# Operating instructions.

## ScaDiag
## Application software for the Scatec Laser Copy Counter
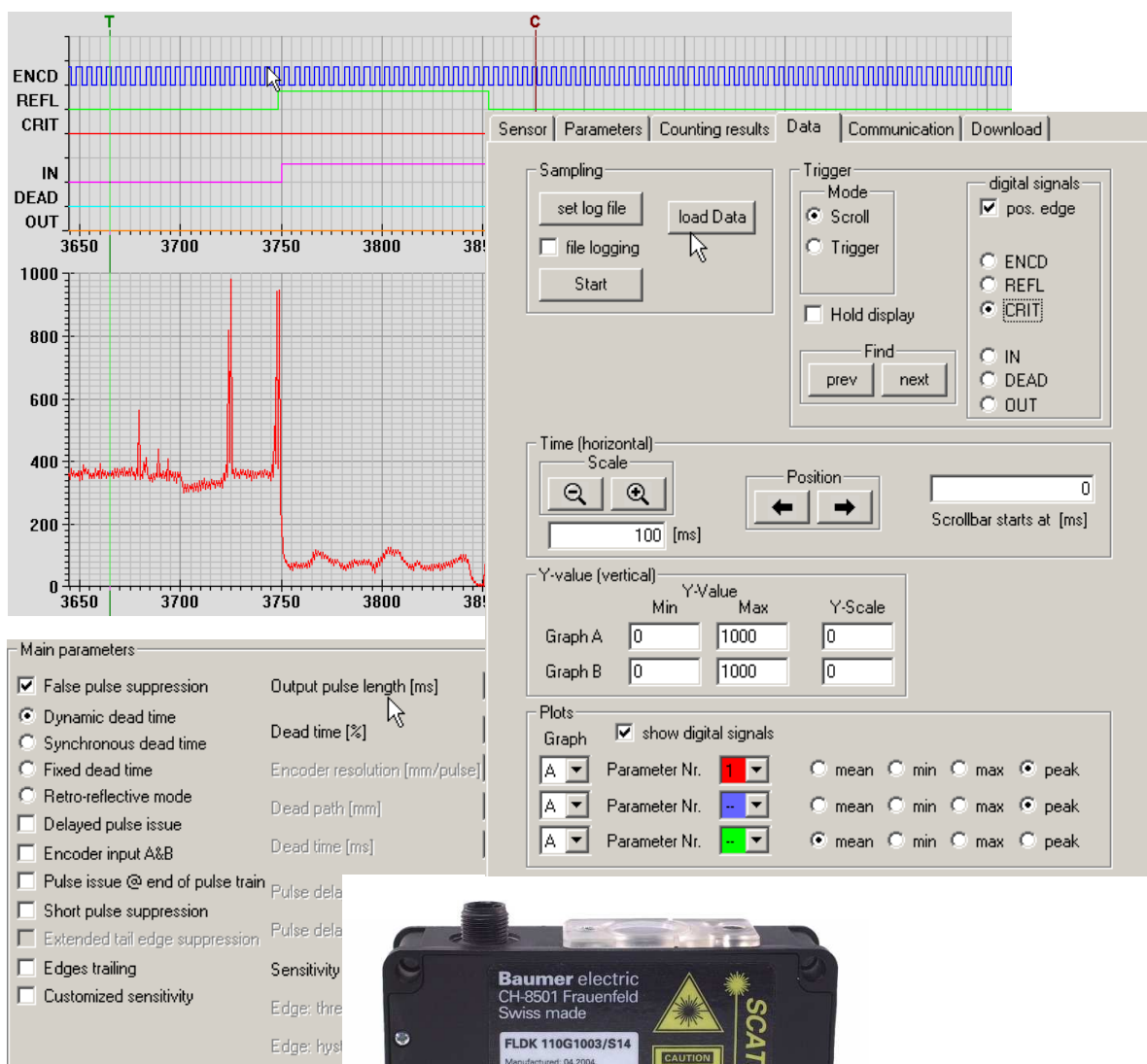
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# Content

# 1 Introduction

## 1.1 What is the ScaDiag Software used for ?

Every *Scatec* can be operated as a stand-alone sensor. However, it can also be interfaced to a PC. *ScaDiag*, the software used for remote controlling a *Scatec*, is a powerful tool with very helpful features especially in the following two areas:

parameterization: With a few key strokes, all of the *Scatec* parameters (within the bounds given by the connected *Scatec* model) can be retrieved and manipulated. Additionally, a file documenting the complete sensor status can be created very easily. This file can be e-mailed to an applications engineer at Baumer Electric making numerous queries on the *Scatec* parameter setting details unnecessary.

recording data: Data logging is a core application of *ScaDiag*. The possibility of reading out, saving, and graphically displaying data even while the *Scatec* is running, is a tremendous help if there comes a need to take a closer look at certain aspects of a production run. The collected data can be analyzed by the customer himself or they can be forwarded to Baumer electric for that purpose.

## 1.2 What resources are needed ?

In order to interface a *Scatec* to a PC, the following items are needed:

Hardware: Any *Scatec* (second generation)  
PC with a USB port  
Y-cable (*)  
Serial-to-USB- converter (*)  
Software: *ScaDiag* (*)  
Driver for Serial-to-USB converter (*)

(*) included in the corresponding ScaDiag kit.

Passion for Sensors

# 2 Setting up ScaDiag

## 2.1 System requirements

*ScaDiag,* as well as the driver software for the Serial-to-USB- converter, run under the following operating systems:

- Windows 2000
- Windows XP

The Serial-to-USB converter connects to the USB port of the PC.

## 2.2 Installation of the Serial-to-USB Converter

### 2.2.1 Installation

1. Close the *ScaDiag* application if running
2. Insert the CD containing the *ScaDiag-* Software package into the PC
3. Connect the *Ser./USB-Converter/S14* to the USB-port on your PC
4. Your PC should find a new USB device.
5. Follow the instructions given by Windows.



Choose
*Install from a list or specific location*
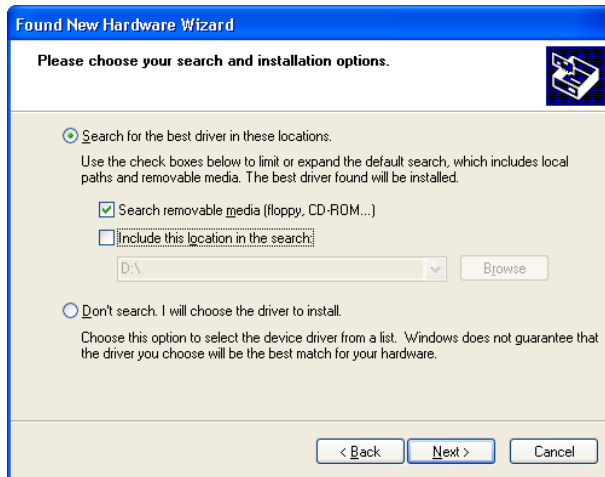
Choose
*Search for the best driver in these locations*

and check
*Search removable media(floppy, CD-ROM...)*


After clicking *Next*, the driver for the *Ser./USB-Converter/S14* will be installed



Click
*Continue Anyway*


6.      Now the *Scatec* can be connected to the Serial-to-USB converter.

## 2.2.2 Checking for correct driver installation

If the driver has been correctly installed, *FTDI FT8U2XX Device* should be in the list of USB-controllers.

