# Differential pressure transmitter-regulator

## E2408DF

### User Manual

Evikon

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## Specifications

| | |
|---|---|
| Sensing method | Thermal microflow |
| Detection range options | E2408DF-50 -50...+50 Pa<br>E2408DF-500 -500...+500 Pa |
| Resolution | 0,025% of the range |
| Gas flow through sensor | < 0,2 ml / minute / Pa |
| Zero point accuracy | ± 0,2 Pa, stability < 0,1 Pa / year |
| Span accuracy | ±1,5% of reading at +23°C, 1000 hPa |
| Temperature effect | < 0,5% of reading per 10°C |
| Atmospheric pressure effect | < 0,1 % of reading per hPa |
| Analog outputs | 2 × 4-20 mA or 0-10 V, user settable |
| Digital interface | RS485, Modbus RTU protocol |
| Load resistance | RL < (Us - 3 V) / 22 mA for 4-20 mA<br>RL > 100 kOhm for 0-10 V mode: |
| Operating conditions | -20...+70 °C, <99 %RH, without<br>Aggressive gases or oil, residential or business spaces |
| Power supply | 11...30 VDC<br>90...265 VAC<br>With integrated mains supply module |
| Power consumption | < 2 VA |
| Electromagnetic compatibility | According to 2014/30/EU:<br>EN 61000-6-3:2020, EN 61326-1:2013(EMC, emissions)<br>EN 61000-6-1:2019, EN 61000-6-2:2019(EMC, Immunity) |
| Enclosure | Light beige ABS 82×85×55 mm, IP65 |
| Relays | 2 × SPST, max 5 A, 30 VDC / 250 VAC |

# Product description

Differential pressure transmitter-regulator E2408DF is a member of the new PluraSens® family of multifunctional measurement instruments. The transmitter is intended for measurement of pressure of air and non-aggressive gases with superb accuracy and no offset drift.

The differential pressure is measured by a thermal sensor element using flow-through technology. Compared with membrane based sensors, the method provides an extended dynamic range, better long-term stability and improved repeatability, especially near zero.

E2408 features two independent analog outputs OUT1 and OUT2 user-selectable to 4-20 mA or 0-10 V. RS485 Modbus RTU digital communication interface allows easy instrument configuration and integration into various automation systems. Two relays RE1 and RE2 with closing contacts can be used to switch various actuators.

# Safety requirements

Always adhere to the safety provisions applicable in the country of use.

Do not perform any maintenance operation with the power on. Do not let water or foreign objects inside the device.

# Operating conditions

The device should be used in explosion-safe (non ATEX -rated) indoor areas, without aggressive gases in the atmosphere.

# Installation and connections

Unscrew four lid screws and detach the lid from the detector.

Fix the detector on a wall by screws, using cross-shaped mounting lugs supplied with the instrument (see dimensional drawings below).

To connect the device with measurement point, use the hoses of appropriate diameter (4 or 6 mm) and length. Put one end of the hose on the fitting in the bottom part of the device and fix the other end in the selected measurement area. The port marked with + (plus) should be connected with the area of higher pressure (e.g. before air filter), the one marked with - (minus) should be connected to the lower pressure area (e.g. behind air filter).

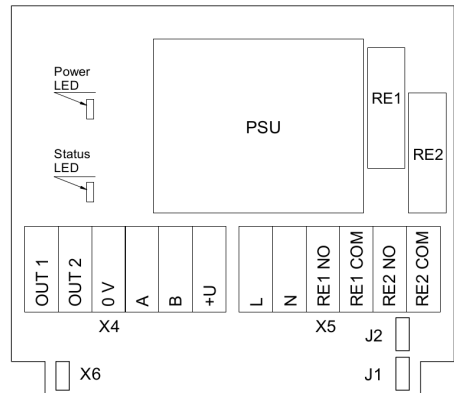NB! The connecting hoses should not be squeezed or folded.

