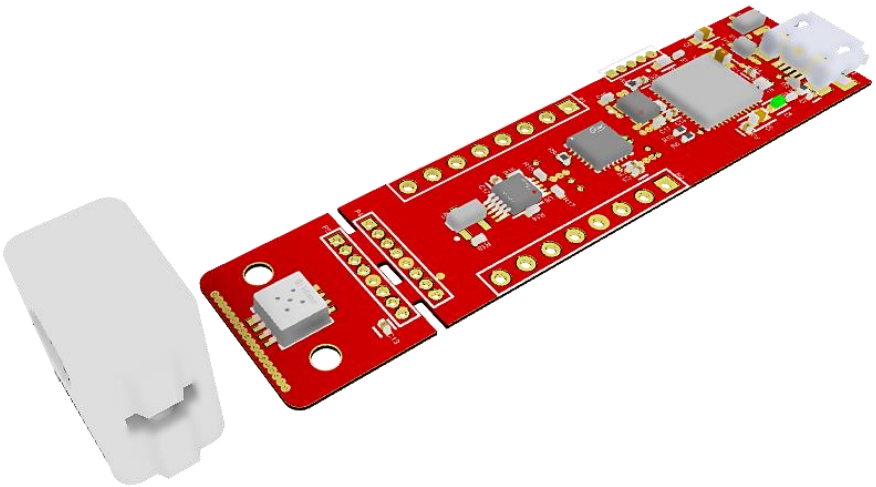
XENSIV™ Pressure Sensor 2GO Kit - KP46x

User guide



About this document

Scope and purpose

This document describes the Hardware and Software functionalities of KP466 Pressure 2Go and KP467 Pressure 2Go kits, named generically in this document as “KP46x Pressure 2Go Kit”.

The KP46x Pressure 2Go Kit allows fast evaluation and provides a better understanding of the KP46x pressure sensors family. The KP46x Pressure 2Go Kit is compatible with the software provided by Infineon via the Infineon Developer Center platform.

Intended audience

This Pressure 2Go Kit user guide is written for hardware and software engineers involved in the evaluation of sensors of the KP46x series.

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1 Introduction

The KP46x Pressure 2Go Kit is a budget-priced evaluation kit enabling the possibility to evaluate the pressure sensors included in the KP46x pressure sensor family. The compatible software provided is designed to visualize data acquired from the KP46x pressure sensors with all supported interface settings and resolutions. The KP46x sensors are used to measure the barometric air pressure, with different pressure and temperature ranges. Compatible sensors are listed in Table 1.

Table 1 Currently supported Sensors of the KP46x family

Sensor	Description and features
KP466	**Default assembly for KP466-PS2GO-KIT** Absolute pressure sensor, 60 to 165 kPa range, temperature measurement range -40 to 125°C
KP467	**Default assembly for KP467-PS2GO-KIT** Absolute pressure sensor, 45 to 200kPa range, temperature measurement range -40 to 105°C, low power mode
KP464	**Alternative assembly*** Absolute pressure sensor, 40 to 115kPa, temperature measurement range -40 to 125°C
KP464E	**Alternative assembly*** Extended temperature transfer function variant of KP464
KP465	**Alternative assembly*** Absolute pressure sensor, 60 to 320kPa pressure measurement range, temperature measurement range -40 to 125°C
KP466P	**Alternative assembly*** Higher precision variant of KP466. Same pressure / temperature range

***Note**: Implies that the graphical user interface software is compatible to this product, but the user shall re-assemble the KP46x-PS2GO-KIT board with the specified sensor, or shall connect an external module based on the specified sensor.*

The KP46x Pressure 2go kits offers a limited set of features, mainly directed towards sensor interface, data acquisition, interpretation and logging. For full set of features, including sensor EEPROM programming, consider using the bundle KP46x EVAL BOARD together with the PGSISI-3 board.

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Getting Started

This chapter describes the required hardware and the installation of the software components of an Evaluation Kit package.

1.1 Evaluation Kit Hardware

1.1.1 Content

The evaluation kit package consists of the following components:

- KP46x-PS2GO-KIT board. Hardware details and revision history are provided within this document.
- Pressure adapter: 3D printed adapter including silicone gasket
- M2 screws & nuts for attaching the pressure adapter to the PCB
- Pneumatic fast connector for 6mm tubes and M5 thread for fastening to pressure adapter.

The evaluation hardware may be ordered online, on Infineon Website or via our Sales channels. The required order numbers are listed in **Table 2**.

Table 2 KP46x Evaluation Kit Hardware list with order numbers

Name	Description	Infineon Sample Request (ISaR) SP Number
KP466-PS2GO-KIT	Pressure 2GO kit assembled with KP466	SP005879969
KP467-PS2GO-KIT	Pressure 2GO kit assembled with KP467	SP005879971

Figure 1 depicts the content of the KP46x-PS2GO-KIT. Please note that this picture is generic and the latest variant might suffer modifications.



Figure 1 KP46x-PS2GO-KIT components.

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1.1.2 Hardware Design

This chapter offers a detailed description on the latest hardware design version of KP46x-PS2GO-KIT board, version V1.1. Please check the Hardware Revision Appendix for details on previous hardware variants.

The hardware is composed of the following main blocks:

- **On-board Debugger** [U3]: the board features an on-board debugger implemented via an XMC4200 microcontroller. This auxiliary microcontroller features a debug probe firmware delivered by SEGGER – JLink. This debugger is used for flashing the target microcontroller and for establishing a serial communication via USB.
- **Target Microcontroller** [U1]: the main microcontroller is an XMC1100, QFN24 package, 64kB of flash. This device handles the communication with the sensor and data forwarding to USB via the debugger.
- **Power supply** [U2]: the TLS202B1MBV33 is being used as LDO for supplying the debugger microcontroller and the target microcontroller with 3.3V. The input voltage is the USB supply – 5V.
- **Application circuit**:
    - Sensor under evaluation [IC1]: default assembled sensor as listed in Table 1. A PMOS transistor is used in series on VDD for turning ON/OFF the power supply.
    - Dual-SPDT switch for SPI lines [U6]: used for allowing user to connect various types of configured SPI interfaces (3-wire, open drain MISO etc.)
- **USB Connector** [J1]: the board is equipped with a micro-USB connector which has a dual purpose:
    - Supplying the board with ~5V from USB port.
    - Ensuring data communication between PC and on-board debugger block.
- **Auxiliary Connectors:** PCB side connectors (P1, P2 – 2.54mm headers, default not assembled), PCB break-out connectors (P4, P5 – 1.27mm headers, default not assembled).

