



# Manual **OPUS 10**

Version V5 (3/2002)



**8152.10 OPUS 10 TSE**

**8152.00 OPUS 10 THI**

**8254.00 OPUS 10 TCE**

**8253.00 OPUS 10 TPR**

**8255.00 OPUS 10 TCO**

**8257.00 OPUS 10 THC**

**8256.00 OPUS 10 TIC**

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## 1 General

The compact design and modular technology enables the OPUS10 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 OPUS10 family are :

8152.00	OPUS 10 THI = temperature / humidity internal
8152.10	OPUS 10 TSE = temperature / humidity external
8254.00	OPUS 10 TCE = thermocouples
8253.00	OPUS 10 TPR = temperature / air pressure
8255.00	OPUS 10 TCO = temperature / CO2
8257.00	OPUS 10 THC = temperature / humidity compact (without display)
8256.00	OPUS 10 TIC = temperature / compact (without Display)

The 8152.00 is an electronic mini thermo-hygrograph with internal sensors.

The 8152.10 has two channels, to which either two temperature sensors or one combined temperature/humidity sensor can be connected.

The 8254.00 is a 2 channel datalogger for thermocouples(J,K,N,E,R,S,T).

The 8253.00 enables the measurement of the air pressure as well as of the temperature.

The 8255.00 measures CO2 and temperature whereas the

8257.00 is a pricedly affordable datalogger for temperature and humidity without display and the 8256.00 , 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.

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The professional version SmartGraph 2 (8152.SGP) 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/m<sup>3</sup> (absolute humidity).

The technical data of the OPUS10 can be found on the internet under the following address:

## 2 Display module

The OPUS10 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.

