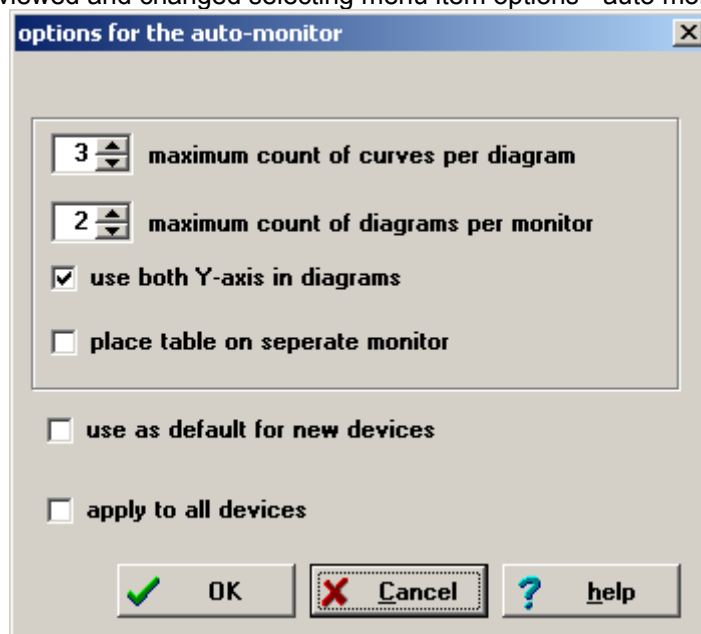
- select the device from the selection list in the toolbar
- select the device from the menu item file - selected device

The name and identifier of the selected device are displayed in the caption of the main window.

Auto Monitor options:

Diagrams and table for the selected device are displayed based on the options set for the auto monitor for this device.

The settings can be viewed and changed selecting menu item options - auto monitor:



- Maximum number of curves per diagram: With this the number of curves that are displayed in a single diagram can be limited. Valid values are between 1 and 10. If more channels than the maximum for one diagram are present in a data source, an additional diagram is displayed.
- Maximum number of diagrams per monitor page: The number and units of the channels of a data source determine how many diagrams are necessary for presentation. If more diagrams are needed than the maximum number allowed per monitor page, additional monitor pages are displayed, and can be selected by the tab on the bottom of the window.
- Use both axes in diagrams: When this option is activated, each diagram is provided with a left and right Y-axis if necessary, so that channels with data in two different units can be displayed. If the option is deactivated, only the left Y-axis is used.
- Place table on separate monitor: When this option is activated, the table is displayed on a separate monitor page without diagrams. Otherwise diagrams and table are arranged together on one (the first) monitor page.
- Use as default for new devices: when this option is selected, the values set for the current monitor will be used as default values for new devices that are added later to SmartGraph.
- Apply to all devices: when this option is selected, the values set for the current monitor page/device will be applied to all configured devices.

After the settings have been changed, diagrams and table will be formatted for the selected device according to the new settings.

The labels of the monitor pages are created from the device name and a serial number and cannot be changed by the user.

1.2.4 Monitor page for Tables and Diagrams



The monitor page is divided into two parts (if a table is present on the page). On the left side up to 9 diagrams are presented, on the right side a table. The border between the two sides can be moved using the mouse. The diagrams are arranged on the left side so that the space is filled as completely as possible. The arrangement of diagrams can be horizontal or vertical (see menu item View->Monitor).

Selection:

Whenever a diagram or table is selected, various menu items and buttons like the "Print" button, are related to the selected object. The selected object (diagram or table) is marked with a blue border. An object can be selected by clicking with the mouse on the object. The next object can be selected by using the tab key.

Full Screen/Normal Screen:

Each object (diagram or table) can be expanded to full screen size. The diagram or table then fills the entire monitor page. Switching to full screen and back to normal screen size can be done in 4 ways:


- clicking on the button  or  on the upper right in the object.
- Using the key combination <Ctrl> + and <Ctrl> -
- Selecting the desired function from the monitor page context menu.
- selecting the desired function from the menu item "Monitor" in the "Edit" menu.

The menu items always relate to the selected object.

hide/show object:

Each object (table or diagram) can be hidden, i.e. it disappears from the screen, but is not lost and can be shown again. The remaining objects on the monitor page are re-arranged.

Hiding an object can be done via:

- the button  in the upper right corner of the object.
- the context menu of the monitor page.
- the menu item "Monitor" from the "Edit" menu.

The menu items always relate to the selected object.

Showing an object that has been hidden can be done via the context menu of the monitor page or the menu items in the "monitor" menu of the "Edit" menu. The object to be shown is selected from a list of hidden objects in a dialog box that pops up, and the position of the object in reference to the other visible objects can be specified.


Note: The mechanism can be used to change the sequence of the objects on a monitor page by hiding an object and showing the object at a different position.

