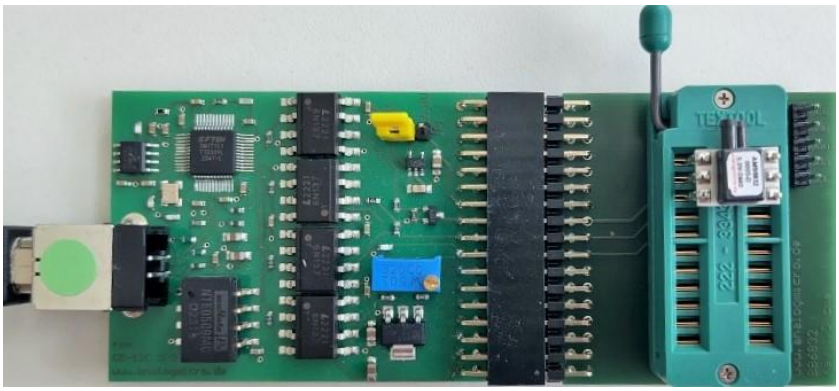
User Guide

Starter Kit AMS 6832



CONTENT

INTRODUCTION

The USB Starter Kit AMS 6832 offers a fast and convenient solution for testing and evaluating AMS 6832 pressure sensors with a standard Windows PC. Without additional components, the kit enables the read out and display of AMS6832's current digital pressure and temperature measurement values. Measurement values can be saved directly to a data file using the integrated data logger. In addition, the starter kit can be used to program an individual I2C address to an AMS 6832. Different I2C addresses are prerequisite for the operation of several AMS 6832 pressure sensors together on one I2C bus. Furthermore, the sampling mode of the AMS 6832 can be changed using the starter kit and set to pressure and temperature measurement with no oversampling (default) or 4x, 8x or 16x oversampling.

Included in the kit are two printed circuit boards CB-I2C and BB6832, the CS6832 software package and a USB cable to connect the hardware to the PC. A Windows PC with USB port and with operating system WIN10 or WIN11 is required. The kit is powered by the USB port, an external power supply is not necessary.

Note: For optimal operation, we strongly recommend to read the AMS 6832 datasheet, before using the starter kit: https://www.analog-micro.com/de/produkte/drucksensoren/board-mount-drucksensoren/ams6832/

HARDWARE

The Starter Kit AMS 6832 hardware consists of two printed circuit boards: the communication board *CB-I2C* and the adapter board *BB6832*. ***Figure 1*** shows the assembled kit with mounted sensor.