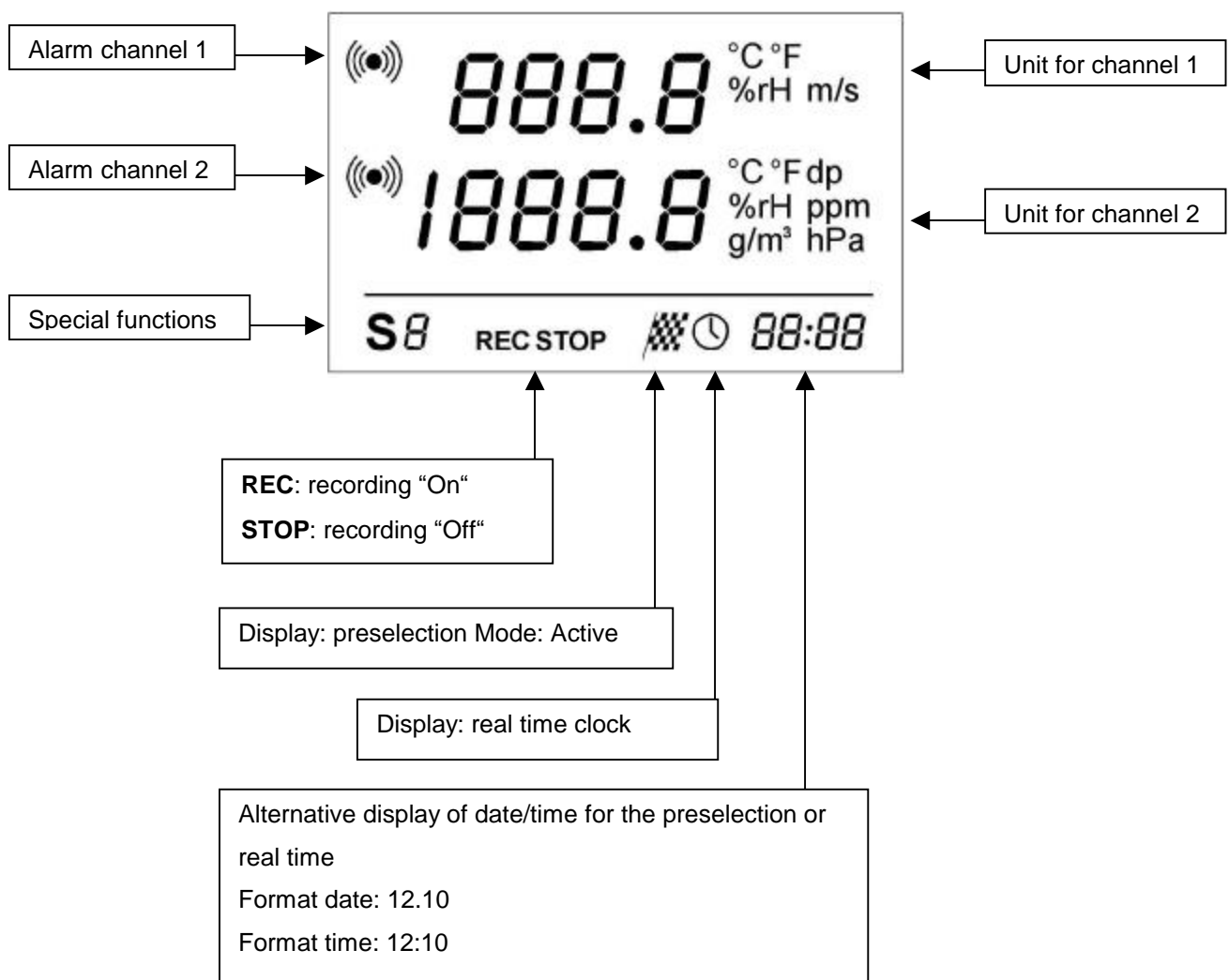


Figure: OPUS10 Display Elements

**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 disappears, the real time clock becomes active and the OPUS10 starts recording.

### 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 OPUS10 TSE for external sensors (8152.10)

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

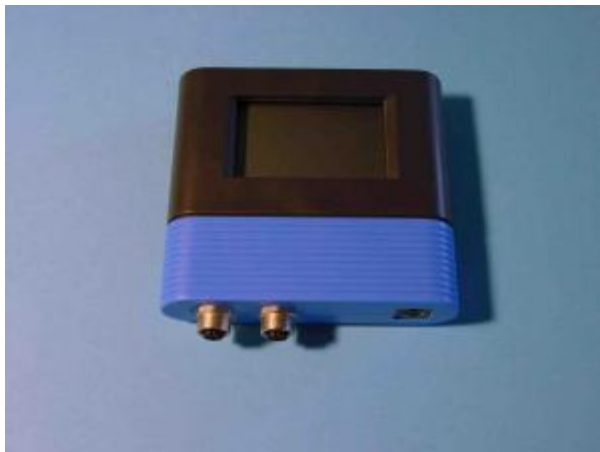


Figure: module with external sensors

Either one or two temperature sensors (8152.TF) or one to two combined temperature/humidity sensors (8152.TFF) can be connected. (Two sensors are only to be used in combination with the Professional version SmartGraph 2 (8152.SGP)). If only one external sensor is used, it will be connected to the left hand sensor socket.

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.

The extension cable 8152.KAB can be used with both 8152.TF and 8152.TFF.

**Important:** a maximum of 3 extensions (8152.KAB) can be connected to one 8152.TFF and a maximum of 4 extensions (8152.KAB) to one 8152.TF.

**Extensions can affect the accuracy!**

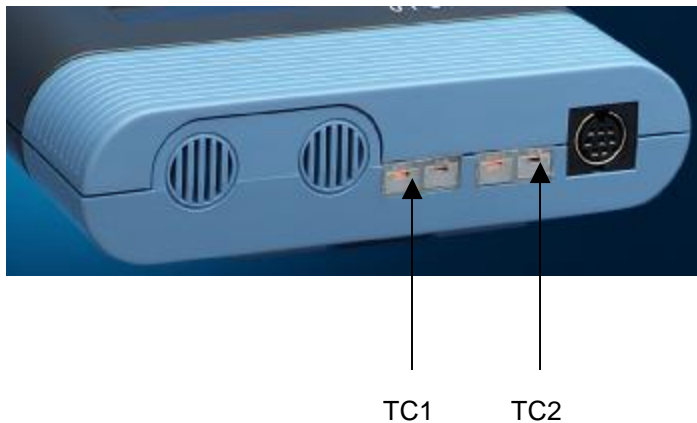
Necessary calibration intervals are dependent on the environmental conditions and the requirements of the permissible tolerance deviations.

A single point calibration of the 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.

## 5 OPUS10 TCE for thermocouples (8254.00)

The OPUS10 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**

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

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 OPUS10-TC

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

**Important: check on the polarity when connecting a TC.**

## 6 OPUS10 TPR for temperature and air pressure (8253.00)

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 OPUS10. You will then obtain an air pressure value based on the sea level (1013,25 hPa).

