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Encoder Demo Software

Users Manual

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1 Introduction

This manual explains the use of the Encoder Demo Software. The Encoder Demo Software demonstrates the functionality of the EOIR007 encoders with the help of the Demo Case and a PC.

2 Software installation

The requirements for using this software are:

- PC with operating system XP or WIN7, WIN8
- PC with USB interface

The installation of the Encoder Demo Software is done by double clicking the installation setup (Fig. 1).

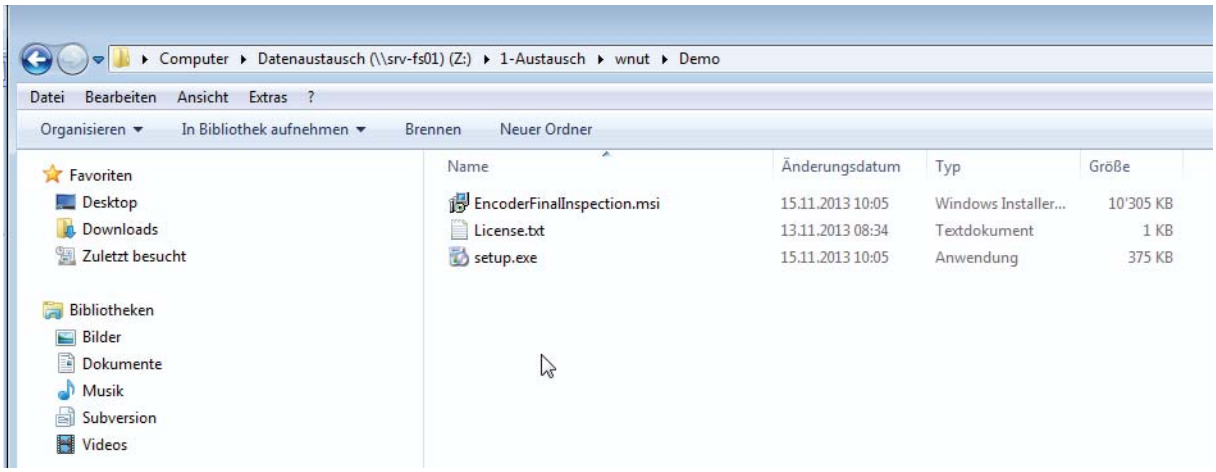

Fig. 1: Installation by double clicking the setup.exe

The Encoder Demo Software is installed automatically. After installation, an icon will appear on the desktop. Double click on this icon starts the software (Fig. 2).

Fig. 2: EFI-Icon after installation appears on the desktop

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3 Software Validation

The Encoder Demo Software has to be validated by entering the license key, owner name and the order date. The customer will receive this data set directly from Elesta GmbH.

If the Encoder Demo Software has been installed for the first time a window (*Fig. 3*) appears and requests the owner name, key and the order date. Otherwise the Encoder Demo Software window will be displayed.

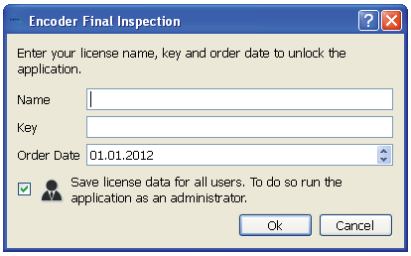

Fig. 3: Window for changing the customer name and the license number

After closing this window by clicking the OK button the Elesta logo appears for a few seconds.

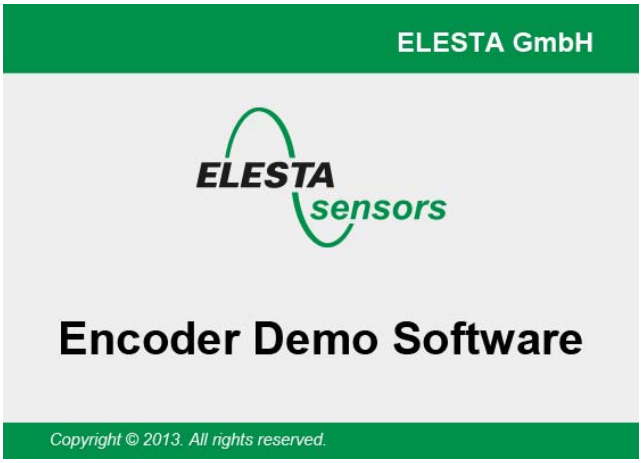

Fig. 4: ELESTA GmbH logo after starting the Encoder Demo Software

The logo disappears after a while and then the Encoder Demo Software window is displayed with the **Gray Power** button at the top left side of the window, showing that the Demo Case is not connected to the PC (*Fig. 5*).