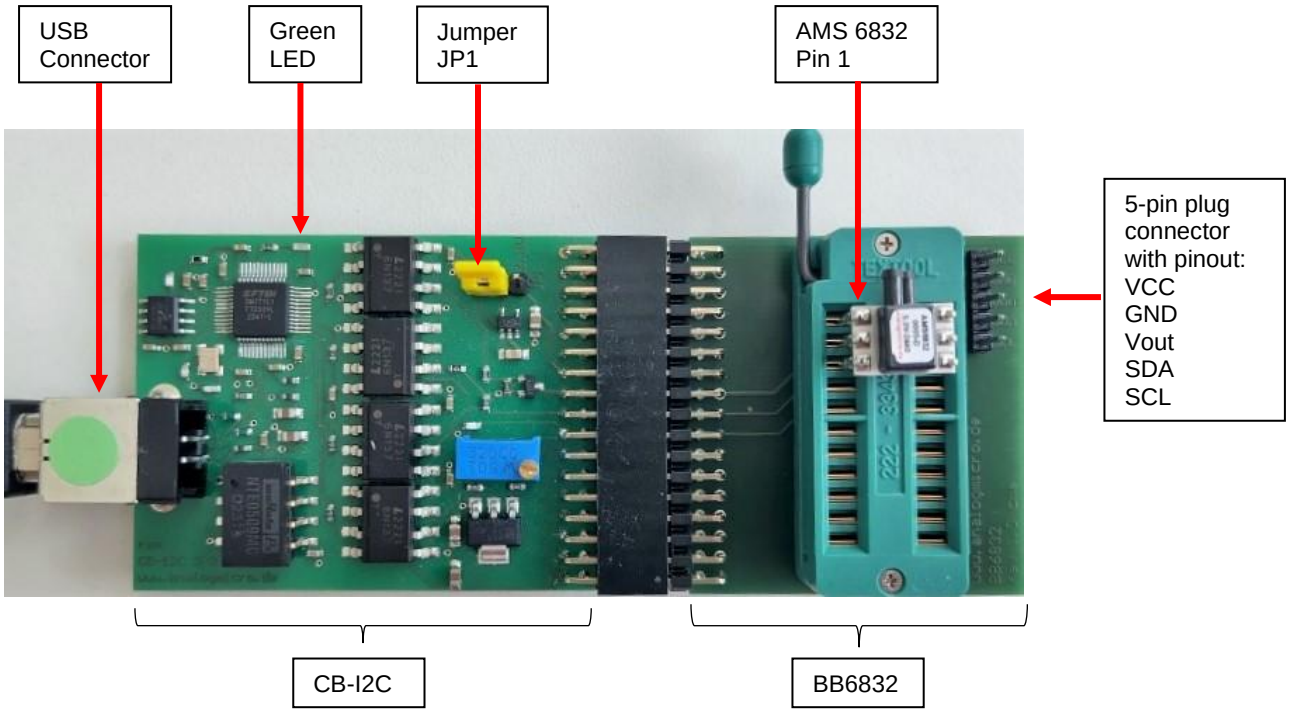


Figure 1: **Assembly of the Starter Kit AMS 6832.** The kit consists of the communication board CB-I2C and the adapter board BB6832, connected by a 34-pin connector. After mounting the AMS 6832 sensor on the ZIF socket with pin 1 flushed to the upper left corner, the lever in horizontal position and plugging in the USB cable into CB-I2C, the hardware is ready to use.

The CB-I2C printed circuit board provides the hardware required to connect a PC via USB-2.0 port to a pressure sensor with I2C interface. The BB6832 printed circuit board provides convenient connection to an AMS 6832 pressure sensor with the CB-I2C via a 34-pin connector. A zero-injection force (ZIF) socket on the BB6832 allows easy mounting and exchanging of the AMS 6832 pressure sensor. Pin 1 of the sensor must be aligned to the upper left corner of the ZIF-Socket and the lever must be in the horizontal position (see ***Figure 1***).

The jumper JP1 on the communication board CB-I2C is by delivery located at the 5 V position.

In addition, the BB 6832 features a 5-pin connector that can be used to monitor the sensor supply or communication, or to connect and test sensors, which are already assembled. The pin assignment is shown in ***Figure 1***. VCC and GND are the power supply pins. Vout is an output pin, where the AMS 6832's ratiometric analog voltage output can be measured. SDA and SCL are the I2C bus lines for data transfer.

To operate the starter kit, use the USB cable to connect the CB-I2C to a free USB-port at the PC. Therewith the starter kit and the connected pressure sensor can be powered without an additional supply.

Important**: If an AMS 6832 sensor is connected to the 5-pin connector on the *BB6832*, the sensor must be powered by the starter kit to ensure the full functionality of the starter kit software.**

SOFTWARE

The free software package CS6832 is delivered on an USB-Stick. Alternatively, a download link is available upon request. The software package enables the communication between the PC and the starter kit hardware.

Installation

For the installation of the software package, administrator rights are necessary. Before starting the installation process, please disconnect the starter kit from the PC. By executing the file *CS6832_rev1.exe*, an installer is started which guides through the installation process. Choose the target directory for the installation of the software package (default directory: C:\Programm Files (x86)\Starter Kit AMS 6832). After the installation of the starter kit software is finished, an additional installation of the USB driver is necessary. The driver installer Driver_Setup.exe can be found in the target directory. Execute the driver installer to make sure that the computer can establish a connection to the starter kit hardware. The USB Starter Kit 6832 is now ready to use and can be connected to the PC.

