



User Manual

EE610

Low Differential Pressure Sensor



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EMC note USA (FCC):

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

EMC note Canada (ICES-003):

CAN ICES-3 (A) / NMB-3 (A)

CONTENT

| | | |
|----------|--|-----------|
| 1 | General | 4 |
| 1.1 | Explanation of Symbols | 4 |
| 1.2 | General Safety Instructions | 4 |
| 1.2.1 | Intended Use | 4 |
| 1.2.2 | Mounting, Start-up and Operation | 5 |
| 1.3 | Environmental Aspects | 5 |
| 2 | Scope of Supply | 5 |
| 3 | Product Description | 6 |
| 3.1 | General | 6 |
| 3.2 | Dimensions | 6 |
| 3.3 | Electrical Connection | 7 |
| 3.4 | User Interface | 7 |
| 3.4.1 | LED Indication | 7 |
| 3.4.2 | Display | 7 |
| 4 | Mounting and Installation | 8 |
| 4.1 | Pressure Connection | 8 |
| 5 | Setup and Configuration | 9 |
| 5.1 | Analogue Version | 9 |
| 5.1.1 | Select the Measurement Range with S1 and S2 | 10 |
| 5.1.2 | Select the Response Time with S3 and S4 | 10 |
| 5.1.3 | Select the Displayed Unit with S5 and S6 | 10 |
| 5.1.4 | Select the Backlight for the Display with S7 | 10 |
| 5.1.5 | Select the Output Signal with S8 | 10 |
| 5.1.6 | Select the Source of Settings with S9 | 11 |
| 5.1.7 | Outputs | 11 |
| 5.2 | Digital Version | 11 |
| 5.2.1 | RS485 Digital Interface Settings | 11 |
| 5.2.2 | BACnet Protocol Settings | 12 |
| 5.2.3 | Modbus Protocol Settings | 12 |
| 5.2.4 | Modbus Register Map | 13 |
| 5.2.5 | Reading Example | 14 |
| 5.2.6 | Freely Configurable Custom Modbus Map | 14 |
| 5.2.7 | Device Status Indication | 15 |
| 5.3 | Display Settings and Output Signals | 15 |
| 5.3.1 | Analogue Version with DIP Switch Settings and Output Signals | 15 |
| 5.3.2 | Analogue Version with PCS Settings or Digital Version | 15 |
| 5.4 | PCS10 Product Configuration Software | 15 |
| 6 | Maintenance and Service | 16 |
| 6.1 | Cleaning | 16 |
| 6.2 | Repairs | 16 |
| 6.3 | Readjustment of EE610 | 16 |
| 6.3.1 | Zero Point Adjustment | 16 |
| 6.3.2 | Span Point Adjustment | 17 |
| 6.3.3 | Return to Factory Adjustment | 17 |
| 6.3.4 | Auto-zero (Optional) | 17 |
| 7 | Technical Data | 18 |

1 General

This user manual serves for ensuring proper handling and optimal functioning of the device. The user manual shall be read before commissioning the equipment and it shall be provided to all staff involved in transport, installation, operation, maintenance and repair.



Please find this document and further product information on our website at www.epluse.com/ee610.

The user manual may not be used for the purposes of competition without the written consent of E+E Elektronik® and may not be forwarded to third parties. Copies may be made for internal purposes. All information, technical data and diagrams included in these instructions are based on the information available at the time of writing.

Disclaimer

The manufacturer or his authorised agent can only be held liable in case of willful or gross negligence. In any case, the scope of liability is limited to the corresponding amount of the order issued to the manufacturer. The manufacturer assumes no liability for damages incurred due to failure to comply with the applicable regulations, operating instructions or the operating conditions. Consequential damages are excluded from the liability.

1.1 Explanation of Symbols



This symbol indicates safety information.

It is essential that all safety information is strictly observed. Failure to comply with this information can lead to personal injuries or damage to property. E+E Elektronik® assumes no liability if this happens.



This symbol indicates instructions.

The instructions shall be observed in order to reach optimal performance of the device.

1.2 General Safety Instructions



- Avoid any unnecessary mechanical stress and inappropriate use.
- Installation, electrical connection, maintenance and commissioning shall be performed by qualified personnel only.
- Use the EE610 only as intended and observe all technical specs.
- Do not blow into the pressure connections.
- Connecting to EE610 a pressure beyond the measurement range according to the product specification may permanently damage the device.
- Do not use EE610 in explosive atmosphere or for measurement of aggressive gases.
- Do not apply the nominal voltage to the output terminals.

1.2.1 Intended Use

The EE610 is dedicated for the highly accurate measurement of differential pressure. The multi-range device is suitable for air as well as all non-flammable and non-aggressive gases. The sensor can be used between -20 °C (-4 °F) and +60 °C (+140 °F) and max. 95 %RH (non-condensing).

Please observe the mounting and installation instructions in chapter 4 Mounting and Installation. Check the measuring range for the appropriate use and be aware of the maximum overload limit.

The manufacturer cannot be held responsible for damages as a result of incorrect handling, installation and maintenance of the device.

Unauthorized modifications of the product lead to loss of all warranty claims. The device may only be powered as described in this manual.

1.2.2 Mounting, Start-up and Operation

The EE610 differential pressure sensor has been produced under state of the art manufacturing conditions, has been thoroughly tested and has left the factory fulfilling all safety criteria. The manufacturer has taken all precautions to ensure safe operation of the device. The user must ensure that the device is set up and installed in a manner that does not have a negative effect on its safe use.

The user is responsible for observing all applicable safety guidelines, local and international, with respect to safe installation and operation on the device. This operating manual contains information and warnings that must be observed by the user in order to ensure safe operation.

- Mounting, start-up, operation and maintenance of the device may be performed by qualified staff only. Such staff must be authorised by the plant operator to carry out the mentioned activities.
- The qualified staff must have read and understood this operating manual and must follow the instructions contained within.
- All process and electrical connections shall be thoroughly checked by authorised staff before putting the device into operation.
- Do not install or start-up a device supposed to be faulty. Make sure that such devices are not accidentally used by marking them clearly as faulty.
- A faulty device may only be investigated and possibly repaired by qualified, trained and authorised staff. If the fault cannot be fixed, the device shall be removed from the process.
- Service operations other than described in this operating manual may only be performed by the manufacturer.

