



**INFRALOG**  
for Windows

---

Datalogger  
Software

---



Driesen + Kern GmbH

Bedienungsanleitung  
für Datalogger  
"Rugged"

Manual for  
datalogger series  
"Rugged"



*Save Life and Energy*

**CO<sub>2</sub>-Logger**

## Copyright

© 2013 All rights reserved.

The contents of this User Guide could be changed anytime without prior notice. Driesen+Kern GmbH disclaims liability for these changes.

In using this software, Driesen+Kern GmbH takes no guaranty for any kind of damages including all direct or indirect damages resulting from body injury, profit loss, operation interruptions, information / data loss etc.

Without written permission by Driesen+Kern GmbH no part of this publication may be reproduced for any purpose or transmitted in any form or in any means either electronic or mechanic.

## Key Account Manager

If you have any questions about installation or functionality of the software, please contact your local dealer or:

### **Driesen+Kern GmbH**

Am Hasselt 25  
D-24576 Bad Bramstedt  
Germany

Tel: +49 4192 8170-0

Fax: +49 4192 8170-99

[www.driesen-kern.de](http://www.driesen-kern.de)

[info@driesen-kern.de](mailto:info@driesen-kern.de)

## Trademarks

MS-DOS, Windows 95/98/2000/ME/NT/2000 and Windows XP/Win7/Win8 are registered trademarks of Microsoft Corporation. All other product names are trademarks or registered trademarks of the respective owners.

<b>1</b>	<b>Content</b>	
<b>1</b>	<b>Content</b> .....	<b>3</b>
<b>2</b>	<b>Hardware Checklist</b> .....	<b>5</b>
<b>3</b>	<b>Quickstart</b> .....	<b>6</b>
<b>4</b>	<b>General Information</b> .....	<b>7</b>
4.1	Battery lifetime .....	8
4.2	Manual operation .....	9
4.2.1	Logger display – State symbols.....	9
4.2.2	Logger display – Meter Mode .....	10
4.2.3	Logger display – LoggerTime .....	10
4.2.4	Logger display – Logger battery .....	10
4.2.5	Logger display – LogMode (Start/Stop Logger).....	10
4.2.6	Logger display – AlarmMode .....	10
4.2.7	Logger display – Display Off.....	11
4.2.8	Logger display – Zero-calibration differential pressure .....	11
4.2.9	LCD – Device Setup (Deactivate LED/LCD).....	11
4.3	Software installation.....	13
4.3.1	System requirements.....	13
4.3.2	Installing InfraLog for Windows.....	13
<b>5</b>	<b>Main Software-Menu</b> .....	<b>14</b>
5.1	Preferences and general Setup .....	14
5.2	Search for Devices.....	15
<b>6</b>	<b>Logger Identification</b> .....	<b>16</b>
<b>7</b>	<b>Logger Control</b> .....	<b>17</b>
7.1	Online Meter .....	17
7.2	Start/stop logger.....	18
7.3	Download Data .....	20
7.4	Logger Setup - General .....	21
7.4.1	CO2-Measurement (DK660 only) .....	22
7.4.2	Indicator for Air Quality .....	22
7.5	Logger Setup – Sensor Slots .....	23
7.5.1	Temperature PT1000/PT1000/Thermistor (DK660-3S) .....	25

7.5.2	Sensors for temperature (Thermocouple) (DK660-3S).....	25
7.5.3	Combined Sensors for temperature / humidity (DK660-3S) .....	25
7.5.4	Sensors for condensation or water detector (DK660-3S) .....	25
7.5.5	Pulse Count - potential-free contacts (DK660-3S).....	26
7.5.6	State recording - potential-free contacts (DK660-3S).....	26
7.5.7	Pulse Count - Voltage pulses <3Volt CMOS (DK660-3S).....	26
7.5.8	Pulse Count - Voltage signals >3V (DK660-3S) .....	27
7.5.9	Voltage - GND reference signals (max 10V) (DK660-3S).....	27
7.5.10	Strain gauge – sensors (DK660-3DMS only) .....	29
7.5.11	Lowest-voltage measurement (DK660-3DMS only) .....	29
7.5.12	Voltage - GND reference signals ((DK660-3S).....	30
7.5.13	Current measurement (max 24 mA) (DK660-3S).....	30
7.5.14	Soil moisture sensor - Decagon series.....	32
7.6	Logger Setup – Configuring Alarms .....	34
7.7	Display logged data as a graph.....	35
7.8	Display logged data as a table .....	35
7.9	Exit.....	35
<b>8</b>	<b>Troubleshooting .....</b>	<b>36</b>
<b>9</b>	<b>Understanding LEDs .....</b>	<b>37</b>
<b>10</b>	<b>Important notes for measuring humidity.....</b>	<b>38</b>
<b>11</b>	<b>Calibration/ Maintenance .....</b>	<b>39</b>
11.1	CO <sub>2</sub> -Measurement principle .....	39
11.2	User-calibration of the CO <sub>2</sub> -Logger .....	40
11.2.1	Preparing a calibration .....	40
11.2.2	One-point zero-gas calibration .....	40
11.2.3	One-point calibration at fresh air .....	42
11.2.4	Two-Point calibration using CO <sub>2</sub> -zero and CO <sub>2</sub> -Span-Gas .....	42
11.3	ABC-Calibration of the CO <sub>2</sub> -Logger.....	44
	<b>Certificate of Conformity .....</b>	<b>48</b>

## 2 Hardware Checklist

### Included in delivery for all loggers are:

- Data logger series DK660 "rugged"
- 2x Lithium battery type LITH 9 (Size AA, 3.6V/2.1AH)
- USB cable
- Software InfraLog for windows supplied on USB-Stick or CD ROM

### Further options include:

- Calibration certificate
- Wall holder, metal strip and seal
- 3 pcs DKC-S cables (open ended) for small signals and pulses (only supplied if option "-3S" has been ordered)
- Connection cables DKC-I,DKC-U, DKC-P  
(for connecting voltage/current signals >1V to the inputs)
- Keys for InfraLog light or enhanced (if ordered)

## 3 Quickstart

### Receive your first readings in only six easy steps:

- ▶ Install the USB driver from the CD:  
execute file: ...\\USBDriver\\USBXpressInstaller.exe
- ▶ Install InfraLog for Windows  
Execute file ...\\setup.exe
- ▶ Open the logger by turning off its rear cap. Insert the battery. Connect the USB cable to the respective ports of the logger and your PC.
- ▶ The Operating System will detect the device automatically. Wait for the notice that the device can be used.
- ▶ Start InfraLog. The program automatically recognizes the logger and displays a picture.  
Double click on the logger picture to select the logger.
- ▶ Right Click on the logger and select Metermode. After a few seconds you will be able to see online readings from your logger on the screen.

### Start logging in two additional steps

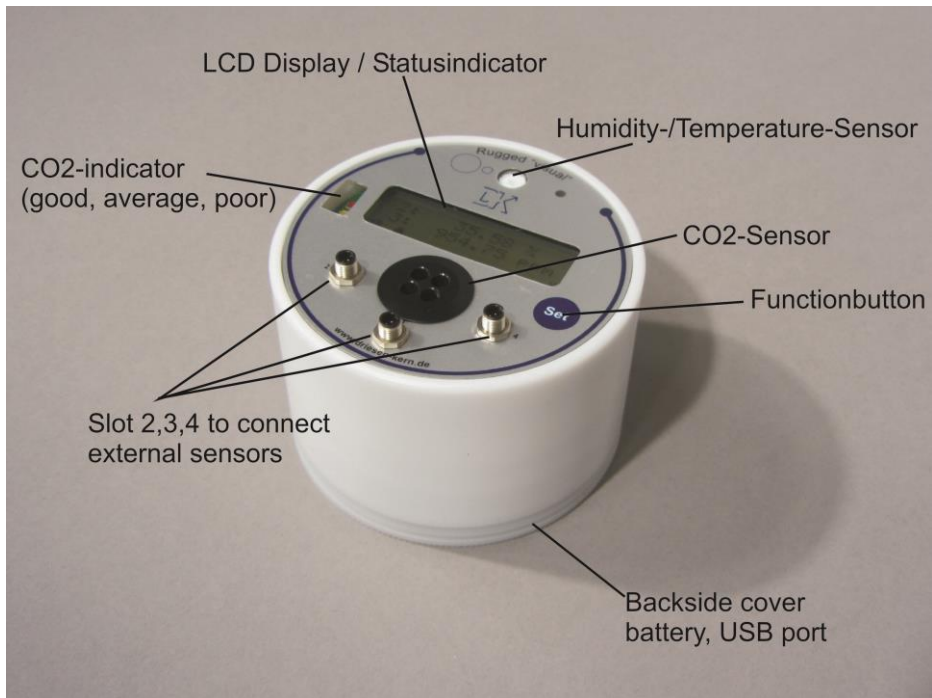
- ▶ Perform user calibration as described in chapter 11.
- ▶ Again Right Click on the loggers picture and then click at **Start Logger**.
- ▶ Click on **Start Logger now**. The logger will start on the nearest minute with the pre-set interval of 10 seconds. The loggers blue LED will flash accordingly.