User Interface

After installation, the CS6832.exe in the target directory can be executed by double click. The software comes up with the user interface shown in ***Figure 2***. The user interface of the CS6832 is structured into four parts, organized in four registers: *Initialization and Communication Check*, *Measurement*, *Data Logger* and *Settings*.
With the *Initialization and Communication Check* register the communication between the computer and the AMS6832 is established and the sensor type is selected. The *Measurement* register offers a quick and easy data readout of the pressure and temperature measurement values of the AMS 6832 sensor. For more detailed data analysis with data logging and included sensor status readout the *Data Logger* register is provided. The options to change the I2C address or the sampling mode (oversampling setting) are located in the *Settings* register. All registers are described in detail below.

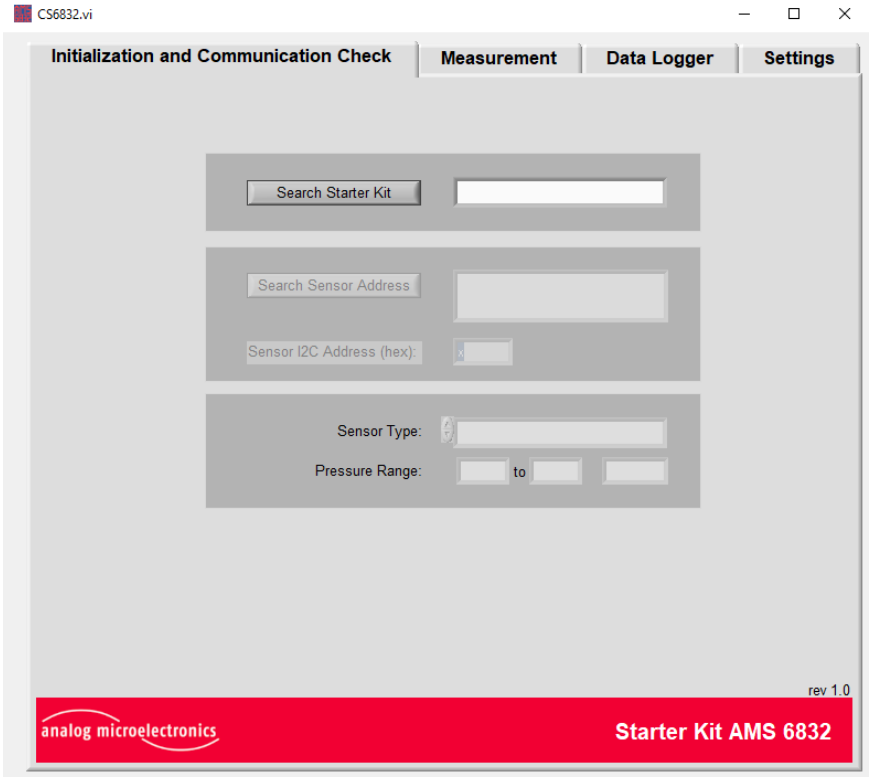


***Figure 2*: User interface.** This is the user interface of the Starter Kit Software CS6832 directly after starting the software.

Register *Initialization and Communication Check*

The *Initialization and Communication Check* register is illustrated in ***Figure 3***. It is activated automatically after starting the software. Following the steps listed below, the intended functioning of the starter kit as well as of the sensor can be verified.

1. Click the *Search Starter Kit* button to establish a connection between the PC and the command board CB-I2C. The successful connection to the CB-I2C is shown in the status field ('Found Starter Kit') and enables the *Search Sensor Address* button. If no starter kit is found check the connection between the computer and the CB-I2C as explained in detail in chapter INITIAL OPERATION.

2. Click the *Search Sensor Address* button to establish the I2C communication with the AMS 6832. The status field on the right of the button displays the sensor status. The field below shows the sensor's I2C address. If an error-free communication with the sensor is accomplished, the status field displays: *Sensor responds*. If no sensor is found, check the proper placement of the sensor, the BB6832 connection to the CB-I2C and the position of the jumper JP1. If the error still remains the sensor might be defect.