1.3 Environmental Aspects



Products from E+E Elektronik® are developed and manufactured observing of all relevant requirements with respect to environment protection. Please observe local regulations for the device disposal.



For disposal, the individual components of the device must be separated according to local recycling regulations. The electronics shall be disposed of correctly as electronics waste.

2 Scope of Supply

- EE610 differential pressure sensor according to ordering guide
- Quick guide
- Test report according to DIN EN 10204-2.2
- Pressure connection set, including 2 m (6.6 ft) PVC hose with two ABS pressure connection nipples
- Mounting material
- For digital version (ordering code J3): one additional M16x1.5 cable gland for daisy chain wiring

3 Product Description

3.1 General

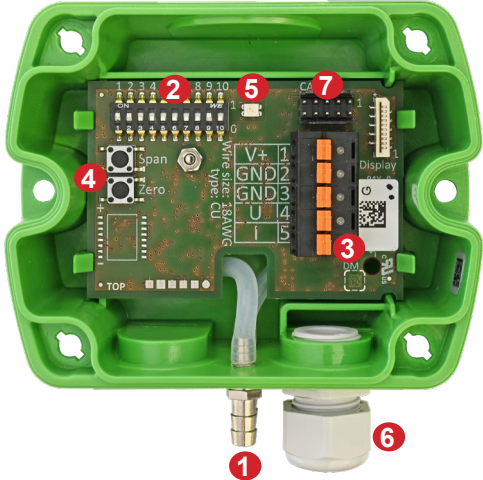
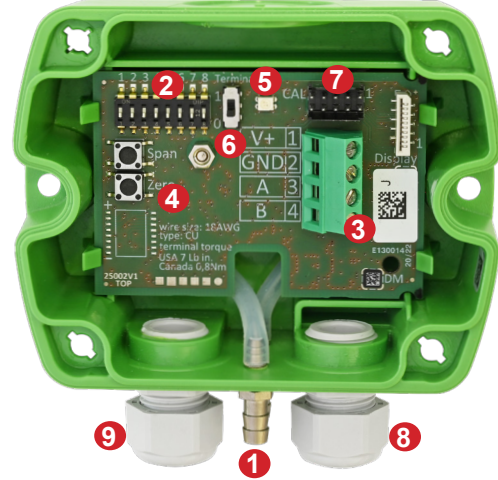
| Analogue version (A7) | Digital version (J3) |
|--|---|
|  <ol style="list-style-type: none"> 1. Pressure connection nipples 2. DIP switches: Configuration (Ranges, response time, ...) 3. Terminals: spring loaded 4. Push buttons for zero point and span point adjustment 5. Status LED 6. Cable gland for wiring 7. Service interface connector |  <ol style="list-style-type: none"> 1. Pressure connection nipples 2. DIP switches: RS485 addressing 3. Terminals: screw 4. Push buttons for zero point and span point adjustment 5. Status LED 6. Slide switch termination resistor 7. Service interface connector 8. Cable gland for wiring 9. Additional cable gland for daisy chain wiring |

Fig. 1 Design and components

3.2 Dimensions

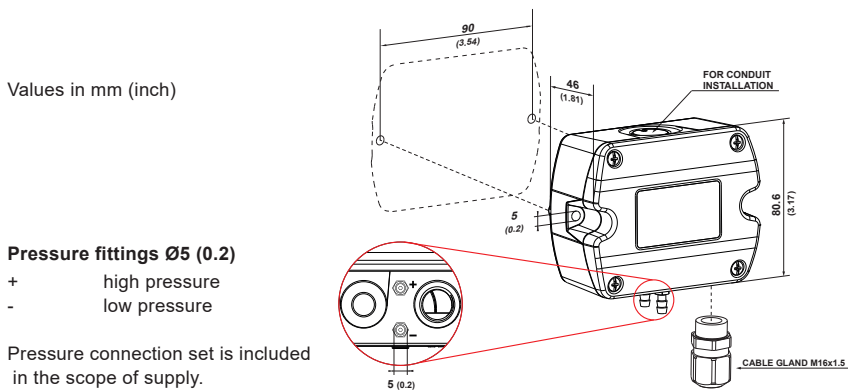



Fig. 2 Dimensions

3.3 Electrical Connection

Important note:
 The manufacturer cannot be held responsible for personal injuries or damage to property as a result of incorrect handling, installation, wiring, power supply and maintenance of the device.

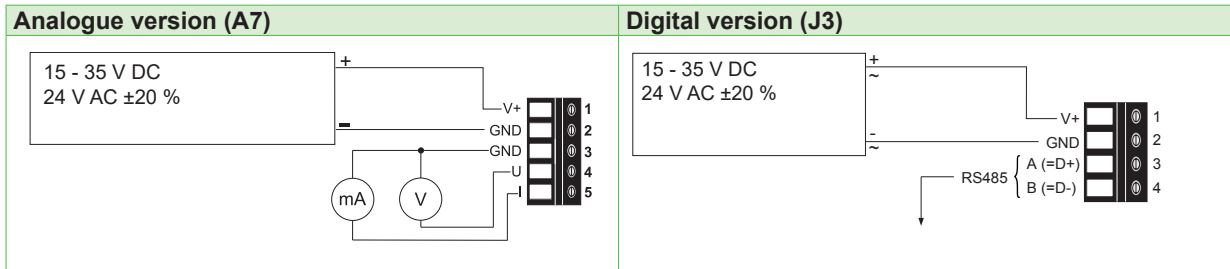


Fig. 3 Connection diagram

3.4 User Interface

3.4.1 LED Indication

Green LED

- Flashing (1s interval) = EE610 operates normally, the measured data is within the selected measuring range
- One flash (2s) = Confirms adjustment or return to factory settings
- Off = No power supply or electronics failure
- Fast flashing (0.2 s interval) = Auto-zero is executed, first time 10 s after start / reset.

Red LED

- Flashing (1s interval) = The measured data is out of the selected range (overload or reversed pressure connection)
- One flash (2s) = Indicates the failure of the attempt to adjust zero point or span point, or to return to factory adjustment

3.4.2 Display

The optional display shows the measured differential pressure and the selected unit (see chapter 5.1.3 Select the Displayed Unit with S5 and S6).