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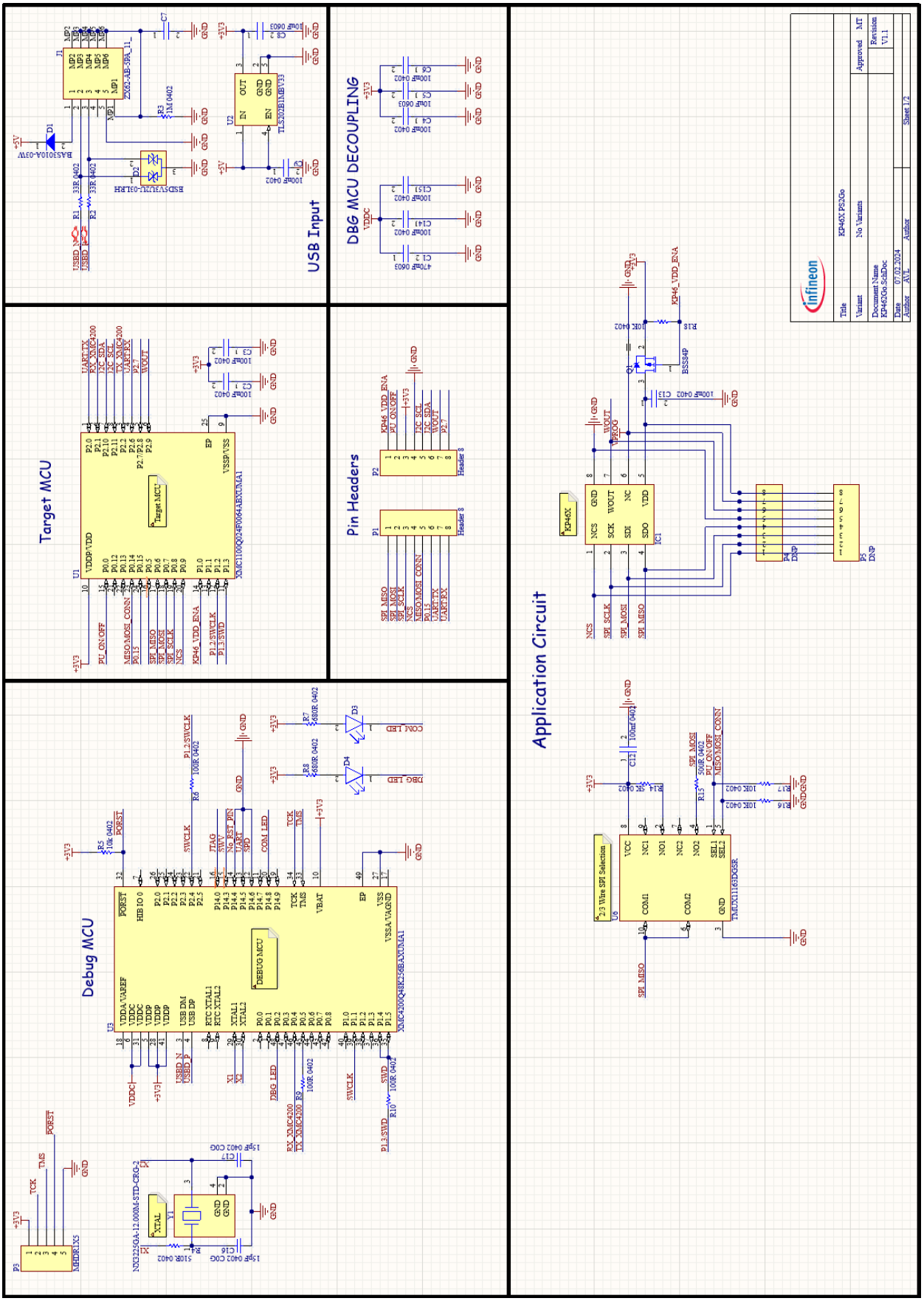


Figure 2 KP46x-PS2GO-KIT schematic design.

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The side connectors P1 and P2 are described below and may be used for debugging, probing or connecting additional hardware:

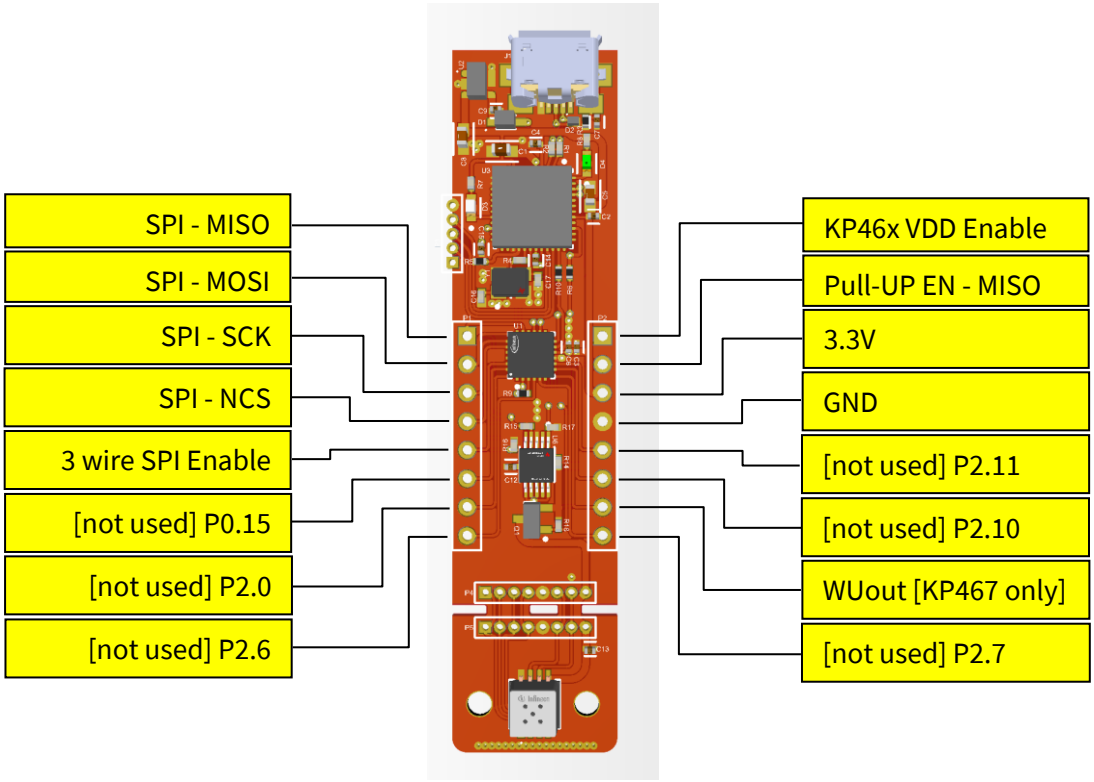


Figure 3 KP46x-PS2GO-KIT side connectors pin-out.

The board comes prepared for allowing users to connect the KP46x sensor remotely, by breaking away the sensor part, as depicted below and reconnecting it to the KP46x-PS2GO-KIT if needed. Please note that bending the PCB for breaking apart the sensor side is not allowed, as this can damage the connectors P4 and P5. A clean cut is required.

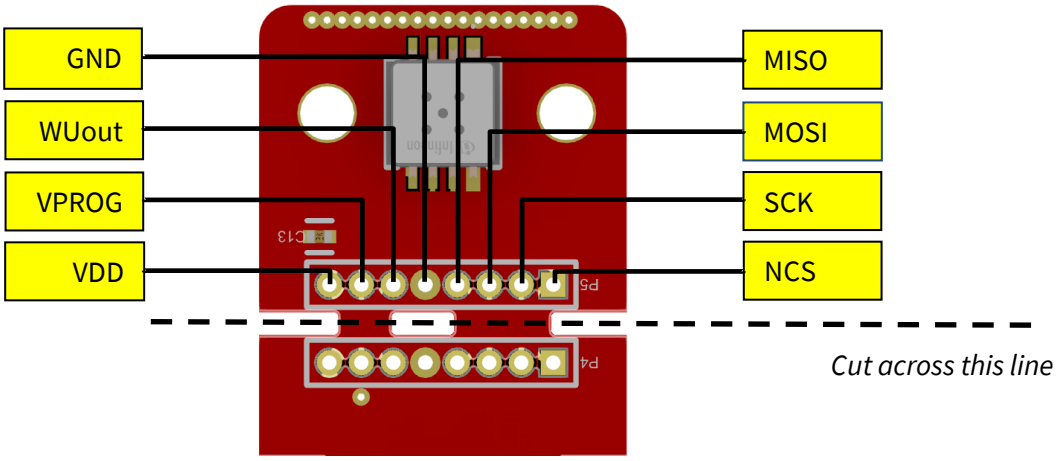


Figure 4 KP46x-PS2GO-KIT Break-Out board pin-out.

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1.1.3 PCB Layout considerations

The design described in section 1.1.2 is physically implemented in PCB technology using a standard process with following characteristics:

- PCB material: FR4
- PCB thickness: 1.6mm +/- 10%
- Copper: 2 layers Top/Bottom, 35µm thickness

