TLE5x09A16(D) Evaluation Kit

Analog AMR/GMR Angle Sensor Evaluation Kit

About this document

Scope and purpose

This document describes the Evaluation Kit for the TLE5x09A16(D) angle sensor. The purpose of this manual is to describe the software installation process and how to use the TLE5x09A16(D) angle sensor Evaluation Kit.

Intended audience

This document is intended for anyone who wants to use the TLE5x09A16(D) Evaluation Kit

Table of contents

1 General description

This kit is based on XMC™4700 platform. The kit is equipped with the TLE5x09A16(D) dual die angle sensor and a FTDI chip that implements a high baud rate communication.

The EvalKit consists of:

- Dual Die Angle Sensors Evaluation Board
- Rotation knob (3D printed) with magnet (MTS SD-6x2.5-NI-N35SH)

The EvalKit does not contain:

- micro USB cable

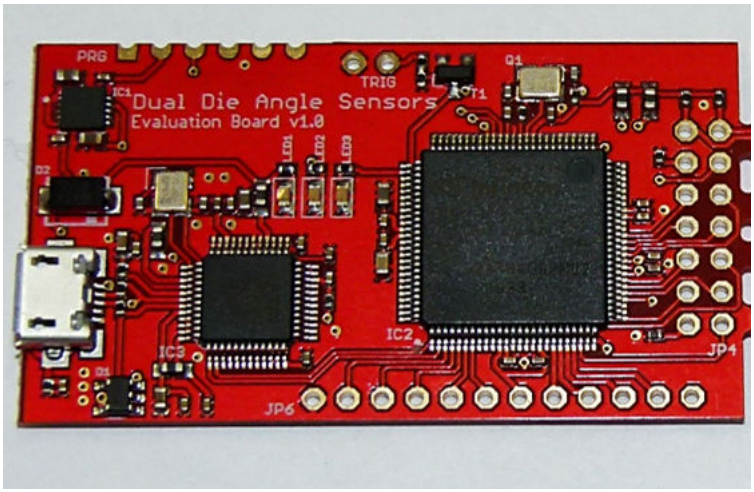

Figure 1 Dual Die Angle Sensors Eval Kit with XMC™ 4700

Figure 2 Rotation knob with TLE5x09A16(D) angle sensor below

The Evaluation Kit includes a GUI software application that can be downloaded from the Evaluation Kit product page

2 Installation

This is the installer entry point.