Additionally, the bar graph indicates the actual pressure within the selected range (see chapter 5.1.1 Select the Measurement Range with S1 and S2).



Fig. 4 Display example

In case of differential pressure out of the measuring range or negative pressure due to inverse pressure connection the display indicates:

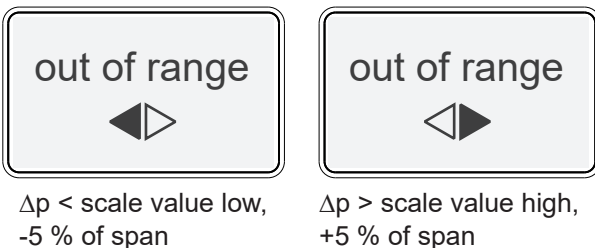


Fig. 5 Out of range indication

4 Mounting and Installation



- Mount the EE610 onto a vertical, smooth surface.
- Important: The pressure connection nipples must point downwards.
- Avoid installation close to heaters and sources of strong electromagnetic interference.
- Insert the cable for supply voltage and output signal through the cable gland and connect it to the spring terminals according to the wiring diagram (Fig. 3 Connection diagram).
- Important: Make sure that the connecting cable or wires do not impact with the push buttons in order to prevent unintentional trigger of the span or zero point adjustment.
- Close tightly the cable gland. This is essential for the compliance with the IP65 / NEMA 4X protection rating of the EE610 enclosure.

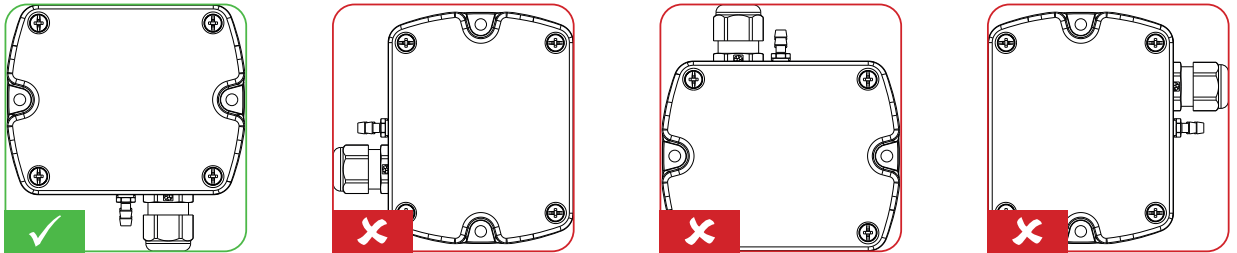


Fig. 6 Mounting orientation

4.1 Pressure Connection

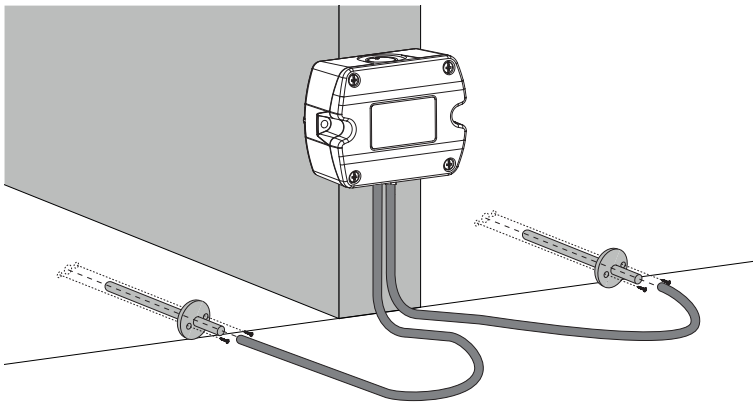


Fig. 7 Pressure connection

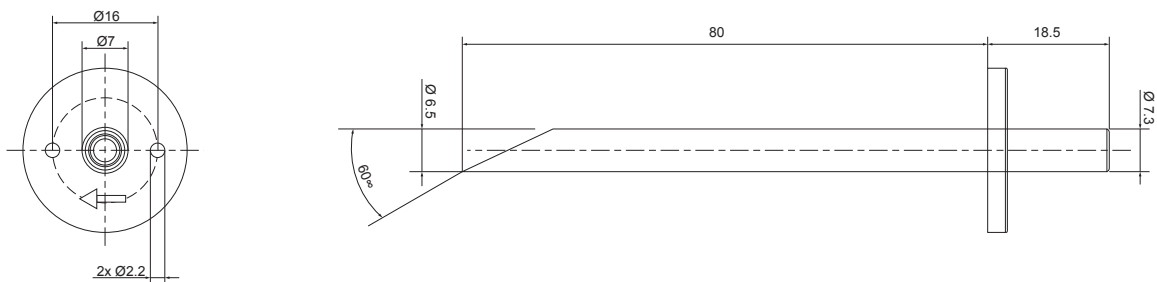


Fig. 8 Dimension of pressure connection nipples

- Install first the pressure connection nipples (included in the scope of supply) onto the duct. Use a Ø7.5 mm drill.
- Connect the pressure hose (included in the scope of supply) first to the EE610 and then to the nipples at the duct. Route the pressure hose for avoiding sharp bends which might lead to the hose obstruction (Fig. 9 Pressure hose route).

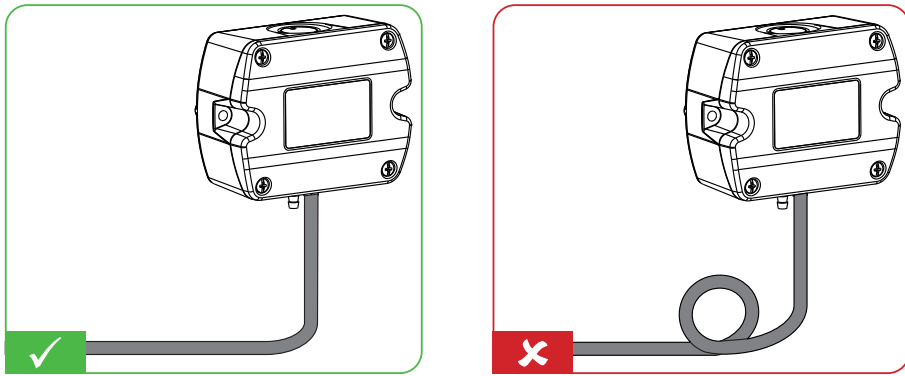


Fig. 9 Pressure hose route



Important: Make sure to connect the higher pressure at the “+” pressure connector and the lower pressure at the “-” pressure connector. Inverted connection leads to “out of range” information on the optional display and at the analogue outputs, see 5.1.7 Outputs and 3.4.2 Display.