(on the Windows 2000 taskbar, click **Start** > **Settings** > **System** or on the Windows XP taskbar, click **Start** > **Control Panel** > **System**. Double-click the **System** icon. On the hardware tab, click **device manger**. Double-click the **USB-Controller** icon and look for the *FTDI FT8U2XX Device*.)
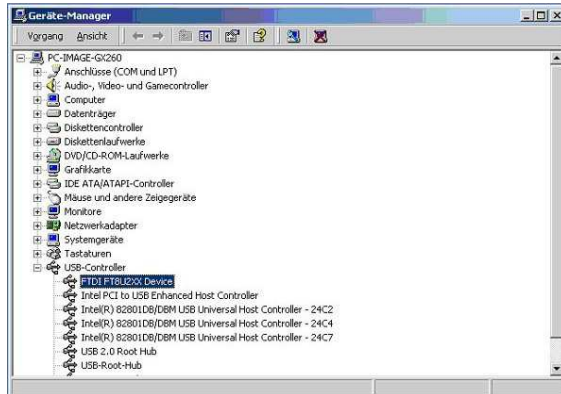


## 2.2.3 Uninstalling

In case the *FTDI FTD2XX USB Drivers* need to be uninstalled, proceed as follows:

1. On the Windows 2000 taskbar, click *Start > Settings > Control Panel*. Double-click the *Software* icon. The following window should be displayed:

   On the Windows XP taskbar, click *Start > Control Panel > Add or Remove Programs >*. Double-click the *Software* icon. The following window should be displayed:
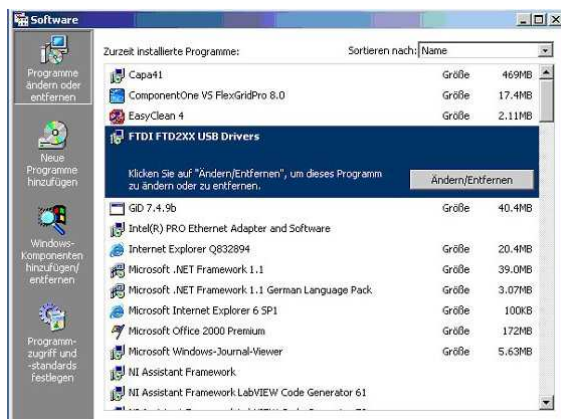


   Click *FTDI FTD2XX USB Drivers*.
   Click *Change / Remove*.

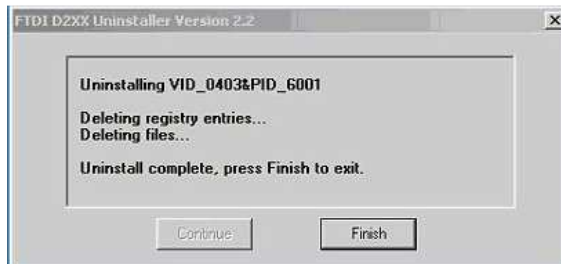2. Unplug the Ser./USB-Converter/S14



Click *Continue*

3. The FDTI driver has been uninstalled:



Click *Finish*.

## 2.3 Installation of ScaDiag

1. Copy both files

*ScaDiag_E_xxxxxxy.exe* and
*ScaDiagTyp.txt*

from the CD to the **same** directory on your PC (for example: to C:\Program files\Scatec)

2. Now you are ready to run *ScaDiag_E_xxxxxxy.exe* or *ScaDiag_D_xxxxxxy.exe*

(The letter *E* stands for English and *D* for German)

Note: communication with a *Scatec* is not possible if the driver for the Serial-to-USB converter has not been previously installed.

## 2.4 How to connect a Scatec to a PC

*ScaDiag* allows to read out and to log data without interfering with the running production. How the *Scatec* is hooked up to the PC is shown subsequently for each *Scatec* model. All accessories needed are included in the corresponding *ScaDiag*-kit.

**Scatec-2:**

required accessories:

| Y-Cable: | article 155670 | for *Scatec-2 /S14* |
| | article 156256) | for *Scatec-2 /S42* |
| USB-to-Serial Converter: | | article 155304 |

After inserting the Y-cable the *Scatec-2* is reconnected fully to the customer's control system.
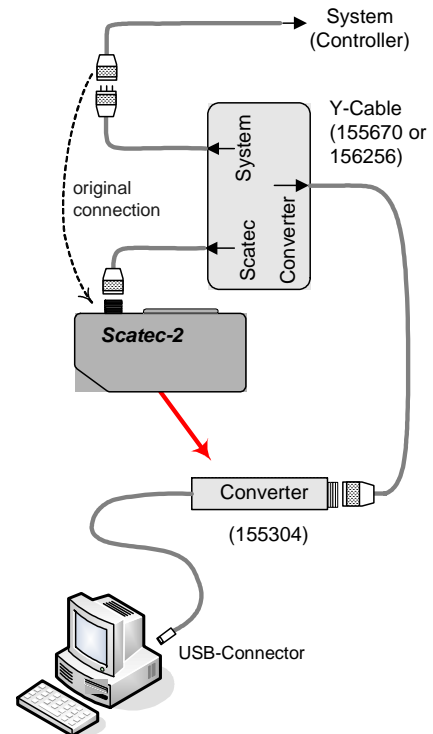
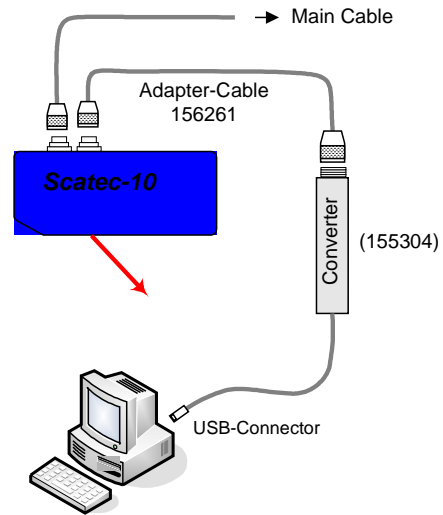**_Scatec-10:_**

required accessories:

| | |
|---|---|
| Adapter cable: | article 156261 |
| USB-to-Serial Converter: | article 155304 |

Without interrupting the connection to the customer's control system, the adapter cable 156261 is connected to the Scatec's interface connector and to the converter.



**_Scatec-15:_**

required accessories:

| | |
|---|---|
| Y-Cable:article | article 156257 |
| USB-to-Serial-Converter: | article 155304 |

After inserting the Y-cable the *Scatec-15* is reconnected fully to the customer's CAN bus.