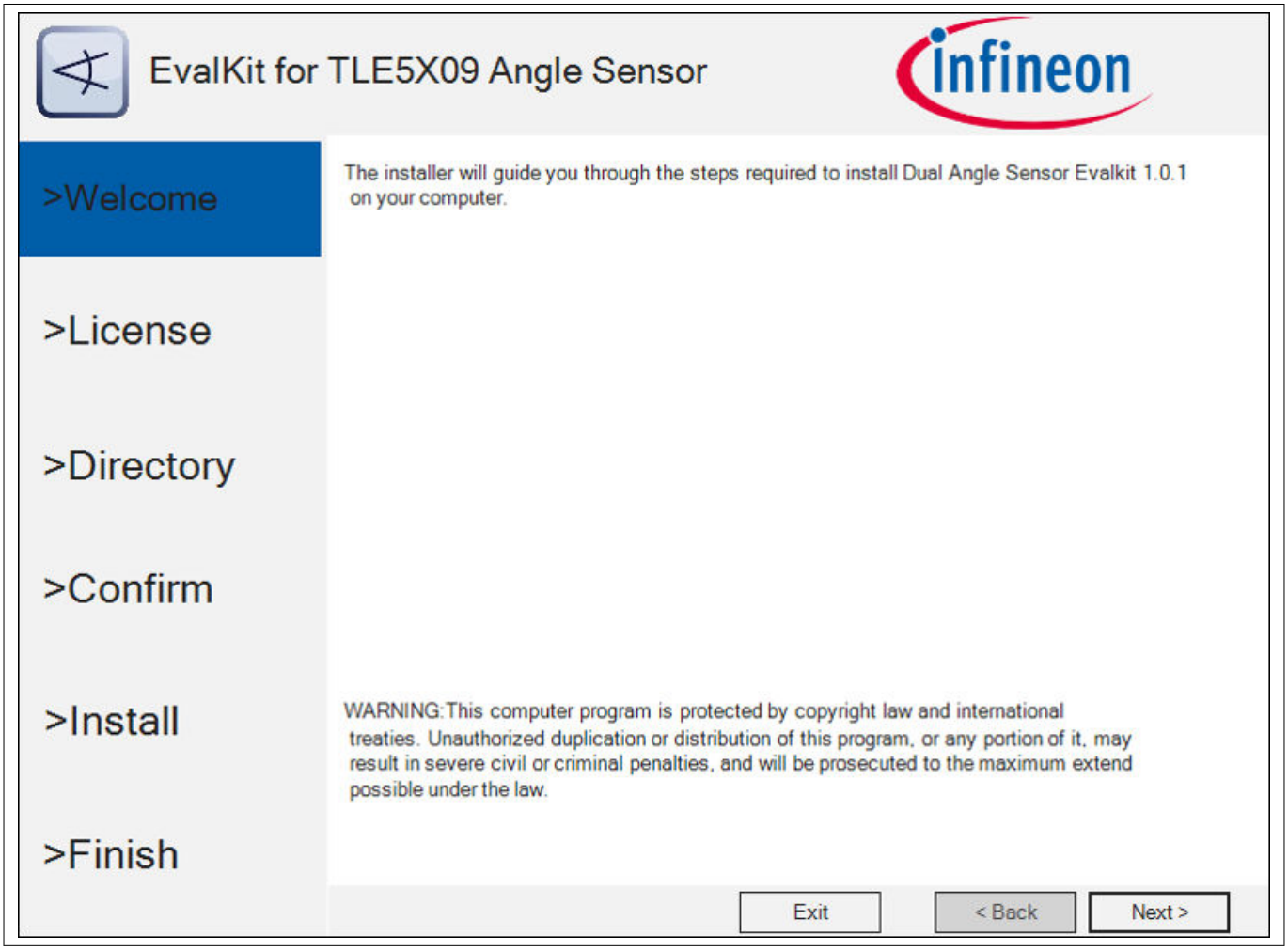

Figure 3 Installer entry point

1. Click Next to go forward with the process
2. Please read the license agreement
   a. Check the *"I accept the terms in the License Agreement"* checkbox
   b. The "Next" button activates only after agreeing with the terms
3. Directory for the software installation
   a. You may select the installation folder – recommended is to leave the default installation path
   b. You may select if a desktop icon is generated or not
   c. The hardware device may only operate on a computer that has the FTDI driver installed
   d. The Software GUI is built in .NET environment 4.5. A check is being done for compatibility and you may choose to install (if not already installed) the .NET framework 4.7 (web installer – requires connection to internet)
4. Confirm the installation process
5. Beginning of the installation process
   a. Windows UAC (user access control) will prompt for access confirmation
   b. Depending on the security settings, you may need administration rights on the installation machine
   c. Wait for the installation process to finish
6. Beginning ot the FTDI driver installation process

2 Installation

7. Device driver installation Wizard
   a. This wizard helps you install the software drivers that some computers devices need in order to work
   b. Click next to continue
8. Please read the license agreement and check the *"I accept this agreement"* checkbox. The "Next" button activates only after agreeing with the terms
9. Finalize the installation by clicking Finish
   a. Check the message provided by the installer. In case of errors, the Software will not be available for running

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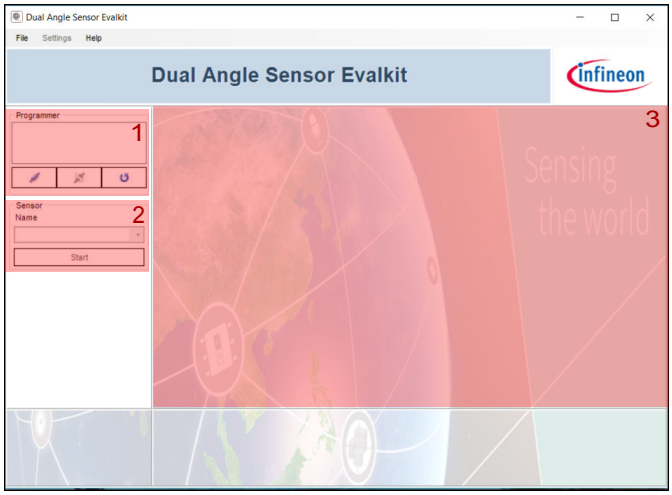
3.1 Connection to PC and starting the application