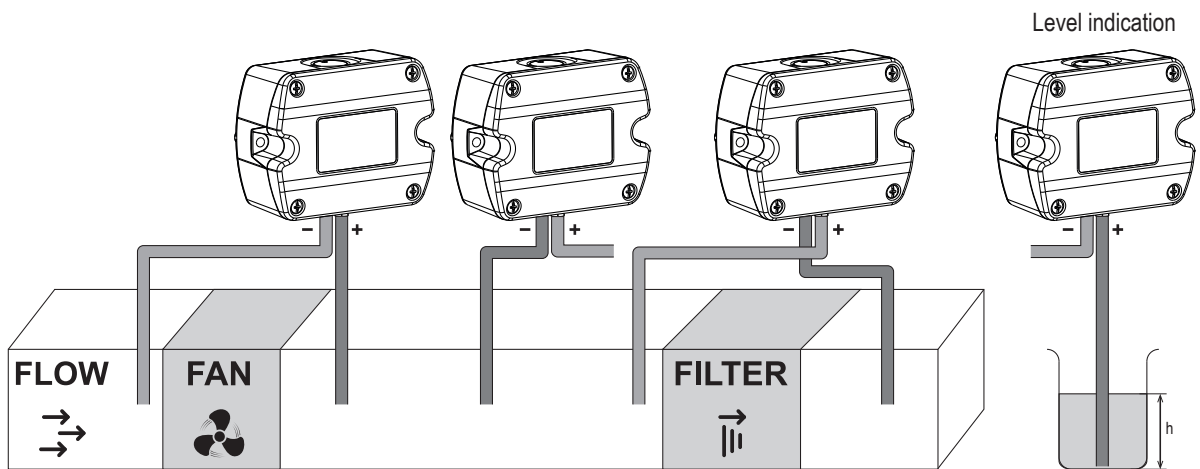


Fig. 10 Mounting examples

5 Setup and Configuration

The EE610 is ready to use with its factory settings. The user can change the factory setup with the on-board DIP switches or the PCS10 Product Configuration Software and the USB configuration adapter (order code HA011066), please refer to the chapters below.

5.1 Analogue Version

Each EE610 is delivered with the following factory settings (all switches on “0”):

- Measurement range: 100 % of the full scale (± 100 Pa)
- Response time: 50 ms
- Displayed unit: Pa
- Display backlight: on
- Output signals: 0 - 10 V and 4 - 20 mA
- Settings: DIP switch settings (only available with auto-zero version)

The analogue version is intended to be configured primarily with the on-board DIP switches. All the changes to the factory setup can also be done with the PCS10.

Settings that can be changed with PCS10:

- Display visualisation (see chapter 5.3.2 Analogue Version with PCS Settings or Digital Version)
- Measurands and their measuring range
- Auto-zero on/off and interval (see chapter 6.3.4 Auto-zero (Optional))
- Response time



EE610 is fully configurable. Before commissioning, set the individual configuration of EE610 according to the application requirements using the DIP switches S1 to S9 as described below (S10 does not have any functionality). The function of the DIP switches is also indicated inside the EE610 front cover.

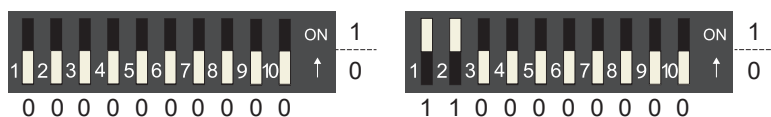


Fig. 11 DIP switch examples



Please note: If settings were changed via PCS10 and DIP switch settings shall apply again, be sure to restore the factory settings before applying the DIP switches.

Outputs scale: -100...+100 Pa
Analogue bar limits: -100...+100 Pa
Number of lines: 1

5.1.1 Select the Measurement Range with S1 and S2

| EE610-HV51A7: | | | | | |
|---------------|----|-------|-------|---------|---------------------|
| S1 | S2 | Pa | mbar | inch WC | mm H ₂ O |
| 0 | 0 | ±100 | ±1 | ±0.4 | ±10.2 |
| 1 | 0 | ±50 | ±0.5 | ±0.2 | ±5.1 |
| 0 | 1 | ±25 | ±0.25 | ±0.1 | ±2.55 |
| 1 | 1 | 0-100 | 0-1 | 0-0.4 | 0-10.2 |

Tab. 1 DIP switch settings - Measurement range

5.1.2 Select the Response Time with S3 and S4

| S3 | S4 | Response time |
|----|----|---------------|
| 0 | 0 | 50 ms |
| 1 | 0 | 500 ms |
| 0 | 1 | 2 s |
| 1 | 1 | 4 s |

Tab. 2 DIP switch settings - Response time

5.1.3 Select the Displayed Unit with S5 and S6

| S5 | S6 | Displayed unit |
|----|----|----------------|
| 0 | 0 | Pa |
| 1 | 0 | mbar |
| 0 | 1 | inch WC |
| 1 | 1 | kPa |

Tab. 3 DIP switch settings - displayed unit

5.1.4 Select the Backlight for the Display with S7

| S7 | Backlight |
|----|-----------|
| 0 | on |
| 1 | off |

Tab. 4 DIP switch settings - Backlight

5.1.5 Select the Output Signal with S8

EE610 provides simultaneously a voltage and a current output signal at the spring terminals.

| S8 | Output signals |
|----|------------------------|
| 0 | 0 - 10 V and 4 - 20 mA |
| 1 | 0 - 5 V and 0 - 20 mA |

Tab. 5 DIP switch settings - Output signals

5.1.6 Select the Source of Settings with S9

| S9 | Settings Source |
|----|-----------------|
| 0 | DIP switches |
| 1 | PCS10 |

Tab. 6 Source of settings

5.1.7 Outputs

The measured data is available at the spring terminals as 0 - 10 V and 4 - 20 mA or as 0 - 5 V and 0 - 20 mA signals (see chapter 5.1.5 Select the Output Signal with S8).