Table: referenced atmosphere

Altitude/m	Average airpressure/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 OPUS10 TCO for temperature and CO2 measurement (8255.00)

**Reasons for measuring the CO2:** though the percentage of CO2 in the air is only 0,034%, it is considered an indicator for the quality of the air in a room.

0,1% (1000ppm) is the limit value in a room.

Example: 35% of the people are reportedly bothered at a rate of 2000ppm.

The concentration at work is affected at 5000ppm.

Table: content of air

Gas	Unit	Volume
Nitrogen	N <sub>2</sub>	78,08 %
Oxygen	O <sub>2</sub>	20,95 %
Argon	Ar	0,93 %
Carbon dioxide-gas	CO <sub>2</sub>	340 ppm

**Measurement principle:** the measurement of gases via infrared is based on the fact that gases absorb discrete wavelengths. The absorption intensity does not depend on the gas concentration. The CO2 absorbs infrared radiation for example at 4,26 μm wavelength. This measurement procedure is also called „non dispersive infrared radiation” (NDIR).

**Measurement setup:** when measuring the CO<sub>2</sub>, a test cage, an infrared source, a filter, an infrared receiver as well as a suitable controlling and signal processing circuit for transmitter and receiver are needed.

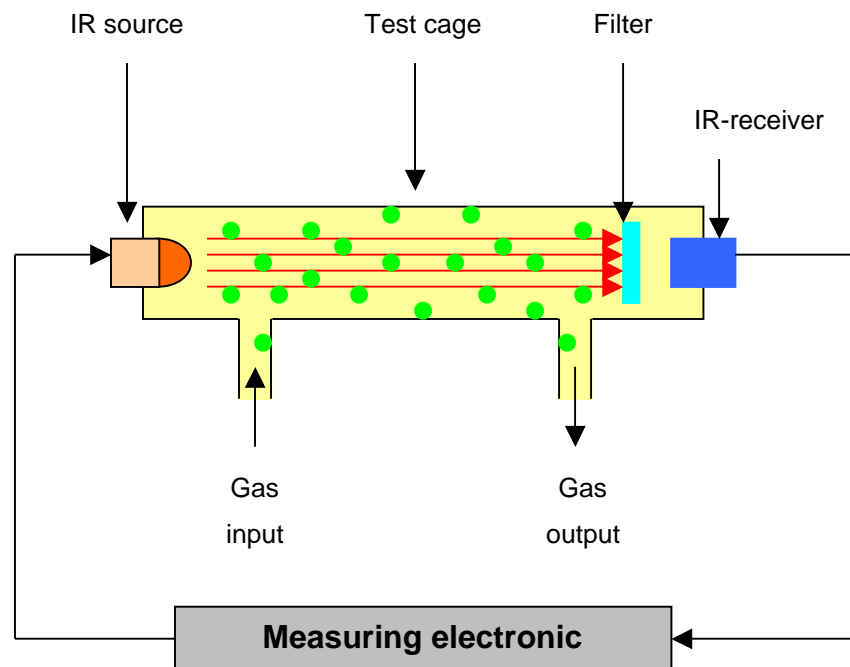


Figure: standard gas measurement setup with IR absorption

**Life span of the battery:** the measurement of CO<sub>2</sub> with IR absorption requires a lot of energy since the IR source is warmed up to more than 400 °C to be able to measure. Therefore the larger the sampling rate, the better in order to reduce the energy consumption. The sampling rate should be larger than or 1 minute and the recording rate larger than or 10 minutes.

**Calibrations:** calibrations at one point can be carried through by the user himself who will have to place the OPUS10 for about one hour in a fresh air environment (preferably far away from the city!).