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Fig. 5: Encoder Demo Software window after starting the software

The Demo Case needs to be connected to the PC with a USB cable with USB type A and USB type mini B plugs (Fig. 6).

Fig. 6: USB Cable with Type A and Type mini B plugs

The USB mini B plug has to be plugged into the Demo Case at the left hand side (Fig. 7).

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Fig. 7: Demo Case with EFI Board (left) and switching board (right). The USB Type mini B plugged in on the left side.

Fig. 8: Demo-Kit connectors for PC (left) and oscilloscope (A, B, Z)

The encoder signals are transferred to the oscilloscope (Fig. 9) with three coaxial cables. They are displayed on channel 1, channel 2 and channel 3.

The three coaxial cables are supplied with BNC connectors on each end and have a diameter of 1.8 mm and a characteristic wave impedance of 50 Ohms.

The connection to the PC is a USB cable with USB type A to mini USB type B connector with a length of 1.8 m.

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Fig. 9: The signals of the encoder are transferred to the oscilloscope via three coaxial cables

With USB cable plugged in at PC and Demo Case the Encoder Demo Software displays a **Red Power** button at top left.

On the switch board, the switch for selecting **speed or angle measurement** has to be set to **speed measurement**. The directional switch has to be set to **CW direction**.

On the left side of the center is the speed indicator displayed. On the right side is placed the indicator for the angle.

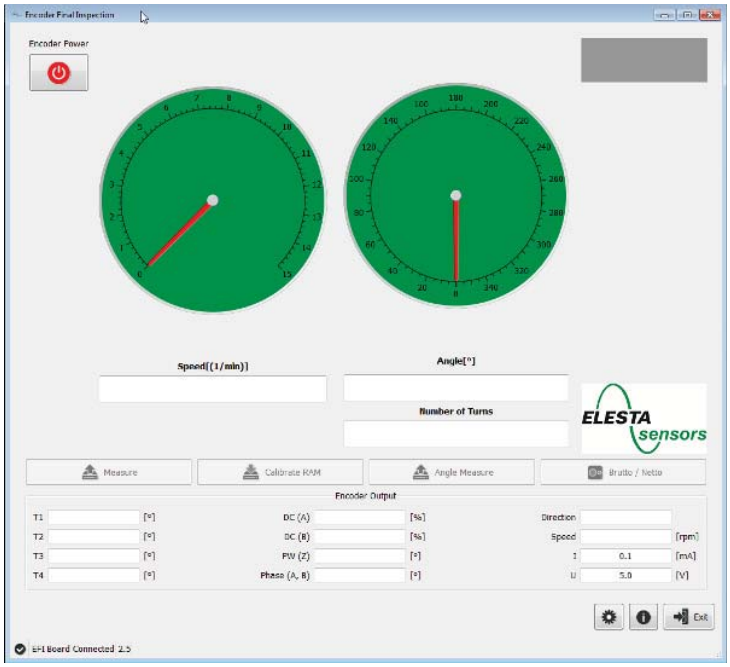

Fig. 10: Encoder Demo Software window after starting the software

At the bottom left part of the window (*Fig. 11*), the status message confirms the connection to the Demo Case and the version of the firmware is also displayed.

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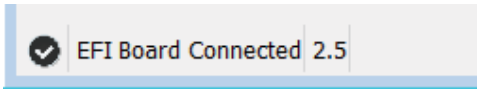

Fig. 11: Connection message: PC and EFI-Box are connected properly together

With a successful connection the green and red LEDs on the EFI Board are flashing.