3. Select the sensor type of the AMS 6832 series mounted in the ZIF-socket on the BB6832 from the list of the implemented AMS 6832 standard sensor configurations shown in the *Sensor Type* selection register. The corresponding pressure range of the selected sensor type is automatically displayed in the panels below. In case of a customized sensor type select *'Custom Range'* in the *Sensor Type* selection register as shown in ***Figure 4***. Now the individual pressure range can be entered in the entry fields below as well as the corresponding pressure unit.

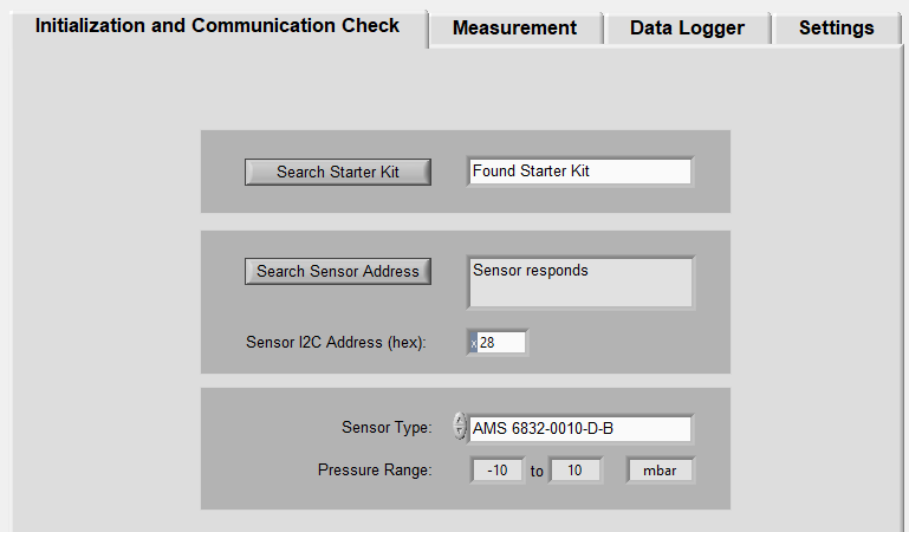


***Figure 3*: *Initialization and Communication Check* Register.** Execute the steps for the initialization of the AMS 6832 Starter Kit and the AMS 6832 sensor from top to bottom. Search for the starter kit and the sensor address to establish the I2C communication. Then select the *Sensor Type* for correct calculation of the sensor's measurement values.

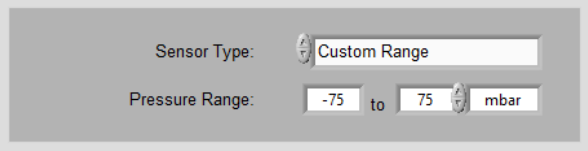


***Figure 4:* Initialize a customized AMS 6832 pressure sensor.** If using an AMS 6832 sensor with a customized pressure range, choose '*Custom Range'* as *Sensor Type* and enter the customized minimum and maximum pressure and the corresponding pressure unit in the fields below.

Register *Measurement*

The *Measurement* register is displayed in ***Figure 5***. In the *Settings* box, the field *Selected Sensor* displays the previously selected sensor type. To calculate the measurement data in physical units, the desired units for *Pressure* and *Temperature* have to be selected. The *Loop Time* defines the time between subsequent measurements for continuous measuring. A measurement is started by using the buttons in the *Measurement* box of the register. The *Single Shot* button triggers a single measurement and data readout cycle of the measurement values. The *Continuous* button starts a continuous measurement and data readout with the selected loop time. The data logging function is activated by the *Data Logger* button. In the *Data Readout* box, the sensor's digital pressure and temperature measurement values as well as the calculated physical values are displayed.