Connect the hardware to PC using a USB to Micro-USB cable

Start the application (via shortcut on desktop or Start → All Programs → Infineon Technologies → Dual Angle Sensor Evalkit)

1: This GUI component will show any connected devices. You may select the device and open a connection / flash the device.

Note: Press the ´Connect´Button to go on. There are three buttons available: Connect, disconnect, refresh



2: You may select the sensor type via the combo-box and start/stop acquisition.

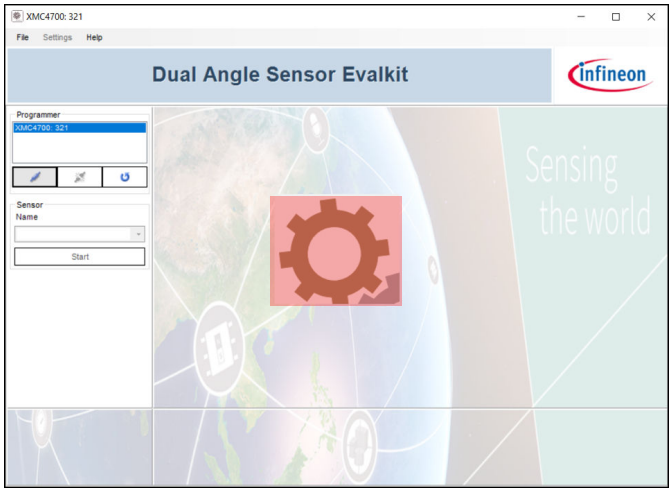
3: Sensor panel – will be displayed after valid sensor is being selected by the user.

3.2 Connecting to the device

While connecting to the device, the animated picture with rotating gears will appear.

The software will check the firmware version and flash if it needs to be updated.

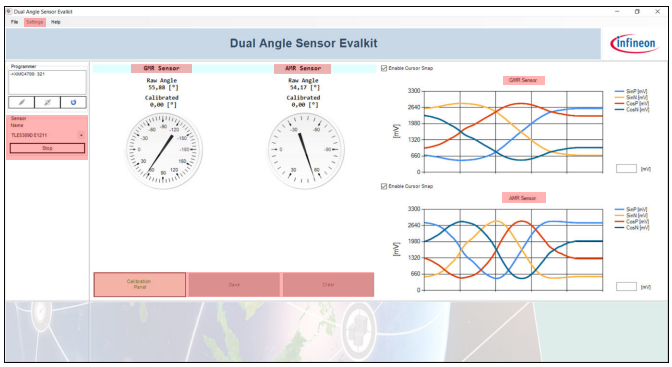
The picture will disappear when the process is complete and the device is ready.



3.3 TLE5x09A16(D) sensor panel

After selecting the sensor from the drop down list, the sensor panel will appear.

You can now start the data acquisition. All controls (Settings, Calibration Panel, Save, Clear) become available only if data acquisition is stopped.



3.4 Calibration panel

The raw signals of the analog angle sensor TLE5x09A16(D) have to be calibrated to achieve high angle accuracy.

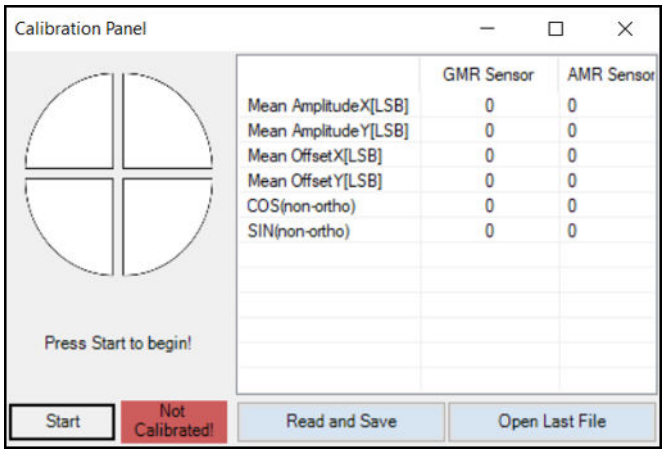
A calibration of amplitude, offset and non-orthogonality has to be done when the sensor is used the first time (end-of-line calibration).