Monitor page context menu:

All functions that concern the monitor page are found on the context menu for the monitor page. This appears when the right mouse button is activated and the mouse is positioned over the tab panel of the Monitor or over the border between the diagrams and the table. The menu items also appear on the "edit -> monitor" menu (maximize/minimize object, hide/show object) or in the "view->monitor" menu (arrange diagrams horizontally/vertically)

1.3 Measurement device

1.3.1 read data

The content of the data logger/device that is connected to the PC via the serial interface is read and stored. This function can be started by selecting menu item "device -> read data" or by clicking the  button on the toolbar.

Requirement: The correct communication port must be configured.
The communication port can be configured via menu item "device->communication".

Messages:

The date and time from where data is to be read from the device memory can be specified here. Default is the date and time of the last read out of the device memory. With the "read complete memory" option all data stored in the device will be read.

While the data is read from the device the message "transmission of data" is shown with an indication of the progress of the transmission (percentage reading).


If the communication port has not been set up correctly, a message "interface already open" may be displayed indicating the configured interface is already in use, e.g. the mouse could be connected to that port, or a message "device does not respond" may be displayed if no device is attached to the configured port. Please check the configured communication port if such an error message is displayed.

1.3.2 recorder

With the recorder function measurement data from the attached device is read in intervals. Unlike the data read by "read data", the data read via the recorder function is not obtained from the device memory, but the measured values are read directly.

While the recorder is active, the connection to the attached device is permanently open.

Note : using the recorder function reduces battery life !

The recorder is started or stopped via the menu item 'device - recorder - start/stop recorder' or via the corresponding button  in the toolbar. When recording is active, the recorder symbol is displayed in the status bar.

In recording mode, the following menu items under menu "device" are disabled:


- communication
- read configuration
- read data
- clear memory
- synchronize clock

The device internal clock is synchronized to the PC clock during the recording process.

The following actions stop the recording mode:

- changing device or channel settings ("configure devices")
- "delete device"

The time interval for data collection in recording mode is determined from the device's "sample interval" setting.

If "auto scroll" is checked (menu device-> recorder or toolbar button ) new data read from the device is displayed on the auto monitor page(s) for the device, and diagrams are scrolled to show the new data.

When the recorder function is active, the time range for neither the diagrams (curves) or nor the table can be changed, and the selected device cannot be changed either.

1.3.3 clear memory

This function clears the memory of the attached device, i.e. the data stored in the device is deleted.

1.3.4 read configuration

The configuration of the connected device is read.

If no corresponding auto monitor page for the attached device has yet been set up, it is created. SmartGraph offers to switch to the appropriate auto monitor page for the device.

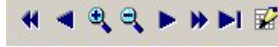
1.3.5 synchronize clock

The clock of the connected device is synchronized to the PC clock.

1.4 Display and analyze data

Measurement data can be displayed in diagrams covering time ranges from 10 seconds to 1 year.


To navigate within the time range of the diagrams use the buttons on the navigation toolbar on the upper left under the main menu:




The same functions are available via menu "edit". Zoom in/out can also be done using mouse clicks. See also: [3.1 Keyboard](#)

zoom in, zoom out:

As soon as you move the mouse pointer over a diagram it changes into a magnifying glass.

To **zoom in** hold the magnifying glass over the required position and click twice with the left mouse button (double click) or click on the  button on the toolbar. The diagram now switches to the next smaller time range, with the clicked position centered on the diagram.


To **zoom out** click twice with the right mouse button or click on the  button on the toolbar.


The possible time ranges are:


Year-Month-Week-Day-6Hours-1Hour-10Minutes-1Minute-10Seconds


Scroll:

 scroll small interval backward

 scroll small interval forward

 scroll large interval backward

 scroll large interval forward

 scroll to the end of the data


 edit date / time range

A dialog box to enter the date/time range to be used is displayed. The minimum time range is 10 seconds, the maximum time range is 1 year. See [2.2.8 edit date / time range](#).

The selected date/time range applies to all diagrams (and all devices).

1.5 Documentation

Printing of tables and diagrams:

The selected table or diagram can be printed via the context menu of the selected object, or the menu item file - print, or the print button  from the toolbar.

(See chapters [2.1.2 print](#) and [2.1.3 print setup](#)).

1.6 Organization of measurement data

The measurement data for each device is kept in a different folder within the SmartGraph installation folder.

The data folders are named "DLxxx", where xxx is the unique number assigned to each device by SmartGraph.

The measurement data is saved in files on a "calendar week" basis (i.e. one file per week) named "KWjjnn.sgr", where "jj" stands for the year and nn stands for the week number.