### Graph measured data in just another step

- ▶ Click at **Download Data**.  
Stored readings will be downloaded, saved as an ASCII file, and a graph is displayed.

## 4 General Information

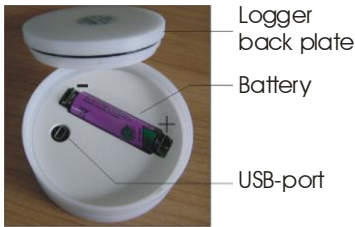
The DK660 is a datalogger for CO<sub>2</sub>, humidity and temperature. In addition, the DK660-3S has three inouts which can be used for connection of various sensor and signals. Driesen+Kern GmbH manufactures a complete line of rugged dataloggers which can be seen at: [www.driesen-kern.de](http://www.driesen-kern.de)



The logger uses sensor slots to which external sensors may be connected to. Some of our sensors are combined sensors (for example humidity and temperature). Such a combined sensor for example RFT-325 Sensors can be connected to a single slot.

The loggers have a memory capacity for 4 Mio readings standard. It can be set to either "stop-when-full" or ring-buffer mode (continuous mode). The logger's power supply is provided by 2pcs 3.6V lithium battery (LiTh-9).

For setting up the datalogger or data-retrieval you have to open the backside of the logger by unscrewing it.



Here, you will find the battery compartment as well as the USB-port of the logger.

## 4.1 *Battery lifetime*

The battery life depends mainly on the interval selected. The table gives an overview for typical intervals.

<b>DK 660 logger</b>		
interval [h]	batterylife	
	LCD off	LCD on
> 10 minutes	2 years	4 weeks
1 minute	1/2 year	4 weeks

Some other factors reduce battery life as well. e.g., low temperatures decrease the capacity. Downloading data or operation in MeterMode also cause an increased energy consumption, which further decreases battery life.



## 4.2 Manual operation

Any of the logger functions can be accessed via USB connection, which is described in the chapter 5.

Furthermore you may use the push button and the LCD for various functions as well.

When fist pushing the button, the display will wake up and display the main menu as well as a few state symbols.

Pushing the button shortly will cycle through the main menu of the logger. The blue LED will flash once.

Pressing it longer (about 1-2 seconds) will enter the menu which is actually displayed. Pressing it longer again will leave the actual menu. The blue LED will start flashing to indicate that the logger will enter/leave the menu.

Pressing it very long (10 seconds) will start a more sophisticated action. This is only available in some of the menus.

### 4.2.1 Logger display – State symbols

#### Statusbar

T= operating internal clock

L= Log-Mode

C= Counting function in use

A= Alarm occurred

Bat= battery status

⚡ = Alarm settings activated

The “T” symbol shows that the internal clock is working properly.

The “L” symbol shows that the logger is actually in LogMode and is taking samples.

The “C” Symbol shows that the CountMode is in use i.e. pulses are being counted at the moment.

If the “A” symbol is displayed, an alarm has occurred and not been resetted so far. This will be latched even if the alarm condition is not met anymore.

The lightning bolt symbol will appear as soon as the alarm settings have been activated.



Finally, the battery symbol has got three states: full, half full and empty.

The software InfraLog will additionally warn you if you need to replace the battery (see chapter 7.4). In addition, the red LED flashing rapidly indicates the need for the battery to be replaced (see chapter 9, understanding LEDs for further information).

#### 4.2.2 Logger display – Meter Mode

The actual readings, two channels at the time, are displayed. Press the loggers' button again to display the next two channels.

#### 4.2.3 Logger display – LoggerTime

Enter this menu to check if the logger time is correct. If it is not correct you need to set it using InfraLog for Windows.

#### 4.2.4 Logger display – Logger battery

Enter this menu to verify the battery capacity.

A brand new battery has a capacity of 3.6 V. A completely worn battery has less than 2.9V. The logger also predicts battery life. Please refer to chapter 9 to understand the meaning of the LEDs

#### 4.2.5 Logger display – LogMode (Start/Stop Logger)

Enter this menu to start/stop the logger.

The display prompts you to confirm that you want to start the logger.

### **IMPORTANT**

**Note, that any stored readings are overwritten when the logger is started.**

If you don't want to start the logger now (i.e. because you hit the start button accidentally), you may toggle between <Yes> and <No> by pressing the button shortly. If <No> is displayed push the button just a bit longer to go back to the main menu.

If you want to start the logger confirm <Yes> by pushing and holding the button for about 10 seconds until the LED turns into green to show the logger is going to start taking readings.

Note, that the interval in which the readings are taken needs to be set within InfraLog for Windows and cannot be altered here.

If you want to stop the logger you will again be asked to confirm this. Toggle between <Yes> and <No> by pressing the button shortly. Confirm your order by pressing the button for about 10 seconds until the LED flashes in a green colour.

#### 4.2.6 Logger display – AlarmMode

Enter this menu to activate the alarm settings that have previously been set within InfraLog for Windows.

You will be prompted to confirm to activate/deactivate alarms. Toggle between <Yes> and <No> by pressing the button shortly. Confirm your order by pressing the button for about 10 seconds until the LED flashes in a green colour. After the alarm settings have been activated, a lightning bolt symbol is displayed in the logger screen.

#### **4.2.7 Logger display – Display Off**

The logger display goes off after an hour. In order to save battery capacity you may turn it off manually by entering this menu.

#### **4.2.8 Logger display – Zero-calibration differential pressure**

Any logger that measure differential pressure has an additional functionality for on-site Zero-calibration. When in MeterMode press the pushbutton for about 30 seconds to perform a zero-calibration. While holding the button, the LED starts flashing rapidly in blue. Wait until it flashes rapidly in a green color until the zero-calibration is complete.

#### **4.2.9 LCD – Device Setup (Deactivate LED/LCD)**

In this menu you will find information about firmware and serial number of the logger. When pressing the Set-button you may change a few items of the loggers' general setup.

##### **4.2.9.1 LCD - Device Setup – LCD disabled / LCD always on**

In the menu-structure you will find the functions <timed LCD>, <LCD always on> and <disable LCD>.

The default setting is <timed LCD> which means, that the LCD will shut off after 60 minutes in order to save battery power.

If you deactivate the LCD it will always stay off even if the Set-button is pressed. In order to deactivate the display go to function <disable LCD> and press and hold the button for about 10seconds until the status LED changes from blue to green. Release the button and a message appears: LCD disabled.

Select <Display off> from the menu and press the Set-button once again to shut off the display. If you now press the Set-button again, the logger will not display any information in the LCD.

In order to reactivate the LCD you have to use following procedure: Remove the USB-cable as well as the batterie(s) from the logger. Wait for approx 10 seconds. Now, press and hold the Set-button while re-inserting the batterie. The three LEDs flash shortly and the LCD pops up with manufacturer's name. Press the Set-button again to use the LCD/button as usual.

If you select <LCD always on> it will not go off at all.  
Note, that this will drastically decrease the expected battery life of the logger according to the table in chapter 4.1.

#### 4.2.9.2 LCD - Device Setup – De-activate / Re-activate LEDs

The DK660 has 3 LEDs which can be used to display air-quality. More information about the meaning of the LEDs , you may find in chapter 7.5.15 and chapter 9.

If the LEDs are not going to be used you may deactivate them.  
Navigate with the set-button until you will find "Device Setup" and here "CO2-indicator" <enable 3 LEDs>. Press and hold Set for 10 seconds until the status LDE changes from blue to green.  
A message appears saying <LEDs activated!>, to show that the LEDs now indicate air quality.