Note

- o In order to insert the Y-cable only the connection to the CAN-bus is for a short time interrupted while the main cable (power supply, encoder input, *Scatec* output) is untouched.
- o A *Scatec-15* run without connection to a CAN-bus can be directly connected to the USB-to-Serial-converter with the adapter cable 156261 normally used with a *Scatec-10*.
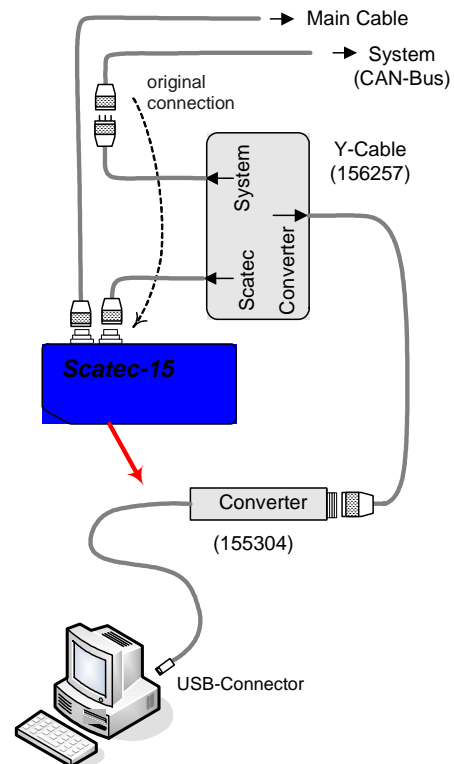
# 3 Instructions for use

## 3.1 General comments on ScaDiag

- *ScaDiag* can be used with any *Scatec* model equipped with an interface.
- The operation method of *ScaDiag* remains the same independent of the *Scatec* model.
- *ScaDiag* can be used without a *Scatec* connected to the PC.  For example in the case of pure data analysis.  Just click any error message "*sensor does not respond*".

## 3.2 How to run ScaDiag

Run *ScaDiag* by double-clicking the file *ScaDiag_E_xxxxxxy.exe* or a corresponding link. Make sure that the file *ScaDiag.txt* is in the same directory where *ScaDiag* is executed.
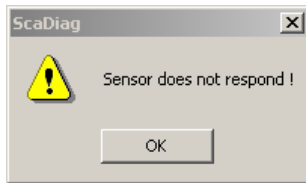
Certain operations (such as tab switching for example) causes *ScaDiag* to communicate with the connected *Scatec*. Failed communication prompts an error message "*sensor does not respond*".

## 3.3  ScaDiag Main Window
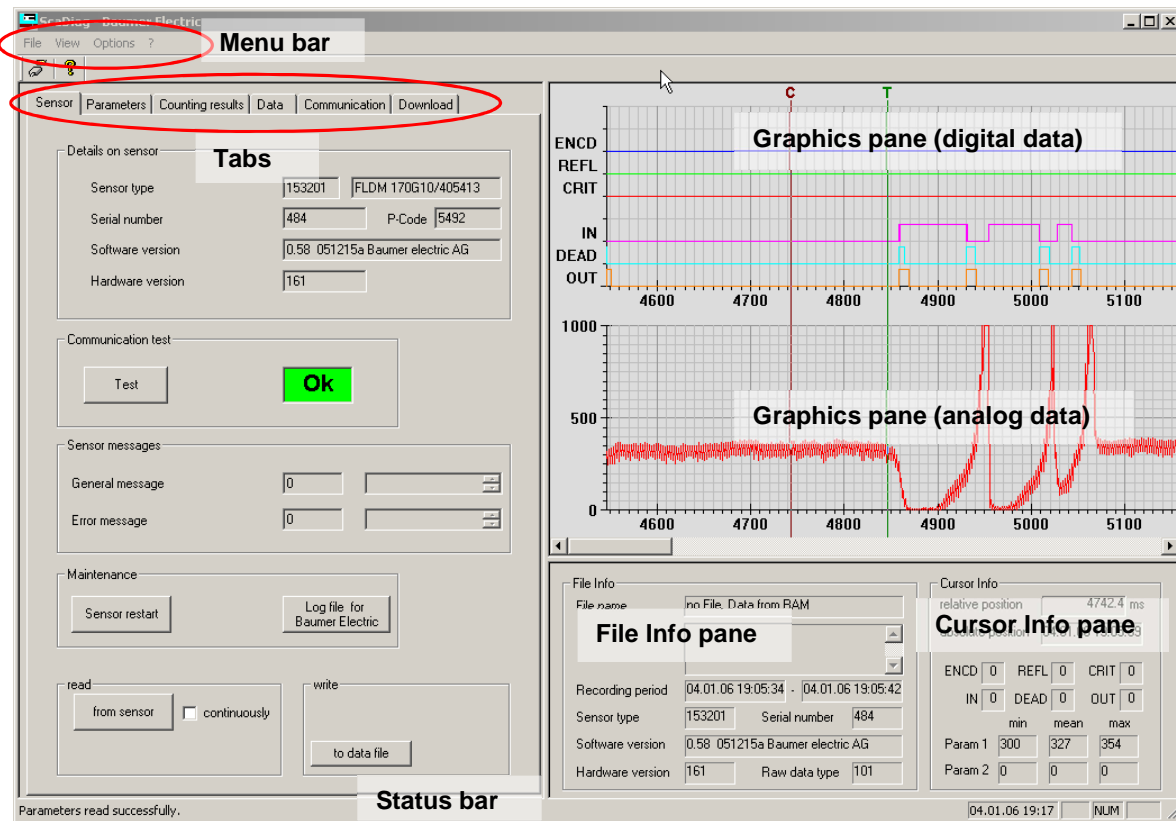


The main window presents a menu bar, a status bar, and the following three panes:

Tab:                          all control functions are grouped into several tabs
Graphics pane                 displays the measured value of several parameters graphically as plotted over time
File and Cursor Info pane     file info shows information contained in the header of a data file.
                              Cursor info shows details on the cursor position

All three panes can be resized.

All these elements are described in the following sections.