When a device is deleted the subdirectory DLxxx for the data of this device is renamed to DLxxxBAK. The files are not deleted. If a device has been inadvertently deleted, the procedure can be reversed as follows: quit SmartGraph and rename the folder DLxxxBAK to the DLxxx (e.g. using the File Manager). The next time SmartGraph is started the data for the device will be displayed again.

1.7 Upgrade to Extended Functions

In the professional edition of SmartGraph the following functions are available:

- Beside the standard measurement units (e.g. temperature in °C and humidity in %RH) other units (e.g. temperature in °F or dew point temperature, etc.) can be assigned to the channels/sensors of a device.
- Measurement data can be exported to text files (with several options for formatting).
- Extended functions for printing of diagrams are available (e.g. print all diagrams of a device, print all/selected diagrams of all/selected devices, print up to 4 diagrams on a single page).

Unlocking via key-code

The upgrade to the professional version is done by acquiring a key code.

To do this, select the menu item options -> upgrade -> order. Fill out the fields in the dialog box "offer/order for unlock code". Select print to print out the order form. Fax the order to the given fax number / your distributor and you will shortly receive the Key-Code for the requested version.

If you are in agreement with the License conditions select the menu item options -> upgrade -> unlocking. Enter the key-code. The additional functions can now be used.

If the number of managed devices does exceed the number matching the professional version you have ordered, the additional functions are deactivated.

Test-Upgrade

Upgrade to professional or pharma version for testing - limited to 4 weeks.

2 Menu Commands

2.1 “file” menu

The File menu contains the following items:

2.1.1 device

Select the device to be displayed on auto monitor

2.1.2 print

Print diagram or table

The selected object (diagram or table) or a screenshot (complete visible monitor page) can be printed.

In the professional version of Smartgraph extended printing functions (like printing all diagrams of a device or selected/all diagrams from selected/all devices) are available.

Tip: the logo saved in the file LOGO.BMP in the folder “support” is printed in the right upper corner. If you replace this file you can use your own logo.

2.1.3 print setup

Select printer and configure printer options.

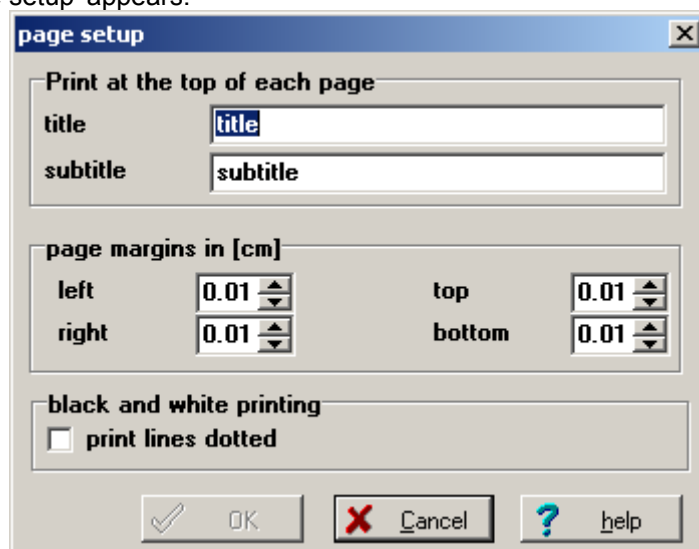
With most printers you have the choice between various graphic resolutions. A higher resolution increases quality, however the time required for printing is longer. Try various resolutions to find the best solution.

Tip: For printing diagrams on a single page "landscape" orientation is best suited, for printing tables “portrait” orientation may be suited better, depending on the number of columns.

2.1.4 page setup

Set up title and page borders

The dialog box 'page setup' appears:



title, subtitle

Title and subtitle will be printed on every page.

Page margins

Specify the margins (in cm) to be used (the paper size and page orientation is configured via print setup for the printer)

Print lines dotted:

If this option is checked, the diagram curves are printed dotted (as configured for the diagram - see [2.2.9.3 Edit curve](#)), if printing to a black and white printer. For color printers, this option does not take effect.

Tip: A logo appears in the top right corner of every printed page. This logo is read from the file Logo.bmp, which is located in the folder "support". This file can be replaced (or supplied) if a logo is required. If no logo is required the file can be renamed or deleted.

2.1.5 exit

Exit SmartGraph (end the program).

2.2 "edit" menu

The Edit menu contains the following items:



2.2.1 large interval backward

scroll selected time range one (displayed) time interval backward.



2.2.2 short interval backward

scroll selected time range one (next shorter) time interval backward.



2.2.3 zoom in

Use the next smaller time interval in diagrams (double click left mouse button over diagram).

Possible time intervals are: Year-Month-Week-Day-6Hours-1Hour-10Minutes-1Minute-10Seconds.



2.2.4 zoom out

Use the next larger time interval in diagrams (double click right mouse button over diagram).