In order to deactivate them, you will use a similar way:  
Navigate with the set-button until you will find "Device Setup" and here "CO2-indicator" <disable 3 LEDs>. Press and hold Set for 10 seconds until the status LED changes from blue to green.  
A message appears saying <LEDs de-activated!>, to show that the LEDs now indicate air quality.

## 4.3 Software installation

### 4.3.1 System requirements

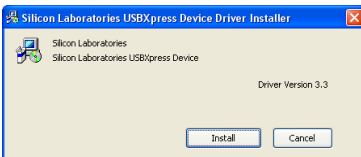
Hard-/Software	Minimum-Configuration	Recommended Configuration
Computer:	Intel Pentium, 1 GHz	Intel Pentium III, 2 GHz
Operating system:	Windows XP/Win7	Windows XP/Win7
RAM:	512 MB	1 GB or more
Monitor:	Any windows-supported monitor	Monitor with VGA- or higher resolution graphic
Mouse:	Any windows-supported mouse	Any windows-supported mouse
Port:	1 free USB-port	1 free USB-port
Printer:	Any windows-supported printer	Any windows-supported printer

### 4.3.2 Installing InfraLog for Windows



The setup program for InfraLog can be found on the USB-stick supplied. Start the **Setup\_InfraLog\_ForWindows.exe** which will guide you through the installation progress.

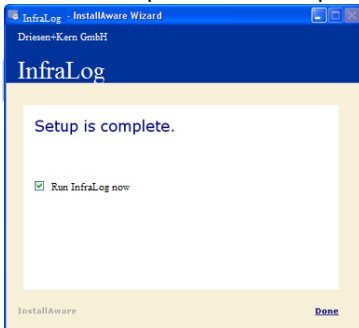
Choose appropriate folder and after a few seconds the software has been installed.



You will now be prompted to install the **USB driver**.

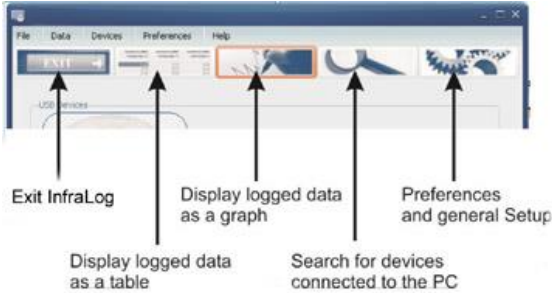
Click at Install and wait until the driver has been installed.

After the setup has been completed activate the box and click at **Done** to directly run InfraLog.



NOTE: If InfraLog is not started automatically, please start it up manually. You will find it as usual in your Start section of the windows software as well as a shortcut on your desktop.

## 5 Main Software-Menu

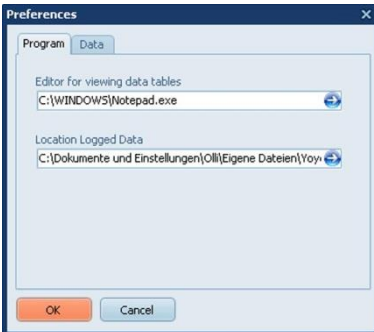


Within the main software menu you will find several important functions described on the left.

### 5.1 Preferences and general Setup

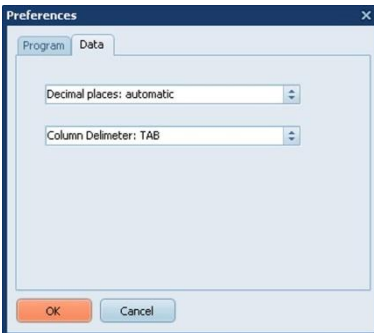


In this section you may set up preferences for the InfraLog Software. Click at **Preferences/Program** to set these.



Click at **Program** to change settings and paths for InfraLog. Select the **program** to start for viewing tables (ASC-files of InfraLog)

Select **Location** where readings are going to be saved when downloaded.



Click at **Data** to change export settings.

Select **Decimal places** to **automatic** (default) if you want to export data with as many decimal places as the sensor channels physically allows. Select any other number of decimal places, if you want to keep numbers small. Select the **Column delimiter** to **TAB** or **Semicolon**, whichever is convenient.

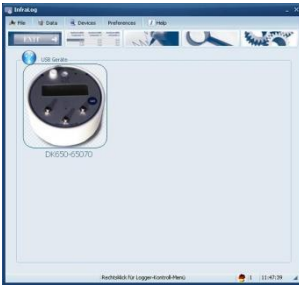
## 5.2 Search for Devices



Click at the Icon or at **Devices/Search Devices** in order to scan at USB Ports for new devices. Normally, a logger will be automatically detected at time of connection.

Locate the USB-Port of your datalogger next to the battery and plug in the USB transfer cable supplied with the logger.

Now plug in the cable into any USB-port of your computer.



You will note that Windows will start to identify the logger using the USB-Express driver and that within the Infra-Log software a picture of your datalogger will appear. This might take up to 30 seconds.



If you have more than one logger and also more than one USB port on your computer, you might as well connect up to 6 loggers to your PC. More pictures will appear and you will be able to take control on any of them. (If more than 6 loggers are connected, only 6 will be shown).



Normally, the logger is automatically detected and a picture is automatically displayed. If not you may try and search for devices, here. If it still doesn't show, please check if the USB cable is properly connected and refer to chapter 8 for troubleshooting.

## 6 Logger Identification

As soon as you move your mouse across the picture and wait for a second you will be prompted to click once or twice at the picture.



By clicking once at the picture, you will get some further information to identify the logger.

**A serial number, the Short ID, Date Code, Description as well as the manufacturers name will be displayed.**

Double click at the picture of the logger you want to communicate with and get information for.



Note that the logger gets marked on the screen. Now, you have selected the logger and can get further information and further control over it.

If you now **left-click once** onto the loggers' picture you will get additional information about the logger model and status.

You will see the **full serial number, logger status, number of channels, firmware version, battery capacity, memory percentage used and the actual logger time.**

**Logger Status** informs about the actual state of your logger. If the status is **"sleeping"**, no readings will be taken and it will just wait for being set to log.

If it is **"logging"** you will additionally see the interval which has been set.

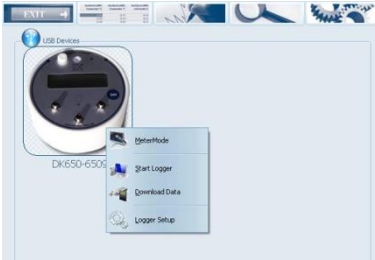
The **battery voltage** is an indication for the capacity of the battery. We recommend to keep track of the battery usage or simply use a new one if the status of the battery is unknown and data is important. Refer to table in chapter 4.1 to understand the impact of the interval on the battery life. The logger works with a lithium battery whose life isn't easy to predict. A brand new battery has a capacity of 3.6 V. A completely worn battery has less than 2,5V. The logger also predicts battery life. Please refer to chapter 9 to understand the meaning of the LEDs.

**Memory %** shows the memory capacity used.

**Actual Time** shows the loggers' time. The logger automatically synchronizes its logger time with the PC time, when it is started, so always make sure your PC time is correct.



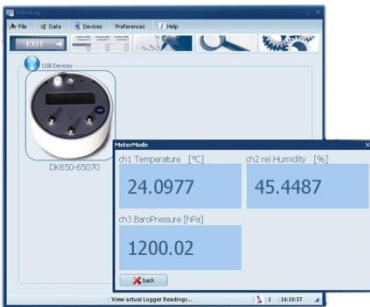
## 7 Logger Control



Once the logger has been selected you may also right- click on it to control the logger.

A logger control window is opened up and you will see functions like **Metermode**, **Sart/Stop Logger**, **Download Data** and **Logger Setup**.

### 7.1 Online Meter



In the Logger control window click at **Meter-mode**, if you wish to see actual readings of the datalogger.

Note that the screen shows channels in their numeric order. That means that first of all, all channels assigned to slot 1 will be displayed, then all channels assigned to slot 2 and so on. Please refer to 7.4 to get more information on Slot numbers and channel numbers.

Note: The logger is mainly used for unattended long term logging, so Meter Mode is mostly used to check the logger and verify that the sensors have been connected correctly and giving readings.