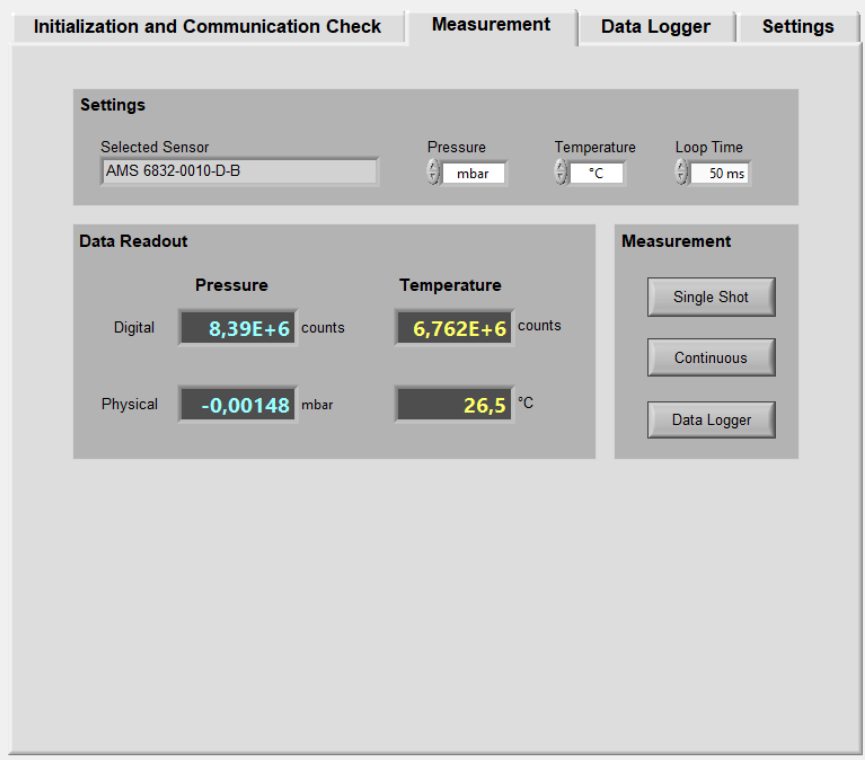


Figure 5: **Measurement Register.** Select the settings for the data measurement and readout in the *Settings* box. Start a *Single Shot* measurement, a *Continuous* measurement or go to the *Data Logger* register by clicking the corresponding buttons in the *Measurement* Box. The measurement values for pressure and temperature are displayed in the *Data Readout* box.

By clicking the *Data Logger* button, a dialog window is opened to select a file name and a location to save the data logger file. After the selection is confirmed the data logging starts immediately and the *Data Logger* register is activated.

Register *Data Logger*

The register *Data Logger*, which is illustrated in ***Figure 6****,* enables a continuous measurement of pressure and temperature data from the AMS 6832 sensor with graphical data display and data logging.
In the *Settings* box, the physical *Pressure* and *Temperature* units for displaying the sensor data can be chosen. Also, the *Loop Time* can be set here. The *Realtime Graph* check box decides whether or not the measurement data are graphically displayed with real time update rate or with reduced update rate to maximize measurement speed. After clicking the *Start* button in the *Logging* box a dialog window opens to select a file path and file name in which the sensor output data will be saved. The default directory for the data logging file is the user's desktop directory.
By confirming the file name and path, the dialog window is closed and the continuous measurement starts. The graph displays the sensor measurement data over time for pressure (blue, left axis) and for temperature (yellow, right axis). Additionally, the current measurement values for pressure *P* and temperature *T* are shown in the upper left corner of the *Graph* box. The slider above selects whether the digital values in counts or the calculated physical values are displayed in the graph. The *Log File Path* field below the graph shows the location of the data file. To end the continuous measurement, click the button in the *Logging* box again which is now named *'Stop'*.