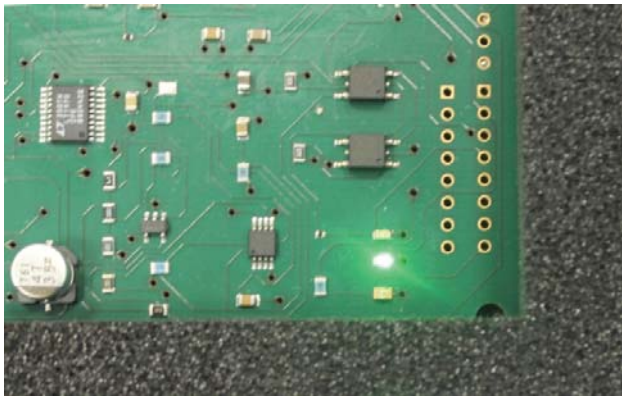

Fig. 12: Successful connection with green and red LED flashing on EFI Board

If the license key has to be changed after the initial setup, it is possible to replace the old key with the new one.

To get to the license key window, the info button ("i" icon) on the bottom right part (*Fig. 13*) should be clicked.

Fig. 13: Info button with the "i" sign

By doing this, a window opens, displaying the Elesta and the customer logo, which is shown in *Fig. 14*.

All software and component versions are displayed in the producer details. In the customer section the license key number of the ordered software with the name and the logo of the customer are displayed.

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Fig. 14: Info page with Producer and Customer part and the possibility to change the license key

Clicking on the "**Change**" button opens another window, with the possibility to change the name of the customer and the license number of the product as it is shown in *Fig. 15*.

By using the Text-File, which customer gets from Elesta GmbH, the validation of the Encoder Demo Software can be done. In this window all three fields have to be filled in as in the Text-File.

After completion of these steps, the Encoder Demo Software can be now started.

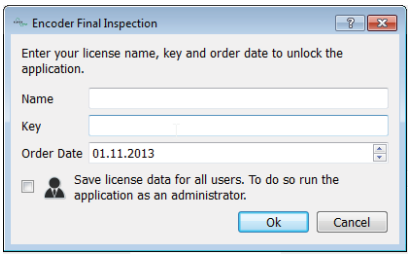

Fig. 15: Window for changing the customer name and the license number

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4 Using the Encoder Demo Software

Before the Encoder Demo Software can be used, the directory for the logging data should be created. The measured data are saved in this directory. To specify the Logfile path, click on the "cog-wheel" button (*Fig. 16*). This is necessary for logging the data of the measurements and calibration of the encoders.

Fig. 16: Settings button with the "cog-wheel" sign

By clicking this button a window appears as shown in *Fig. 17*. In this window the Logfile path have to be inserted. The content of the Logfiles in this directory will be explained at the end of this manual in the section Logfiles.

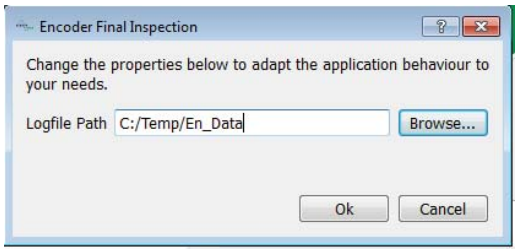

Fig. 17: Settings window for the Logfile path

After having completed all necessary steps to get the Encoder Demo Software running, the encoder must be turned on. Upon turning on the encoder the green image on the top right part of the window in *Fig. 18* signalizes that the encoder is switched on properly.

Fig. 18: The message after turning on the encoder.

On the EFI Board in the Demo Case, the power on is indicated by the yellow LED (Fig. 19*).*

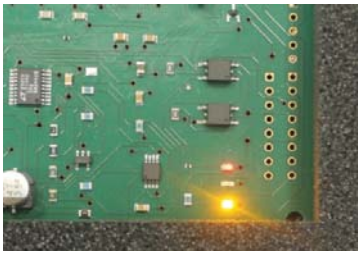

Fig. 19: Yellow LED indicates the power on of the Encoder.