The connection diagram of the device is shown below.
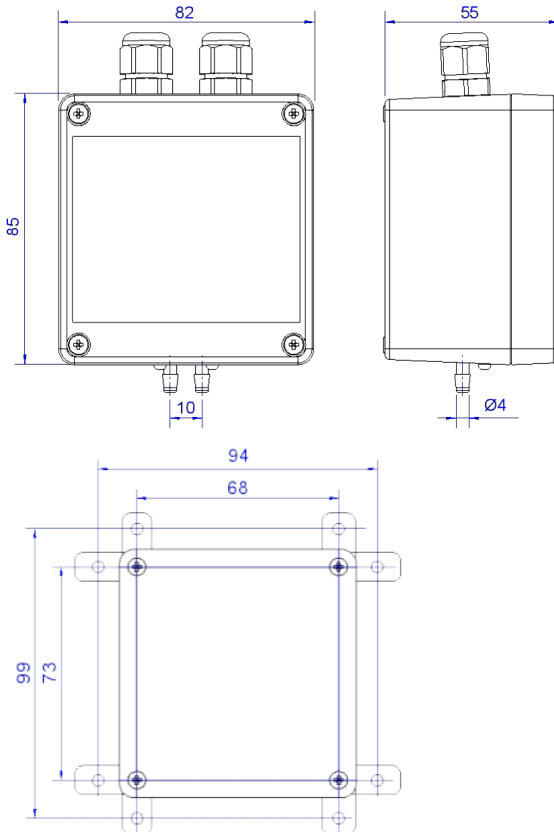
Plug the power cable and connect the analog outputs and/or digital interface terminals to the relevant devices according to the connection diagram and table.
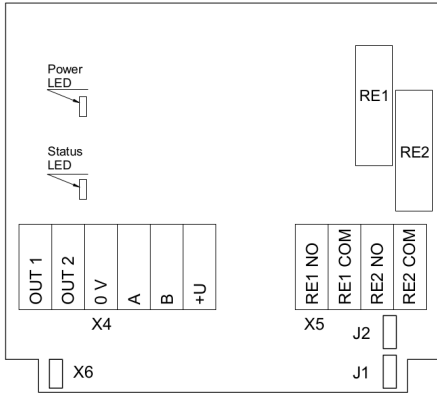


Version without PSU                                 Version with PSU

| Jumpers | |
| --- | --- |
| **J1** | OUT1 type (open: 4-20 mA; closed 0-10 V) |
| **J2** | OUT2 type (open: 4-20 mA; closed 0-10 V) |
| **X6** | Reset Modbus network parameters to default |
| **X4 terminals** | |
| **OUT1** | 4-20 mA / 0-10 V output |
| **OUT2** | 4-20 mA / 0-10 V output |
| **0V** | 0 V / 24 VAC Neutral (optional) |
| **A** | RS485 A / Data + |
| **B** | RS485 B / Data - |
| **+U** | +24 VDC / 24 VAC Phase (optional) |

| X5 terminals (optional) | |
|---|---|
| **L** | 90…265 VAC Phase |
| **N** | 90…265 VAC Neutral |
| **RE1 NO** | Relay 1, normally open terminal |
| **RE1 COM** | Relay 1, common terminal |
| **RE2 NO** | Relay 2, normally open terminal |
| **RE2 COM** | Relay 2, common terminal |

Make certain that the cable gland is properly tightened to ensure the conformity to IP65 protection class.

The screwless quick connect spring terminals on the E2407 are suitable for a wide range of wires with cross-section 0,2...1,5 mm$^2$. The recommended wire stripping length is 8...9 mm. Push the spring loaded terminal lever, insert the wire end into the terminal hole and release the lever.

Use twisted pair cable, e.g. LiYY TP 2×2×0,5 mm2 or CAT 5, to connect the device to the RS485 network. Use one pair for A and B wires and the second pair for common 0V and power +U wires. to connect the transmitter to the Fieldbus network.polarity must be respected when connecting to an external RS485 network.

Overall length of all connections via the RS485 interface should not exceed 1200 m.

Both analog outputs can be independently changed between 4-20 mA and 0-10 V type using jumpers J1 (OUT1) and J2 (OUT2). By closing pins on a specific jumper the related output is 0-10 V, with an open jumper the output is 4-20 mA. Power restart is required after changing the position of the jumpers.

**NOTE!** The outputs are not galvanically isolated from the external power supply and share a common 0V. Allowed load resistance limits are stated in the Specifications table. To power the instrument from an external power source, connect terminals 0V and +U to the source. If the integrated mains power supply module is used, connect terminals L and N to the mains.