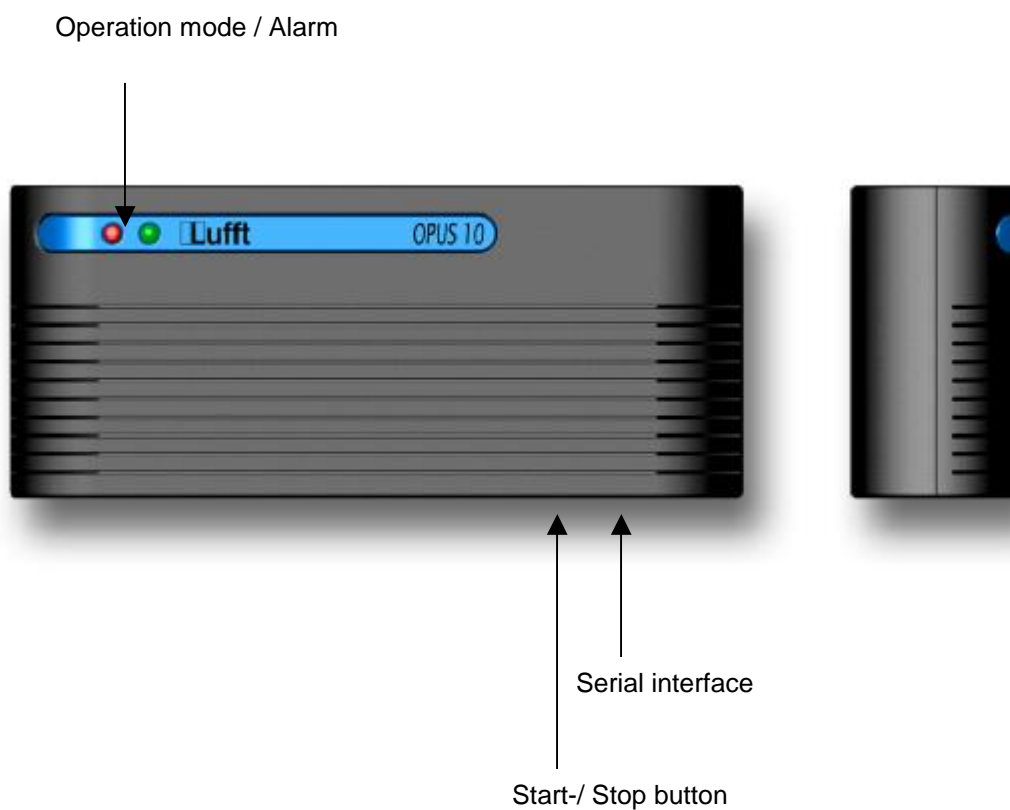
The measured value will have to be modified afterwards in the software SmartGraph2 via an offset, so that it comes to 340 ppm.

Calibrations at various points can only be carried out at dostmann electronic.

## 8 OPUS10 TCI / THC (T°, T°/H without display, 8256.00, 8257.00)

**General:** the hardware of the OPUS10 compact is almost identical to the hardware of the OPUS10 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.

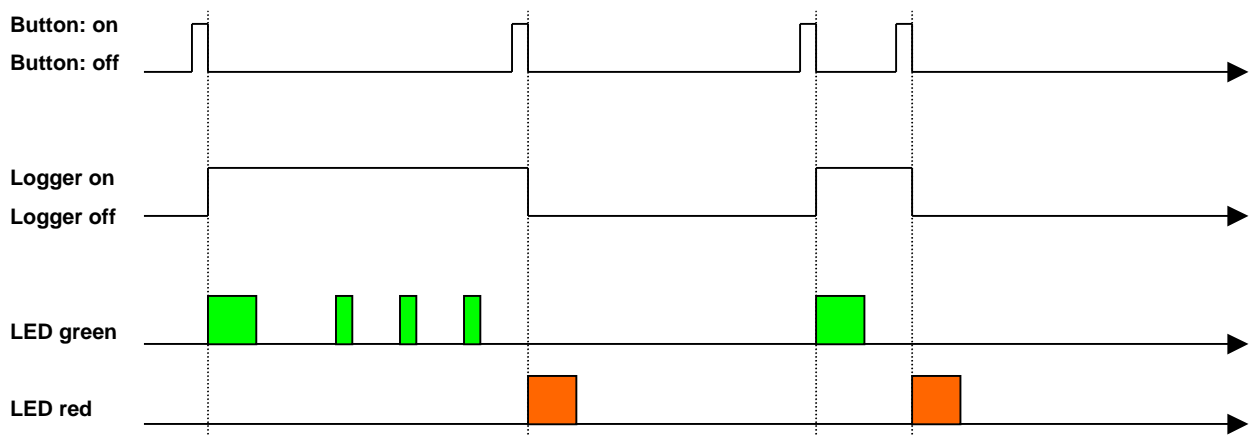
In addition, you will find close to the serial interface a start / stop button to switch on / off the datalogger.