## 3.4 Menu bar
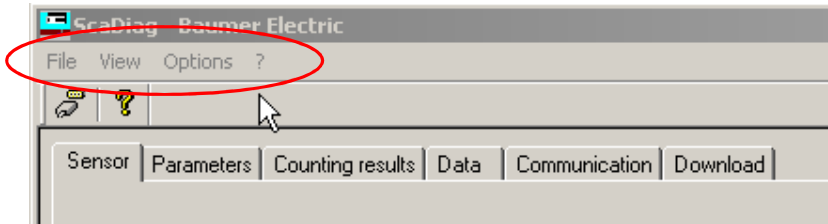


| | | | |
|---|---|---|---|
| o | *File* | *port settings:* | to define the port used for communication between the *Scatec* and the PC. |
| | | *exit:* | to exit the program |
| o | *View* | | to select the tab to be presented as well as to show and hide the toolbar and status bar. |
| o | *Options* | *Service code:* | to enter a corresponding password |
| o | ? | *Info on ScaDiag:* | to show the *ScaDiag* version |
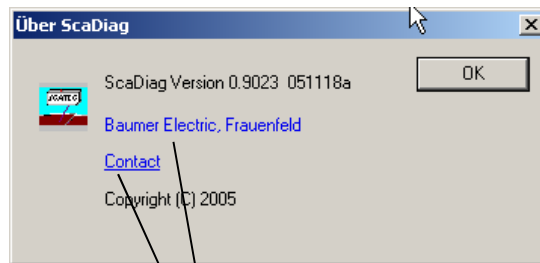


Link to the Baumer Electric homepage

Prompts an e-mail to Baumer electric (support@baumerelectric.com)

## 3.5 Tabs
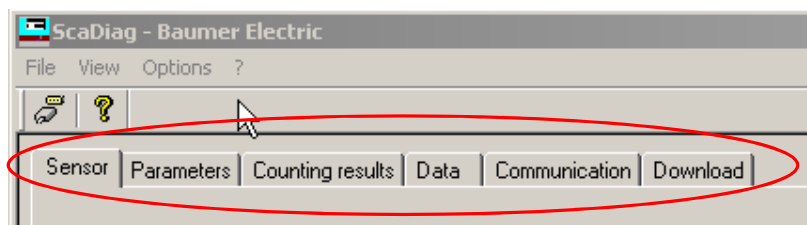
### 3.5.1 General remarks on the tabs



Whenever the tab is switched *ScaDiag* automatically updates the parameter values shown on the new tab. For this purpose, *ScaDiag* tries to set up a communication with the *Scatec*. If the communication fails, the error message *Sensor does not respond* appears. Simply continue by clicking OK but keep in mind, that no data with the *Scatec* can be exchanged!

### 3.5.2 Sensor

The Sensor tab appears by default when *ScaDiag* is launched.
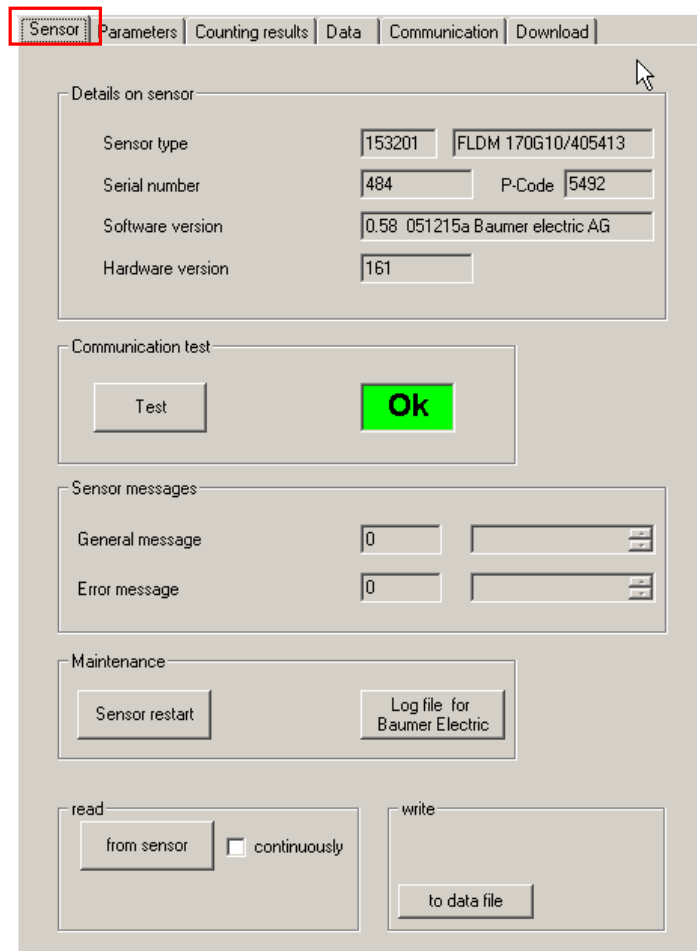


Details on Sensor

o *Sensor-Type*          Baumer part number and type of the attached *Scatec*
o *Serial number*        Serial number of the attached *Scatec*
o *P-Code*               production date of the attached *Scatec* given in the format (y)ywwd

- *Software-Version*     Version of the *Scatec* operating software

Communication test
- *Test*                 to check if the communication works properly. Does not update the Sensor tab!

Sensor Messages
- *General message*      general message given by the *Scatec*
- *Error message*        error message generated by the *Scatec*

Maintenance
- *Sensor restart*       has the same effect as switching off and on the *Scatec* power supply.
- *Sensor status for BE* to record the complete momentary *Scatec* status. You will be asked for a directory where to save this file. This file must be saved as binary file (extension: .bin).
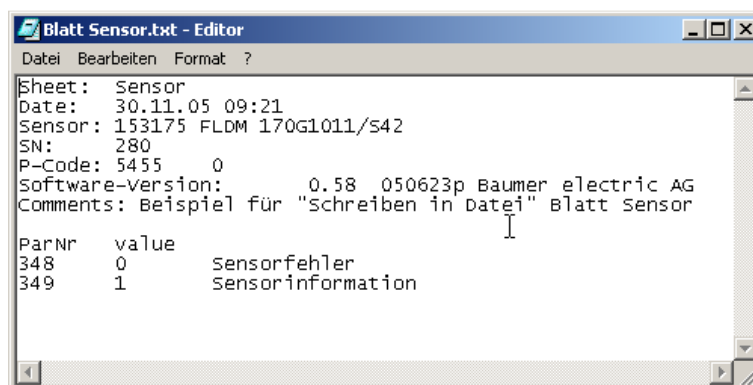
> ☝ A *sensor status for BE* should be created whenever Baumer electric is contacted for technical support with a specific *Scatec* application. This file can be forwarded by e-mail to the applications engineer at Baumer Electric. This way in one easy step, the complete parameter setting is communicated avoiding many cumbersome queries!

read
- *from sensor*          the tab will be updated with data read from the attached *Scatec*.
- *continuously*         the tab will be updated continuously as long as the box is checked.

write
- *to data file*         to create a text file documenting the settings shown in this tab. General information about the attached *Scatec* is saved in the header of this file. A box will pop up asking to enter the directory where the text file should be saved. After saving, an input window pops up allowing adding comments to the text file.

         In the case of the Sensor tab shown above, *write to data file* would result in the following text file:

### 3.5.3 Parameters

The Parameter tab helps

1. to get an overview on how the parameters of the attached *Scatec* are set
2. to change these parameters

---

☝ 1.) Only parameters are displayed which make sense for the attached *Scatec*. (for example: with a Scatec-2 attached, no parameters relating to an encoder will show up because a *Scatec-2* does not have any encoder inputs)

2.) Parameters stored in the *Scatec* but not enabled due to the current setting will be shown in grey.

3.) For detailed information on the parameters please refer to the corresponding *Scatec* manual!