**NOTE!** If the instrument is powered from mains, connect to 0V and +U terminals only light external loads, which consume less than 30 mA in total, as the integrated mains supply module capacity is limited.

**NOTE!** Actuator short-circuits should be avoided, to protect the instrument relays use external fuses or safety switches.

When the detector is fixed and the external devices connected, place the lid back and fix it with the screws.

## Delivery set

- Differential pressure transmitter-regulator E2408DF
- Mounting accessories:
  - 4 cross-shaped mounting lug with screws and 4 screws with plastic dowels

**Order code for E2408DF options**

| E2408DF options | Order code |
|---|---|
| Differential pressure transmitter-regulator, mass flow, -50...50 Pa, resolution 0,025 Pa | E2408DF-50 |
| Differential pressure transmitter-regulator, mass flow, -500...500 Pa, resolution 0,25 Pa | E2408DF-500 |
| Integrated 90...265 V mains power supply module | E2408DF-230 |

## Configuring

Differential pressure transmitter-regulator E2408DF shares all functionalities of the PluraSens® multifunctional transmitter platform. The features and options include:

- Digital output change rate limiting filter
- Digital integrating (averaging) filter
- Temperature measurement channel with internal sensor
- Free assignment of each analog output to chosen parameter
- Flexible setting of analog output scales for each output
- Free assignment of each of two relays to chosen parameter
- Several relay control logic modes (HI or LO with hysteresis, U or Π)
- Switch delays and minimum on/off state durations for each relay
- Modbus controlled forced state options for analog outputs and relays.

E2408 can be configured through its RS485 interface by Modbus RTU commands.

## Return to default settings

To reset the device's Slave ID, baud rate and stop bit number to factory settings, proceed as follows:

1. De-energize the device
2. Connect the X6 jumper
3. Turn on the device
4. De-energize the device
5. Disconnect the X6 jumper
6. Turn on the device

## Emergency mode.

The current outputs of the detector may be programmed via Modbus commands (register 255) to signal if the connection with the sensor is lost. The signal may be set to 3,8 mA (low current) or 21,5 mA (high current).

| Bites | Functions | Notes | Default |
|---|---|---|---|
| bit[0]=0/1 | sensor present/absent | Read-only | |
| bit[1]=0/1 | analog outputs activated/deactivated | | 1 |
| bit[2]=0/1 | in case of sensor absence, turn signalling off/on (OUT 1) | | 1 |
| bit[3]=0/1 | In case of sensor absence turn on signalling with low/high current on OUT 1 | if bit [2]=0, this bit is ignored | 0 |
| bit[4]=0/1 | in case of sensor absence, turn signalling off/on (OUT 2) | | 1 |
| bit[5]=0/1 | In case of sensor absence turn on signalling with low/high current on OUT 2 | if bit [4]=0, this bit is ignored | 0 |
| bit[6]=0/1 | Current/voltage output detected on OUT 1 | Read-only | User defined |
| bit[7]=0/1 | Current/voltage output detected on OUT 2 | Read-only | User defined |
| bit[8]=0/1 | LED deactivated/activated | Always 0 for 2408DF | 0 |
| bit[9]=0/1 | Buzzer deactivated/activated | Always 0 for 2408DF | 0 |