Possible time intervals are: Year-Month-Week-Day-6Hours-1Hour-10Minutes-1Minute-10Seconds.



2.2.5 short interval forward

scroll selected time range one (next shorter) time interval forward.



2.2.6 large interval forward

scroll selected time range one (displayed) time interval forward.



2.2.7 last record

scroll to the end of the data (to last data record).



2.2.8 edit date / time range

A dialog box to enter the date/time range to be used is displayed. The minimum time range is 10 seconds, the maximum time range is 1 year.

The other menu items depend on selected object:

When a monitor page or object is selected, to which these functions are not applicable (e.g. Protocol monitor), these menu items do not appear or are deactivated.

2.2.9 Yt diagram or table

These menu items are also available in the context menu that pops up when the right mouse button is clicked over the surface of a diagram or table.

The following settings can be specified here:

2.2.9.1 edit title

Whenever a table or diagram object is created, a standard title (consisting of the object name and a number) is assigned to the object.

“edit title” opens a dialog box to enter a user defined title for the object. To use the user assigned title, the checkbox “special title” has to be marked. End the dialog with OK. An empty title is not allowed.

The standard title can be reactivated by marking the “stanrad title” checkbox.

2.2.9.2 hide/show column (for tables only)

hide column:

A dialog box appears in which the column to be hidden can be selected. The selected column is hidden, but not deleted, and can be made visible again using “show column”.

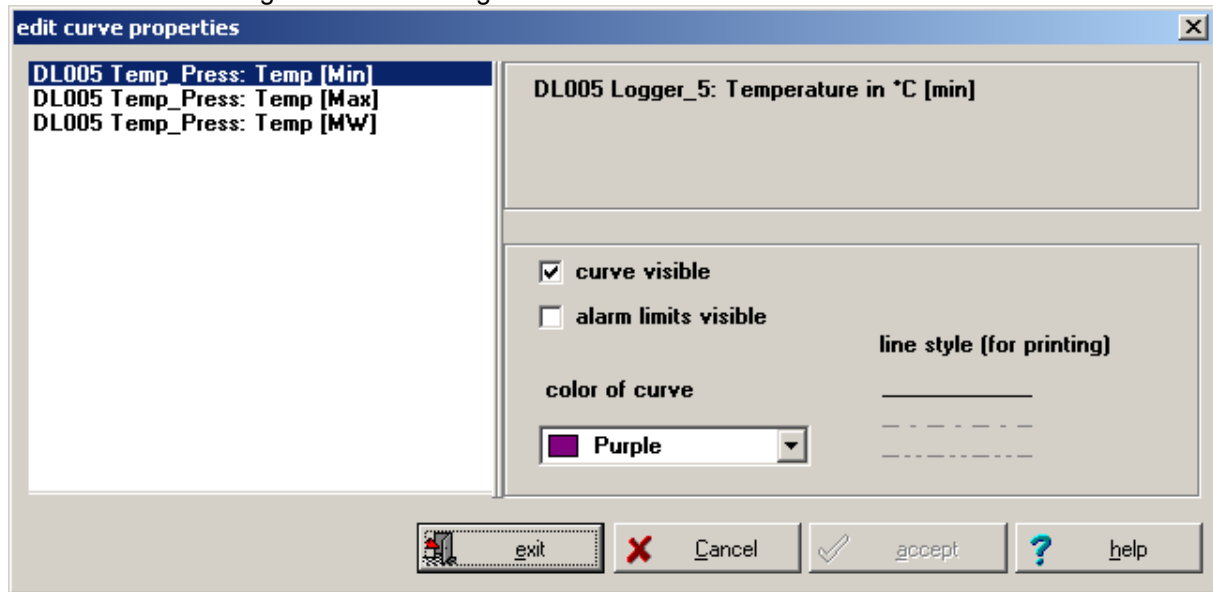
show column:

This menu item is only available if columns have been hidden. A dialog box appears in which the column to be shown can be selected. The position of the column can be specified.

Note: The mechanism can be used to change the sequence of the columns in a table.

2.2.9.3 edit curve (for diagrams only)

View/edit curve settings for selected diagram.



The available curves are shown in a list on the left side of the dialog. The entry in the list that belongs to the current curve is highlighted, i.e. selected. To edit the settings of a specific curve select the curve from the list on the left.

The parameters that can be set on the selected curve are shown on the right side of the dialog:

- curve visible: If this setting is activated the curve appears in the diagram and in the reference, otherwise the curve is hidden.
- alarm limits visible: If this option is checked the alarm limits of the selected curve (device channel) appear on the diagram in the color of this curve. This option is only available when the curve is visible.
- color of curve: by clicking with the left mouse button a list with the 16 standard colors is displayed. A color for the curve can be selected by clicking on the corresponding entry. If a different color (not in the standard colors) is desired, clicking with the right mouse button on the selection element starts a color selection dialog. The curve and the corresponding reference entry are then shown in the selected color.

buttons:

- accept: with "accept" all changes specified since the start of the dialog, are saved.
- cancel: the dialog is ended without saving the changes that were specified since the beginning of the dialog.
- exit: the changes are saved (see "accept") and the dialog is ended.