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Now there are four actions, which can be taken in the following:

- Measuring
- Calibrating
- Angle Measurement
- Brutto/Netto switching

Fig. 20 shows these four possibilities

Fig. 20: Action fields of the EFI-Software

5 Speed Measurements and Calibration

After turning on the encoder, the Encoder Demo Software is able to measure the values **T1** through **T4** for the sub times**, DCA** and **DCB** the Duty-Cycles of the signals **A** and **B, PW** the **Z** pulse duration**, Phase (A, B)** the phase between **A** and **B**, **Direction** the direction of the motor revolution, **I** the current and **U** the voltage of the connected encoder. *Fig. 21* illustrates the Encoder Output part after the EFI-Software has been invoked but no measurement has been started yet.

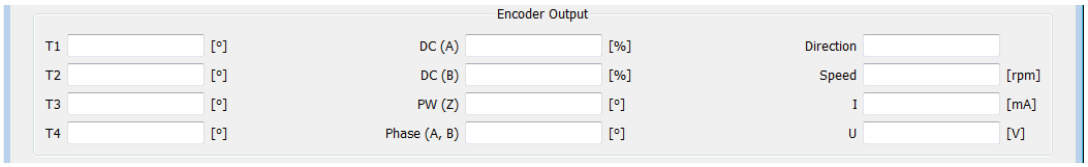

Fig. 21: Encoder Output part with its different fields

By clicking the "**Measure**" button, the Encoder Demo Software measures continuously all the above mentioned values and fills all the fields as shown in *Fig. 22*.

Fig. 22: Measured relevant parameters with the green success message

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By clicking the "**Measure**" button again, the Encoder Software stops the measurements.

The actual signals of the encoder are displayed on the oscilloscope with the help of three coaxial cables.

The oscilloscope is set to 20 µs/Div. horizontal and to 5 V/Div. vertical for the channels 1, 2 and 3. The signal A is on channel 1, the signal B on channel 2 and the signal Z on channel 3.

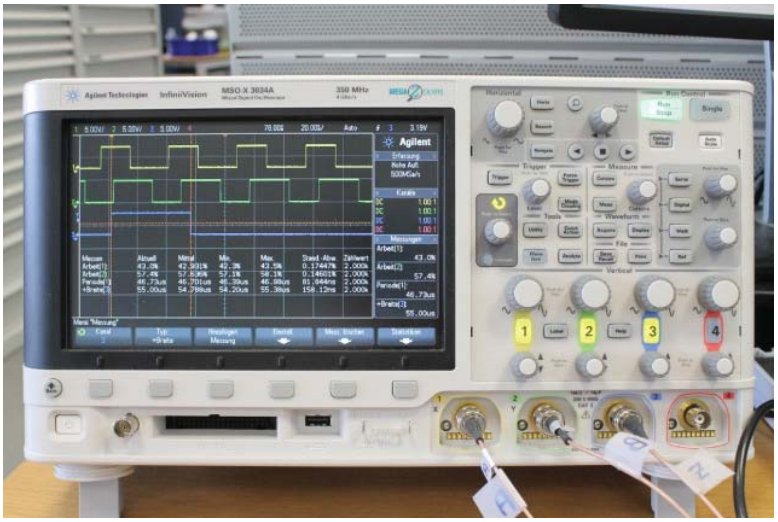

Fig. 23: The signals of the encoder are displayed on the oscilloscope. The encoder has not been calibrated.

By clicking the "**Calibrate RAM**" button the EFI-Software begins to calibrate the encoder. At first it tries to get the **Duty-Cycles** of the signals **A** and **B** to almost a value around **50%** (ideal encoder).

After having done these two Duty-Cycles to almost 50%, EFI-Software tries to get the **high pulse width** of the **Z** signal almost around the period of **A** or **B**.

After this step, the calibration operation brings the **high phase** of the modified **Z** signal to the position, in which the **high pulse** of **A** and **B** is centered around the high Z pulse position. *Fig. 24* displays this setting. For an ideal encoder the two values **Z2** and **Z4** should be equal.