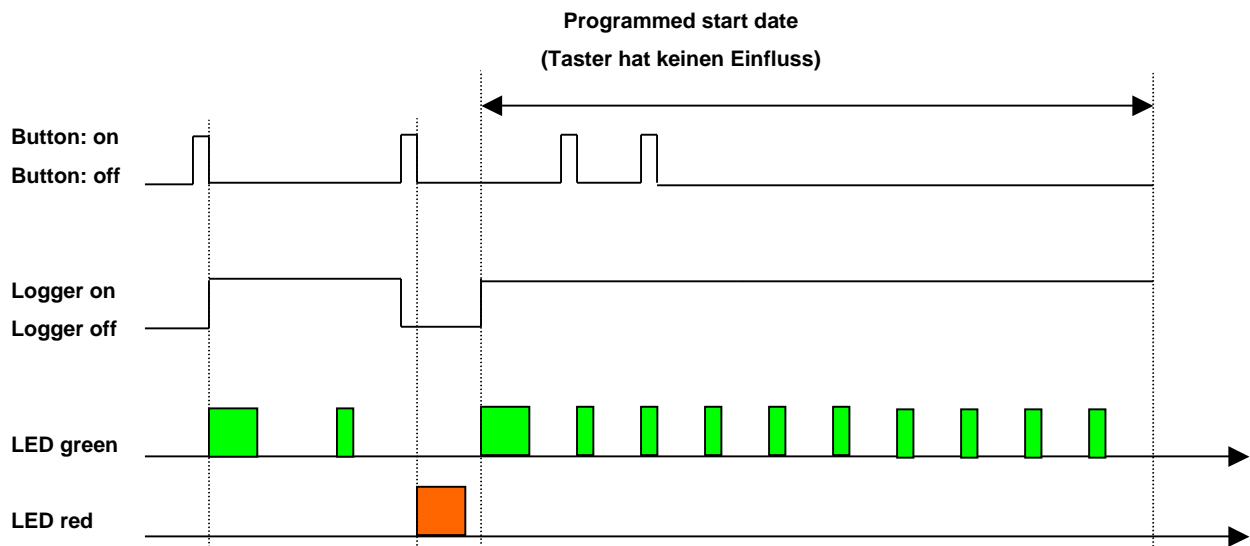
**Start/Stop function:** the off / on button enables the OPUS10 to start and stop recording. The manual activation / deactivation of the datalogger and the configuration in start/stop or in ring mode are independent.. By pressing the off / on button, the OPUS10 will start recording ; by pressing it again, the OPUS10 will stop etc...

**Important:** In the start / stop mode, the OPUS10 will start recording from the start date on (provided that this date is set in the opus) no matter if the start / stop button is being pressed during this time.

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



Timing diagram: OPUS 10 THC/TIC in ring mode



Timing diagram: OPUS10 THC/TIC in start/stop-mode

The button should be kept pressed for approx. 1 sec. to start / stop the OPUS10.

When activating the OPUS10, the green LED remains on during 3 sec. The red LED remains on during 3 sec. when deactivating the OPUS10.