When the panel opens the final parameters used for angle calibration are read from the microcontroller.

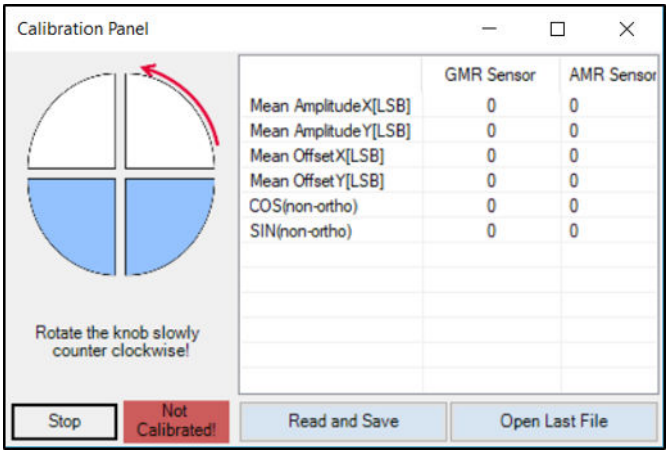
In this panel the user can start the sensor calibration procedure. Every start will reset the existing calibration parameters stored on the microcontroller.

Below the circle quadrants, instruction messages are displayed.

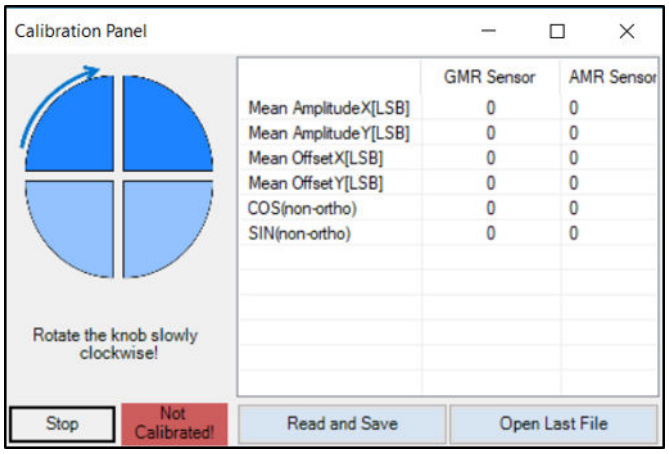
Press Start to beginn.



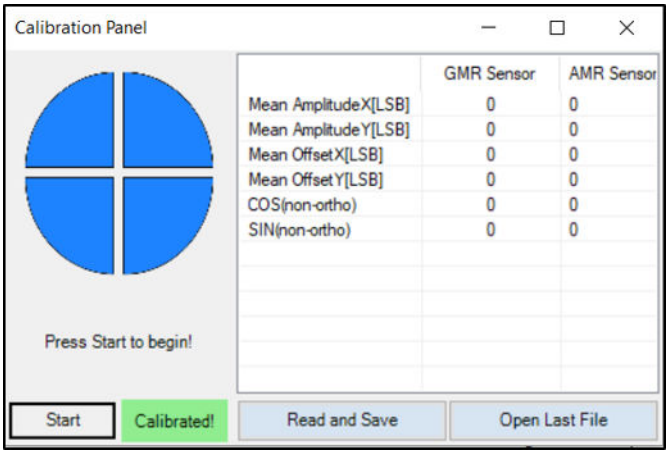
Rotate the knob slowly counter clockwise.



Rotate the knob slowly clockwise.



Calibration finished.



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After the calibration process is complete, the user can read and save the calibration parameters stored on the microcontroller.

In the panel are displayed only the final parameters used for angle calibration. By clicking “Open Last File”, the user can access the full parameters list stored on a csv file at every “Read and Save”.