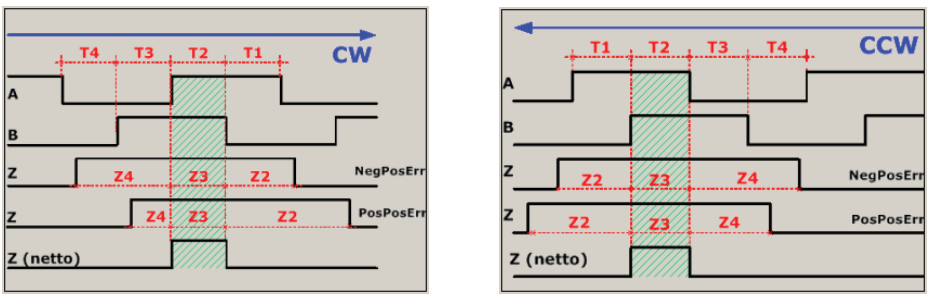

Fig. 24: Position of the Z (Brutto) high phase in relation to A and B high phases

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If the calibration process was successful, the green message “Calibrate RAM Succeeded” is displayed at the top right part of the EFI-Software (*Fig. 25*).

Fig. 25: Green success message after Calibrating the RAM with measured values

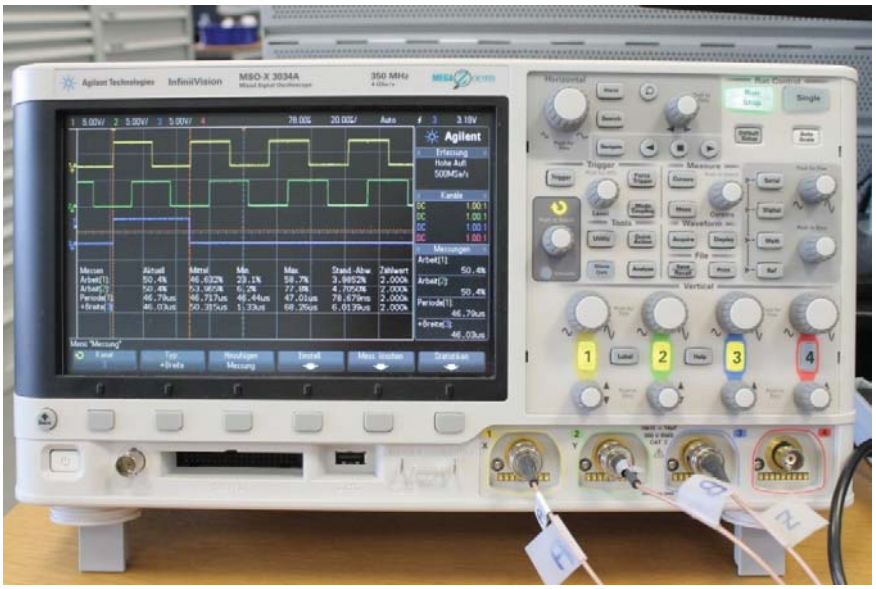

Fig. 26: The signals of the calibrated encoder are now displayed on the oscilloscope.

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If the encoder is faulty (e.g. if the signals do not achieve the expected values within the tolerances of the settings), the calibration process will be stopped and the red message "**Calibrate RAM failed**" is displayed at the top right side of the window (*Fig. 27*). The failure code is showed beneath this info field, e.g. "MOTORSPEED out of range".

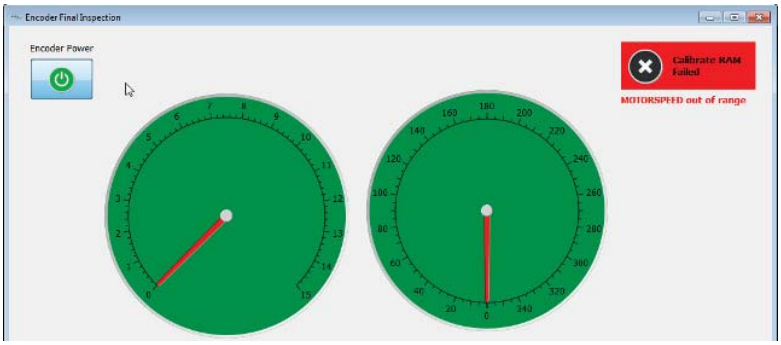

Fig. 27: Failed calibrating due to an error (MOTORSPEED out of range).