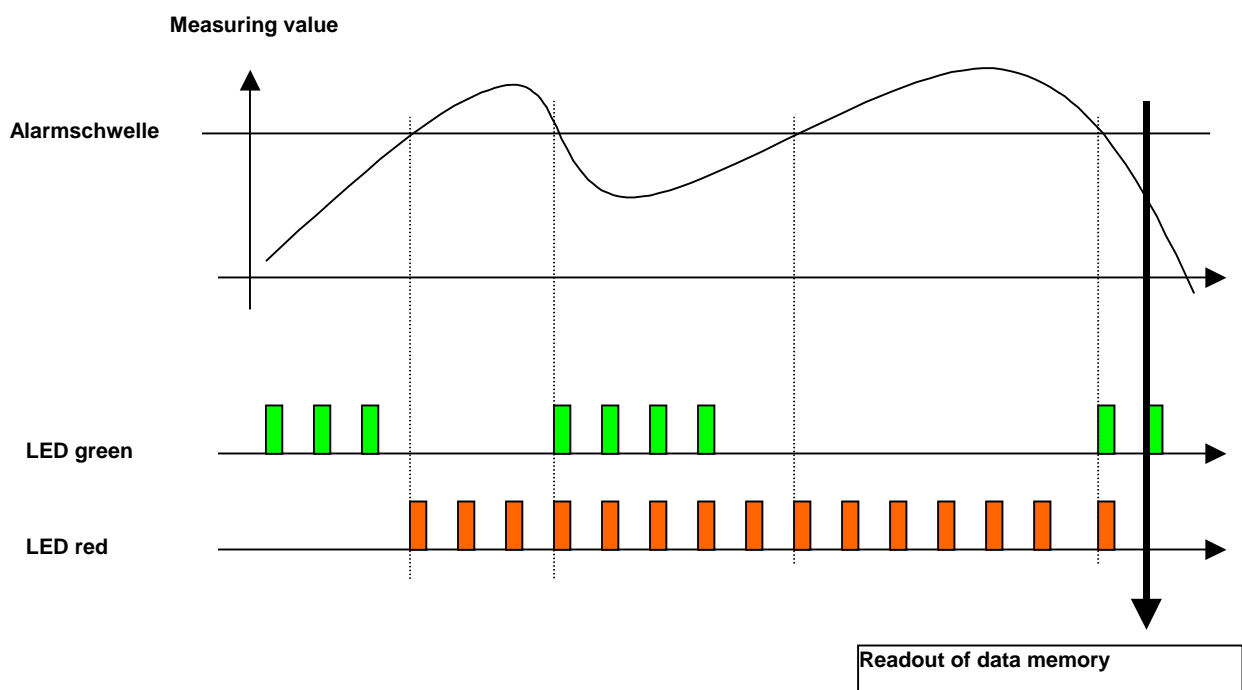
While recording, both LEDs on the OPUS10 or just one of them will flash at 10 sec interval. This time interval is completely independent of the recording and storage intervals set by the user in the OPUS10.

**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 OPUS10 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: OPUS 10 THC/TIC alarm

## 9 Changing the sensor module

To change the sensor module, carefully remove the OPUS10 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.

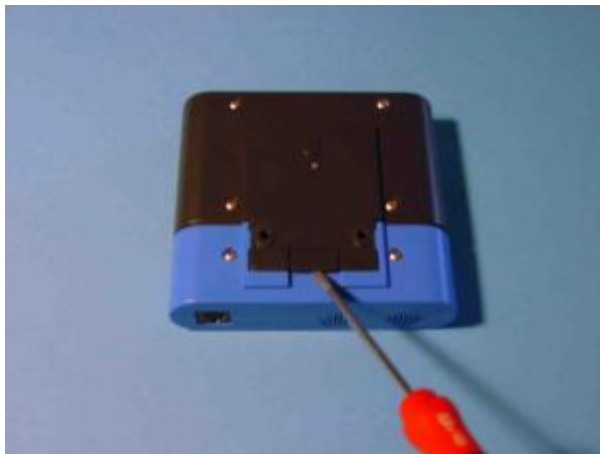


Figure: removing the back plate



Figure: assembly of the modules

## 10 Changing the battery

When the indication **BAT** flashes in the upper line of the display, the battery must 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.

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

Now remove the old battery and insert the new one (Type: LS14500/Saft, 3.6V; Order No: 8152.SV1) into the holder.

**Important:** observe the correct polarity of the battery and read the safety tips mentioned on it.

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

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



Figure: Opening the OPUS10 to change the battery



Figure: changing the battery

## 11 Mounting the OPUS 10

The OPUS10 can be used either as mobile or stationary data acquisition system. For stationary applications the OPUS10 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 OPUS 10

**An anti-theft device made out of aluminium is now available alternatively to the mounting system. This device additionally enables OPUS10 to be dismantled and the data to be downloaded much easier.**

## 12 Tips and Tricks

- The battery should be changed annually (Type: LS14500/Saft, 3.6V; Order No: 8152.SV1).
- Frequent communication with the PC reduces the battery lifespan. A sampling rate of 1 minute and a storage rate of 10 minutes are advisable (energy savings!)
- For the data transfer to the PC, only use the cable supplied.
- The sensors and the OPUS10 should be kept away from condensation

### 13 DECLARATION OF EC CONFORMITY

For the following product(s)

**OPUS10, ref. 8152.XXX**

it is hereby confirmed that they comply with the principal safety requirements which are set out in the guidelines of the council for the unification of legal regulations of the member states concerning electromagnetic compatibility (89/336/EEC).

This declaration is valid for all specimens which are manufactured according to the current production drawings -which are the component of this declaration.