2.2.9.4 range of left/right Y-Axis (for diagrams only)

The dialog enables setting of the value range for the Y-axis for a given diagram (vertical zoom).

automatic:

The automatic setting is selected by activating the relevant upper option field. The corresponding value is shown on the right. The value for maximum/minimum in automatic setting are taken from the sensor settings (see [2.4.2.2 Edit Channel](#)) - the automatic maximum/minimum value for the axis is the maximum/minimum "view range" configured for all channels associated to this axis.

Manual:

The manual setting is effective when the relevant lower option field is activated and the requested value is entered in the input field.

Buttons:

- OK: With "OK" all changes are saved. The dialog is closed.
- Cancel: The dialog is closed without saving the changes.

2.2.10 monitor

This menu item is visible (as an item on the "edit" menu) if a monitor page for diagrams and tables is selected – or are displayed as part of the monitor page context menu.

maximize object

The selected object is maximized to full screen size

normal view of object

The maximized object is returned to its normal size

hide / show object

The selected object is hidden, but not deleted. With 'show object' a dialog box with all hidden objects is displayed.

When a monitor is in use, to which these functions are not applicable (e.g. Protocol monitor), these menu items are not shown.

2.3 “view” menu

The menu item View shows the appropriate sub menu items depending on the selected object:

2.3.1 monitor

This menu item is displayed when a monitor page for diagrams and tables is selected.

Diagrams on the monitor page can be arranged horizontally or vertically by selecting

- arrange diagrams horizontally
- or
- arrange diagrams vertically

2.3.2 Yt diagram

This menu item appears if a diagram is selected.

grid for left y-axis:

Show or hide the grid lines for the left y-axis

grid for right y-axis:

Show or hide the grid lines for the right y-axis (only available if both axis are used on the selected diagram).

reference:

Show or hide the reference on the selected diagram.

These menu items are also available in the context menu for the diagram, which pops up when the right mouse button is clicked over the surface of the diagram.

2.3.3 table

This menu item appears if a table is selected.

horizontal grid lines:

Show/hide horizontal grid lines.

vertical grid lines:

Show/hide vertical grid lines.

2.4 “device” menu

2.4.1 communication

The communication port (serial port) on which the device(s) are attached can be configured here.

Mark the interface to which you wish to connect the device and close the dialog box with 'OK'.

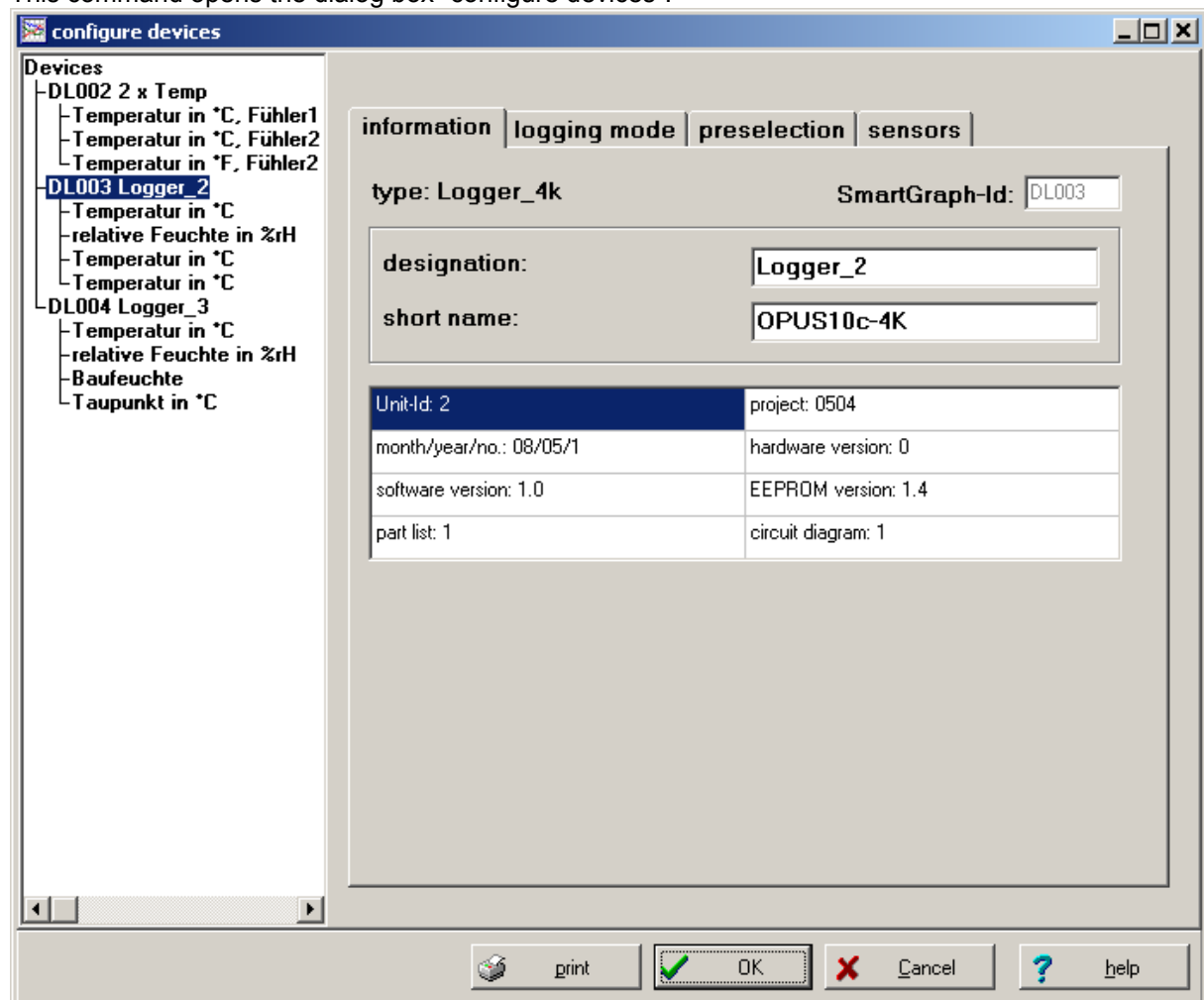
Note:

If an error message **'Interface already open'** is displayed when connecting to a device, make sure the proper serial port is configured and not used by another application.

If an error message **'device does not respond (Timeout)'** is displayed make sure the device is connected to the selected interface, and the proper cable (supplied with the device) is used.

2.4.2 configure devices

This command opens the dialog box “configure devices”:



The device and channel configuration can be changed here.

The available devices that can be configured are presented in a tree diagram in the left part of the dialog.

The device (or channel) to be configured can be selected by clicking on the corresponding entry in the tree view.

By double-clicking a device entry the associated list of the subordinate elements (the channels for this device) can be expanded or hidden.

The selected entry is highlighted.

On the right side of the dialog the settings for the selected entry (device or channel) can be edited.

For further information please refer to chapters:

- edit device
- edit channel

Buttons:

- OK: With "OK" all changes that were made since the beginning of the dialog are saved. The dialog is ended.
- Cancel: The dialog is ended without the changes being saved. All changes made since the beginning of the dialog are discarded.
- Print: the configuration data of the currently selected device is printed. A dialog to enter a comment is displayed. The comment will be shown on the printout.

2.4.2.1 edit device

Following configuration items for a device can be viewed/edited:

Information:

- SmartGraph-Id:
This identifies a device uniquely within the SmartGraph software. It correlates to the name of the folder where the data for this device is stored (e.g. DL005)
The identifier can not be changed
- designation:
The designation of a device. Any name/description can be assigned. This name (and the assigned ID) is used in SmartGraph to identify the device.
- short name:
The short name for a device is used where showing the designation would use too much space. Therefore only a short string should be assigned here.
- Further internal information from the device like hardware and software versions are displayed, but cannot be edited.

logging mode:

The logging mode parameters for the device can be configured here.

- storing mode: In “start/stop” mode data logging (recording) stops when all available memory has been used to store data. In “circular” mode the recording is continuous, but if all available memory has been used, oldest data entries are overwritten with new values
- sorting of: The following measurement values can be logged/recorded:
 - o average: average measurement value over “storage interval”
 - o maximum : maximum measurement value in “storage interval”
 - o minimum : minimum measurement value in “storage interval”At least one value must be selected.
- Sample interval : time difference between samples (times when measurement values are read from the sensor)
- Storage interval : time interval for data logging

preselection:

When preselection is enabled data logging only occurs at the preselected time. The selected date/time must be set to a time in the future.

Note for devices of the DL-series: preselection does work for devices of the DL-series in start/stop and ring mode. For the DL 100M the device must be switched to mode S3 or S4 in order to activate preselection. A flag symbol in the display of the devices indicates that preselection is enabled. A clock symbol in the display indicates that preselection was activated (i.e. data is recorded). Other devices of the DL-series, i.e. all two- and four-channel devices with and without display, need to be switched on in order for preselection to work!

Attention: For the DL 100M the symbol for enabled preselection is displayed even if the device is in mode S1 or S2 – but in those modes no data is recorded by the device!

sensors:

The sensors attached to the two logger channels are displayed here.