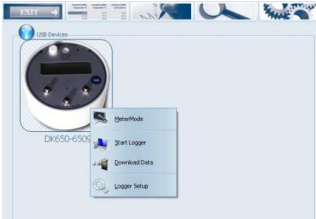
While the logger is connected to a USB Port it will warm up a bit so readings from internal temperature sensors will not be as accurate.

In fact, they will be about 2 °C higher than real values.

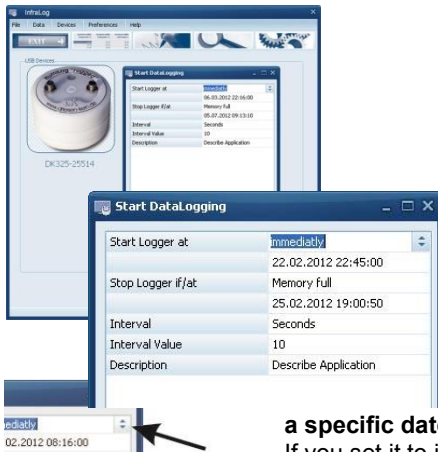
Depending on outside conditions it may take a few minutes to a few hours before the readings of internal sensors are most accurate after the logger has been disconnected.

## 7.2 Start/stop logger

Before starting the logger you will have to perform a zero calibration. Additional information can be found in chapter 11.



Clicking at **Start Logger** in the logger control window will bring up the most important settings for logging. (Note, that if the logger has been started earlier, the **Start Logger** command will not be available. Instead the **Stop Logger** command will be displayed, which you need to execute before being able to start it again.)



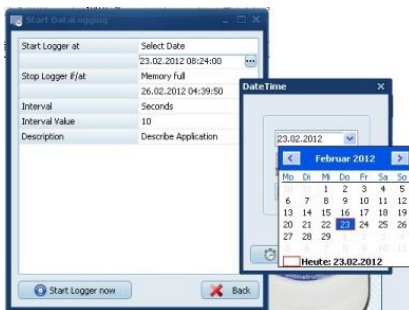
These settings are **Logger Start condition, logger stop condition, interval (unit/value)** and a **run description**.

You may start the logger **immediately** or at **a specific date/time**.

If you set it to immediately the logger will start logging at the nearest full minute.

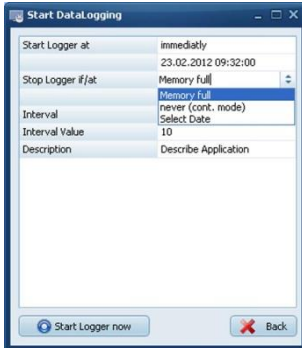
click here  
to change

To change the settings left click on the right side next to the actual condition.



You may as well set the logger to start at a specific date/time. Change the **Logger Start at-condition to Select Date** and find a **calendar** in which you may change the **start date**. Furthermore, you will find a **clock** in which you may change the **start time**.

In the **Start Datalogger** screen, you may now select the **Stop condition** for the logger.



If **Memory full** is selected the logger stops taking new readings when the memory is full.

If **never (cont mode)** is selected the logger will start to overwrite the oldest readings when the memory is full.

The **Select Date** option is not available for the yoyo-Loggers.

You may now set the interval in which the logger is taking readings.

Simply select the unit Hours, Minutes, Seconds or Hertz and define the Interval Value.

**Examples:** If you wish to log at every 10 Minutes, select **Minutes** at the Section **Interval** and enter **10** as the **Interval Value**.

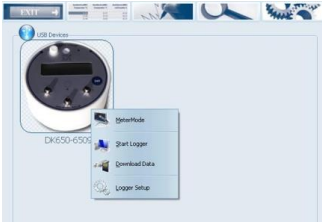
If you wish to log at 5 Hertz, select **Hertz** at the Section **Interval** and enter **5** as the **Interval Value**.

Finally, you may enter a **Description** of about 50 characters. This Description will be stored in the datafile to identify the readings, later.

If all settings have been entered as desired, click at **Start logger now**.

After a few seconds InfraLog informs you about a successful start.

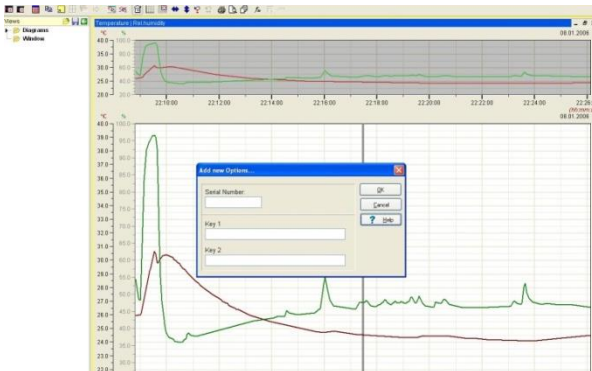
## 7.3 Download Data



Clicking at **Download Data** will transfer all stored data on your computer. It will automatically store the files as a **\*.BIN-File** and as an **\*.ASCII file**. The original **\*.BIN-File** is a compressed datafile which can be archived with a minimum of harddisk space required. The **\*.ASCII-File** is used for the graphical analysis with the GraphTool of InfraLog (only InfraLog light / -enhanced) and for Import in third-party software.

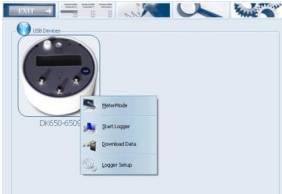
As soon as the data has been fully processed the GraphTool-Software will pop up. If you have purchased the InfraLog light / -enhanced software you have received a serial number and two keys which you need to enter here. If these have already been entered you may now analyse the data. (more details about graphical analysis can be found in a separate manual for GraphTool software package)

The files are automatically stored in a folder defined by InfraLog. This can be found at **C:\Users\Public\Public Documents\Graphtool**



If you haven't purchased the InfraLog light / -enhanced, you may upgrade the software. Please contact your sales channel to purchase a InfraLog light / -enhanced license.

## 7.4 Logger Setup - General



Click at **Logger Setup**, to define general settings for the logger, i.e. channel settings, alarm settings).



A picture of the logger is displayed so you can identify the inputs/slots.

Furthermore, the battery capacity is displayed. If the battery status is “green” the battery is still in good shape and you may perform your measurements. If it is red, you should replace the battery, soon and may only perform a short term logging period.



Click at general to additionally enter a logger name which will be used for later identification.

Click at „**more values**“, to define calculated readings as appropriate.



Within the next screen you may select the values that you want to calculate. These will be stored in the same ASCII-file as the original data.

### Note:

If you forgot to define these before you started the logger, you may do this any time later by just importing the \*.bin file once again and selecting calculated values as appropriate.

### **7.4.1 CO2-Measurement (DK660 only)**

The DK660 has an internal sensor for CO<sub>2</sub>, humidity and temperature. The ranges of CO<sub>2</sub> sensors are available 2000ppm, 5000ppm and 10000ppm.

Before starting any CO<sub>2</sub>-measurement campaign we strongly recommend to perform a 0-calibration. This is necessary in order to obtain accurate readings.

More information about calibrating the logger and the setup of the ABC calibration (background calibration) can be found in chapter 11.

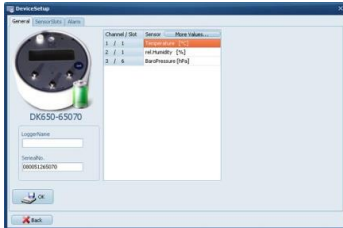
### **7.4.2 Indicator for Air Quality**

The logger has a „traffic light“ LED as an addition to the LCD-display showing the level of CO<sub>2</sub>. Three LEDs (green, yellow, red) show the indoor air quality, as long as the following conditions are met:

1. LED-functionality has been activated (see chapter 4.2.9.2) and
2. Logger is in LogMode.

More information can be found in chapter 9 „Understanding LEDs“  
Furthermore, you will find additional information on CO<sub>2</sub>-measurement principle as well as necessary CO<sub>2</sub>-Logger setting in chapter 11.1.

## 7.5 Logger Setup – Sensor Slots



Click at **Logger Setup**, to configure the inputs.

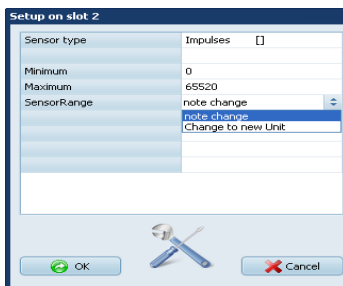
You will see the actual configuration of the logger and the range.