After the encoder has been calibrated successfully, there is the possibility to switch between the **Brutto** and the **Netto** of the **Z** signal. The Netto signal is generated by "**AND**ing" of the three signals **A**, **B** and **Z**.

Fig. 28 illustrates the possibilities to change the state of the ***Z*** signal. Each time by pressing the ***Brutto/Netto*** button the **green circle** in the icon changes its position showing the state of the ***Z*** signal. *Fig. 28 a)* shows the **whole length** of the **Z** signal (**Brutto**) and in the case of *Fig. 28 b)* the **Netto** signal will be displayed.

Fig. 28: Brutto/Netto Switching of Z

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6 Angle Measurements

To start the angle measurement, the switch in the center of the switch board needs to be set to Angular-Encoder (Fig. 29*).*

Fig. 29: Switch Board in the Demo Case

By clicking the **Angle Measure** button the angle of the Angular-Encoder is measured continuously and any full turn is counted and displayed in the Encoder Demo Software screen (Fig. 30*).*

By clicking again the **Angle Measure** button the continuous measurement is stopped and the values of **angle** and **number of turns** are set to zero.

Fig. 30: Angle measurement in the Encoder Demo Software

The angle of the Angular-Encoder can be measured with a resolution of 0.7°. Any full turn in CW direction increases the **turn counter** and any full turn in CCW direction decreases the value of that counter.

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7 Log Directory

Two Logfiles are generated by the Encoder Demo Software. They are called ***_RAW.log** and ***_CAL.log**. **CAL**-File contains all the settings of the encoders, which passed the calibration process. If an encoder cannot be calibrated, no line is inserted into the **CAL**-File. All measurements and calibration results are logged into the RAW-File (*Fig. 31*).

This directory contains other Logfiles. Their names contain the name of the tested encoder and the rotational direction of the motor. These file are for engineering purposes only.

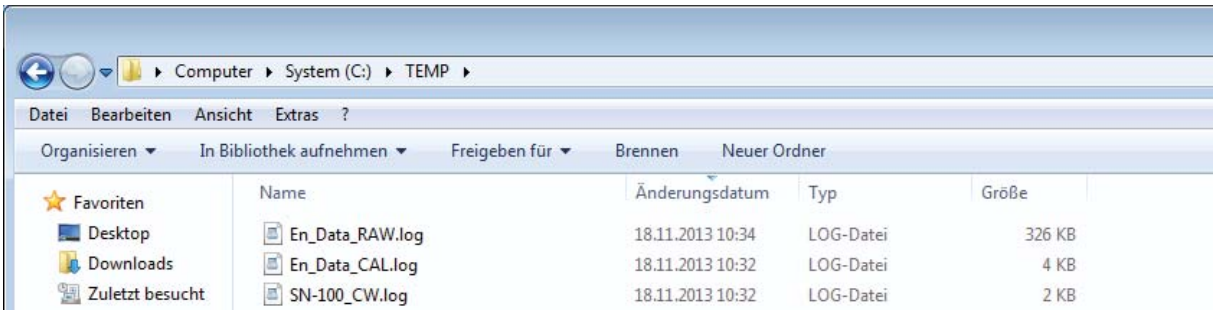

Fig. 31: Log file directory after setting the Logfile path in the Setting menu.

8 Logfiles

The layout of the Logfiles (***RAW*** and ***CAL*** files) consists of a headline and the logged values. *Fig. 32* shows an example of a ***CAL***-File imported to MS-Excel.