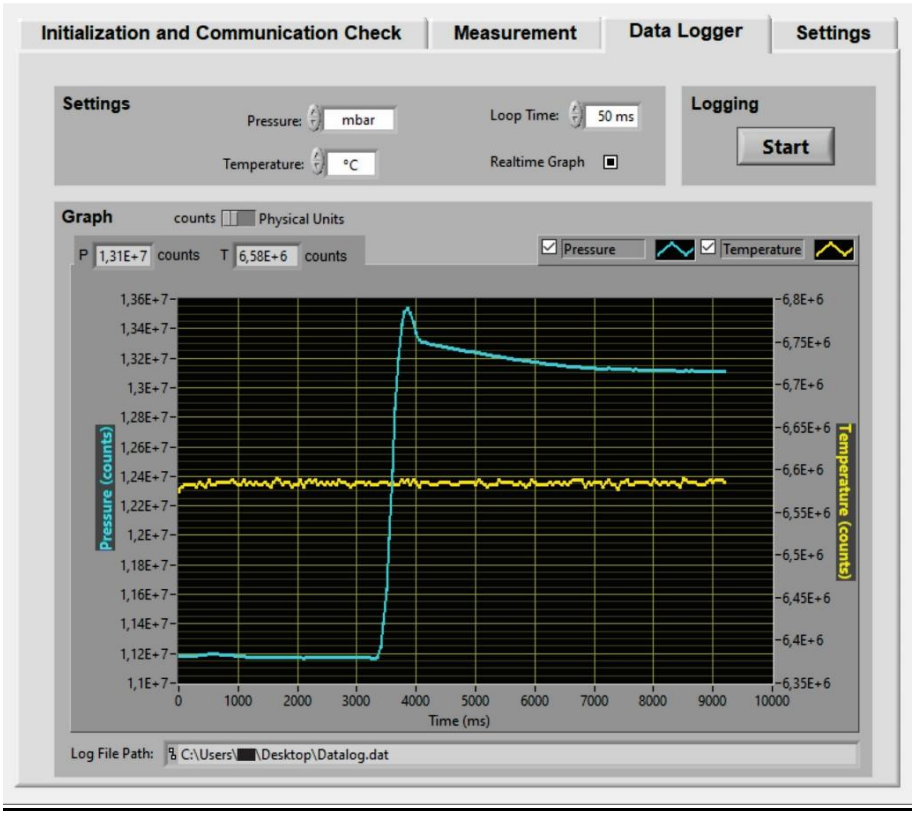


Figure 6: **Data Logger Register.** The button in the *Logging* box of the register starts and stops a continuous data measurement. The pressure and temperature measurement values are displayed graphically and saved in a data file.

The measurement data are stored in the selected data file in the following manner: the measurement time (after start), the time stamp, the pressure in digital and in physical values, the temperature in digital and physical values and the sensor's status byte. The status byte indicating the sensor status is explained in ***Table 1***.

status bit	7	6	5	4	3	2	1	0
default	0	1	1	0	1	0	0	0
meaning	-	-	-	-	-	0, if memory check was passed	-	0, if sensor is not in overflow

Table 1: **Sensor Status.** The data file generated in the *Data Logger* register stores the 8-bit sensor status. The table shows the interpretation of the status. MSB is bit 7.

Note: If a real 10 ms loop time is important for your application, disable the real time graphical display by deselecting the *Realtime Graph* checkbox in the *Settings* box. Therewith the graph is actualized only every 500ms. If the real time function is activated and the data logger is used with a loop time of 10 ms, the number of measurements is restricted to 10 000 (larger numbers delay the measurement).

Register *Settings*

The *Settings* register allows the user to change the characteristics concerning the sensor's I2C address and the sensor's sample mode (oversampling).