The example in ***Figure 4*** shows the calibration parameters amplitude, offset and non-orthogonality of TLE5309(D) sensor. The X value corresponds to the cosine output while the Y value corresponds to the sine.

The GMR sensor is placed on the top and the AMR sensor on the bottom of the package. The bottom sensor is in flipped configuration compared to the top sensor in TLE5x09A16(D) dual die variants.

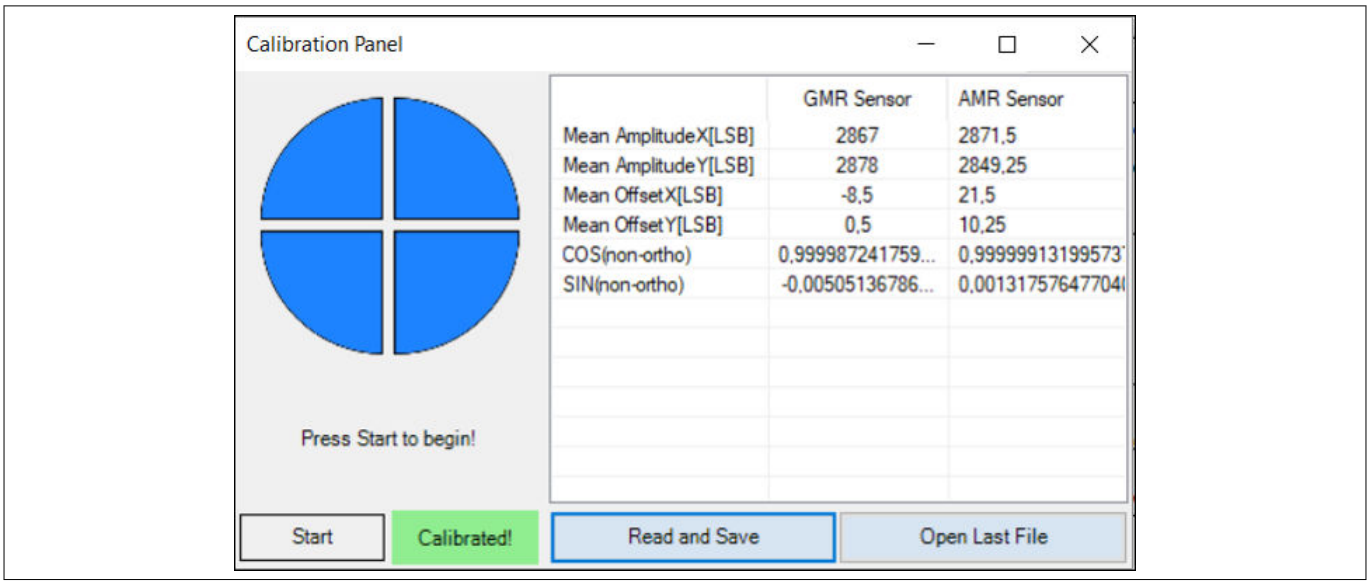
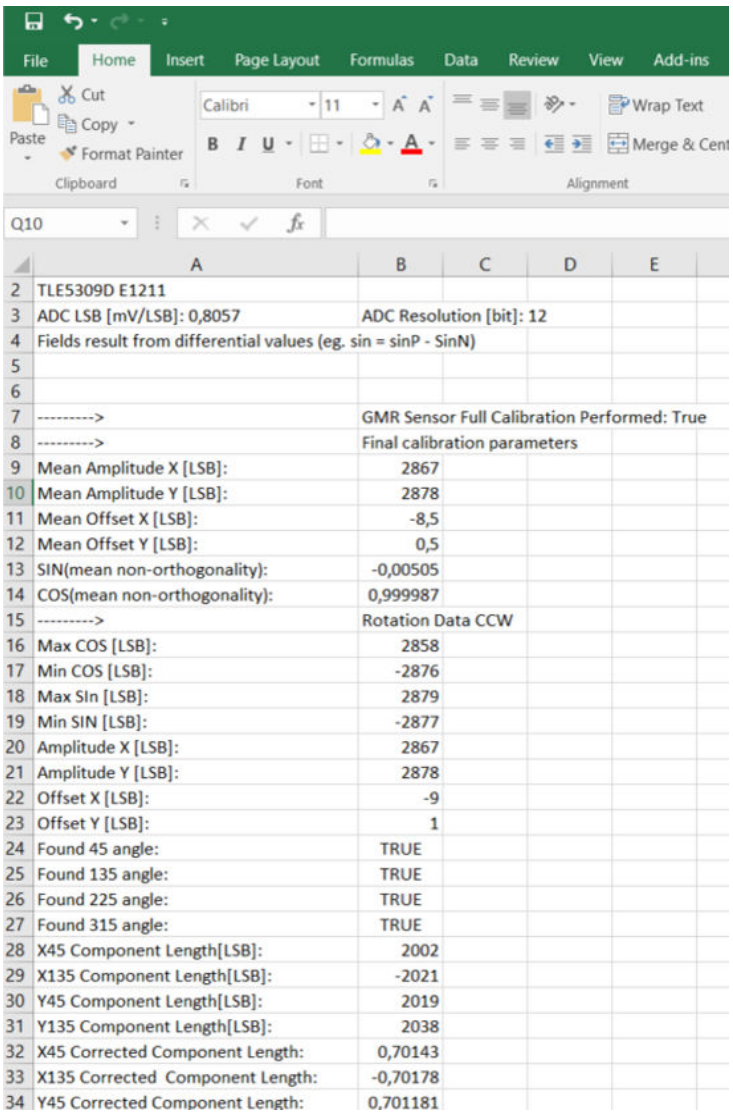