# Modbus RTU Communication

**Modbus main holding registers (00xxx or 40xxx): 0-based, decimal**

| Reg | RW | Description | Supported values |
|---|---|---|---|
| 1 | R | hardware version | 0...65535 |
| 2 | R | software version | |
| 3 | R | product serial number | 0...65535 |
| 4 | RW* | Slave ID [1...247] | 0...247 |
| 5 | RW* | baud rate | 1200, 2400, 4800, 9600, 19200, 38400, 57600 |
| 6 | RW** | Response delay, ms | 1...255 ms |
| 7 | RW* | Stop bits | 1, 2, 3, 4 |
| 8 | R | Last error code | 1...255 |
| 17 | RW*** | Technological: data age in seconds (read) / restart(write) | 0...65535 s (read), 42330(write) |
| 167 | RW* | Change rate limit for pressure data, pressure units | 1...32000 pressure units,0=no limit |
| 168 | RW* | Integrating filter time constant for pressure data, s | 1...32000 s, 0=no filter |
| 201 | RW** | Parameter assigned to OUT1 | 0=none, 1=temperature, 2=pressure, 9=forced Modbus control, value set in 203 |
| 202 | RW** | Parameter assigned to OUT2 | 0=none, 1=temperature, 2=pressure, 9=forced Modbus control, value set in 204 |
| 203 | RW** | Forced value for OUT1 | 0...1000 (0.0%...100.0% of scale) |
| 204 | RW** | Forced value for OUT2 | 0...1000 (0.0%...100.0% of scale) |
| 211 | RW** | Parameter assigned to RE1 | 0=none, 1=T, 2=P, 9=forced by 213 |
| 212 | RW** | Parameter assigned to RE2 | 0=none, 1=T, 2=P, 9=forced by 214 |
| 213 | RW** | Forced state for RE1 | 0=off, 1=on (relay control by Modbus) |
| 214 | RW** | Forced state for RE2 | 0=off, 1=on (relay control by Modbus) |
| 215 | RW** | Switch delay for RE1 | 0...1000 s, default 0 |
| 216 | RW** | Switch delay for RE2 | 0...1000 s, default 0 |

| 217 | RW** | Min on/off time for RE1 | 0...1000 s, default 0 |
|-----|------|--------------------------|------------------------|
| 218 | RW** | Min on/off time for RE2 | 0...1000 s, default 0 |
| 219 | RW** | Control logic for relay RE1 | 0:‗, 1:_↓↑‾, 2:‾↑↓_, 3:_↑‾↓_, 4:‾↓_↑‾ |
| 220 | RW** | Control logic for relay RE2 | 0:‗, 1:_↓↑‾, 2:‾↑↓_, 3:_↑‾↓_, 4:‾↓_↑‾ |
| 221 | RW** | LOW setpoint for relay RE1 | -32000...+32000 |
| 222 | RW** | HIGH setpoint for relay RE1 | -32000...+32000 |
| 223 | RW** | LOW setpoint for relay RE2 | -32000...+32000 |
| 224 | RW** | HIGH setpoint for relay RE2 | -32000...+32000 |
| 255 | RW** | Sensor control/status | see Emergency mode paragraph |
| 257 | R | Raw pressure data | -32000...+32000 pressure units |
| 258 | R | Measured temperature, °Cx100 | signed integer, -4000...+12500 (-40,00...+125,00 °C) |
| 259 | R | Measured pressure | -32000...+32000 pressure units |
| 261 | RW** | 0% value of analog OUT1 | -32000...+32000 pressure units |
| 262 | RW** | 100% value of analog OUT1 | -32000...+32000 pressure units |
| 263 | RW** | 0% value of analog OUT2 | -32000...+32000 pressure units |
| 264 | RW** | 100% value of analog OUT2 | -32000...+32000 pressure units |

\* - the new value is applied after restart.

\*\* - the new value is applied immediately.

\*\*\* -writing 42330 restarts the device immediately, no response on Modbus

Broadcast ID=0 may be used to assign a new ID to device with unknown ID

For registers 203, 204, 213, 214 the value is dynamic and not kept in EEPROM

Pressure unit is 10 Pa

**RS485 Communication parameters**

| Parameter | Permitted values | Default |
|---|---|---|
| Supported baud rates | 1200, 2400, 4800, 9600, 19200, 38400, 57600 | 9600 |
| Data bits | 8 | 8 |
| Parity | none / odd / even | none |
| Stop bits | 1, 2 | 1 |
| Protocol | Modbus RTU | |
| Modbus functions | 03 - Read multiple registers<br>06 - Write a single register | |
| Error codes | 01 – Illegal function<br>02 – Illegal data address<br>03 – Illegal data value<br>04 – Slave device failure<br>         (details of last error 04 can be read from register 0x0008) | |

## Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of the original sale. During this warranty period, the Manufacturer will, at its option, either repair or replace a product that proves to be defective. This warranty is void if the product has been operated in conditions outside ranges specified by the Manufacturer or damaged by customer error or negligence or if there has been an unauthorized modification.

## Manufacturer contacts

Evikon MCI OÜ

Teaduspargi 7/9, Tartu
50411 Estonia
info@evikon.eu
www.evikon.eu

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