Additionally, the analogue outputs indicate measurement out of range as follows.

Indication of $\Delta p < -5\%$ of measuring range and of negative difference pressure due to inverted pressure connection.

| Output signal | Indication of negative differential pressure |
|---------------|--|
| 0 - 10 V | -0.5 V |
| 0 - 5 V | -0.25 V |
| 4 - 20 mA | 3.2 mA |
| 0 - 20 mA | -1 mA |

Tab. 7 Indication of $\Delta p < \text{scale value low, } -5\%$ of span

Indication of $\Delta p > 105\%$ of measuring range

| Output signal | Indication of overload |
|---------------|------------------------|
| 0 - 10 V | 10.5 V |
| 0 - 5 V | 5.25 V |
| 4 - 20 mA | 20.8 mA |
| 0 - 20 mA | 21 mA |

Tab. 8 Indication of $\Delta p > \text{scale value high, } +5\%$ of span

5.2 Digital Version

The digital version is intended to be configured with PCS10 Product Configuration Software and the USB configuration adapter (code HA011066). The device address can be overruled by setting the DIP switches (see chapter 5.2.1 RS485 Digital Interface Settings).

Settings that can be changed with the PCS10:

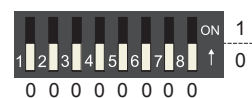
- Digital communication parameters
- Display visualisation (see chapter 5.3.2 Analogue Version with PCS Settings or Digital Version)
- Auto-zero on/off and interval (see chapter 6.3.4 Auto-zero (Optional))
- Response time

5.2.1 RS485 Digital Interface Settings

Hardware Bus Termination

The bus termination can be realised enabling the slide switch on board (120 Ω resistor). Factory setting disabled (see Fig. 1 Design and components, digital version J3).

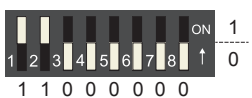
Address setting via software



All DIP switches at position 0 → address has to be set via software (via PCS10 Product Configuration Software or via protocol BACnet / Modbus).
Default address 44.

Example: Address is set via Configuration Software.

Address setting via DIP switch



Setting the DIP switches to any other address than 0, overrules the default address (44) or the address set via software.

Example: Address set to 3 (0000 0011 binary).

5.2.2 BACnet Protocol Settings

| | Factory settings | Selectable values |
|-----------|----------------------------|---------------------------------------|
| Baud rate | As per type number ordered | 9 600, 19 200, 38 400, 57 600, 76 800 |
| Data bits | 8 | 8 |
| Parity | None | None |
| Stop bits | 1 | 1 |
| Address | 44 | 0...127 |

Tab. 9 BACnet Protocol settings



The recommended settings for multiple devices in a BACnet MS/TP network are 38 400, 8, None, 1.

The EE610 PICS (Product Implementation Conformance Statement) is available on the website at www.epluse.com/ee610.

BACnet address, baud rate can be set via:

1. PCS10, Product Configuration Software and the USB configuration adapter cable code HA011066
2. BACnet protocol, see the PICS.

5.2.3 Modbus Protocol Settings

| | Factory settings | Selectable values |
|-----------|----------------------------|-----------------------|
| Baud rate | As per type number ordered | 9 600, 19 200, 38 400 |
| Data bits | 8 | 8 |
| Parity | Even | None, even, odd |
| Stop bits | 1 | 1 or 2 |
| Address | 44 | 1...247 |

Tab. 10 Modbus Digital Settings



The recommended settings for multiple devices in a Modbus RTU network are 9 600, 8, Even, 1.

The EE610 represents ½ unit load on an RS485 network.

Modbus address, baud rate, parity and stop bits can be set via:

1. PCS10, Product Configuration Software and the USB configuration adapter HA011066.
2. Modbus protocol in the register 60001 (0x00) and 60002 (0x01). See Application Note Modbus AN0103 (available on www.epluse.com/ee610).

The measured values are saved as a 32 bit floating point value and as 16 bit signed integer, see the Modbus register map below.

The serial number as ASCII-code is located in the register addresses 0x00...0x07 (16 bits per address).

The firmware version is located in the register address 0x08 (bits 15...8 = major release; bits 7...0 = minor release). The sensor name is located in register address 0x09. The beforementioned registers can be read out with function code 0x03 or 0x04.



Please note: When reading the serial number or the sensor name, it is always necessary to read all 8 registers, even if the desired information requires less.



Please note: For obtaining the correct floating point values, both registers have to be read within the same reading cycle. The measured value can change between two Modbus requests, therefore, exponent and mantissa may get inconsistent.

| Communication settings (INT16) | | |
|---|-------------------------------------|--------------------------------------|
| Parameter | Register number ¹⁾ [Dec] | Protocol address ²⁾ [Hex] |
| Write register: function code 0x06 | | |
| Modbus address | 1 | 0x00 |
| Modbus protocol settings ³⁾ | 2 | 0x01 |
| Initiate manual zeroing | 508 | 1FB |

| Device information (INT16) | | |
|---|-------------------------------------|--------------------------------------|
| Parameter | Register number ¹⁾ [Dec] | Protocol address ²⁾ [Hex] |
| Read register: function code 0x03 / 0x04 | | |
| Serial number (as ASCII) | 1 | 0x00 |
| Firmware version | 9 | 0x08 |
| Sensor Name | 10 | 0x09 |
| Device status (bit decoded) ⁴⁾ | 602 | 0x259 |

1) Register number starts from 1.

2) Protocol address starts from 0.

3) For Modbus protocol settings see Application Note Modbus AN0103 (available at www.epluse.com/ee610).

4) See chapter 5.2.7 Device Status Indication.