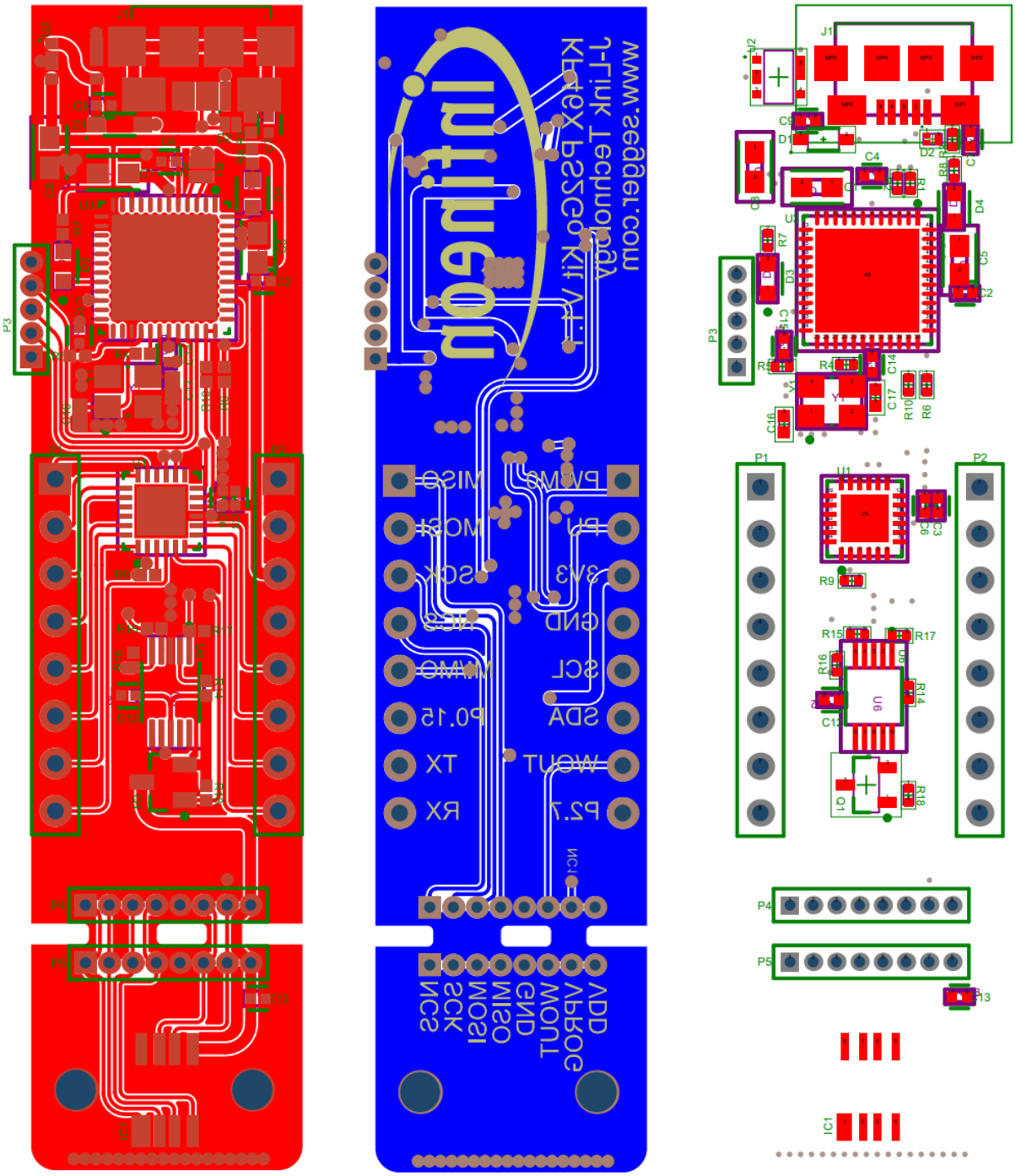


Figure 5 KP46x-PS2GO-KIT PCB Layout Details

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1.1.4 Bill of materials

Table 3 KP46x-PS2GO-KIT PCB Assembly bill of materials

Designator	Description	Quantity	Assembled on PCB	Infineon Part
C1	470nF 0603 10V 10%	1	YES	No
C2, C3, C4, C6, C9, C12, C13, C14, C15	100nF 0402 10V 10%	9	YES	No
C5, C8	10uF 0603 10V 10%	2	YES	No
C7	C0402C104K4RACTU	1	YES	No
C16, C17	15pF 0402 C0G	2	YES	No
D1	BAS3010A-03W	1	YES	**YES**
D2	ESD5V3U2U-03LRH	1	YES	**YES**
D3	150060RS75000	1	YES	No
D4	LTST-C190GKT	1	YES	No
IC1	**KP46x (Evaluated Sensor)**	1	YES	**YES**
J1	ZX62-AB-5PA_31_	1	YES	No
P1, P2	Header 8 pin, 2.54mm pitch	2	**NO**	No
P3	MHDR1X5	1	**NO**	No
P4, P5	Header8 pin, 1.27mm pitch	2	**NO**	No
Q1	BSS84P	1	YES	**Yes**
R1, R2	33R 0402 1%	2	YES	No
R3	1M 0402 10%	1	YES	No
R4	510R 0402 1%	1	YES	No
R5, R16, R17, R18	10k 0402 10%	4	YES	No
R6, R9, R10	100R 0402 10%	3	YES	No
R7, R8	680R 0402 10%	2	YES	No
R14	5K 0402 10%	1	YES	No
R15	500R 0402 10%	1	YES	No
U1	XMC1100Q024F0064ABXUMA1	1	YES	**YES**
U2	TLS202B1MBV33	1	YES	**YES**
U3	XMC4200Q48K256BAXUMA1	1	YES	**YES**
U6	TMUX1136DGSR	1	YES	No
Y1	NX3225GA-12.000M-STD-CRG-2	1	YES	No

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1.2 Software Installation

1.2.1 Requirements

The KP46x Pressure 2GO Kit hardware and software bundle was developed and tested on the following PC configuration:

- Operating system: Windows 10 / Windows 11.
- RAM: 8 GB (maximum RAM usage estimated at 250 MB, when data logging is ON)
- Storage: 512 GB (minimum required for installation: 250 MB, including dependencies)
- CPU: 3 GHz, 4 cores (lower performance CPUs might have an impact on the performance of the graphical user interface)

1.2.2 Software Download

The graphical user interface software is offered free-of-charge on our website, via the Infineon Development Center online platform, section tools, or from the Infineon Developer Center Launcher application. The user may filter the tool list by inserting the text “KP46” and the following record shall appear: ***XENSIV KP2xx & KP46x Pressure Sensors Evaluation App***.

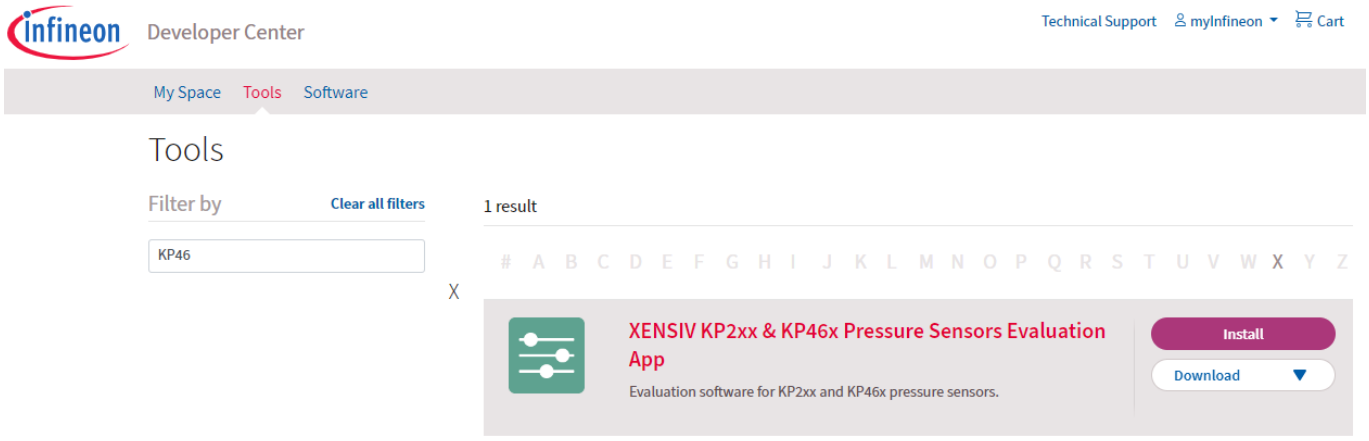


Figure 6 Infineon Development Center – online tools filtering

It is highly advised to install the Infineon Developer Center Launcher application prior to installing the above mentioned app.

Please note that the download of the *XENSIV KP2xx & KP46x Pressure Sensor Evaluation App* is open only for users registered with a MyInfineon Account.

1.3 Software Installation

Download the ***KP2xx & KP46x Pressure Sensors Evaluation App*** from Infineon Website or from Infineon Developer Center Launcher. Install the Evaluation Kit software by double clicking on the installer file. Please notice that administrator rights are required.

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The installer file contains the following elements:

- Binaries / compiled objects needed for running the graphical user interface
- SEGGER JLink Driver for establishing a serial port communication with the on-board debugger
- .NET 4.8 online installer (needed only for older versions of Windows which do not have this already installed). Installation requires stable internet connection.