Settings: Using the buttons the edit dialog for the corresponding channel can be accessed (see edit channel).

modify sensors (professional version only): the measurement units in which the data for a device channel is stored can be changed here. The dialog box “modify sensors” appears.

The (physical) unit in which the data for a device channel is stored and presented can be modified here.

Depending on the sensor circuit board installed in the device the following measurement units are available:

Temperature in °C or °F, relative humidity in %RH, absolute humidity in g/m³,
dew point in °C or °F

Not all measurement unit configurations are possible. The following limitations apply:

- With the internal sensor circuit board and the external circuit board with one probe the measurement units in the two channels must be different.
- With the external sensor circuit board with two probes the measurement units in the two channels must originate from different probes.

When the measurement unit for a channel for which data has already been stored by Smartgraph is changed, a new channel for the new unit is created.

The old data stored with the old unit setting can still be viewed. The device appears in SmartGraph now with more than two channels. The channel with the old unit settings no longer corresponds to any physical device channel. Accordingly, some parameters for this now "virtual" channel cannot be modified

For detailed instructions on the device settings please refer to the device manual.

2.4.2.2 edit channel

The following parameters of a channel can be viewed/edited:

information:

- SmartGraph-ID: The SmartGraph Identifier for this device. Cannot be changed.
- sensortype, sensor PCB, assigned device channel : additional information about the attached sensor, can not be modified.
- offset : offset (calibration) for the attached sensor.
- designation : descriptive name for the channel (up to 79 characters). Used to refer to this channel within SmartGraph
- short name: short name for the channel (up to 20 characters). Used within SmartGraph where the descriptive name would be too long (use too much space).

alarms:

- alarm at: if set to “storing data”, alarms are triggered when data exceeding the given alarm limits is stored, if set to “sampling of data” alarms are triggered when data exceeding the given alarm limits is sampled.
- alarm limits: maximum and minimum boundaries for the alarm. An alarm is triggered if the (stored or sampled) value is below the minimum or above the maximum value configured.
- Alarm hysteresis: the hysteresis for the alarm.

display:

- decimal places : number of decimal digits used in data representation for this channel
- view range in diagrams : the default range assigned to the y-axis of a curve in a diagram where data for this channel is displayed. (See [2.2.9.4 Range of left/right Y-Axis \(for diagrams only\)](#))

Notes:

- If (device or channel) parameters are modified that are stored in the device, clicking the 'OK' button will cause SmartGraph to connect to the device and transfer the configuration changes. The device needs to be connected to the configured serial port.
- If the device or channel configuration has been changed outside this SmartGraph installation (e.g. with SmartGraph on a different PC, or through a firmware update or a change in the sensor hardware), the configuration needs to be read first (device -> read configuration) before changes can be applied.

2.4.3 delete device

With this command a device can be deleted. After removal the device is not displayed in SmartGraph anymore.

A selection box to select the device to be deleted is shown.

Select the desired device from the list. 'OK' deletes the device, 'Cancel' aborts the action.

If a device is deleted, the data stored for this device is not really removed from the hard disc, but the folder is renamed from DLxxx to DLxxxBAK.

Instructions regarding recovery of the data can be found in chapter [1.6 Organization of measurement data](#).

2.4.4 read configuration

Read the device configuration.

See also: [1.3.4 read configuration](#)

2.4.5 read data

The data stored in the logger device is read and stored.

See also: [1.3.1 read data](#)

2.4.6 clear memory

delete the data stored in the device memory.

See also: [1.3.3 clear memory](#)

2.4.7 synchronize clock

The internal clock of the connected device is synchronized with the PC clock.

See also: [1.3.5 synchronize clock](#)

2.4.6 recorder

The recorder function reads data from the device "online" and displays this data.

See also: [1.3.2 recorder](#)

2.5 Options Menu

2.5.1 auto monitor

Set auto monitor options.

See also: [1.2.3 Auto Monitor](#)

2.5.2 protocol

Set protocol options:

short protocol

only errors are logged in the protocol.

limit size of protocol file

the maximum size of the protocol file is limited to the given size. If the size is exceeded the old file is renamed. The new file name consists of the date of the last entry.

maximum size:

The maximum size of the protocol file can be selected between 10 Kbytes and 9999 Kbytes. This setting is only available when the option "limit size of protocol file" is set.

protocol only during Auto Mode:

Messages are only written to the protocol file in Auto Modus.


When the current protocol file contains messages, an additional monitor page "protocol" is displayed.

Auto Mode is only active when the recorder is active.

2.5.3 export

The “export” function is only available with the professional version of SmartGraph.

Export data to a text file. Data from devices controlled by SmartGraph can be exported to a text file for further processing with other applications (e.g. for import in a database, word processing or spreadsheet application). The formatting of the text file can be customized.

