

USER MANUAL

EVALUATION BOARD FOR
DIFFERENTIAL PRESSURE SENSOR
PDUS

25132545xxx9x

VERSION 2.1

OCTOBER 25, 2024

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

Revision history

Manual version	Product version	Notes	Date
1.0	1.0	<ul style="list-style-type: none"> Initial release of the manual 	October 2019
2.0	2.0	<ul style="list-style-type: none"> Adapting the manual to company's new corporate design Added figure 1 Added new evaluation board part numbers 2513254515491, 2513254510192 and 2513254510492 to section 1.2 Added section 1.4 for the EV boards with horizontal-barbed nozzle sensors Updated section 2.2: Schematic diagram Added section 2.3 	July 2023
2.1	2.1	<ul style="list-style-type: none"> Updated section Schematic diagram and Layout to version 2.1 Updated section Important notes and Legal notice 	October 2024

Abbreviations

Abbreviation	Description
I ² C	Inter integrated circuit
MEMS	Micro electro mechanical system

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1 General description

1.1 Introduction

This EV-Board provides a straightforward and cost-effective option to test and evaluate the differential pressure sensors from Würth Elektronik eiSos. It can be connected to the host controller (e.g. Arduino) using I²C interface pins. Through hole pin header connections allow the board to be mounted on a bread board.

The differential pressure sensor (Part No: 25131308xxx01) is a MEMS based 15-bit piezo-resistive pressure sensor with a digital I²C and an analog interface. The sensor EV-Board is available in five pressure measurement ranges from 0.1 kPa to 1000 kPa (see table 1). In addition to the sensor and decoupling capacitors, the EV-Board consists of a mounted adapter with two nozzles. Pneumatic tubes can be connected to the nozzles. Barbed nozzle design improves the overall mechanical stability of the connection.

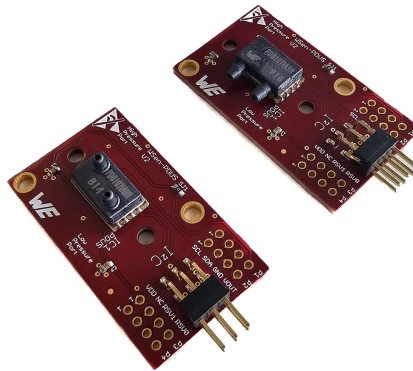


Figure 1: EV-Board for the differential pressure sensor

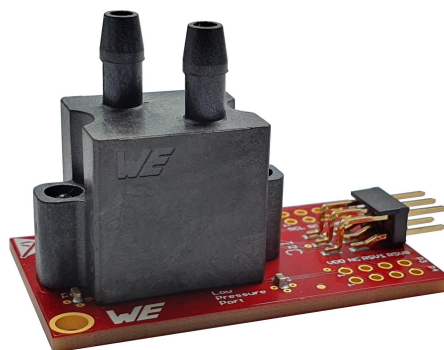


Figure 2: Evaluation board for the differential pressure sensor with mounted adapter

1.2 Ordering Information

WE order code	Pressure range [kPa]	Sensor Marking	Sensor Part Nr.	Operating Voltage
2513254510091	± 0.1	PDB100IA0N	2513130810001	5V
2513254510191	± 1	PDB101IA0N	2513130810101	
2513254510291	± 10	PDB102IA0N	2513130810201	
2513254510391	0 to 100	PDU103IA0N	2513130810301	
2513254510491	-100 to 1000	PDU104IA0N	2513130810401	
2513254515491	0 to 1500	PDU154IA0N	2513130815401	
2513254510492	-100 to 1000	PDU104IA3N	2513130810402	3.3V
2513254510192	± 1	PDU101IA3N	2513130810102	

Table 1: Ordering information



EVAL boards with order codes 2513254510192 does not include the adapter, o-rings and snap-rivets.

1.3 Vertical Nozzles

Sensors with vertical straight nozzles are recommended to be used for manifold mounting. For the evaluation boards with vertical straight nozzles, additional mounting accessories are also provided.