Installation steps:

- License agreement. It is required that you agree with Infineon Terms and Conditions before continuing

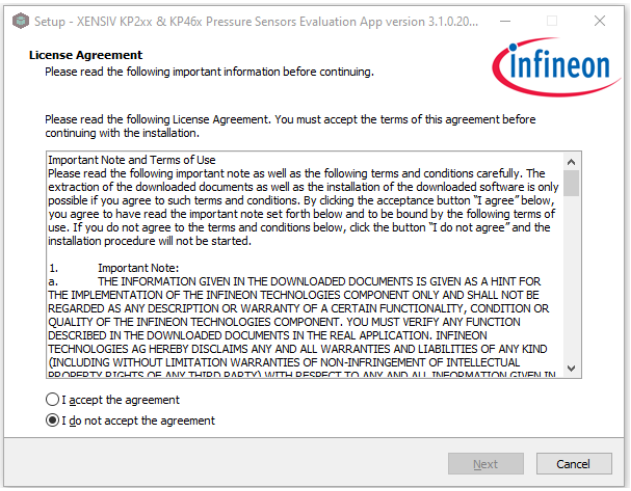


Figure 7 Software Installation Step – License Agreement

- Installation type selection. We recommend using the Quick Installation type. After pressing “Install” the installation process will start.

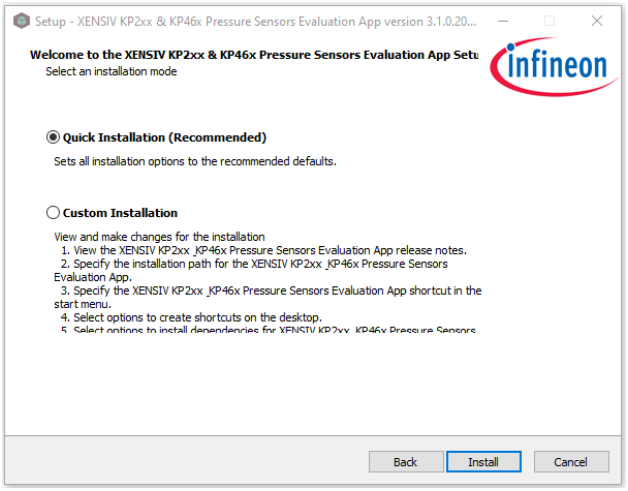


Figure 8 Software Installation Step – Quick Installation

- After the binaries are copied to the installation folder, the user is prompted for installing JLink Segger Driver. If this is already installed on your PC the user can cancel this operation. Please note that by not having this driver installed, the USB connection between PC and the KP46x-PS2GO-KIT board will not function.

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Figure 9 Software Installation Step – SEGGER J-Link Driver Installation

- After the SEGGER JLink driver is installed or the operation is cancelled, the user is prompted for installing .NET Framework 4.8. Please note that for operating systems starting from Windows 10, build 1903 this comes pre-installed and the user is notified that the required package is already installed. If the framework is not already installed, the user shall make sure that an internet connection is in place in order to complete the installation process.

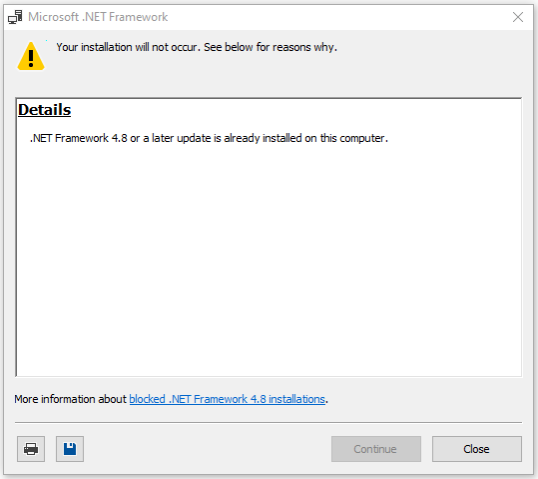


Figure 10 Software Installation Step – .NET 4.8 Installation

The user is notified upon completion of all installer processes and a shortcut is by default created on Desktop. The user may opt for running the installed ***XENSIV KP2xx & KP46x Pressure Sensors Evaluation App***.

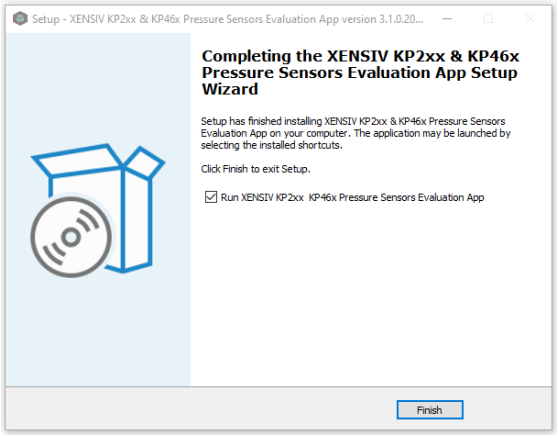


Figure 11 Software Installation Step – Completion

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1.4 Software Uninstall

In order to uninstall the software package, go to '**Start**' -> '**Add or remove programs**' and search for the "*XENSIV KP2xx & KP46x Pressure Sensors Evaluation App"*. Press '**Uninstall**' for deleting the software from your PC.

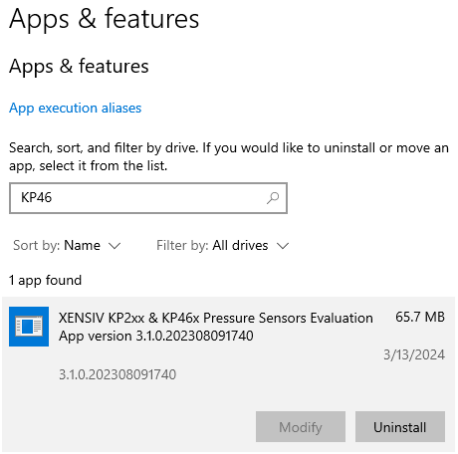


Figure 12 Software Uninstall

All Installation files are deleted from the system except:

- Segger JLink driver, which if needed, can be uninstalled separately .
- .NET 4.8 dependencies, which on most cases are part of the operating system.

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2 Using the Evaluation Software

This chapter describes all features and their usage of the *XENSIV KP2xx & KP46x Pressure Sensors Evaluation App* in correlation with the KP46x-PS2GO-KIT board. Please make sure that the KP46x-PS2GO-KIT is attached to you PC via micro-USB cable before exploring next steps.

2.1 Startup Screen and Connecting to the Programmer

Figure 13 depicts the default screen of the *XENSIV KP2xx & KP46x Pressure Sensors Evaluation App* after startup.

The graphical user interface software will monitor all USB ports and check if any connected device matches the signature of KP46x-PS2GO-KIT. If a match is found, a new device will appear as depicted in Figure 13: “XMC Device on COMx”. By selecting the device, the Graphical User interface will connect and flash the correct firmware for the target microcontroller.

Note: If the target does not feature the latest firmware, the software will update it automatically.



Figure 13 Software Usage: Startup Screen

The *XENSIV KP2xx & KP46x Pressure Sensors Evaluation App* is a graphical user interface compatible with multiple board types including KP215 / KP229 / KP236 / KP254 / KP275 board variants. In the next window, please make sure you select the correct hardware for this use-case: **KP466 or KP467.**

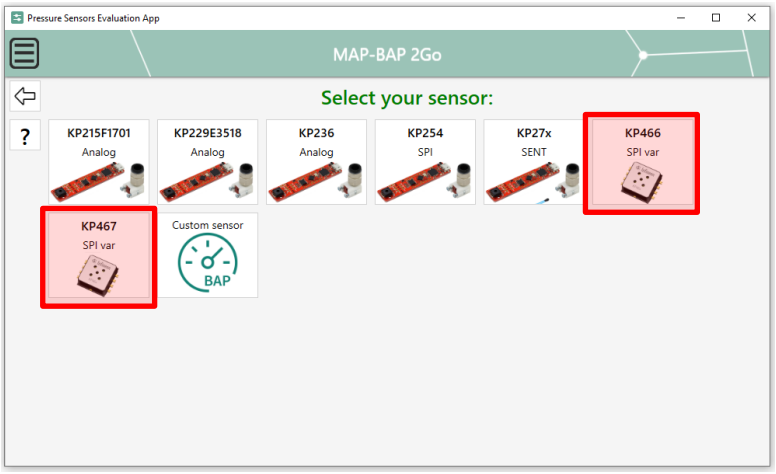


Figure 14 Software Usage: Hardware selection screen

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2.2 Main Window and Graphical Elements

Once a sensor is selected from the hardware selection screen, the graphical user interface changes as it is shown in **Figure 15**. In this example KP466 is used. The main functions are listed below and explained in detail in the following sections.