Figure 4 Calibration panel

Files are saved in the computer: “C:\Users\<user>\AppData\Local\InfineonDualAnalogAngleTemp”

The calibration procedure is done on the microcontroller with the “Library for One Time Calibration & Compensation”.



	A	B	C	D	E
2	TLE5309D E1211				
3	ADC LSB [mV/LSB]: 0,8057	ADC Resolution [bit]: 12			
4	Fields result from differential values (eg. sin = sinP - SinN)				
5					
6					
7	--------->	GMR Sensor Full Calibration Performed: True			
8	--------->	Final calibration parameters			
9	Mean Amplitude X [LSB]:	2867			
10	Mean Amplitude Y [LSB]:	2878			
11	Mean Offset X [LSB]:	-8,5			
12	Mean Offset Y [LSB]:	0,5			
13	SIN(mean non-orthogonality):	-0,00505			
14	COS(mean non-orthogonality):	0,999987			
15	--------->	Rotation Data CCW			
16	Max COS [LSB]:	2858			
17	Min COS [LSB]:	-2876			
18	Max SIn [LSB]:	2879			
19	Min SIN [LSB]:	-2877			
20	Amplitude X [LSB]:	2867			
21	Amplitude Y [LSB]:	2878			
22	Offset X [LSB]:	-9			
23	Offset Y [LSB]:	1			
24	Found 45 angle:	TRUE			
25	Found 135 angle:	TRUE			
26	Found 225 angle:	TRUE			
27	Found 315 angle:	TRUE			
28	X45 Component Length[LSB]:	2002			
29	X135 Component Length[LSB]:	-2021			
30	Y45 Component Length[LSB]:	2019			
31	Y135 Component Length[LSB]:	2038			
32	X45 Corrected Component Length:	0,70143			
33	X135 Corrected Component Length:	-0,70178			
34	Y45 Corrected Component Length:	0,701181			

Figure 5 Parameter list of calibration process

3.5 TLE5x09A16(D) sensor panel

The TLE5x09A16(D) eval kit displays real-time angle values.

After the sensor is fully calibrated, the calibrated angle value will be displayed.

The user can click and pin a cursor in the signal chart. If the checkbox “Enable Cursor Snap” is checked, the cursor will point to the nearest signal value. The cursor value is displayed in the right corner box.

The user can also zoom into the chart by using mouse scroll.