1.3.1 Material Contents

- **1 differential pressure sensor board:** With digital I²C and analog output; Includes all necessary de-coupling capacitors and SMT pin header
- **1 Adapter:** With barbed nozzles that can fit the pneumatic tubes with inner diameter 4 mm. (recommended tube: Festo PUN-6x1-XX)
- **2 O-rings:** 1.8 x 2 mm rubber (NBR-70) O-ring for sealing
- **2 Snap-rivets or Screws:** Provides quick and robust connection of the adapter with the PCB. Snap-rivets for operating pressure <500 kPa and screws (M3) for higher operating pressure >500 kPa.



EV-Board with order codes 2513254510091, 2513254510191, 2513254510291 and 2513254510391 are shipped with snap-rivets.



EV-Board with order code 2513254510491, 2513254515491 and 2513254510492 are shipped with screw fasteners.



Figure 3: EV-Board for the differential pressure sensor

1.3.2 Assembly

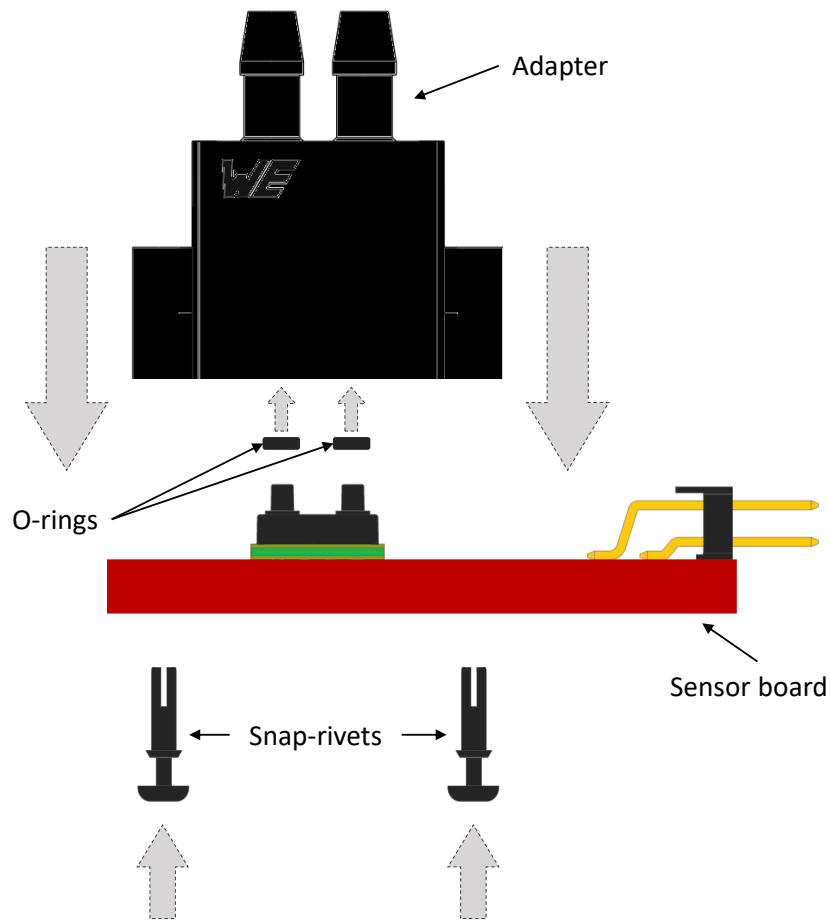


Figure 4: Assembly of the EV-Board



Warning: The adapter can withstand pressure upto 1000 kPa. Do not apply more than 1000 kPa to the adapter.

1.4 Horizontal Nozzles

The evaluation boards featuring horizontal-barbed nozzle sensors do not come with additional adapter, O-rings, and snap-rivets. The design of the barbed nozzle enables a direct tube connection to the sensor, eliminating the need for manifold mounting. For a secure and reliable connection to the sensor, it is advised to use a tube with a 2 mm inner diameter.