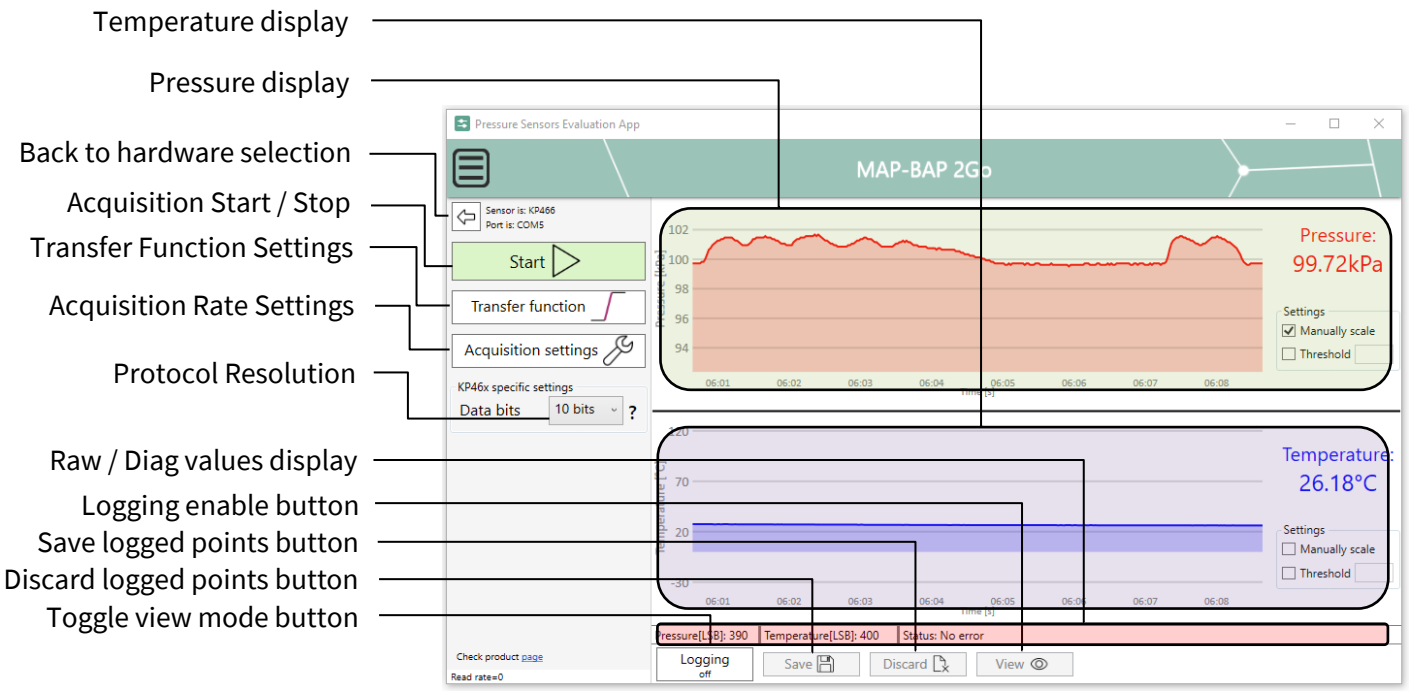


Figure 15 Software Usage: Main Window Description

2.2.1 Sampling Frequency

To customize the SPI acquisition settings the user shall use the “Acquisition settings” function. The default acquisition frequency is set to 2k Samples/second and the user may choose from a list of predefined frequency values described in **Figure 16**. The user may opt for using also the following functions:

- Auto stop: the acquisition will automatically be stopped after a user defined number of minutes.
- Auto log: the acquisition will log only the number of points requested by user.

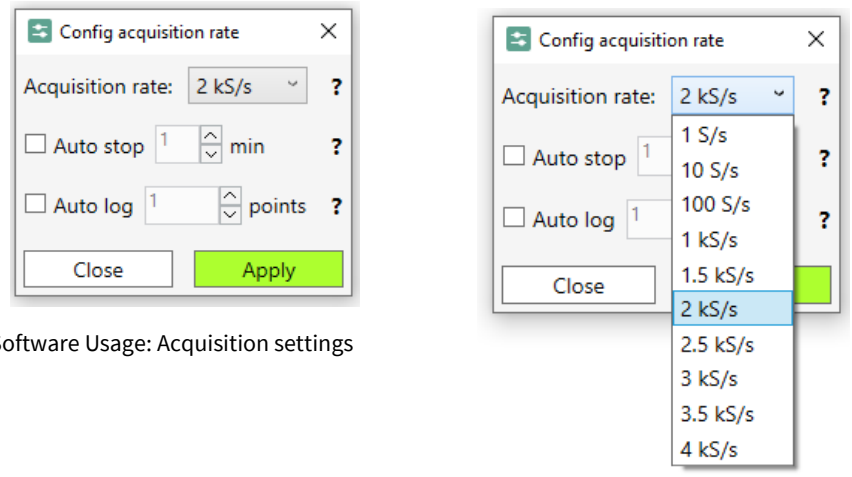


Figure 16 Software Usage: Acquisition settings

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2.2.2 Sensor Data Logging

The user shall first decide on the resolution of the sensor data – by default the software uses the 10 bit data resolution, but the user may opt for changing the resolution to 12 bit or 14 bit data by using the Protocol Resolution combo-box depicted in figure 15.

Before pressing “Start” button, the user shall decide if the acquired data needs to be logged and extracted in CSV format. By default, logging is disabled in order to minimize RAM usage. The user shall click on the “Logging” button, and if the state is changed to “ON”, the software will save all acquired values in RAM. Please note that for protecting RAM usage, it is allowed to store maximum 1.000.000 points – if this limit is reached, a pop-up window will notify the user and data logging will be stopped.

An example sensor readout of 10-bit pressure data using KP466 is shown in **Figure 17**. Here four pressure pulses have been applied to the sensor. The plot on top depicts the measured pressure values, which are converted to kilo-pascal. The plot on bottom side will always log temperature data, converted automatically to degrees Celsius. On the right side of the graphs, the user may configure two settings:

- Manually scale checkbox: this setting will allow user to adjust the scale of the graph by scrolling over it.
- Threshold checkbox: this setting will add an indication line on the plot to the value indicated by user.

Under the temperature plot, the user may find a display of raw data from sensors: Pressure data in LSB, Temperature data in LSB and diagnostic information.

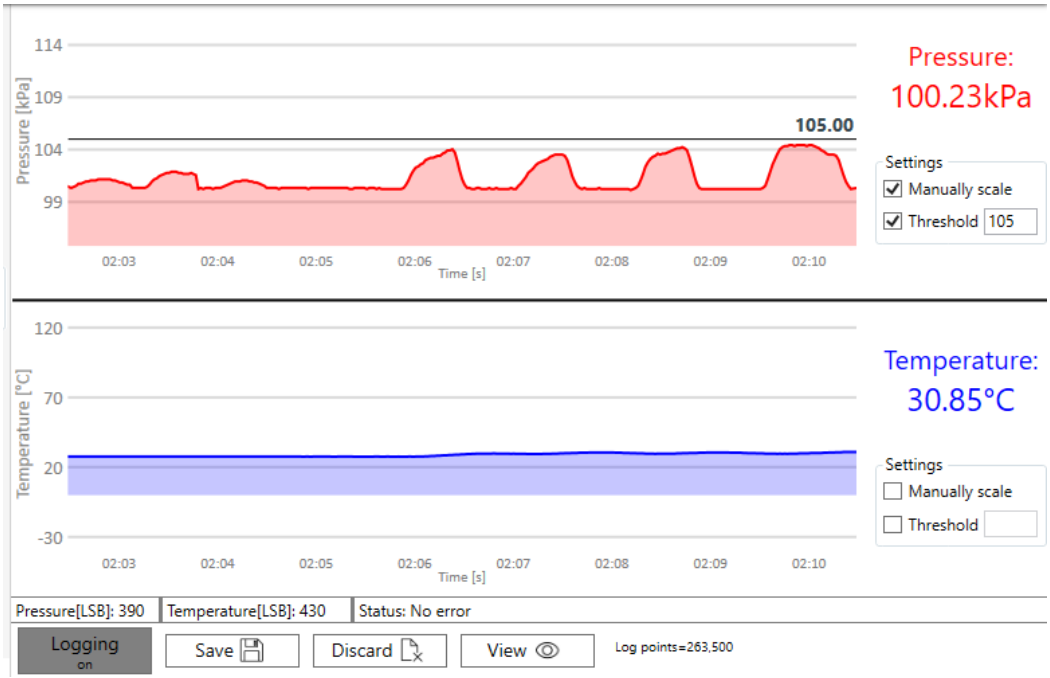


Figure 17 Data Logging Example – Graphical User Interface

After ending the measurement by clicking the STOP button, the user has the following options:

- Discarding acquired data, by pressing the “Discard” button
- Saving acquired data to disk, in CSV format by clicking “Save” button
- Analyzing the acquired data by clicking “View” button.