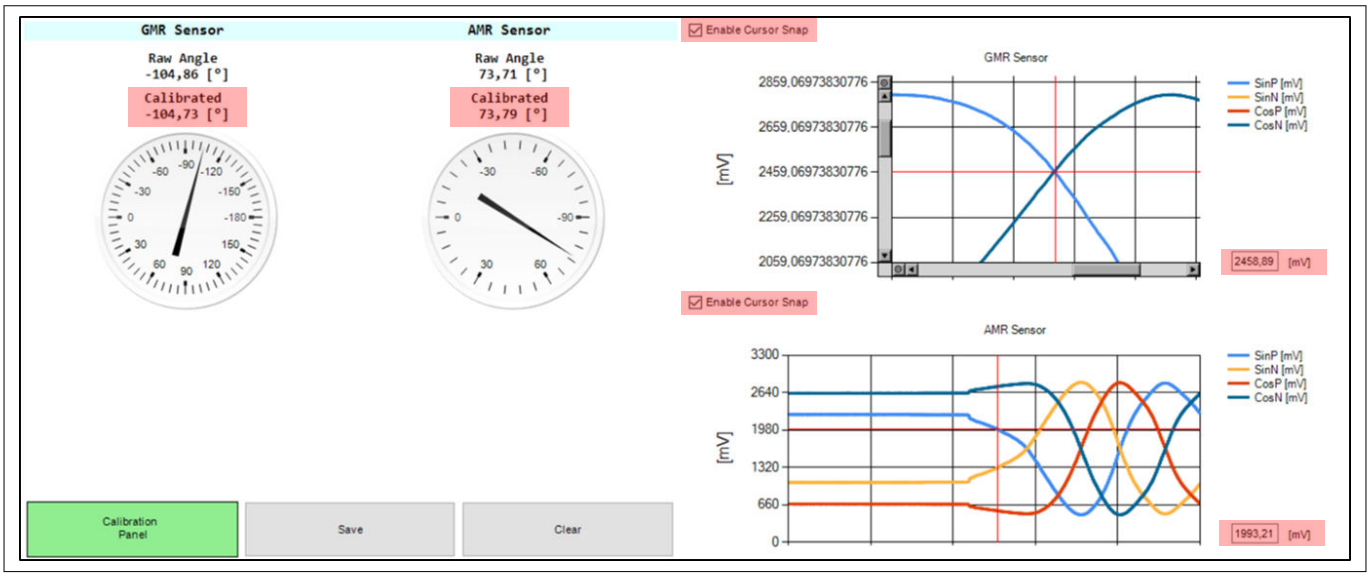


Figure 6 Sensor panel

3.6 Sensor config panel

This panel can be accessed while data acquisition is stopped at Settings → Sensor Config.

The user can select a predefined acquisition rate for the sensor data read. Lowering the rate will reduce the required processing power (on the microcontroller and computer).

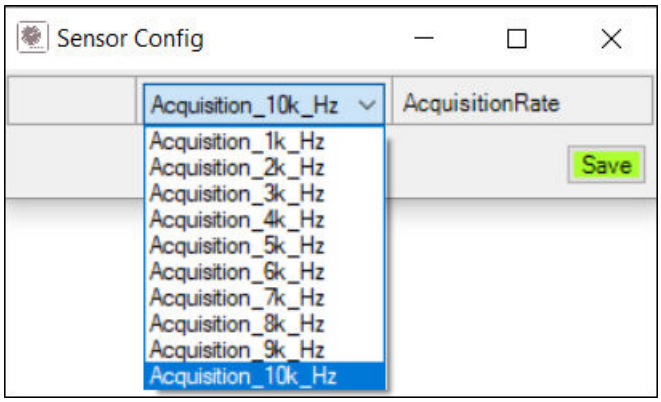


Figure 7 Sensor confi panel

3.7 TLE5x09A16(D) saved sensor acquired data

All sensor acquired data can be saved in a csv file, by pressing “Save” button from the sensor panel.