4.) Values changed on the tab will not be effective in the attached *Scatec* unless they are sent by clicking *write to sensor* !

4.) Switching to the Parameter tab will automatically initiate an update of the displayed values by retrieving the actual values from the attached *Scatec*. Further updates have to be triggered by clicking *read from sensor*.

---
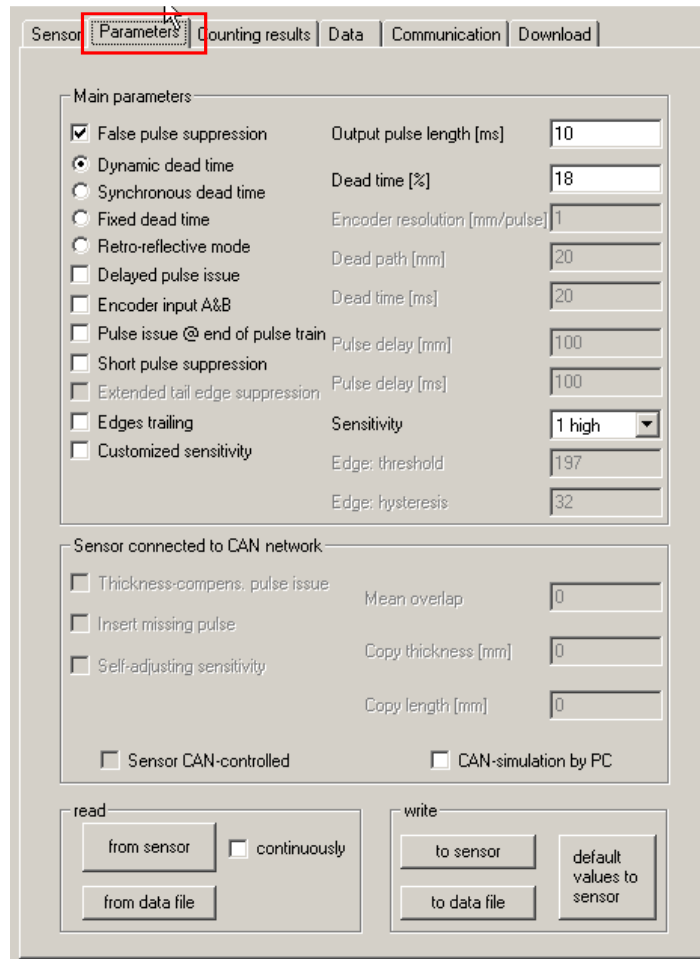
Main parameters

A checked box or a filled round button indicates that the corresponding function with its parameter value is enabled. The meaning of the parameter and its value is explained in the corresponding *Scatec* manual.

read

o   *from sensor*          The Parameter tab will be updated with data read from the attached *Scatec*.

o   *from data file*       The Parameter tab will be updated with data read from a text file. This text file must be of the same structure as a text file created by clicking *write to data file* on the same tab.
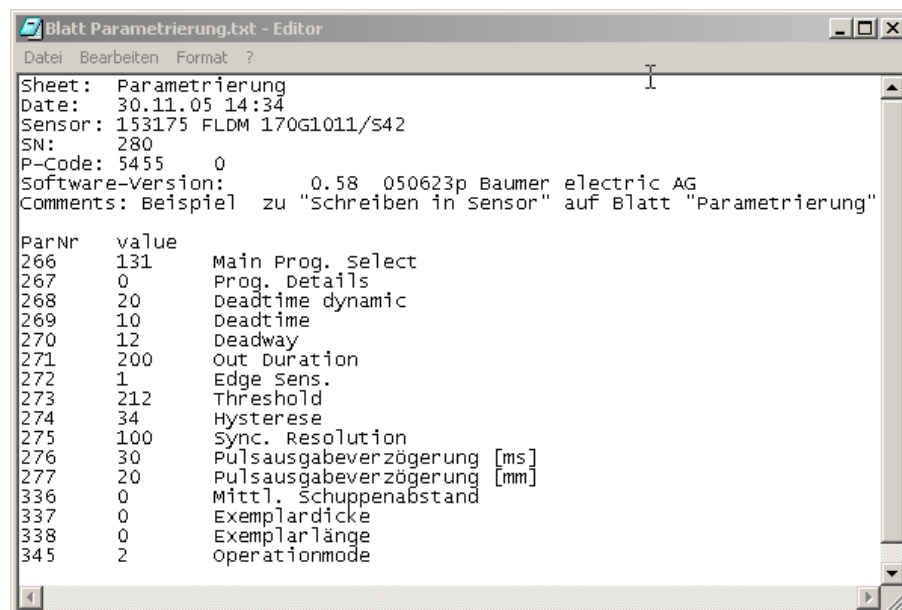
write

o   *to sensor*            The values displayed on the Parameter tab will be transmitted to the attached *Scatec*. Immediately afterwards, the Parameter tab will be updated with the actual values in the *Scatec*. This allows the user to check if all the values were accepted.

o   *to data file*         To create a text file documenting the settings as shown on the Parameter tab, along with the general sensor information about the attached *Scatec*. A box will pop up asking for a directory where to save the text file. After the file is saved, an input window pops up that allows adding a comment to the text file.

> ☝   Write to data file documents the settings as they are shown on the Parameter tab. If the user made any changes on the Parameter tab, the settings shown on the tab might differ from the settings in the attached *Scatec* unless the Parameter tab has been updated by clicking on *read from sensor*.

In the case of the Parameter tab shown above, *write to data file* would result in a text file with the following content:
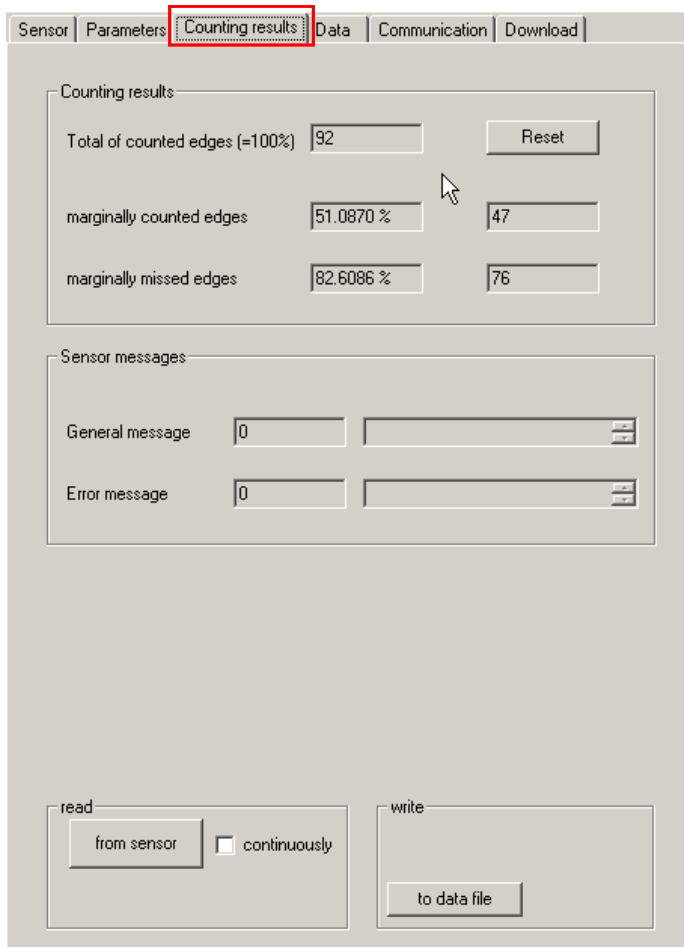
☞    Application note:

*write to data file* is an easy way to document different versions of parameter settings. At a later time, one of these versions can be easily reloaded to a *Scatec* in two steps: First, update the Parameter tab by clicking *read from data file* and choosing the file where this specific version was documented. Than send these parameter values to the attached *Scatec* by clicking on *write to sensor*.

o    *default values to sensor*        to recall the default setup. The *Scatec* is set up for normal operation when it is shipped from the factory. This is the default setup. The default setup cannot be altered by the customer and is documented in the corresponding manual. Note, that values specifying the CAN communication parameters shown on the Communications tab will not be affected by this reset procedure.

### 3.5.4   Counting results

Counting results

o   *Total of counted edges*          number of issued *Scatec* output pulses
o   *Reset*                          used to set the counters back to 0
o   *Marginally counted edges*        number as percentage and absolute value
o   *Marginally missed edges*         number as percentage and absolute value

Sensor-messages

o   *General message*                 general message given by the *Scatec* (Code-number and description)
o   Error message                   error message generated by the *Scatec* (Code-number and description)
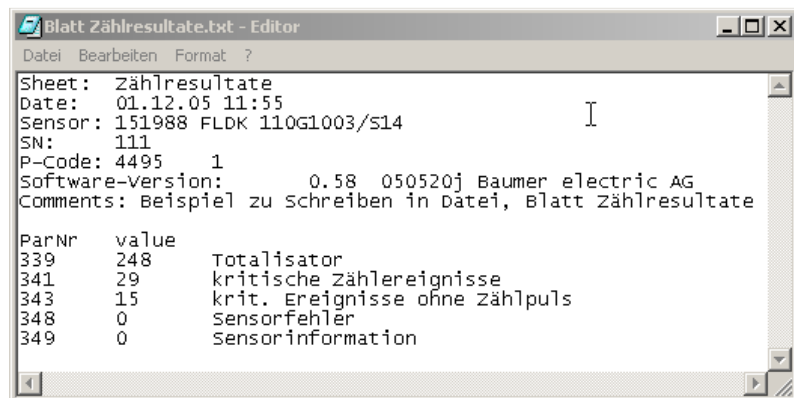
read

o   *From sensor*                     The Counting result tab will be updated with data read from the attached *Scatec*.

write

o   *To data file*                    To create a text file documenting the settings as shown on the Counting results tab together with the general sensor information about the attached *Scatec*. A box will pop up asking for a directory where to save the text file. After the file is saved, an input window pops up allowing comments to be added to the text file.

In the case of the Parameter tab shown above, *write to data file* would result in a text file with the following content:

```
Blatt Zählresultate.txt - Editor
Datei  Bearbeiten  Format  ?

Sheet:  Zählresultate
Date:   01.12.05 11:55
Sensor: 151988 FLDK 110G1003/S14
SN:     111
P-Code: 4495    1
Software-Version:       0.58  050520j Baumer electric AG
Comments: Beispiel zu Schreiben in Datei, Blatt Zählresultate

ParNr   value
339     248     Totalisator
341     29      kritische Zählereignisse
343     15      krit. Ereignisse ohne Zählpuls
348     0       Sensorfehler
349     0       Sensorinformation
```

### 3.5.5 Data

On the Data tab, all functions relating to recording, saving, displaying, and analyzing data are listed. The button operation is closely based on the operation of an oscilloscope.

All the necessary settings are performed on the Data tab while the results are displayed in the Graphics, File info and Cursor info pane
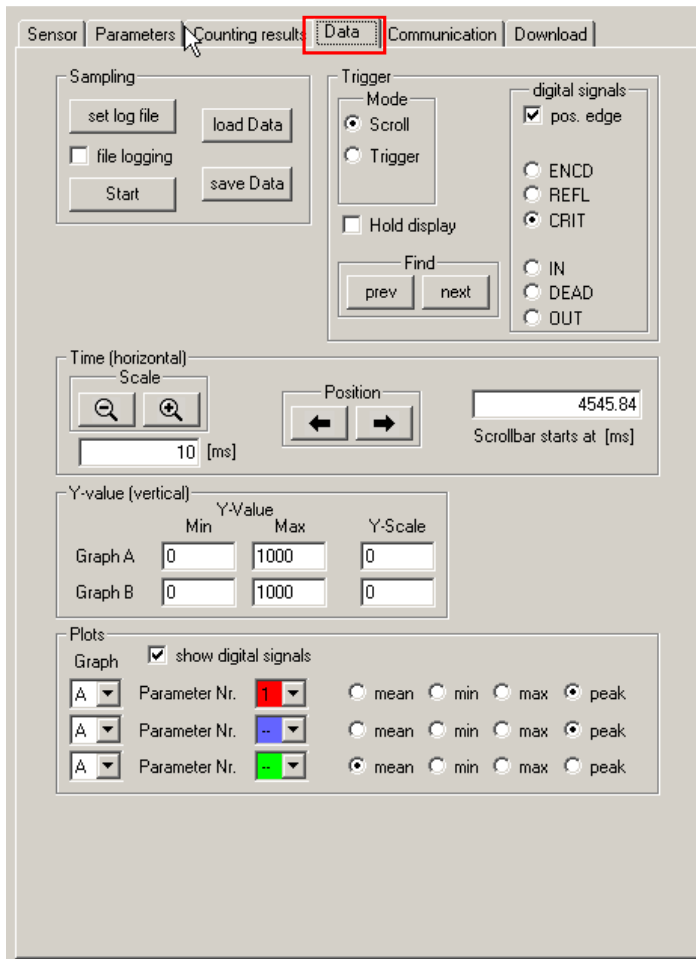


Sampling:

o  *set log file*  To enter the file name and the directory on where to save the data. On saving data, the entered file name will automatically be expanded by an appendix consisting of the time stamp when the file was saved. Log files are saved as binary files. Therefore the name of a saved log file will have a structure as follows:

*name_appendix.bin*

with        name:        name as entered by user after clicking *set log file*

        appendix        time stamp, format yymmdd_hhmm_ss

By default the name is *SCATEC* and the directory is the desktop.

| | | |
|---|---|---|
| o | *file logging* | Enabled file logging causes data to be saved periodically between pressing the *start* and *stop* button. The sampled data is saved in files with names as described under *set log file*. Note that all files generated during such a run will later be recognized as belonging together. |