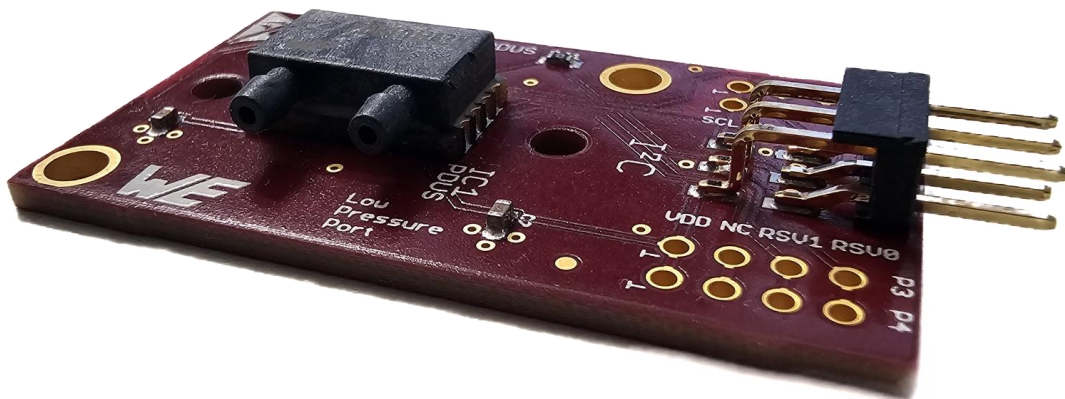


Figure 5: Assembly of the evaluation board (horizontal-barbed nozzles)

2 Functional description

The differential pressure sensor EV-Board supports the standard I²C communication interface as well as analog voltage output.

- A positive supply voltage 5 V or 3.3 V is applied to the sensor through *VDD* pin.
- The I²C interface pins *SDA* and *SCL* are connected with the interface pins on the host controller side
- 7-bit slave address of the differential pressure sensor on the board is 0x78.



SDA and *SCL* pins must be connected to the *VDD* through pull-up resistors on the host controller (master) side. There are no-pull up resistors on the sensor board (slave)



In case the host controller is working on 3.3 V, proper hardware set up including level-shifters and stable 5 V power supply must be used to power up the EV boards with the sensors operating on 5 V supply.

Pin No.	Name	Function	Input/output	Comments
1	<i>SCL</i>	I ² C serial clock	Input	
2	<i>SDA</i>	I ² C serial data	Input/Output	
3	<i>GND</i>	Negative supply voltage	Supply	
4	<i>VOUT</i>	Analog output	Output	
5	<i>VDD</i>	Positive supply voltage	Supply	
6	<i>NC</i>	No connection		
7	<i>RSVD</i>	Reserved		Do not connect
8	<i>RSVD</i>	Reserved		Do not connect

Table 2: Pin description of the sensor



Please refer to the corresponding data sheet of the sensor (Part No: 25131308xxxxx) for more information about the sensor parameters and electrical properties.

2.1 EV-Board in operation

2.1.1 Pin header connection

Pin no.	Description
1	GND
2	SCL
3	SDA
4	Not connected
5	VOUT
6	VDD

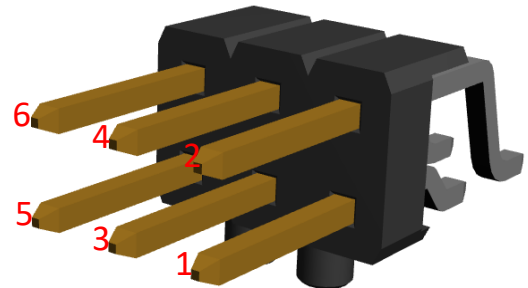


Table 3: Pin header connection to external boards

2.1.2 Analog Output

SJ1 is assembled with a 0 Ω resistor enabling the analog voltage output. The analog output can be read directly through the pin 5 (VOUT) of the pin header connection.