Click at the Sensor Slots.

**NOTE:** This function is only available if the logger is actually not in logmode.

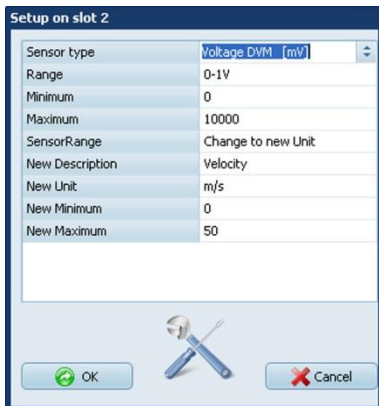


Click at the symbol of the slot, you wish to modify for example Slot2.



Here you can choose which sensor is connected to slot 2. If you are using one of the standard sensors for the rugged loggers, simply select the corresponding sensor type.

If you are using a sensor with an analogue output you may define the input here.



InfraLog automatically defines a **minimum** and a **maximum** of the electrical sensor range. You may alter this, if needed.

In order to use engineering units for the sensor select **Change to new Unit** at the section **SensorRange**.

This is a valuable feature especially if you are using different sensors with analogue outputs.

Now, you may enter further settings. Above example shows the values for a sensor with a linear range of 0...50m/s=0..1V.

In this example for **New Description**: Velocity.

The **New Unit** in this example is m/s.

For the **New Minimum** use "0" and the **New Maximum** would be "50".

After finishing the settings of your connected sensing device confirm with click at the **OK** Button.

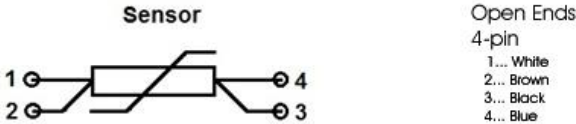
As per default, this new Range will automatically activated and logged, whenever the logger is started. If you wish to deselect the engineering units you may deactivate it at **Logger Setup, General, More values**.

If your logger is a DK65X-3S it has got three additional inputs for analogue and digital sensors. These can be set to the following types:



### 7.5.1 Temperature PT1000/PT1000/Thermistor (DK660-3S)

**Application:** Measuring temperature using two-/four-wire technique (Thermistor/Pt1000/Pt100)



Driesen+Kern's standard temperature sensors are all PT1000 type. For combined humidity/temperature see chapter 7.5.3.

If you are using another temperature sensor (Thermistor or PT100/PT1000), connect it with four-wire technique, assign pins 1 through 4 and colours as shown above.

This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Temp.PT1000 [°C]** or **PT100** or **Thermistor U**

### 7.5.2 Sensors for temperature (Thermocouple) (DK660-3S)

You may also connect thermocouple sensors of several Type (K,T,J,B,E,N,R,S).

If you want to use thermocouple sensors with a Mini-DIN Plug, you would need adapter connector, available from Driesen+Kern. Plug in the sensors with the correct polarity.

This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Thermocouple [°C]**.

### 7.5.3 Combined Sensors for temperature / humidity (DK660-3S)

This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Temp/RH [°C/%]**. Although humidity/temperature-sensors have two channels, they only use one channel at the logger.

### 7.5.4 Sensors for condensation or water detector (DK660-3S)

The condensation sensor Type SHS and as well the water detector SHSW only give a signal "0" or "1". The SHS is used to measure condensation on surfaces while the SHSW detects water ingress. The SHS gives a „1“ Signal when condensation has been detected and a „0“, if not. Similar to this the SHSW gives a "1" Signal when water is on the surface and "0" when there is none.

This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Condensation []** or SlotMode: **waterdetection []**.

### 7.5.5 Pulse Count - potential-free contacts (DK660-3S)

The logger can process signals from external switch contacts. The sensors need to be connected to the DKC-S cable. Just connect cable colours according to the scheme below:

Potential free contact (i.e.Reed relay)



**With both asynchronous and synchronous signals a pulse is counted when the switch is closed.**

This connection can be configured in **LoggerSetup/SensorSlot - SlotMode:**

**Frequency [Hz].**

**Important:**

**Connecting voltages higher than 3 Volts will damage the device!**

### 7.5.6 State recording - potential-free contacts (DK660-3S)

The logger can process signals from external switch contacts the Logger will record the status of the switch. The sensors need to be connected to the DKC-S cable. Just connect cable colours according to the scheme below:

Potential free contact (i.e.Reed relay)

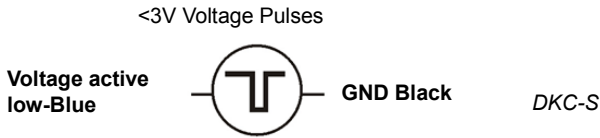


**Important:**

**Connecting voltages higher than 3 Volts will damage the device!**

### 7.5.7 Pulse Count - Voltage pulses <3Volt CMOS (DK660-3S)

If your pulse signal is not a voltage-free signal but has a potential, **which is less than 3V** you may use the standard YY-CS cable. Connect pins 3 and 4 according to the following image:



**With both asynchronous and synchronous signals a pulse is counted on the falling edge. (from high level to low level)**

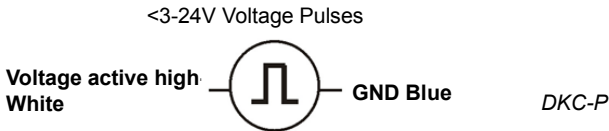
This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Frequency [Hz]**.

### **Important:**

**Connecting voltages higher than 3 Volts will damage the device!**

#### **7.5.8 Pulse Count - Voltage signals >3V (DK660-3S)**

If the logger is used to measure pulse counts with a signal between 3V and 24V **the DKC-P** connection cable has to be used! Operation with other cables may cause damage!



**With both asynchronous and synchronous signals a pulse is counted on the rising edge. (from low level to high level)**

This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Frequency [Hz]**.

### **Important:**

**Connecting voltages pulses higher than 24 Volts will damage the device**

#### **7.5.9 Voltage - GND reference signals (max 10V) (DK660-3S)**

**Applications:** standard analogue levels of industrial transmitters, etc.

This mode is suitable for measuring voltage signals between 0 ... 10 Volts. The signal needs to be connected with the DKC-U cable. Input with another cable may cause damage to the device and mismatched readings!

The software allows to select the input ranges 0...1V / 0...2,5V / 0...5V / 0...10V (or freely selectable between 1...10V). Input impedance in this mode is 100 kOhm.

0...10V Analogue Output



This connection can be configured in **LoggerSetup/SensorSlot** - SlotMode: **Voltage DVM [mV]**.

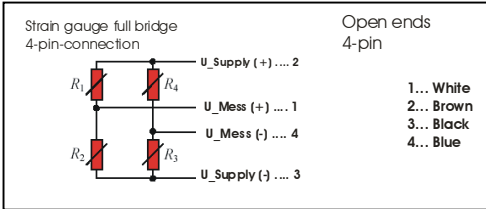
The power supply for additional transmitters needs to be provided externally.

### **Important:**

**Connecting voltages higher than 10 Volts will damage the device.**

### 7.5.10 Strain gauge – sensors (DK660-3DMS only)

If your logger has been ordered with the “-3DMS” option you may measure three strain gauges. It is designed for full bridges at 60...700 Ohms. Simply use DKC-S cables to connect the sensor to the logger.



This connection can be configured in **LoggerSetup/SensorSlot - SlotMode: DMS**. Usually complete DMS-force bridges are supplied calibrated. In the calibration certificate the bridge rated output  $C_N \left[ \frac{mV}{V} \right]$  will be listed. With these specifications the bridge rated output  $C_{NR} \left[ \frac{mV}{mA} \right]$  is converted as followed:

Conversion of the bridge rated output  $C_N \left[ \frac{mV}{V} \right]$  to  $C_{NR} \left[ \frac{mV}{mA} \right]$

$$C_{NR} \left[ \frac{mV}{mA} \right] = \frac{C_N * bridge\ rated\ output}{1000}$$

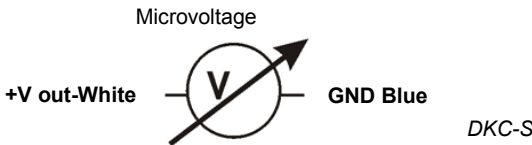
Example:  $C \frac{mV}{V} \frac{mV}{NR} = 2 \frac{mV}{V} @ 50kg \quad / \quad R_{bridge} = 120\Omega$

$$C_{NR} = \frac{2 * 120}{1000} = 0,24 \text{ mV @ 50kg}$$

InfraLog Light has an integrated formula editor, which allows you to enter a formula as described to calculate Forces/tensions from the mV reading.