> ☞ Application notes:
> Data files generated this way do have a size of about 1.4 Mbyte.
> with 1 analog parameter recorded (by default), 1.4 Mbyte covers about 57 seconds (every 0.120 ms a record); with 2 analog parameters recorded, 1.4 Mbyte covers about 68 (!) seconds (every 0.240 ms a record).

| | | |
|---|---|---|
| o | *Start* | to start data recording. |
| o | *Stop* | to stop data recording |
| o | *save Data* | Shown only when file logging is disabled. To save the data contained in the RAM to a data file. The file name will be as defined under *set log file*. Please note that only data buffered in the RAM will be saved. Therefore only the last part of a longer recording run will be saved. Should all data of the complete run be saved then file logging must be enabled before starting the data recording. |
| o | *load Data* | To load previously saved data for analysis. The user will be prompted to choose a file name. Keep in mind, that not only the entered file will be loaded, but all other data files belonging to the same run. The data of all these files will be joined and displayed in the correct chronological sequence. |

Trigger:

Mode:

| | | |
|---|---|---|
| o | *Scroll* | the displayed graphic is continuously updated while new data is recorded. |
| o | *Trigger* | The update of the displayed graphic is initiated by the occurrence of an event defined in the box *digital signals*. |
| o | *hold display* | While *hold display* is enabled, the graphic is not updated. |

Digital signals:

| | | |
|---|---|---|
| o | *pos. edge* | The rising edge of the respective digital signal is used for the trigger. With the button disabled, the falling edge of the respective digital signal is used for the trigger. |
| o | *ENCD* | Trigger source is the encoder signal. Note that the correct display of the encoder pulses requires an adequate resolution of the time axis. |
| o | *REFL* | Trigger source is the digital signal of the retro-reflective sensor. *REFL* is high as long as the laser beam hits the retro-reflective foil. |
| o | *CRIT* | Trigger source is a critical event. |
| o | *IN* | Trigger source is the digital signal *IN*. *IN* goes high when the analog signal *ratio f/b* falls below the actual threshold and it goes low when this analog signal raises again above the actual threshold plus hysteresis. |
| o | *DEAD* | Trigger source is the digital signal dead time. *DEA*D is high while a dead time is activated. |
| o | *OUT* | Trigger source is the output pulse. OUT is high while *Scatec* issues an output pulse. |

Find

| | | |
|---|---|---|
| o | *prev.* | The waveforms in the display are shifted to the right until the previous trigger event gets to the position of the trigger line T. (how to set the trigger position see section 3.6 Graphics pane) |

o   *next*                 The waveforms in the display are shifted to the left until the next trigger event gets to the position of the trigger line T. (how to set the trigger position see section 3.6 Graphics pane)

Time (Horizontal):        controls the horizontal scale of the waveforms

o   *Scale*                The *magnifying glass* zooms in on and out off the center of the displayed plot.
                          The time scale is in units of milliseconds. Every tenth division is labeled.

o   *Position*             **-->**  displays data previously outside the graphics on the right side. Changes you make to this control do not affect the actual scale.
                          **<--**  displays data previously outside the graphics on the left side. Changes you make to this control do not affect the actual scale.

o   *Scrollbar starts at*  Plots start at this time with the x-scroll bar fully to the left. (This is an easy way to bring a specific time section of the data into display.)

Y-Value (Vertical):       controls the vertical scale of the analog waveform

o   *Y-Value Min*          Y-axis starts at this value

o   *Y-Value Max*          Y-axis ends at this value

Plots:

o   *Parameter Nr.*        *Scatec* transmits the values for either one or two analog parameters depending on the setting. Parameter Nr. Defines which one of the two parameter values will be displayed in the graphic. By default, *Scatec* sends the values of only one analog parameter, namely the ratio f/b.

☞ Depending on the time scale of the plot not every single data point sent by the *Scatec* can be assigned to a single pixel. In such cases, a set of data points will be combined into one pixel. There are four combination modes:
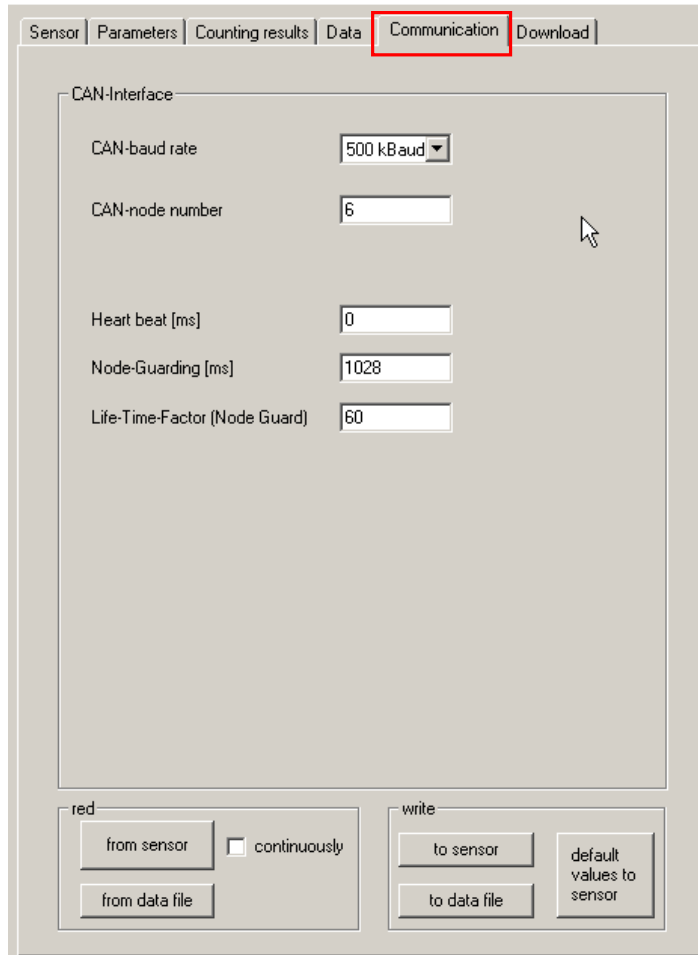
o   *mean*                 displayed is the mean value of the set of data points to be combined.

o   *min*                  displayed is the minimum value of the set of data points to be combined.

o   *max*                  displayed is the maximum value of the set of data points to be combined.

o   *peak*                 displayed is alternatively the maximum and the minimum value of the set of data points to be combined.

                          Note that the combination mode affects only the display, while the data stored in the RAM or in files are not reduced in any way.

---

☞   Application note:
    With a large time scale, the waveforms displayed will vary depending on the combination mode. For example short edges will no longer be visible in the waveforms when *mean* was chosen as combination mode because glitches will be suppressed by the averaging.  In such a case, choose *min* or *peak* – mode if glitches still should be displayed!