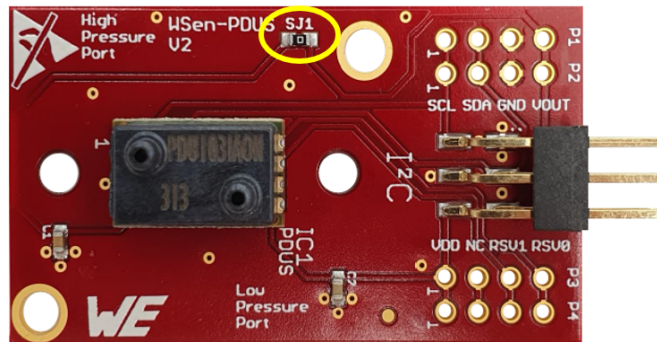


Figure 6: Analog output resistor



By removing the 0 Ω resistor (SJ1), the analog output can be disabled.

2.1.3 Through hole connection

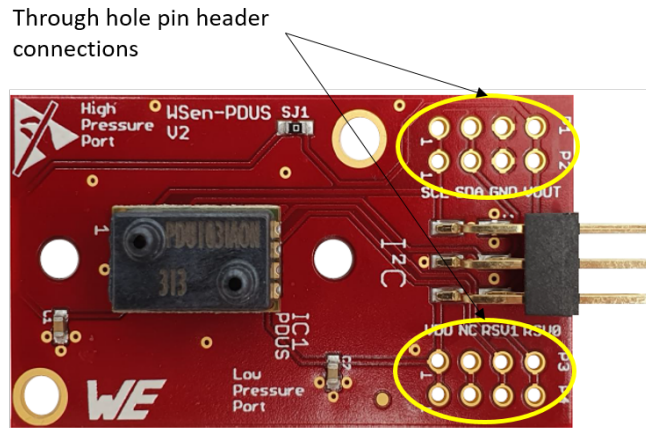


Figure 7: Through hole connection



Please refer to Table 2 for the pin description of the sensor.



Please refer to the user manual of the differential pressure sensor for information regarding the conversion of digital and analog values into pressure SI unit.