### 7.5.11 Lowest-voltage measurement (DK660-3DMS only)

If your logger has been ordered with the “-3DMS” option you may measure very low voltage signals for example in the range of +/-5mV with a resolution as low as 0,15µV.



This connection can be configured in **LoggerSetup/SensorSlot - SlotMode: High-Impedance**.

### 7.5.12 Voltage - GND reference signals ((DK660-3S)

In order to measure low voltage levels < 1VDC from grounded voltage sources, just connect cable colour of the DKC-S according to the scheme above.  
In this mode the logger can perform at an interval of up to 32 Hz.  
Measuring ranges 0...10 mV or 0...1000mV are feasible. The measuring range 0...10 mV allows for a resolution of up to 560 nV! The input impedance in this mode is > 2.5 MOhm.



This connection can be configured in **LoggerSetup/SensorSlot - SlotMode: Voltage DVM [mV]**.

#### **Important:**

**Connecting voltages higher than 1 Volts will damage the device**

### 7.5.13 Current measurement (max 24 mA) (DK660-3S)

**Applications:** standard analogue levels of industrial transmitters, etc.

Current measurements can be made with signals up to a maximum of 24 mA. The signals need to be connected with the DKC-I cable.

Input with another cable will cause damage to the device!

The software allows for the input range to be freely selected between 0...24 mA.

The input impedance in this mode is 100 kOhm. The maximum sampling rate is 32 Hz.

This connection can be configured in **LoggerSetup/SensorSlot - SlotMode: Current [mA]**.

**Connections for DKC-I cable to measure a current upm to 24mA**

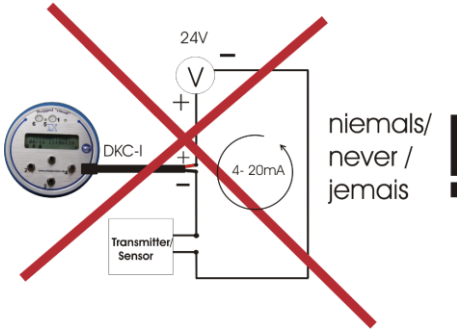
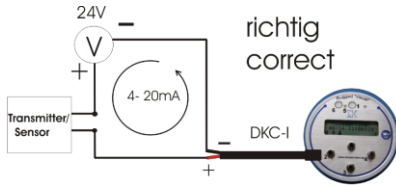
**White = Analogue input +**

**Blue = Analogue input -**

**The DKC-I has a 10 Ohm shunt resistor built in.**

The power supply for the transmitter connected needs to be provided externally.

**Warning! Always connect the data logger to the lowest potential of your current loop. Meter the low-side current and do not meter the high-side current!**



## 7.5.14 Soil moisture sensor - Decagon series



The sensors of the ECH2O series are capacitive sensors for soil moisture which measure the permittivity of the soil. By altering the sensor's reference voltage an output signal proportional to the soil moisture is created. The significant differences between the permittivity of water (80), soil (ca. 4) and air (ca. 1) immensely benefit the measuring principle because an increasing moisture content results in the permittivity changing extensively. The influences of the soil's temperature and salinity are minimised by the special surface coating of the sensors.

### **Specifications:**

#### EC-10 and EC-20

Measuring range: 0...40% VWC

Accuracy:  $\pm 0,04 \text{ m}^3/\text{m}^3$  ( $\pm 4\%$ )  $< 0,5 \text{ dS/m}$

With soil specific calibration:  $\pm 0,02 \text{ }^3/\text{m}^3$  ( $\pm 2\%$ )

Resolution:  $0,002 \text{ m}^3/\text{m}^3$

Operating temperature range: 0...50°C

#### EC-5

Measuring range: 0...saturation

Accuracy:  $< 0,03 \text{ m}^3/\text{m}^3$  for all soils, up to  $8 \text{ dS/m}$

With soil specific calibration:  $\pm 0,02 \text{ }^3/\text{m}^3$  ( $\pm 2\%$ )

Resolution:  $0,001 \text{ m}^3/\text{m}^3$  VWC in mineral soils. 0,25% in natural soil

Operating temperature range: -40...60°C

### **Choosing a measuring site**

When choosing a measuring site keep in mind that the direct surrounding area of the sensor surface has the most influence on the readings.

For example, holes, cavities, and compactions can have an effect on the measurement.

Moreover, the sensor is not to be installed near large metal objects since they can affect the sensor's surrounding magnetic field.

Also sticks or stones between the sensor's brackets need to be watched because they can have an effect on the measurement, too.

When installing the sensor please make sure that the contact areas between the sensor and the soil are maximised.

Two methods can be helpful in doing so:



### Installing the EC-10/EC-20

1. Employ the Decagon Installation Kit. It has a specifically shaped blade that can cut an indentation and a special tool to insert the sensor into the dent.
2. Use a light shovel or a flat bar to dig a hole in the ground. Insert the sensor entirely and make sure that it is completely covered. Now push the shovel into the ground just a few centimetres from the sensor and lightly press the surrounding soil in the sensor's direction.

### Installing the EC-5

1. The EC-5's installation is especially easy to manage. After digging a sufficiently deep hole for the sensor, stick the brackets into unspoiled soil at the bottom or side of the hole. The sensor needs to be entirely buried, including even the rubber overmoulding. If it's too difficult to insert the sensor, try to loosen the ground. DO NOT drive the sensor into the soil by force because it will otherwise be damaged irreparably.
2. Carefully refill the hole. Prevent the rubber-coated segment from being bent too much. It could be damaged.

### Position of the sensor

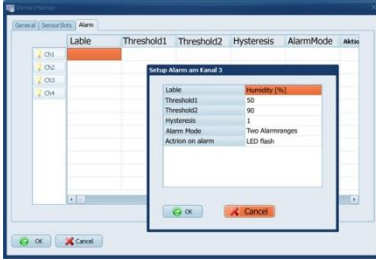
The sensor can be operated in any position, but the installation at right angles to the surface is preferable in order not to impede infiltration.

### Removing the sensor

NEVER pull the sensor's cable if you want to remove it from the ground. This could damage the device!

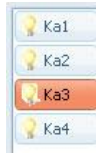
## 7.6 Logger Setup – Configuring Alarms

DK65X rugged visual loggers have an integrated alarm functionality. They have an LED which starts to flash if thresholds are exceeded.



Click at **Alarm**, to display the actual alarm settings.

Click at **enable during logging**, if you would like to use alarms while logging.



Then click at the symbol of the channel whose settings you want to set.

Mode you want to use:

Now, you may select which Alarm

### One alarm range:



There is one alarm range for the selected channel. If the sensor value is higher than the (Alarmthreshold1 ± Hysteresis) and lower than (Alarmthreshold2 ± Hysteresis) the logger goes into alarm.

### Two alarm ranges:



There are two alarm ranges for the selected channel. If the sensor value is higher than the (Alarmthreshold1 ± Hysteresis) and lower than (Alarmthreshold2 ± Hysteresis) There is no Alarm. Otherwise the logger goes into alarm.

Now set the values for **Threshold 1** and **Threshold 2** and define the **Hysteresis** (<http://de.wikipedia.org/wiki/Hysteresis>).



## 8 Troubleshooting

Typical error messages that may occur during operation are listed below.

Try to solve the problem with the following help first. In 99% of the cases you can restore functional capability with these hints.

**A) *No logger is displayed***

First, check if the loggercable is properly connected to the USB Port and to the logger. Secondly, you may uninstall the software and re-install the complete package (software/USB-driver). Make sure to have administration rights during install process! If problem still exists the logger is most probably broken.

**B) *Unknown Logger is displayed***

You may be using an old software version, which doesn't recognize the newer logger hardware. Check with local dealer for any upgrades.