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### 3.5.6 Communication

The communication tab allows the setting of parameters relating to the CAN interface if the attached *Scatec* is equipped accordingly. The parameters listed in this tab are explained in the *Scatec* CAN-manual.
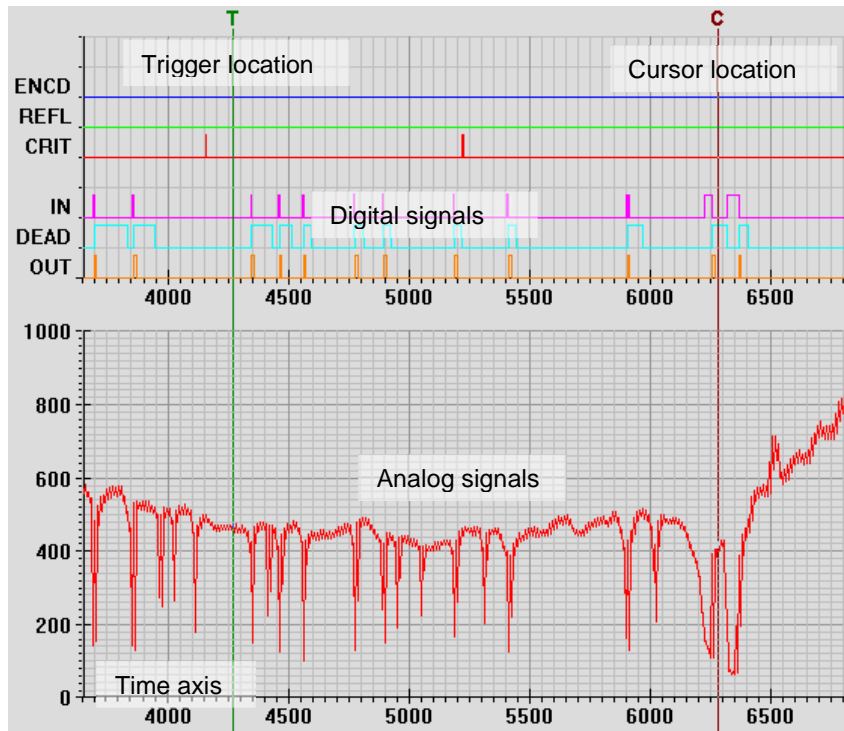


### 3.5.7 Download

With the proper authorization, this tab allows downloading new *Scatec* operating software into the *Scatec*.

## 3.6   Graphics pane



In the graphics box, plots of various signals versus time are shown. Plots of digital signals are displayed in the upper part of the box while plots of analog signals are shown in the lower part of the box. The time scale is the same for all plots.

Digital signals:

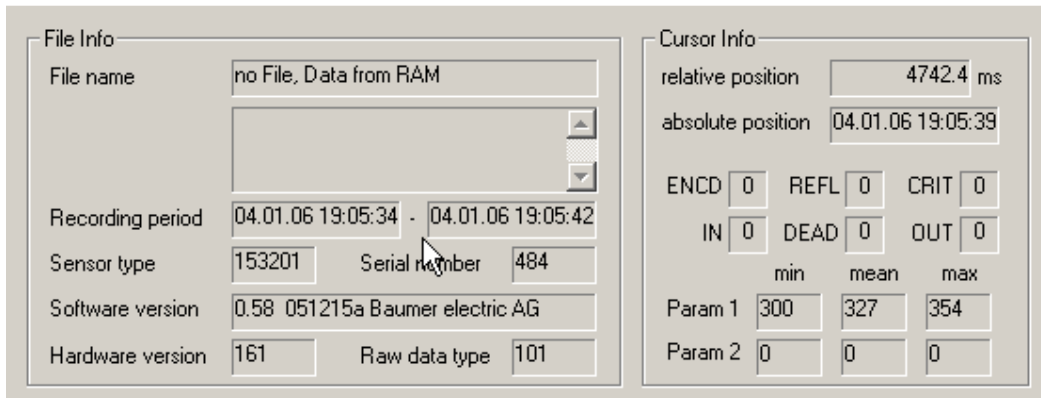| | |
|---|---|
| ENCD | encoder pulses. Note that correct display of the encoder pulses requires an adequate resolution of the time axis. |
| REFL | signal of the built-in retro-reflective sensor. The signal is high as long as the laser beam of the *Scatec* hits the retro-reflective foil. |
| CRIT | Critical count. The signal goes high for 3 ms when a critical count (marginally missed or detected edge) was detected. |
| IN | *IN* goes high when the analog signal *ratio f/b* falls below the actual threshold and it goes low when this analog signal raises again above the value (actual threshold + hysteresis). The yellow edge indicator LED of the *Scatec* lights while *IN* is high. |
| DEAD | *DEA*D is high while a dead time is activated. |
| OUT | OUT is high while *Scatec* issues an output pulse. |

Analog signals

| | |
|---|---|
| Analog signal | by default the analog signal *ratio f/b* is plotted. |
| | (for the meaning of the analog signal *ratio f/b* refer to the *Scatec*-manual) |

| X-axis (horizontal) | time axis, labeled with milliseconds. The time base can be adjusted on the tab *Data*, *Time (horizontal).* |
| Y-axis (vertical) | signal values are shown on the Y-axis. The vertical scale can be adjusted on the tab *Data*, *Y-Value (Vertical).* |

Setting the Trigger and Cursor position:

| Trigger: | move the mouse to the appropriate position in the graphic and click the left mouse button while *shift* key is held down. A vertical line appears on the display labeled with a *T*. |
| Cursor: | move the mouse to the appropriate position in the graphics and click the left mouse button. A vertical line appears on the display labeled with a *C*. Right after setting the cursor it can be moved with the *right* / *left* key. |

## 3.7 File Info and Cursor Info pane



File Info

o  *File Name*          name of the file to which measurement data is saved or name of the file which was chosen on clicking the *load data* button. In the box underneath all file names belonging to the same measurement run are listed. The data of all these files are automatically connected and displayed in the graphics box.

o  *Recording period*   start and end time of the measurement run.

o  *Sensor type*        part number of the *Scatec* which was used for the data acquisition.

o  *Serial number*      serial number of the *Scatec* which was used for the data acquisition.

o  *Software-Version*   version of the operating software of the *Scatec* which was used for the data acquisition.

o  *Hardware-Version*   version of the electronics in the *Scatec* which was used for the data acquisition

o  *Raw data type*      code for the analog parameter which was recorded. By default the parameter *ratio f/b* is recorded which has the code (raw data type) 101.

Cursor Info
o  *relative position*        cursor position relative to the start of the measurement run.
o  *absolute position*        absolute time of the cursor position.
o  *ENCD, REFL, CRIT, IN, DEAD, OUT*        values of the according digital parameters at the position of the cursor. (on the plots, value 1 is high and value 0 is low)
o  *Param 1, 2*        values of the respective analog parameters at the position of the cursor. (Note that by default only one analog parameter is recorded, the *ratio f/b*)

*min, mean, max*:        minimum, mean, and maximum value of the set of data points represented by the pixel at the cursor position.

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Passion for Sensors