2.2 Schematic diagram

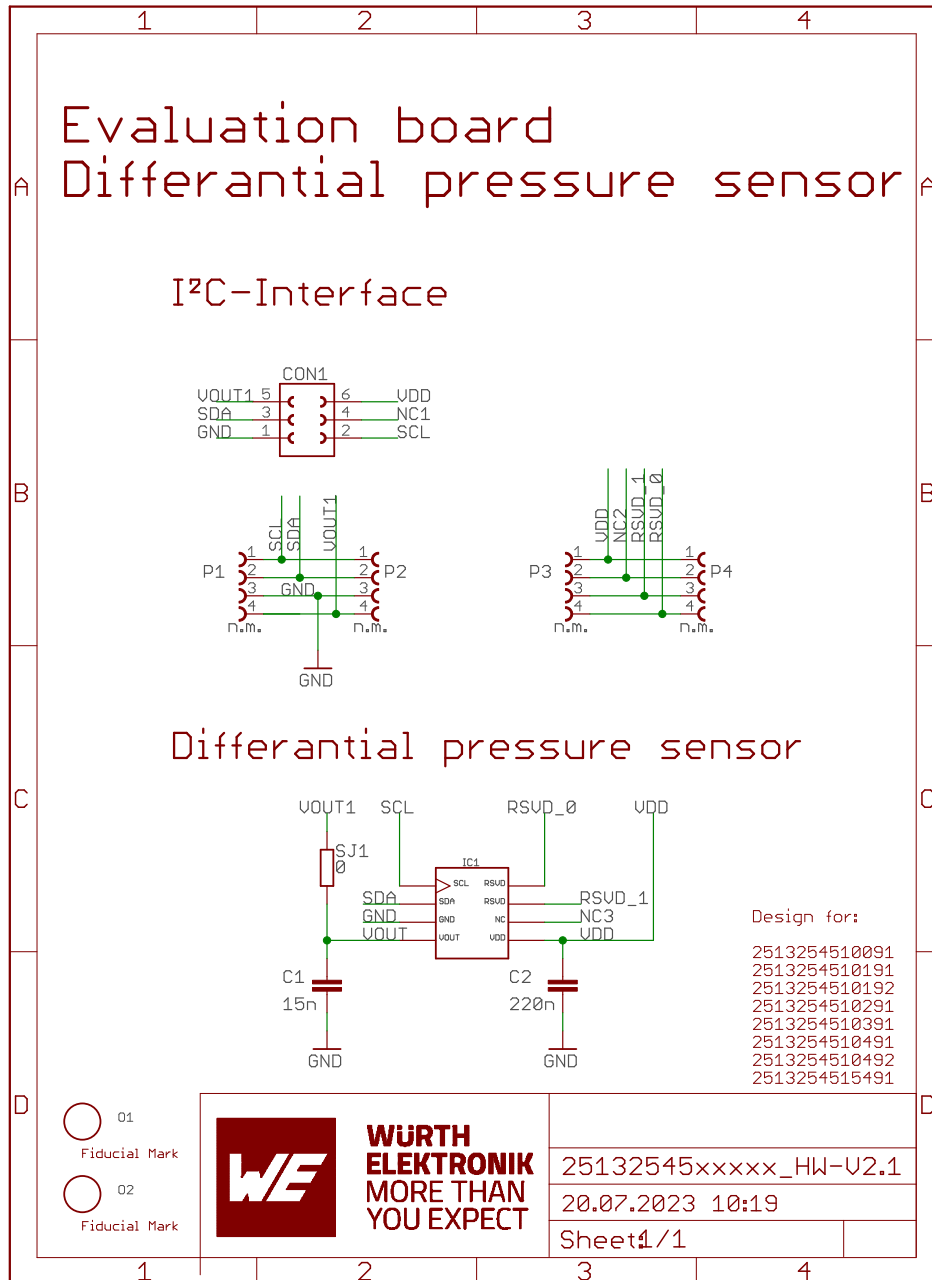


Figure 8: Schematic diagram

2.3 Layout

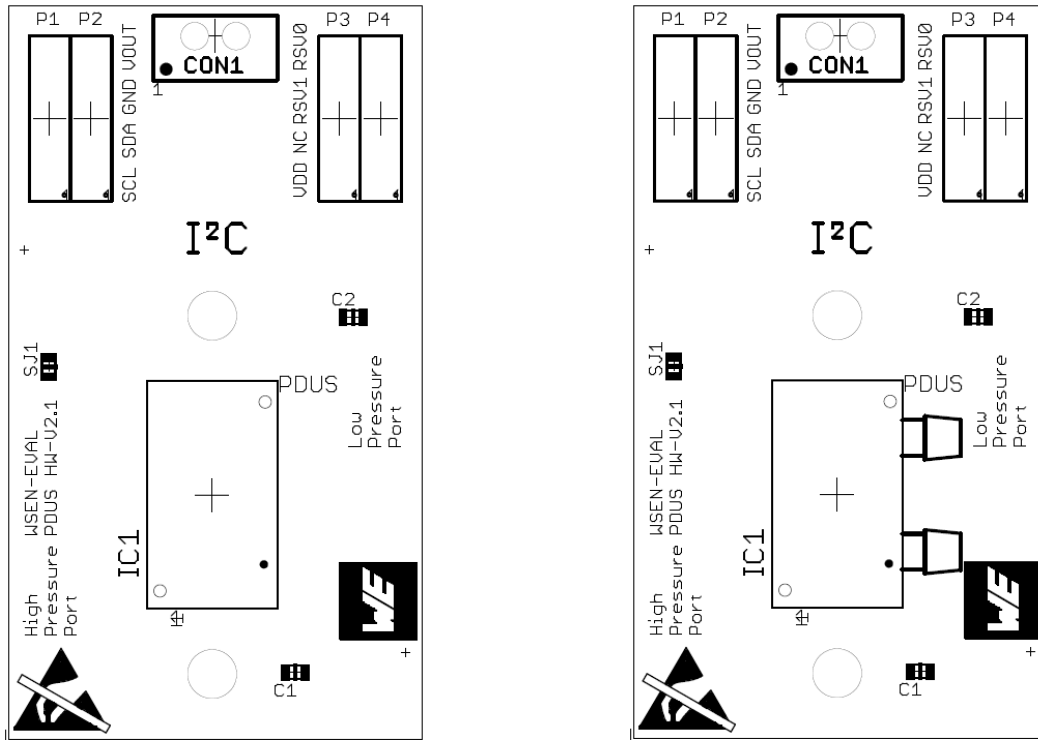


Figure 9: Assembly diagram: vertical nozzles (left); horizontal nozzles (right)