**C) *Cannot contact logger***

The logger is properly connected and the correct logger type is shown within InfraLog, but still you cannot contact it and above error message occurs. This is due to an empty or missing battery inside the logger. Replace the battery and verify initial function test as follows:

After having inserted the battery watch LED on logger front. You should see it flash in all three colours (LED chaser). This shows operability. Now, try again to contact the logger. If problem still exists, the logger hardware is most probably broken.

**D) *Logger stops taking readings after some time logging.***

First check , if during setup you did not specify a stop date/time which might have been reached by now.

Otherwise, this might be due to an empty battery. Check battery voltage in InfraLog and possibly replace battery.

**E) *Humidity/Temperature readings show -40°C/+120°C permanently (or on a regular basis).***

Humidity/Temperature-Sensor is broken or cable has been damaged.

**F) *Other sensors show their range-Max/Min permanently or on a regular basis:***

Sensor or sensor cable destroyed or damaged

## 9 Understanding LEDs

The loggers DK65X and DK660 have a multicolour-LED shortly above the display to indicate the actual loggerstate. The following table shows the meaning of the LED.

Logger Status	Red LED	Blue LED	Green LED
Logs at interval	-	Flashes according to log interval	-
Monitors alarm conditions	-	-	Flashes every 8 secs
Alarm occurred and still active	Long Flash for 1 second every 8 seconds	-	-
Alarm occurred but is not active anymore	Short Flash every 8 seconds	-	-
Battery empty	Intense flickering for 0.5 seconds every 15 seconds	-	-
System check OK after battery change	LED chaser		

The DK660-CO<sub>2</sub>-Logger has an additional „traffic light“ LED to show actual air-quality status. You will find three LEDs below the display. The LED functionality is deselected when and has to be activated as described in chapter 4.2.9.2 before being available and the logger has to be in log-mode. Independent of the selected log-interval, the air-quality is being checked every 60 seconds.

	Green LED	Yellow LED	Red LED
CO <sub>2</sub> -concentration (standard setting)	<1500ppm	1500-2500ppm	>2500ppm

The LED flashes in an 8-second interval.

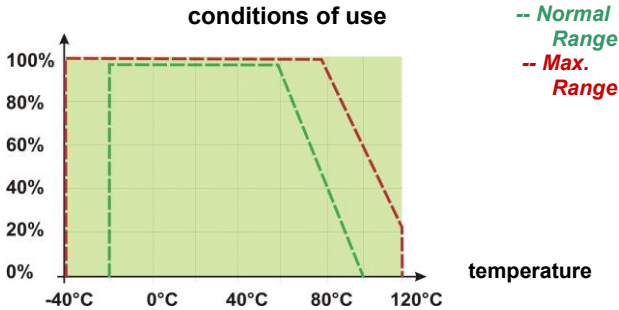
## 10 Important notes for measuring humidity

The humidity/temperature probes from Driesen+Kern GmbH are based upon a precise, reliable humidity sensor element with a good long-term stability. The capacitive sensor allows for humidity measurement in many applications and gives stable readings in clean environments for several years.

Depending on the environmental conditions the sensor can be contaminated due to manifold influences (dust, chemicals, dirty water).

Furthermore, there are other limitations in use. This means that it may be used in a range of 0...100% RH but the recommended range is reduced at elevated temperatures. This is due to the fact that quite an aggressive environment is developed when you are measuring at high humidity and at the same time at a high temperature:

### Rel. humidity



The sensor is normally not damaged when condensation occurs from time to time. After having dried out the sensor will go back to normal readings, except the sensor polymer is contaminated with substances (see above).

If condensation occurs regularly or for a longer time period, the sensor life is reduced. If the sensor is even wetted excessively it may give incorrect readings in the range of 0...100% RH (sometimes even negative readings), but will recover when water droplets have evaporated.

To ensure a high quality of the readings we therefore recommend to verify and calibrate the probes/loggers on an annual basis.

# 11 Calibration/ Maintenance

The logger itself only requires a minimum of maintenance. Verify O-Rings are clean and non-damaged and take off battery while the logger is not in use for a long time.

To ensure that measurements are reliable and correct we recommend to calibrate the logger sensors at the factory within 12 months.

For accurate CO<sub>2</sub>-readings you will need to perform additional calibration. Please find further information in the following chapters.

## 11.1 CO<sub>2</sub>-Measurement principle

The measurement principle of the CO<sub>2</sub>-Logger is based on the NDIR (non-dispersive-infrared) technology. The air diffuses through a membrane into a measurement chamber.

An infrared diode sends a beam into the chamber and the beam is reflected several times on its way to a detector. The reflection makes the pathlength much longer than without and ensures a higher accuracy and stability.

Because CO<sub>2</sub> absorbs the infrared light the intensity of the beam coming into the detector can be used as a measure for the CO<sub>2</sub>-concentration.

## 11.2 User-calibration of the CO<sub>2</sub>-Logger

Before starting any measurement campaign the user should perform a Zero-calibration. This will adjust the offset of the sensor in order to correct for any drift that might have occurred due to transport or storage.

We recommend to perform the Zero-calibration with a zero-CO<sub>2</sub>-Gas.

### 11.2.1 Preparing a calibration



Driesen+Kern GmbH offers a zero-gas as well as a regulator and a calibration adapter as a calibration kit.



Connect the regulator to the zero-gas and plug the logger onto the calibration adapter. Make sure the gas bottle lays safe and cannot fall down and destroy nearby items. Now, connect the tube to the regulator and adapter.

### 11.2.2 One-point zero-gas calibration



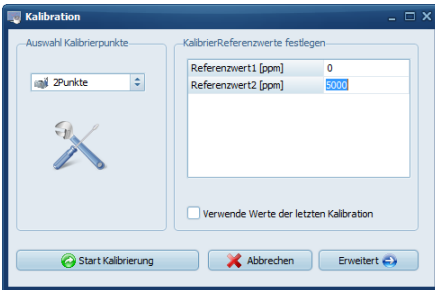
Within InfraLog click right on the logger to enter the main menu. Select **Kalibration**.

Select the sensor that you are going to calibrate.





If **Standardcalibration** had been selected, click at **OK**.

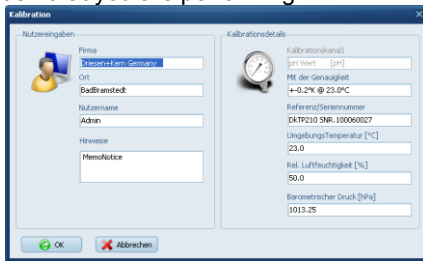


The following screen is displayed. Select "1-point-calibration".

In the field to the right you have to enter the reference values with which you are going to calibrate the unit.

If this is not the first time that you calibrate the unit, and you are using the same gas concentrations again, you may as well select **Use Values from last calibration**.

Within the **Advanced** section, you may enter additional information about the calibration that you are performing:



Here you may enter information about the type of calibration equipment you are using as well as the environmental parameters.

Click at **OK** when settings have been adjusted-

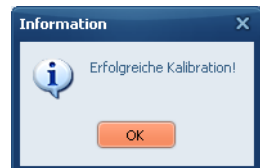
Open the regulator now in order to let the gas pour into the calibration chamber. Click at **Start Calibration** and the following message appears:



The logger waits as long as necessary to achieve a stable reading. After it has stabilized the following screen pops up:



The adjustment is automatically done and the next screen shows that the calibration was successful.



### 11.2.3 One-point calibration at fresh air

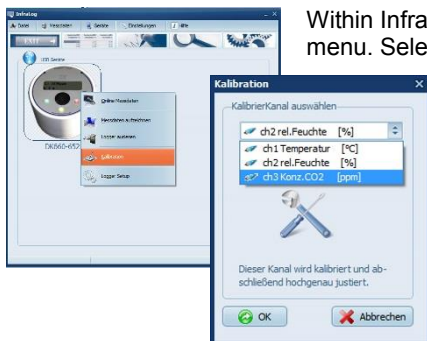
This method can only be used for a really simple calibration.

The calibration can be done at fresh air. Bring you logger into fresh air and wait for approx 30 minutes (temperature stabilisation!). Select Metermode from the logger menu. If the CO<sub>2</sub>-Value has stabilised press and hold the set button for about 30 second while in metermode. During pressing the LED flashes rapidly in a blue colour and will change to green after the calibration has been performed.

The offset of the logger now set to 400ppm and the unit should read about 400ppm in fresh air now. Alternatively, you perform a one-point calibration also with the software using the same steps as described in chapter 11.2.2.