5.2.4 Modbus Register Map

| FLOAT32 | | | |
|---|---------------------|-------------------------------------|--------------------------------------|
| Measured value | Unit | Register number ¹⁾ [Dec] | Protocol Address ²⁾ [Hex] |
| Read register: function code 0x03 / 0x04 | | | |
| Differential pressure | mm H ₂ O | 1211 | 0x4BA |
| Differential pressure | mbar | 1213 | 0x4BC |
| Differential pressure | Pa | 1215 | 0x4BE |
| Differential pressure | kPa | 1217 | 0x4C0 |
| Differential pressure | inch WC | 1219 | 0x4C2 |

| INT16 | | | | |
|---|---------------------|---------------------|-------------------------------------|--------------------------------------|
| Measured value | Unit | Scale ³⁾ | Register number ¹⁾ [Dec] | Protocol Address ²⁾ [Hex] |
| Read register: function code 0x03 / 0x04 | | | | |
| Differential pressure | mm H ₂ O | 10 | 4106 | 0x1009 |
| Differential pressure | mbar | 100 | 4107 | 0x100A |
| Differential pressure | Pa | 1 | 4108 | 0x100B |
| Differential pressure | kPa | 1000 | 4109 | 0x100C |
| Differential pressure | inch WC | 100 | 4110 | 0x100D |

| INT16 | | |
|---|-------------------------------------|--------------------------------------|
| Parameter name | Register number ¹⁾ [Dec] | Register address ²⁾ [Hex] |
| Write register: function code 0x06 | | |
| Modbus address ⁴⁾ | 0001 | 0x00 |
| Modbus protocol settings ⁵⁾ | 0002 | 0x01 |
| Auto-zero initiating | 508 | 1FB |

| INFO (read register) | | |
|---|-------------------------------------|--------------------------------------|
| Parameter name | Register number ¹⁾ [Dec] | Register address ²⁾ [Hex] |
| Read register: function code 0x03 / 0x04 | | |
| Serial number (as ASCII) | 0001 | 0x00 |
| Firmware version | 0009 | 0x08 |
| Sensor Name | 0010 | 0x09 |
| Status / Error information | 0602 | 0x259 |
| | | |

1) Register number starts from 1

2) Register address starts from 0

3) 100 is scale 1:100 (2550 is equivalent to 25.50)

4) If the Address is set via DIP switches, the response will be NAK

5) For Modbus protocol settings please see Application Note Modbus AN0103 (available on www.epluse.com/ee610).

5.2.5 Reading Example

Example of MODBUS RTU command for reading the differential pressure (float value) $\Delta p = -32,260543$ Pa from the register 0x4BE:

Device EE610; slave ID 44 [2C in Hex]

Reference document, chapter 6.3: www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf

Request [Hex]: 2C 04 04 BE 00 02 16 A2

| | Modbus address | Function code | Starting address Hi | Starting address Lo | No. of register Hi | No. of register Lo | CRC | |
|----------------|----------------|---------------|---------------------|---------------------|--------------------|--------------------|-----|----|
| Request [Hex]: | 2C | 04 | 04 | BE | 00 | 02 | 16 | A2 |

Response [Hex]: 2C 04 04 0A CC C2 01 55 C1

| | Modbus address | Function code | Byte count | Register 1 value Hi | Register 1 value Lo | Register 2 value Hi | Register 2 value Lo | CRC | |
|-----------------|----------------|---------------|------------|---------------------|---------------------|---------------------|---------------------|-----|----|
| Response [Hex]: | 2C | 04 | 04 | 0A | CC | C2 | 01 | 55 | C1 |

For decoding of float values (stored according standard IEEE754), please refer to AN0103, chapter 7 (available on www.epluse.com/ee610).

Example of decoding

| Response [Hex] | | | | Value in decimal |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------|
| Byte 1 (Register 2 - Hi) | Byte 2 (Register 2 - Lo) | Byte 3 (Register 1 - Hi) | Byte 4 (Register 1 - Lo) | |
| C2 | 01 | 0A | CC | -32,260543 |

5.2.6 Freely Configurable Custom Modbus Map

It is possible to map measured value/status registers arbitrarily in a block with up to 20 registers provided for this purpose. This means that registers of interest may be mapped in an area with consecutive registers, so that important values can be queried with a single command in one block.

The custom map can be configured via:

1. PCS10 Product Configuration Software and the USB configuration adapter HA011066.

The PCS10 can be downloaded free of charge from www.epluse.com/pcs10.

2. Modbus protocol commands, refer to the example in chapter 5.6 Modbus RTU Examples.

The register block for the configuration of the customisable Modbus map consists of the registers 6001 (0x1770) to 6010 (0x1779). For the blockwise query of the measured values behind Modbus registers 3001 (0xBB8) to 3020 (0xBCB), the firmware accesses this configuration area and thus gets the information which measured value/status registers are to be output. A maximum of 10 user-defined registers can be mapped. The table below shows an example:

| Registers ... | | ... with these assigned measurands ... | | | ... map to registers ... | | ... mirrored from source registers | |
|---------------------------|--------|--|-------------------|---------|--------------------------|-------------------|------------------------------------|-------------------|
| Dec | Hex | Meas. | Unit | Type | Dec ¹⁾ | Hex ²⁾ | Dec ¹⁾ | Hex ²⁾ |
| Function code 0x10 | | Function code 0x03 / 0x04 | | | | | | |
| 6001 | 0x1770 | ΔP | Pa | INT16 | 3001 | 0xBB8 | 4108 | 0x100B |
| 6002 | 0x1771 | V' | m ³ /h | FLOAT32 | 3002 | 0xBB9 | 1055 | 0x41E |
| | | | | FLOAT32 | 3003 | 0xBBA | 1056 | 0x41F |
| 6003 | 0x1772 | v | m/s | FLOAT32 | 3004 | 0xBBB | 1041 | 0x410 |
| | | | | FLOAT32 | 3005 | 0xBBC | 1042 | 0x411 |

1) Register number starts from 1.

2) Protocol address starts from 0.

Tab. 11 Custom Modbus map example

5.2.7 Device Status Indication

If a critical error occurs, all Modbus values are set to NaN (according to IEEE754 for data type FLOAT32) or to 0x8000 (INT16). It is possible to read out all status and error information via Modbus register 602 (0x259). Errors are displayed in bit-coded form. If an event is present, the corresponding bit is set to 1.