The function is available from the menu topic 'options -> export' or the corresponding button  on the toolbar.

The export dialog consists of several steps:

Step 1: time period for export

Begin and end date/time for the data export is specified here. The end date/time must be at least 1 second later than the begin date/time. If “export without date” is selected, the time column will not be part of the exported data rows (e.g. if data from one day only is exported).

Step 2: channels to be exported

The channels to be exported are specified here.

Selected channels are shown in the list (device name and channel name).

Channels to be exported can be selected by

- clicking the button 'channels of selected device' : all channels of the selected device (displayed in AutoMonitor) will be added to the export
- clicking the button “setup channels” : a dialog to select channels from all configured devices is displayed. See [2.5.5.1 setup channels](#)

Step 3: channel information to be exported

In addition to the measurement data, information about the device(s) and channel(s) can be included in the export output file. This information will be included as “header” information in the export output. This header and the rows containing the measurement data are separated by the word 'data'.

The following information is available and can be selected via the checkbox in the selection list.

- channel no: serial number for the channels in the corresponding column
- data source: long name (description) of the device
- data source short: short name of the device
- channel: long name (description) of the channel
- channel short: short name of the channel
- sensor type: identification code for the sensor type
- unit: measurement unit
- min: minimum value of sensor measurement range
- max: maximum value of sensor measurement range
- alarm min: lower alarm limit
- alarm max: upper alarm limit
- logger ID: unique (internal) identifier for data logger device

Step 4: export to file

The file name (including its path) can be changed in the input field or via a “file selection dialog, which is shown when the 'browse' button is clicked. If an existing file is selected, the option 'append to existing file' will append the new data records to an existing text file. In this case, channel information (header, step 3) is not exported. If the option is not active an existing file will be overwritten. If a new file name is selected, this option field does not apply.

Step 5: Format settings

The following settings can be customized:

- date format: date separator, order, year (2 or 4 digits)
- time format: separator character between hours and minutes
- decimal separator: (“.” or “,”) for measurement values
- columns delimiter: delimiter between data columns (e.g. channels). May not be the same as the separator for date and time.
- line end : character to separate lines (rows) (e.g. CR LF)

- Character string to be entered for erroneous or invalid/nonexistent measurement values e.g. "--" or "MISSING". The character string must not contain the column separator. An empty character string is permitted.



The export is executed using the button 'finish'.



2.5.3.1 setup channels


The dialog allows the selection of several channels from any device managed by SmartGraph.

The available devices are displayed in a list on the left hand side of the dialog. The device can be selected by clicking on the corresponding entry. The selected entry then appears highlighted.

All available channels of the selected device are displayed in the list next to the device list. Channels that have been selected are moved to the list on the right side.

Channels can be selected (moved to the list on the right) with the buttons  (if a single channel is selected) and  (if more than one channel is selected). To select multiple channels use the left mouse button together with the 'Shift' and 'Control' keys. To select all channels use the button 'Select All'.

The sequence of the selected channels can be changed with the buttons  and . The selected channel will be moved up/down in the list. The channels will appear in the export file in the order specified here.

A channel can be removed from the list of selected channels with the button .

With 'OK' the selected channels are passed back to the export dialog.

With 'cancel' the dialog is ended without transferring the selection.

2.5.3 Language

Change the current language. This function can be selected by clicking the corresponding button on the tool bar.

2.5.4 Upgrade

Order/unlock key code for professional version.

See also: [1.7 Upgrade to Extended Functions](#)

2.6 Help Menu

2.6.1 Additions to the manual

Show recent changes and additions to the manual that have been implemented after the manual has been printed.

2.6.2 Contents

Start the online help and show the contents index of the help topics.

2.6.3 Using Help

Show introduction to the Windows Help system.

2.6.4 Info

Show version number and copyright information for SmartGraph.

3 Appendix

3.1 Keyboard Shortcuts

For all scroll and zoom functions keyboard shortcuts are available. Depending on the selected device/object, the following key shortcuts are defined:

diagrams and tables :

- Ctrl+ Object Full Screen
- Ctrl- Reverse Object Full Screen
- TAB Change to Next Object

diagrams:

- + zoom in
- - zoom out
- -> Scroll Right
- <- Scroll Left
- Ctrl -> Page Right
- Ctrl <- Page Left
- End Data End

tables:

- Cursor Up Scroll Up
- Cursor Down Scroll Down
- Page Up Large Step Back
- Page Down Large Step Forwards
- Ctrl + Cursor Up Scroll Back by 1 Day/Month/Year
- Ctrl + Cursor Down Scroll Forward by 1 Day/Month/Year
- <- Scroll Left
- -> Scroll Right
- Ctrl -> Large Step to Right
- Ctrl <- Large Step to Left
- Pos1 Go To Beginning of Table
- End Go To End of Table