	Date	Time	Enc	Speed	Dir	DCA	DCB	Z#	T1#	T2#	T3#	T4#	PE	WE	U	I	A0	A1	A2	A3	A4	A5	A6	A7	B/N
2	2012.02.21	10:22:31	EN-546	10964	CW	51.3	49.7	411.2	9.7	-5.1	4.8	-9.4	16.2	1.0	5.0	3.4	2	0	0	2	1	10	5	6	Brutto
3	2012.02.21	10:45:27	EN-546	9782	CW	51.0	49.9	420.1	8.9	-6.1	6.4	-9.2	17.0	1.5	5.0	4.1	2	0	0	2	1	10	5	6	Brutto
4	2012.02.21	10:51:26	EN-546	9698	CW	51.0	50.0	418.3	9.0	-5.3	5.3	-9.0	17.1	1.5	5.0	5.0	2	0	0	2	1	10	5	6	Brutto
5	2012.02.21	10:56:19	EN-546	9715	CW	50.9	49.7	416.9	9.0	-5.9	5.9	-9.0	16.9	1.3	5.0	4.9	2	0	0	2	1	10	5	6	Brutto
6	2012.02.21	11:12:42	EN-546	9698	CW	51.0	50.0	418.3	9.5	-6.1	6.4	-9.8	17.1	1.3	5.0	4.7	2	0	0	2	1	10	5	6	Brutto
7	2012.02.21	11:16:16	EN-546	9698	CW	50.9	50.0	418.3	8.9	-6.1	7.0	-9.8	16.9	1.3	5.0	5.0	2	0	0	2	1	10	5	6	Brutto
8	2012.02.21	11:16:56	EN-546	9681	CW	50.9	50.1	416.4	9.4	-6.3	5.6	-8.8	16.9	1.2	5.0	5.1	2	0	0	2	1	10	5	6	Brutto
9	2012.02.21	11:18:05	EN-546	9731	CW	50.7	49.9	414.5	8.9	-6.1	5.8	-8.6	16.7	1.3	5.0	4.6	2	0	0	2	1	10	5	6	Brutto
10	2012.02.21	11:20:41	EN-546	9748	CW	51.1	49.9	421.2	9.0	-5.9	6.5	-9.7	16.9	1.3	5.0	4.1	2	0	0	2	1	10	5	6	Brutto
11	2012.02.21	13:25:14	EN-546	13992	CW	50.7	50.3	453.4	-5.4	8.1	-4.5	1.8	20.8	-3.5	5.0	3.0	2	8	0	2	11	0	5	4	Brutto
12	2012.02.21	13:27:57	EN-614	14204	CW	50.8	51.8	443.6	-6.9	10.5	-2.3	-1.4	22.0	-3.9	5.0	2.9	2	8	0	2	10	0	5	4	Brutto
13	2012.02.21	13:29:47	EN-608	14725	CW	50.0	50.9	410.5	-1.7	2.1	1.2	-1.7	19.4	-1.4	5.0	3.6	2	8	0	2	10	2	5	2	Brutto
14	2012.02.21	14:50:41	EN-234	14920	CW	49.3	50.4	409.5	-1.9	-1.9	2.9	1.0	18.9	-0.3	5.0	3.8	2	8	0	2	10	2	5	2	Brutto

Fig. 32: LogFile_CAL.log

While the CAL-File contains only the values after a successful calibration, the RAW-File on the contrary lists all trials independent of the calibration outcome and the values after each measurement activity. *Fig. 33* shows an example of a ***RAW***-File imported to MS-Excel.