Measured values outside the measuring range are limited with the corresponding limit value.

| Error Bits | Description | Recommended action |
|-------------------------------------|-------------------------------------|--|
| Bit 0 | Error: Sensor not adjusted | 1. Carry out zero point adjustment 2. Return to factory adjustment 2. Return the faulty unit to E+E for service |
| Bit 1 | Error: Pressure measurement faulty | 1. Check the installation and clean the device 2. Carry out zero point adjustment 3. Return the faulty unit to E+E for service |
| Bit 2 | Error: Faulty display communication | 1. Check the display connection |
| Bit 3 | Error: Auto-zero did not work | 1. Carry out zero point adjustment 2. Return the faulty unit to E+E for service |
| The remaining bits are not relevant | | |

Tab. 12 Device status indication register

5.3 Display Settings and Output Signals

5.3.1 Analogue Version with DIP Switch Settings and Output Signals

See chapter 5.1 Analogue Version for the configuration options.

5.3.2 Analogue Version with PCS Settings or Digital Version

The factory setting of the display (if present) shows the measured differential pressure in Pascal [Pa]. All measurands can also be selected as output signal. With the PCS10 Product Configuration Software and the optional USB configuration adapter HA011066, the user can change the display layout, the visualised parameter according the selected application and the output signal:

Differential pressure measurement

Unit: Pa, kPa, mbar, mm H₂O, inch WC,

Layout: one line with limit bar



Please note: If settings were changed via PCS10 and DIP switch settings shall apply again, be sure to restore the factory settings before applying the DIP switches.

Outputs scale: -100...+100 Pa

Analogue bar limits: -100...+100 Pa

Number of lines: 1

5.4 PCS10 Product Configuration Software



Only available with analogue version with Auto-zero and digital version.

For performing adjustment or changes in EE610 settings, please proceed as follows:

1. Download the PCS10 Product Configuration Software from www.epluse.com/pcs10 and install it on the PC.
2. Connect the EE610 to the PC using the USB configuration adapter.
3. Start the PCS10 software.
4. Follow the instructions on the PCS10 opening page for scanning the ports and identifying the connected device.
5. Click on the desired setup or adjustment mode from the main PCS10 menu on the left and follow the online instructions of the PCS10
6. Refer to the tutorial available throughout PCS10.

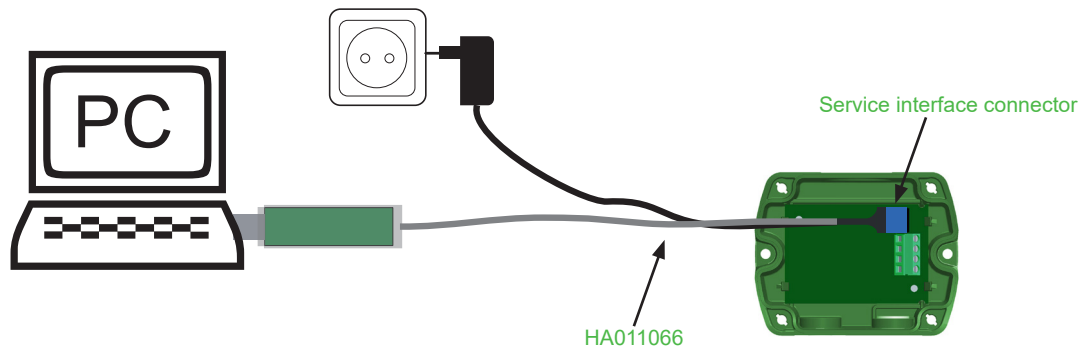


Fig. 12 EE610 configuration and adjustment



Please note: The EE610 may not be connected to any additional power supply when using the USB configuration adapter HA011066.

6 Maintenance and Service

EE610 does not require any special maintenance, nevertheless it is recommended to perform a zero point adjustment every 12 month. If needed, the enclosure may be cleaned and the device may be re-adjusted as described below.

6.1 Cleaning

Use a damp soft cloth to remove deposits of dust or dirt from the exterior of the device and from the display. Do not attempt to clean the interior of the device. Do not use any solvents, alcohol or abrasive cleaning agents.

6.2 Repairs

Repairs may be carried out by the manufacturer only. The attempt of unauthorised repair excludes any warranty claims.

6.3 Readjustment of EE610

A periodical readjustment of EE610 might be required by the regulations of certain industries or by the need of best long-term measurement accuracy. The zero point and the span point can be adjusted with push buttons on the EE610 electronics board.

For adjustment the device must be powered and the enclosure cover removed. Consequently, the adjustment may be performed by authorised staff only, observing the handling of electrical sensitive devices (ESD).

6.3.1 Zero Point Adjustment

The zero point adjustment is used to correct an eventual zero point deviation.

- a. Remove the tubes from both pressure connections of the EE610. By this the pressure equal on both connections. If the sensor has an auto-zero setting, the tubes do not need to be removed.
- b. Press "zero point" button 1-2 sec. (see 3 Product Description).
- c. The successful zero point adjustment is confirmed by the green LED turning on for 2 seconds.
- d. The red LED turning on for 2 seconds indicates that the zero point adjustment did not succeed. In this case repeat b.
- e. The zero point adjustment (b.) may not succeed because of a deviation higher than 5 % of the original full scale of the device. If the zero point adjustment is not successful even after pressing the button for at least 10 seconds, then the deviation is too high for zeroing. Please check the sensor, the tubes and the environment and make sure that the pressure connection nipples are free.
- f. The successful zero point adjustment is confirmed by the green LED turning on for 2 seconds.

6.3.2 Span Point Adjustment

The span point adjustment is used to correct an eventual deviation of the span value.



Important:

Make sure to perform a zero point adjustment as above before any span point adjustment.

- a. Connect the differential pressure reference device/calibrator to the EE610 and set it according to the EE610 span value to be adjusted.
- b. Note: The span value has to be set according to the selected measurement range.

Example:

Analogue version (see 5.1.1 Select the Measurement Range with S1 and S2):

EE610-HV51A7, S1 = 0, S2 = 1, span value = +25 Pa

Digital version: EE610-HV51J3, span value = +100 Pa



- c. Observe the operation manual of the reference device.
- d. Press the span point adjustment button (see 3 Product Description).
- e. The successful span point adjustment is confirmed by the green LED turning on for 2 seconds.
- f. The red LED turning on for 2 seconds indicate that the span point adjustment did not succeed. In this case repeat b.
- g. The span point adjustment (b.) may not succeed because of a deviation higher than 5 % of the original full scale of the device.
This is 5 Pa for the 0 – 100 Pa range. In such a case, the set point adjustment can be forced by pressing and holding the span point button for 10 s. If the zero point adjustment is not successful even after pressing the key for at least 10 seconds, then the deviation is too high for zeroing. Please check the sensor, the tubes and the environment and make sure that the pressure connection nipples are free.
- h. The successful span point adjustment is confirmed by the green LED turning on for 2 seconds.