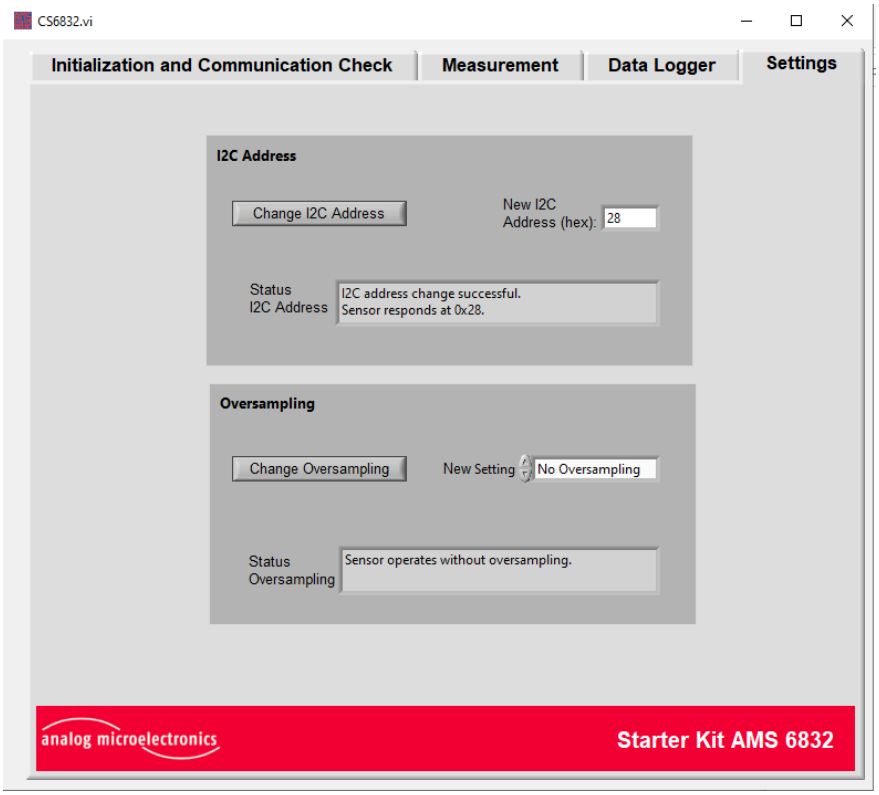


Figure 7: Settings **register.** The I2C address and the sampling mode of an AMS 6832 can be adjusted to the user's application with the functions in the *Settings* register.

I2C Address

AMS 6832's standard I2C address is set by factory to $0x28_{Hex}$. If various AMS 6832 sensors should be used on the same I2C bus or the address $0x28_{Hex}$ is already occupied by another device, a change of the AMS 6832's I2C address is necessary. In general, the I2C addresses from $0x00_{Hex}$ to $0x7F_{Hex}$ with the exception of $0x04_{Hex}$ to $0x07_{Hex}$ are possible.

The I2C address change is performed within the *Settings* register in the *I2C Address* box (see ***Figure 8***). Selecting this register the current AMS6832's I2C address is displayed automatically in the status panel. To execute an I2C address change the new address has to be entered in the *New I2C Address (hex)* panel. Clicking the *Change I2C Address* button performs a complete I2C address change. After a successful change the new address is displayed in the *Status* panel.

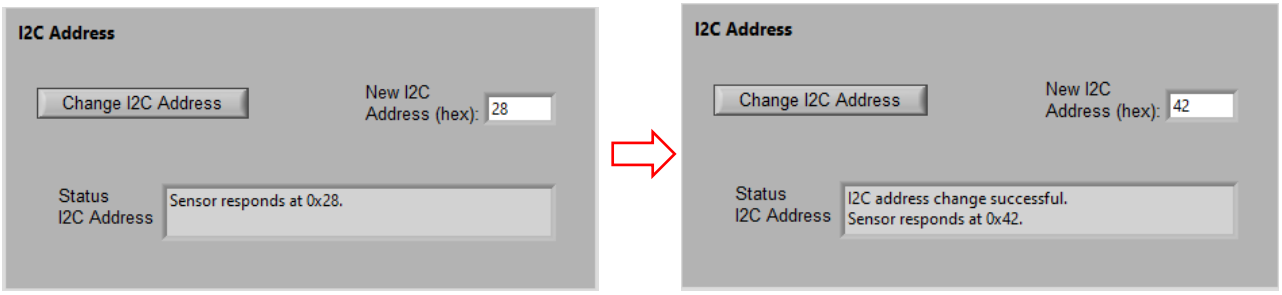


Figure 8: **I2C Address Register**. Left: Display after selecting the *Settings* register, right: Display after executing an I2C address change to the new address $0x42_{Hex}$.

Oversampling

To reduce the noise of the AMS 6832 sensor's digital and analog output signal, the sensor's sampling mode can be adjusted with choosing 4x, 8x or 16x oversampling. The default setting by factory is sampling without oversampling. When oversampling is set to 4x, 8x or 16x oversampling, the AMS 6832 performs four, eight or sixteen full measurement cycles and calculates the mean value. This mean value exhibits lower noise, with a longer measurement time for each measurement cycle. If a noise reduced signal is crucial for your application, the oversampling setting can be changed in the *Oversampling* box. The *Status Oversampling* field shows the sensor's current setting. The *New Setting* field can be changed to the preferred sampling mode and by clicking the *Change Oversampling* button the new setting is programmed to the sensor. The status field actualizes, when the setting is changed successfully.