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The CSV format (Comma Separated Values) implemented in this tool used as delimiter the semicolon sign "**;**". If the default separator of the operating system differs, the user may use the "column split by delimiter" function of post-processing software (e.g. Microsoft Excel).

The exported CSV file has the following structure:

- Header section: in this section, the software will log generic data as sensor name, protocol type, timestamp, number of logged points, acquisition frequency, user comment, transfer functions.
- Data section: each logged line consists of a data bundle containing: index, Pressure data, temperature data, diagnostic data, timestamp.

An example of exported data is depicted in Figure 18.

	A	B	C	D	E	F	G
1	**Column1.1**	**Column1.2**	**Column1.3**	**Column1.4**	**Column1.5**	**Column1.6**	**Column1.7**
2	Date	Thursday.14.March.2024					
3	Time saving started	10.45.38					
4	Sensor name	KP466					
5	Sensor interface	SPIVar					
6	Acquisition rate	2 kS/s					
7	Number of points	1000000					
8							
9	Comment:	Acquisition 1_4 pulses					
10							
11							
12	Pressure Transfer Function	Sp:9.74285714285714	Offsp:-584.571428571429	Min input[kPa]:60	Max input[kPa]:165	Min output[LSB]:0	Max output[LSB]:1023
13	Temperature Transfer Function	Sp:6.2	Offsp:238.7	Min input[C]:-38.5	Max input[C]:126.5	Min output[LSB]:0	Max output[LSB]:1023
14	Sample Index	Pressure[kPa]	Pressure[LSB]	Temperature[C]	Temperature[LSB]	DiagnosisPressure	TimeStamp[ms]
15	0	100.34	0x0189	28.44	0x019F	No error	0
16	1	100.34	0x0189	28.44	0x019F	No error	0.5
17	2	100.34	0x0189	28.27	0x019E	No error	1
18	3	100.34	0x0189	28.44	0x019F	No error	1.5
19	4	100.34	0x0189	28.44	0x019F	No error	2
20	5	100.34	0x0189	28.44	0x019F	No error	2.5
21	6	100.34	0x0189	28.44	0x019F	No error	3
22	7	100.34	0x0189	28.44	0x019F	No error	3.5
23	8	100.34	0x0189	28.44	0x019F	No error	4
24	9	100.34	0x0189	28.44	0x019F	No error	4.5

Figure 18 Data Logging Example – Exporting in CSV format

If the user opts for analyzing recorded data by clicking the "View" button, a pop-up window is displayed, comprising of two scrollable plots containing all data recorded in RAM. The user can zoom in at point level.



Figure 19 Data Logging Example – Data Analysis

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2.2.3 Custom transfer function setting

The KP46x-PS2GO-KIT board comes by default assembled with the KP466 or the KP467 sensor which is pre-calibrated during production. If the customer acquired from Infineon a customized variant of the KP46x family, having a different pressure or temperature transfer function, the user of the software can adjust the transfer function directly in the software by using the Transfer Function Settings function.

The user shall input the pressure / temperature range (minimum and maximum) and the LSB data range. The software will compute automatically the offset and sensitivity parameters which will be used for converting the raw LSB data acquired from sensor into pressure (kPa) and temperature (°C).

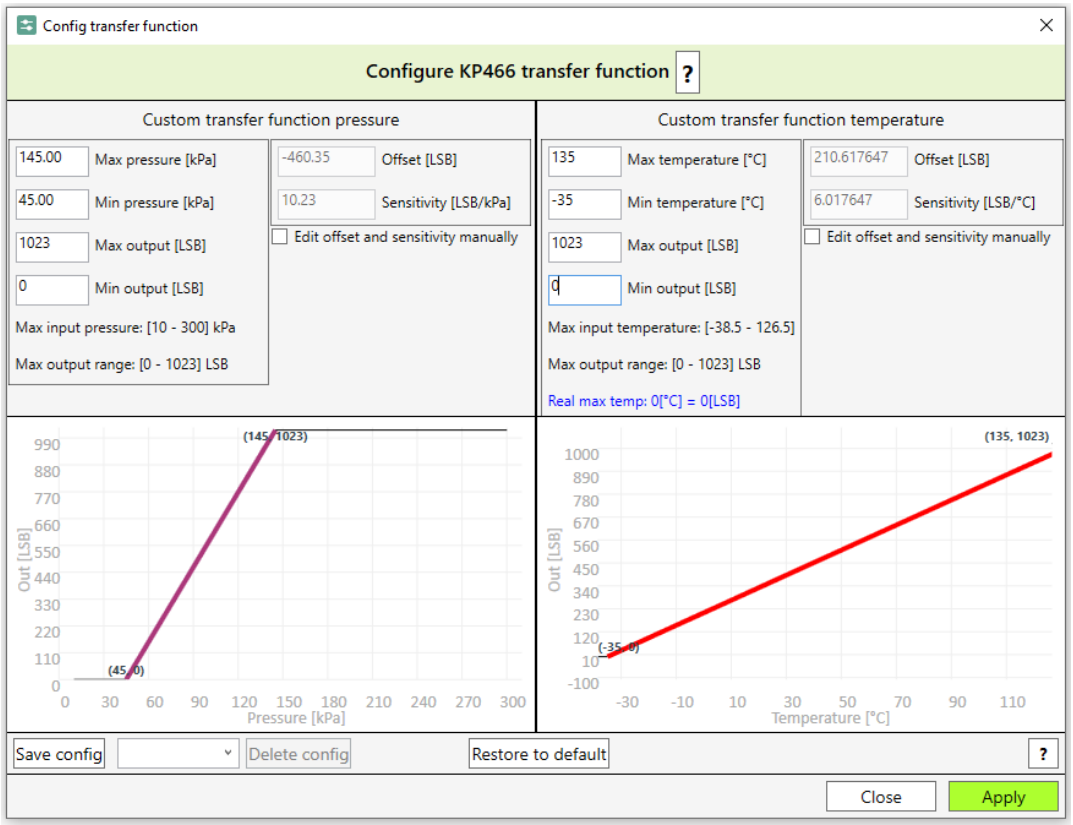


Figure 20 Customized transfer function

2.2.4 KP467 Specific Software Features

Compared to KP466, the KP467 sensor features a configurable low-power monitoring mode, which can be used by customers in order to detect pressure anomalies while keeping a low power consumption. The KP46x-PS2GO-KIT is used only for demonstrating this feature of KP467, but the user will not be able to change the low-power monitoring mode configuration (thresholds, repetitions, duration) as these parameters are stored inside the sensor EEPROM and this kit does not implement EEPROM reading / programming functionality.

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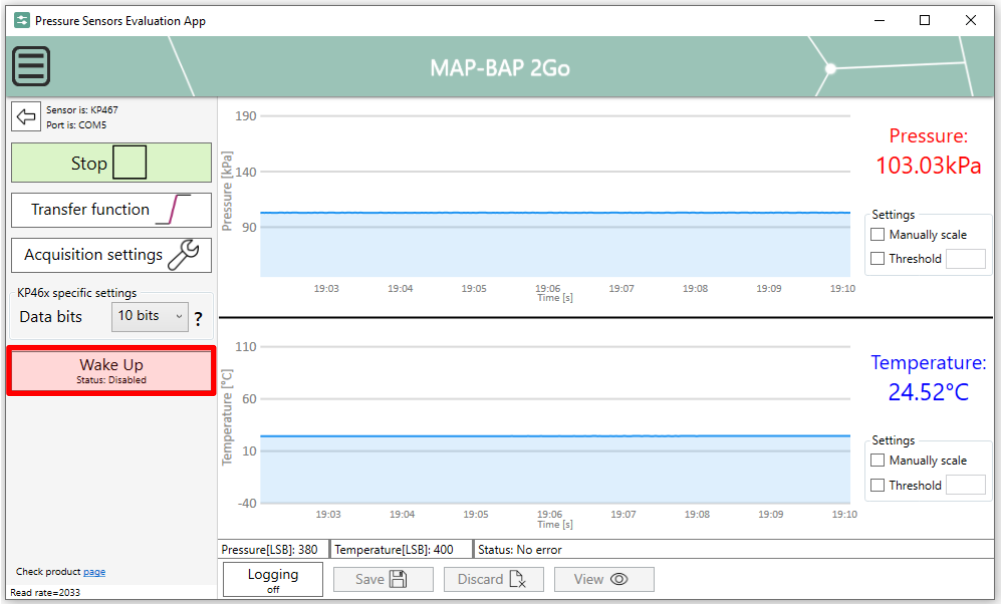


Figure 21 KP467-PS2GO-KIT: Custom Main Window

Figure 21 depicts an additional function only available for KP467 products: Wake-up feature, related to the low power monitoring mode functionality. After pressing the “Wake Up” button, a new pop-up window will appear as depicted in Figure 22. Please note that upon pressing this button, the readout in main window is automatically stopped.