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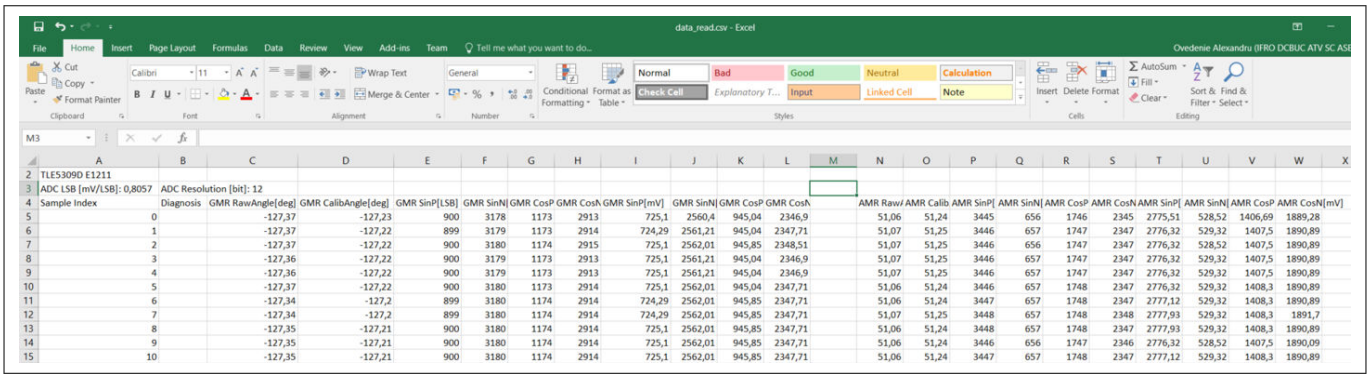

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
2	TLE5309D E1211																							
3	ADC LSB [mV/LSB]: 0,8057	ADC Resolution [bit]: 12																						
4	Sample Index	Diagnosis	GMR RawAngle[deg]	GMR CalibAngle[deg]	GMR SinP[LSB]	GMR SinN[	GMR CosP	GMR CosN	GMR SinP[mV]	GMR SinN[	GMR CosP	GMR CosN		AMR Raw/	AMR Calib	AMR SinP[	AMR SinN[	AMR CosP	AMR CosN	AMR SinP[	AMR SinN[	AMR CosP	AMR CosN[mV]	
5	0		-127,37	-127,23	900	3178	1173	2913	725,1	2560,4	945,04	2346,9		51,06	51,24	3445	656	1746	2345	2775,51	528,52	1406,69	1889,28	
6	1		-127,37	-127,22	899	3179	1173	2914	724,29	2561,21	945,04	2347,71		51,07	51,25	3446	657	1747	2347	2776,32	529,32	1407,5	1890,89	
7	2		-127,37	-127,22	900	3180	1174	2915	725,1	2562,01	945,85	2348,51		51,07	51,25	3446	656	1747	2347	2776,32	528,52	1407,5	1890,89	
8	3		-127,36	-127,22	900	3179	1173	2913	725,1	2561,21	945,04	2346,9		51,07	51,25	3446	657	1747	2347	2776,32	529,32	1407,5	1890,89	
9	4		-127,36	-127,22	900	3179	1173	2913	725,1	2561,21	945,04	2346,9		51,07	51,25	3446	657	1747	2347	2776,32	529,32	1407,5	1890,89	
10	5		-127,37	-127,22	900	3180	1173	2914	725,1	2562,01	945,04	2347,71		51,06	51,24	3446	657	1748	2347	2776,32	529,32	1408,3	1890,89	
11	6		-127,34	-127,2	899	3180	1174	2914	724,29	2562,01	945,85	2347,71		51,06	51,24	3447	657	1748	2347	2777,12	529,32	1408,3	1890,89	
12	7		-127,34	-127,2	899	3180	1174	2914	724,29	2562,01	945,85	2347,71		51,07	51,25	3448	657	1748	2348	2777,93	529,32	1408,3	1891,7	
13	8		-127,35	-127,21	900	3180	1174	2914	725,1	2562,01	945,85	2347,71		51,06	51,24	3448	657	1748	2347	2777,93	529,32	1408,3	1890,89	
14	9		-127,35	-127,21	900	3180	1174	2914	725,1	2562,01	945,85	2347,71		51,06	51,24	3446	656	1747	2346	2776,32	528,52	1407,5	1890,09	
15	10		-127,35	-127,21	900	3180	1174	2914	725,1	2562,01	945,85	2347,71		51,06	51,24	3447	657	1748	2347	2777,12	529,32	1408,3	1890,89	

Figure 8 Sensor acquired data

Revision history

Revision	Date	Changes
Rev. 1.0	2020-06-17	• Initial creation

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