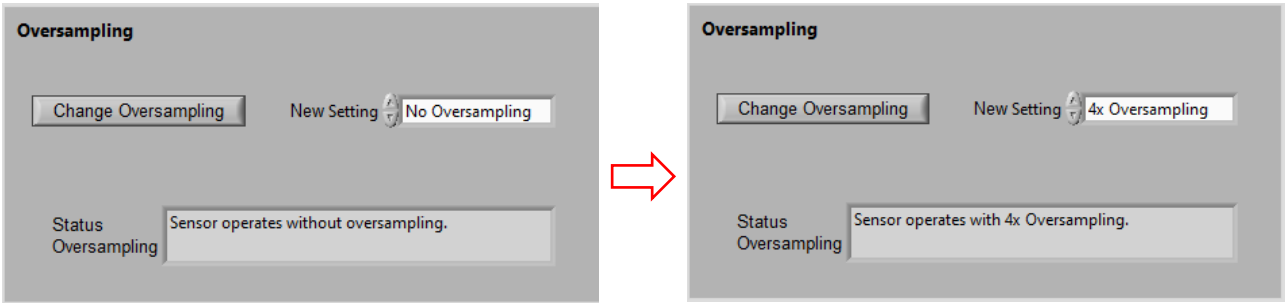


Figure 9: **Oversampling.** Left: Display after selecting the *Settings* register, right: Display after executing an oversampling setting change.

Note: The Starter Kit software adjusts the loop times in the *Measurement* or *Datalogger* register to the selected sampling mode. A 10ms loop time is not possible when operating in 4x, 8x or 16x oversampling mode due to the longer processing times of the sensor.

INITIAL OPERATION

The following steps are necessary for the starter kit initial operation:

1. **Installation of the software package CS6832 and the USB driver**
   Please follow the installation instructions in chapter SOFTWARE on page 4. Execute the CS6832_rev1.exe and the USB driver Driver_Setup.exe on a PC with Windows 10 or Windows 11 operating system. Take care that the starter kit hardware is not connected to the PC.

2. **Assembly starter kit hardware**
   Connect the communication board CB-I2C and the adapter board BB6832 via the 34-pin plug connector. Mount the AMS 6832 sensor onto the ZIF-socket as illustrated in ***Figure 1***. Verify that Jumper JP1 is in the 5V position.

3. **Connect starter kit to the computer**
   Use an USB cable to connect the starter kit hardware's USB jack with a free USB port of a PC. The green LED on CB-I2C flashes, if the starter kit was detected by the computer. The starter kit is now ready to use.

4. **Execute the software**
   The software functions are described in detail in the SOFTWARE chapter.

5. **Possible errors in the register 'Initialization and Communication Check'**
   Message: 'Found no Starter Kit'
   If the green LED on the CB-I2C remains dark, check the correct assembly of the starter kit. Open the Windows Device Manager and check if the starter kit is registered and if the USB driver for the starter kit is installed correctly. Reset the starter kit after driver installation by disconnecting and reconnecting the USB cable from the PC.

   Message: 'No sensor found'
   Check if the AMS 6832 is mounted correctly onto the socket of the adapter board BB6832.
   Check if the jumper JP1 is in the 5V position.

   Message: 'Mode Error'
   The AMS 6832 does not work in the desired mode. The data measurement will not work properly.

   Message: 'Checksum Error'
   The AMS 6832's memory was changed uncontrolled. The sensor may not work properly.

   Message: 'Saturation'
   The pressure applied to the AMS 6832's pressure port(s) is not in the specified pressure range (overflow).

ADDITIONAL DOCUMENTS

See https://www.analog-micro.com/products/pressure-sensors/board-mount-pressure-sensors/ams6832/

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