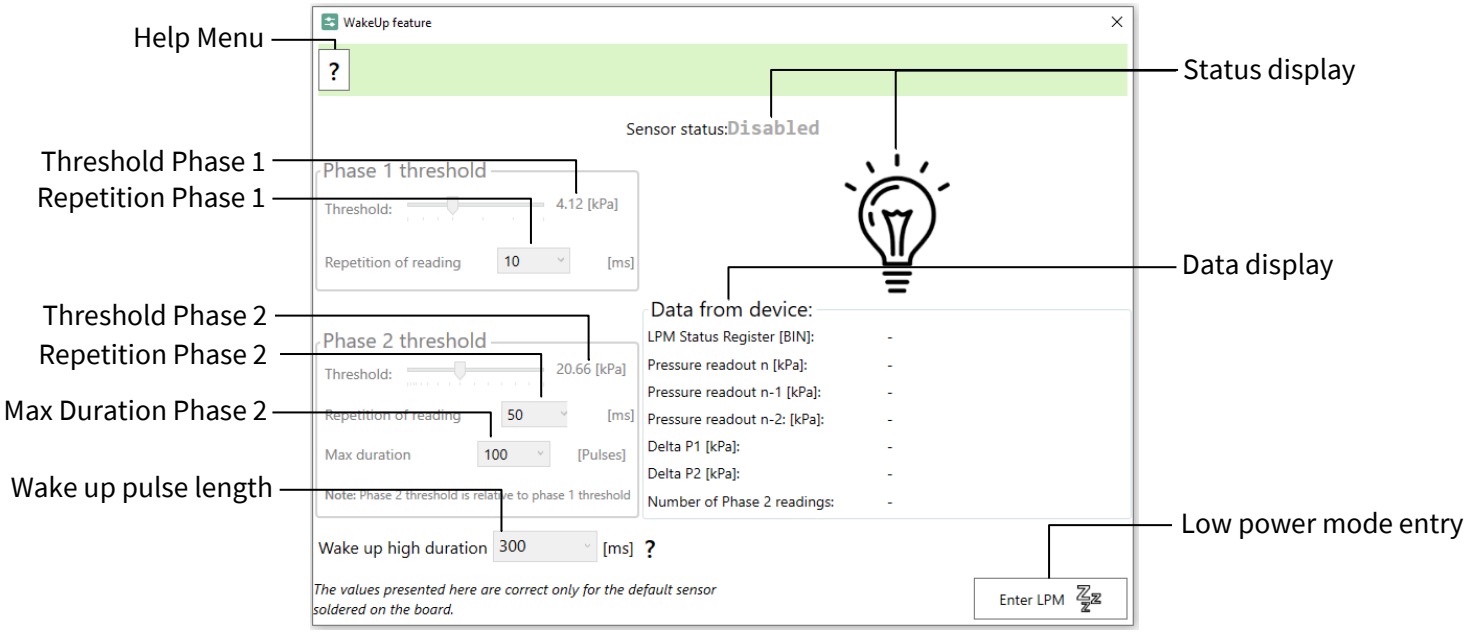


Figure 22 KP467-PS2GO-KIT: Low-power monitoring window

Please note that all settings related to thresholds, repetition, maximum duration, wake-up high duration depicted in Figure 22 are valid only for the default KP467 assembled sensor. If the user connects a KP467 sensor with modified EEPROM LPM configuration, the indications of this menu will no longer be valid. The KP46x-PS2GO-KIT is not prepared for establishing Programming Mode, therefore access to internal EEPROM registers is not possible.

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When the user presses the “Enter LPM” button, the KP467 sensor is put into Low Power Monitoring Mode and the software behavior will change from continuous triggering readouts, to waiting an event on Wake-UP pin. If the Wake-up pin is triggered by meeting the set pressure thresholds, the software will report the value of the LPM status register, previous three pressure readouts and the number of Phase2 readings as depicted in Figure 23.

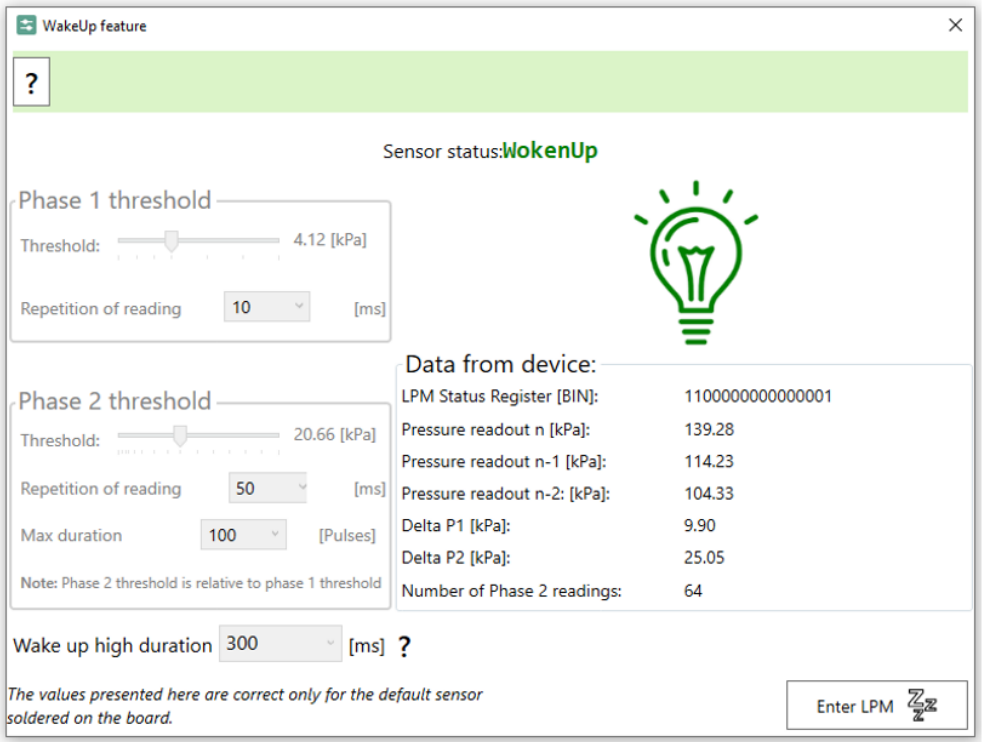


Figure 23 KP467-PS2GO-KIT: Wake-up event

Please note that any activity on SPI interface will disable the low-power mode. Restarting the data acquisition in the main window will lead to deactivation of the low-power mode as well.

2.2.5 Dealing with Alternative Assembly Parts

As described in the Introduction chapter, the KP46x-PS2GO-KIT board comes pre-assembled either with the KP466 or the KP467 sensor. The user may opt for changing the on-board sensor with any other sensor from the KP46x family by re-assembling the PCB. The software is prepared for dealing with alternative parts.

In the hardware selection window, the user may opt for working with a “Custom sensor”(Figure 24).