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- Do not touch the EVB while it is live.
- The EVB must be fully assembled and all devices to be tested must be connected before voltage is applied to the EVB.
- The EVB should never be left unattended during operation.
- Capacitors must be completely discharged. The capacitors must be actively discharged using a suitable resistor.

Protection against static electricity

Use the unpackaged product only in ESD protected areas. Wear the ESD personal protective equipment prescribed for these areas. Ground all conductive components, including personnel, as prescribed in ESD protected areas. Ensure that the product is only used by trained personnel.

Purpose and use

The EVB is not a finished product and is not intended for general use by the consumer. The EVB is intended exclusively for use in the evaluation of WE components in the lab or in development environments by highly qualified technicians or engineers, familiar with the risks involved in handling electrical or mechanical components, systems and subsystems. The use of the EVB is your full and independent responsibility. The EVB is expressly not intended to be installed in a terminal device or to be part of a terminal device in whole or in part. WE reserves the right, at its own discretion, to make corrections, improvements, adjustments or other changes to the EVB or to discontinue the EVB. The EVB is not intended for use in devices and applications for which a higher safety and reliability standard is prescribed. It is also not approved for use in safety-relevant applications or where personal injury or fatal consequences must be expected in the event of failure.

Operation of the EVB

The EVB may only be operated within the specifications and environmental parameters recommended by WE, as described in the instructions for use. Exceeding the specified parameters (including, but not limited to, input and output voltage, current, power, and ambient conditions) may result in damage to property. If you have questions about these electrical parameters, please contact WE at (regulatory-compliance@we-online.com) prior to connecting peripheral electronics (including the input voltage and intended loads). Any load outside a certain power range may lead to negative consequences, including, but not limited to, unintended or inaccurate evaluations or possibly permanent damage to the EVB or the electronics connected to it. Please ensure that the appropriate safety precautions are taken when working with the EVB, as serious injuries, including severe or even fatal injuries from electric shock or electric burns, may occur if you do not follow the appropriate safety precautions. Under no circumstances should the EVB be touched while live. When the EVB is connected to a power source, some of its components are electrically charged and/or have temperatures above 50 °C. This condition also applies for a short time after disconnecting from the supply voltage until the capacitors are completely discharged and hot components have cooled down. These components include connectors, linear regulators, switching transistors, heat sinks, resistors, diodes, inductors and other components, which can be identified from the documentation in the instructions for use. As with all electronic lab work, only qualified persons with knowledge of electronic performance evaluation, measurement and diagnostic tools, should use the EVB.

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Before putting the EVB into operation, please read the instructions for use and especially the various hazards and warnings described therein. The instructions for use contain important safety information on voltages and temperatures. You take full responsibility and liability for the proper and safe handling of the EVB. You agree to comply with all safety requirements, rules and regulations related to the use of the EVB. You also take full responsibility for: (1) establishing safeguards to ensure that the use of the EVB does not cause damage to property, personal injury or death, even if the EVB does not function as described, intended or expected, (2) the test setup in which the EVB is integrated, all safety requirements, rules and regulations and also that no damage to property, personal injury or other hazardous situation occurs even if the EVB fails, and (3) ensuring the safety of all activities performed by you or your employees when using the EVB. In particular, this means that the technical rules VDE [German Electrical Engineering, Electronic and Information Technology Association] 0105-100 and BGI [German trade association information] 891 (or corresponding applicable safety regulations outside Germany) for the operation of electrical test setups must be observed, the test area is protected against unauthorized access or accidental touching, current limitations, and emergency stop mechanisms are functional and test setups are never operated unattended. If you have any questions about the safe use of the EVB, please contact WE at regulatory-compliance@we-online.com for more information.

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