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	Date	Time	Enc	Speed	Dir	Z	T1	T2	T3	T4	Z2	Z3	Z4	A1	A2	B1	B2	U	I	PE	WE	B/N
2	2012.02.21	10:22:31	EN-546	10964	CW	48.8	11.8	10.0	11.2	9.5	15.4	10.2	23.3	21.9	20.8	21.2	21.5	5.0	3.4	16.2	1.0	Brutto
3	2012.02.21	10:42:48	EN-546	9582	CW	64.8	13.2	10.8	13.2	11.7	22.9	10.9	30.7	24.0	24.9	24.0	25.0	5.0	25.1	12.0	2.7	Brutto
4	2012.02.21	10:45:15	EN-546	9731	CW	62.7	14.5	10.8	11.2	11.2	22.7	10.9	29.3	25.5	22.7	22.1	26.1	5.0	4.7	10.6	2.1	Brutto
5	2012.02.21	10:45:27	EN-546	9782	CW	55.9	13.2	11.2	12.9	10.8	17.6	11.3	27.1	24.4	23.5	23.9	24.0	5.0	4.1	17.0	1.5	Brutto
6	2012.02.21	10:51:26	EN-546	9698	CW	56.2	13.2	11.3	12.8	10.8	17.5	11.3	27.1	24.7	23.7	24.2	24.2	5.0	5.0	17.1	1.5	Brutto
7	2012.02.21	10:51:32	EN-546	9698	CW	56.0	13.3	11.2	12.9	10.8	17.4	11.5	26.9	24.7	23.7	24.0	24.2	5.0	5.1	17.0	1.2	Brutto
8	2012.02.21	11:16:16	EN-546	9698	CW	56.2	13.2	11.2	13.0	10.8	17.6	11.4	27.1	24.6	23.8	24.2	24.2	5.0	5.0	16.9	1.3	Brutto
9	2012.02.21	11:16:56	EN-546	9681	CW	56.0	13.2	11.2	12.8	10.8	17.6	11.4	27.1	24.7	23.8	24.2	24.2	5.0	5.1	16.9	1.2	Brutto
10	2012.02.21	11:17:12	EN-546	9681	CW	55.6	13.2	11.2	12.8	10.7	17.6	11.3	26.9	24.8	23.7	24.2	24.2	5.0	4.8	16.7	1.3	Brutto
11	2012.02.21	11:17:33	EN-546	9698	CW	55.5	13.2	11.2	12.8	10.7	17.5	11.5	26.9	24.7	23.7	24.2	24.2	5.0	5.1	16.8	1.0	Brutto
12	2012.02.21	11:18:05	EN-546	9731	CW	55.5	13.2	11.2	12.8	10.8	17.4	11.3	26.7	24.4	23.8	24.1	24.2	5.0	4.6	16.7	1.3	Brutto
13	2012.02.21	13:27:57	EN-614	14204	CW	40.7	7.6	9.2	8.0	8.1	20.0	9.5	11.1	16.8	16.2	17.1	15.9	5.0	2.9	22.0	-3.9	Brutto
14	2012.02.21	13:29:47	EN-608	14725	CW	36.2	7.8	8.1	8.0	7.8	17.3	8.3	10.3	15.9	15.9	16.2	15.6	5.0	3.6	19.4	-1.4	Brutto
15	2012.02.21	13:30:08	EN-608	14763	CW	36.2	7.8	8.0	8.0	7.8	15.3	7.2	12.9	15.8	15.9	16.0	15.8	5.0	3.6	6.8	2.3	Brutto
16	2012.02.21	14:45:42	EN-234	14880	CW	48.8	6.2	7.8	9.6	7.8	25.8	7.9	15.2	14.2	17.3	17.4	14.0	5.0	24.3	21.7	-0.2	Brutto
17	2012.02.21	14:47:11	EN-234	0	STOP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	26.9	100.0	100.0	Brutto
18	2012.02.21	14:49:03	EN-234	14920	CW	35.9	7.6	7.8	8.0	7.9	17.3	7.9	10.5	15.4	16.0	15.9	15.6	5.0	3.7	19.1	-0.3	Brutto
19	2012.02.21	14:50:41	EN-234	14920	CW	35.8	7.7	7.7	8.1	7.9	17.2	7.9	10.5	15.5	15.9	15.9	15.7	5.0	3.8	18.9	-0.3	Brutto

Fig. 33: LogFile_RAW.log

CAL-File and **RAW**-File have **two** different schemes showing the time values for **T1**, **T2**, **T3** and **T4**.

While the **RAW**-File displays the **original** values of **T1**, **T2**, **T3** and **T4** in ***µs***, the **CAL**-File shows **T1#**, **T2#**, **T3#** and **T4#** values in electrical degree. The relation between Tx and Tx# is:

$$Tx\# = \frac{Tx}{T1 + T2 + T3 + T4} * 360° - 90°$$

An ideal encoder has four **equal** values for **Tx**. And because **∑Tx = 360°**, **Tx** is ideally **90°.** With this method a quick check can be performed to decide if the encoder is good or not. The more these values differ from zero, the worse the encoder.

In the RAW-File the values for the Duty-Cycles for **A** (A1, A2) and **B** (B1, B2) signals are given as times of the **high** and **low** pulse. For a **50%** Duty-Cycle these **two values** should be **equal**.