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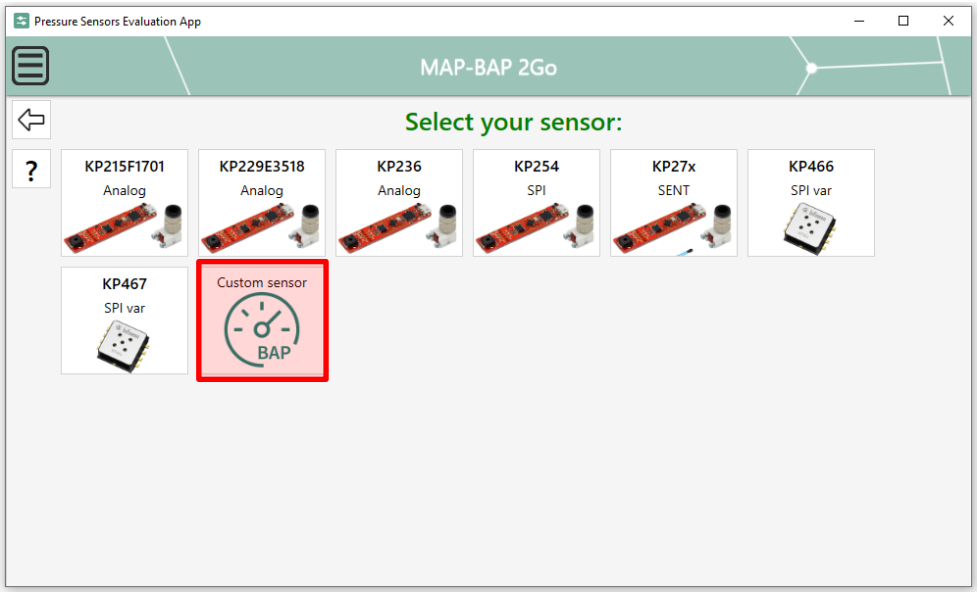


Figure 24 Customized sensor selection

When clicking on “Custom sensor” selection, the user is prompted to search or navigate to the desired sensor.

By selecting for example, the KP464, the software will adjust the pressure and transfer functions automatically to match the KP464 specifications.

Alternatively, the user may introduce the KP464 transfer function parameters manually in the “Transfer Function Settings” window.

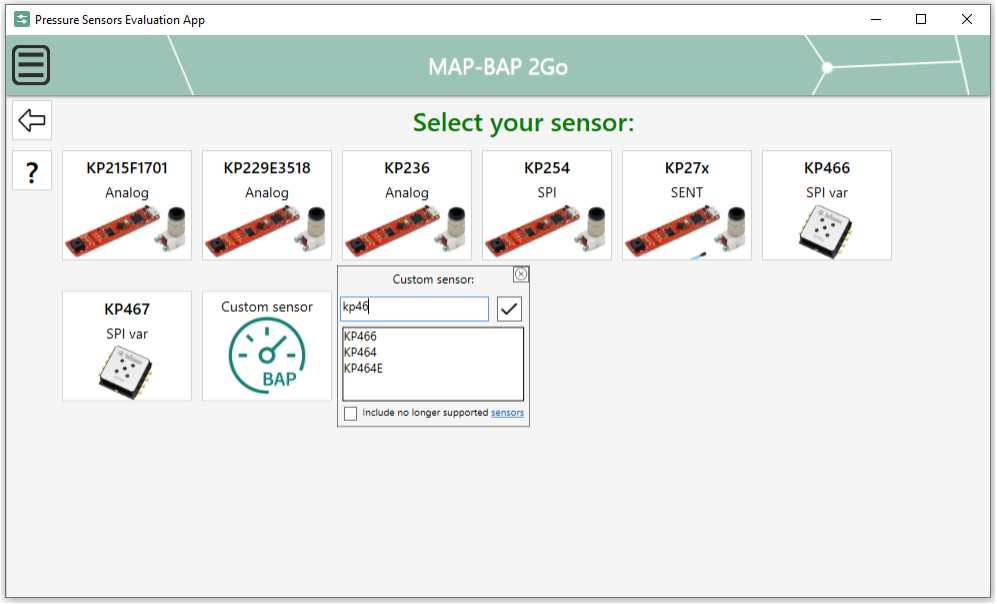


Figure 25 Customized sensor selection by search

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APPENDIX 1 – Hardware Revision History

The chapter **1.1.2 Hardware Design** of this document describes the current state of the hardware: revision V1.1. This APENDIX will highlight the main hardware modifications implemented from revision 1.0 (first release) to current revision.

Schematic design of KP46x-PS2GO-KIT, V1.0:

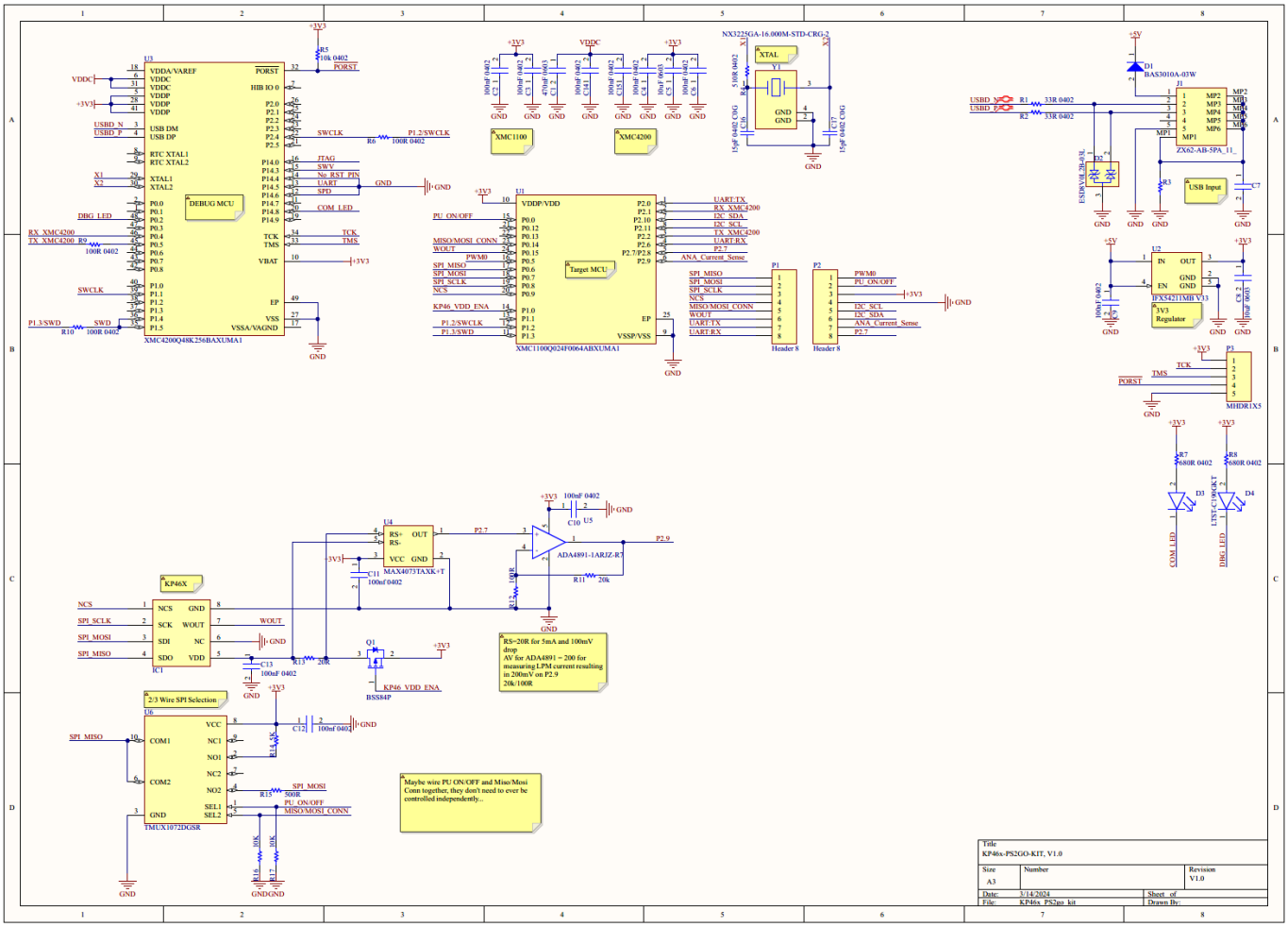


Figure 26 Hardware Revision History – version V1.0

The following changes were implemented in revision V1.1:

- Removal of current sensing circuit (U4, U5 and auxiliary components)
- Modified WUout Pin routing to Microcontroller from P0.15 to P2.9
- Correction: layout text mask not documenting revision and name of the board.
- Correction in layout: VPROG pin not connected to GND plane – allowing re-programmability after sensor board break-out

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Revision history

Document version	Date of release	Description of changes
V1.0	11.04.2024	First release

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