6.3.3 Return to Factory Adjustment

- a. Press and hold simultaneously both “zero” and “span” buttons for 5 sec.
- b. The successful return to factory adjustment is confirmed by the green LED turning on for 2 seconds.
- c. The red LED turning on for 2 seconds indicates that the return to factory adjustment did not succeed. In this case repeat b.



Important: Return to factory adjustment affects both, zero and span.

6.3.4 Auto-zero (Optional)

With auto-zero, no maintenance of the sensor is necessary. Auto-zero is carried out every 24 hours (factory setting). Changing the interval is possible with PCS 10 and the USB configuration adapter (see chapter 5.4 PCS10 Product Configuration Software). The interval can be set from 10 minutes up to 7 days. For this purpose DIP switch 9 (see chapter 5.1.6 Select the Source of Settings with S9) has to be in position 1 (ON). During the auto-zero procedure (takes approx. 4 s), the green LED flashes quickly (see chapter 3.4.1 LED Indication) and the most recent measured value is frozen.



Please note: If the auto-zero interval was changed via PCS10 and DIP switch settings are applied again, the auto-zero interval value will be adopted.

7 Technical Data

Measurands

Differential Pressure (Δp)

| | | | |
|---|--|---|--------------------------|
| Measurement principle | Piezoresistive, no flow-through | | |
| Measuring range Analogue output selectable with DIP switches¹⁾ With PCS10 | $\pm 25 / \pm 50 / \pm 100$ Pa / 0...100 Pa Configurable within max. measuring range | | |
| Accuracy @ 20 °C (68 °F), incl. hysteresis, non-linearity and repeatability | ± 0.5 Pa = ± 0.5 % FS | | FS = full scale (100 Pa) |
| Temperature dependency, typ. | 0.03 Pa/K | | |
| Response time t_{90} | Analogue output¹⁾ | 50 ms / 500 ms / 2 s / 4 s selectable with DIP switches Configurable in the range from 0.05 to 30 s with the PCS10 | |
| | Digital interface²⁾ | Configurable in the range from 0.5 to 30 s with the PCS10 | |
| Auto-zero interval | 24 h (factory setting) Configurable between 10 min and 7 days with PCS10. Can be deactivated. | | |
| Long-term stability | < 0.5 Pa/year | | |
| Overload limits | ± 7000 Pa | | |

1) Factory setup analogue output: measurement range ± 100 Pa; response time t_{90} : 50 ms; displayed unit: Pa; display backlight: on; analogue outputs: 0 - 10 V and 4 - 20 mA. Other ranges upon request.

2) Factory setup RS485: response time t_{90} : 500 ms; displayed unit: Pa; display backlight: on.

Outputs

Analogue

| | | | |
|-------------------------------------|---|---|---|
| Analogue output¹⁾ | 0 - 5 V or 0 - 10 V and 0 - 20 mA or 4 - 20 mA (3-wire) | -1 mA < I_L < 1 mA $R_L \leq 500 \Omega$ | I_L = load current R_L = load resistor |
|-------------------------------------|---|---|---|




1) Voltage and current output signals available simultaneously at the spring loaded terminals. Settings selectable with DIP switches.

Factory setup analogue output: measurement range 0...100 % FS; response time t_{90} : 50 ms; displayed unit: Pa; display backlight: on; analogue outputs: 0 - 10 V and 4 - 20 mA. Other ranges upon request.

Digital

| | |
|---|---|
| Digital interface | RS485 (EE610 = 1/2 unit load) |
| Protocol Factory settings Supported Baud rates Measured data types | Modbus RTU 9600 Baud, parity even, 1 stop bit, Modbus address 44 9600, 19200 and 38400 FLOAT32 and INT16 |
| Protocol Factory settings Supported Baud rates | BACnet MS/TP BACnet address 44 9600, 19200, 38400, 57600 and 76800 |

General

| | | | |
|--|---|--|--------------------------|
| Power supply class III  USA & Canada: Class 2 supply necessary, max. voltage 30 V DC | 15 - 35 V DC or 24 V AC ±20 % | | |
| Current consumption , typ. @ 0 Pa (0 psi)/24 V DC | | Analogue output | Digital interface |
| | Without display | 23 mA | 8 mA |
| | Display with backlight | 49 mA | 29 mA |
| Electrical connection | Analogue output Digital interface | Spring-loaded terminals, max. 1.5 mm ² (AWG16) Screw terminals, max. 2.5 mm ² (AWG14) | |
| Cable gland | M16x1.5 | | |
| Display | Graphic, with backlight | | |
| Selectable units on display with Analogue output via DIP switch Analogue output and digital interface via PCS10 | Pa, mbar, inch WC, mm H ₂ O Pa, kPa, mbar, inch WC, mm H ₂ O | | |
| Humidity range | 0...95 %RH, non-condensing | | |
| Temperature range | Operation Storage | -20...+60 °C (-4...+140 °F) -40...+70 °C (-40...+158 °F) | |
| Enclosure | Material Protection rating Material compliance | Polycarbonat IP65/NEMA 4X UL94 V-0 (with display UL94 HB) approved | |
| Electromagnetic compatibility | EN 61326-1 FCC Part15 Class A | EN 61326-2-3 ICES-003 Class A | Industrial environment |
| Shock and vibration | Tested according to EN 60068-2-64 and EN 60068-2-27 | | |
| Conformity |   | | |

Configurability

| Device | DIP switches | PCS10 |
|-------------------------------------|--------------|-------|
| Analogue output without auto-zero | ✓ | |
| Analogue output with auto-zero | ✓ | ✓ |
| Digital interface without auto-zero | ✓ | ✓ |
| Digital interface with auto-zero | ✓ | ✓ |

Configuration options see above or manual at www.epluse.com/ee610.



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