### 11.2.4 Two-Point calibration using CO<sub>2</sub>-zero and CO<sub>2</sub>-Span-Gas

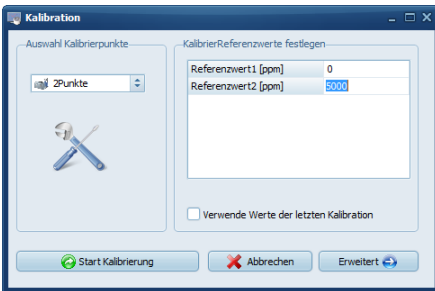
A two-point calibration is not necessary and not recommended. It should only be performed in a very stable environment like in a calibration laboratory (temperature regulated!). If you should decide to perform a two-point calibration, start with the preparation as described in chapter 11.2.1



Within InfraLog click right on the logger to enter the main menu. Select **Kalibration**.

Select the sensor that you are going to calibrate.

If **Standardcalibration** had been selected, click at **OK**.



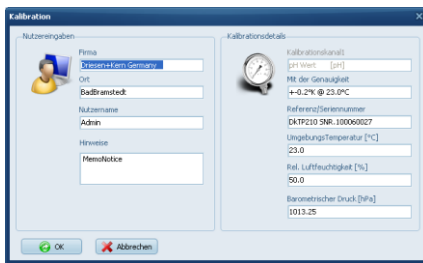
The following screen is displayed.

Select "2-point-calibration".

In the field to the right you have enter the reference values with which you are going to calibrate the unit.

If this is not the first time that you calibrate the unit, and you are using the same gas concentrations again, you may as well select **Use Values from last calibration**.

Within the **Advanced** section, you may enter additional information about the calibration that you are performing:

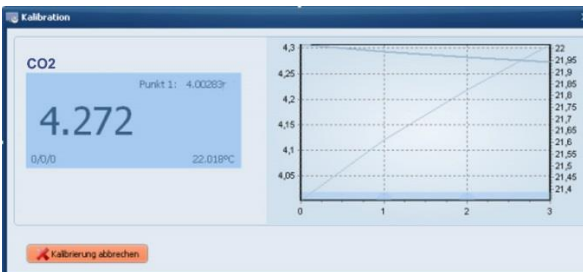


Here you may enter information about the type of calibration equipment you are using as well as the environmental parameters.

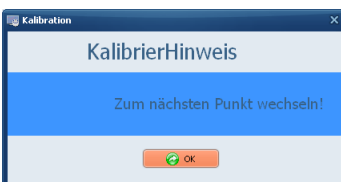
Click at **OK** when settings have been adjusted-

Press the logger onto the calibration adapter and connect the tubing of the zero-CO<sub>2</sub>-gas to the inlet. Open the regulator.

Click at **Start Calibration** and the following message appears:



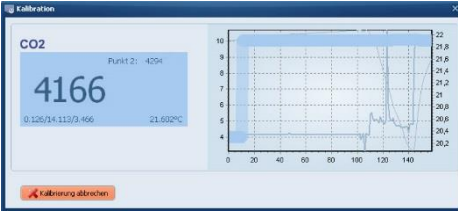
The software waits as long as necessary to achieve a stable reading and will then ask for the next calibration gas.



Now connect the tubing to your high CO<sub>2</sub>-gas and open the regulator.

The software will automatically detect that a new calibration gas is connected and will then go on to the next step.

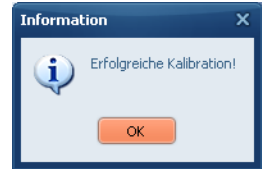
The following screen pops up:



The software waits as long as necessary to achieve a stable reading.



After the value became stable, the following screen appears, showing that the justification is in progress. Then it will automatically be adjusted.



### 11.3 ABC-Calibration of the CO2-Logger

By means of the abc calibration (automatic background calibration) it is ensured that the sensor still measures accurate and reliable readings even after it has been used for several years.

The abc calibration uses the fact that in indoor-applications i.e. even in class-rooms, conference rooms, airports the CO<sub>2</sub> concentration reaches the same level as fresh outside air (approx 400ppm) over a certain period.

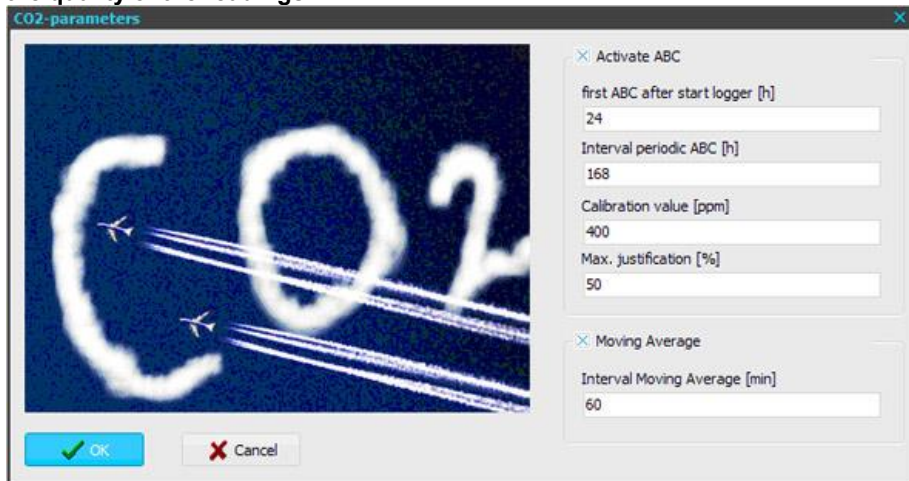
During this period (default: 7 days) the sensor „memorises“ the lowest value and justifies itself automatically to the outside air value of 400ppm.

The software InfraLog for windows allows the user to change the default settings.



Rightclick on the loggerpicture and you will find the menu **Logger Setup/ Setup device**.

**Note:** These default settings should only be altered if you have sufficient knowledge about the application, because it may have a significant impact on the quality of the readings.



### **Activate ABC**

**First ABC after start logger [h]:** The time after which the logger performs its first abc calibration after it has been started. **The default-value is 24 hours.** This value should not be too short in order to ensure that the **calibration value** has been reached. Otherwise, if it wouldn't reach the value (400ppm) in between, it would calibrate the logger to an incorrect value.

**Interval periodic ABC [h]:** The time between two periodic ABC calibrations after the logger has been started (**Default 24 hours**). The logger will be justified to the **calibration value**.

If the logger has not been started, but the batteries remain inserted, it will perform an ABC calibration every 7 days. So if you are storing the logger, it would be best if you do so in a ventilated room, otherwise we recommend to take off the batteries.

**Calibration value [ppm]:** Typically this will be the CO<sub>2</sub> concentration of fresh outside air (**Default: 400ppm**). This should only be altered if you are sure this value is not been reached within the interval for periodic ABC.

**Max. justification: [%]:** You may select here, if a potential difference between the minimum measured value and the calibration value (400ppm) shall be fully adjusted. You may select any value up to 100%. **As per default it is set to 100%**, so if there is any difference detected, it will automatically be fully adjusted.

### **Moving average**

**Interval moving average:** For long-term-studies, you may wish to eliminate the readings from spikes (very low readings or very high readings).

Therefore, the logger offers the calculation of a moving average.

If you are deactivating the moving average the sensor will internally still calculate a moving average over a 32 second interval, which can be stored in a minimum interval of 1 minute.

The minimum for the moving average is **5 minutes, which is the default setting**, as well.

#### Note:

The calculation of a moving average is performed during the process of downloading the logger. This means that as long as you haven't started the logger again you may download it several times with different settings.





## Certificate of Conformity

Driesen + Kern GmbH  
**Physikalisch-Technische-Messgeräte**

**Product:**  
Datalogger „rugged“ visual series DK660

This is to certify that above products are calibrated using dedicated equipment which is calibrated according to ISO9001 by comparison against natural standards, natural physical constants, consensus standards, or by ratio type measurements using self-calibrating techniques.

Bad Bramstedt, Januar 2015

Driesen+Kern GmbH  
(Geschäftsführung)

A handwritten signature in blue ink, appearing to read 'Driesen+Kern'.

Driesen+Kern GmbH  
(Prüfmittelbeauftragter)

A handwritten signature in blue ink, appearing to read 'Kern'.

