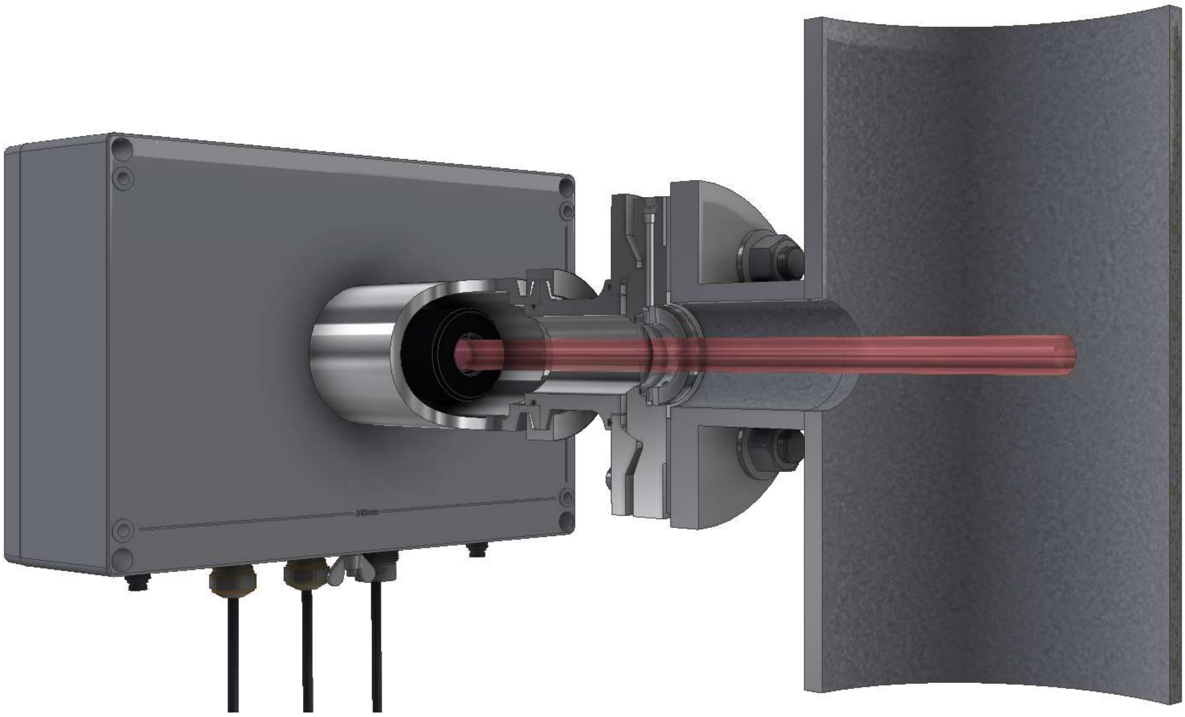
GasEye

Cross Duct

User Manual

AIROPTIC™

GasEye Cross Duct SG and MG



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Product Information:	Gas analyzer
Application:	In-situ analyzer
Brand name:	**GasEye Cross Duct SG and MG**

Table of Contents

1. Introduction

1.1. General information

This manual relates to an instrument that was manufactured with high attention to detail in controlled conditions. By following the description provided in this document our product will work safely and perform the intended measurements properly.

1.2. Warranty conditions

Our company guarantees a 12-month warranty period for the GasEye Cross Duct instrument. This period becomes valid upon delivery of the instrument and will be granted only if the product is installed, operated and maintained according to the information provided in this manual.

1.3. Delivery information

The respective scope of delivery is listed on the shipping documents – enclosed with the delivery – in accordance with the valid sales contract. When opening the packaging, please observe the corresponding information on the packaging material. Check the delivery for completeness and overall condition. In particular, you should compare the Order No. on the rating plates with the ordering data. If possible, please retain the packaging material, since you can use it again in case of return deliveries.

1.4. Calibration information

The GasEye Cross Duct system is factory calibrated using certified gas mixtures. The instrument utilizes an internal in-line reference gas cell for real time verification of the calibration status or a process gas normally present in the process gas stream. Thus, we can assure long term stability an accuracy of the system and there is no need for calibration of the system in field as long as the system status is operational.

2. General information about the analyzer

2.1. Introduction

The laser based GasEye Cross Duct spectrometer is a versatile analyzing tool for industrial process applications. It can be configured to operate in the near-infrared (NIR), mid-infrared (MIR) and infrared (IR) wavelength range thereby covering the majority of all gases of interest in the industrial process monitoring.

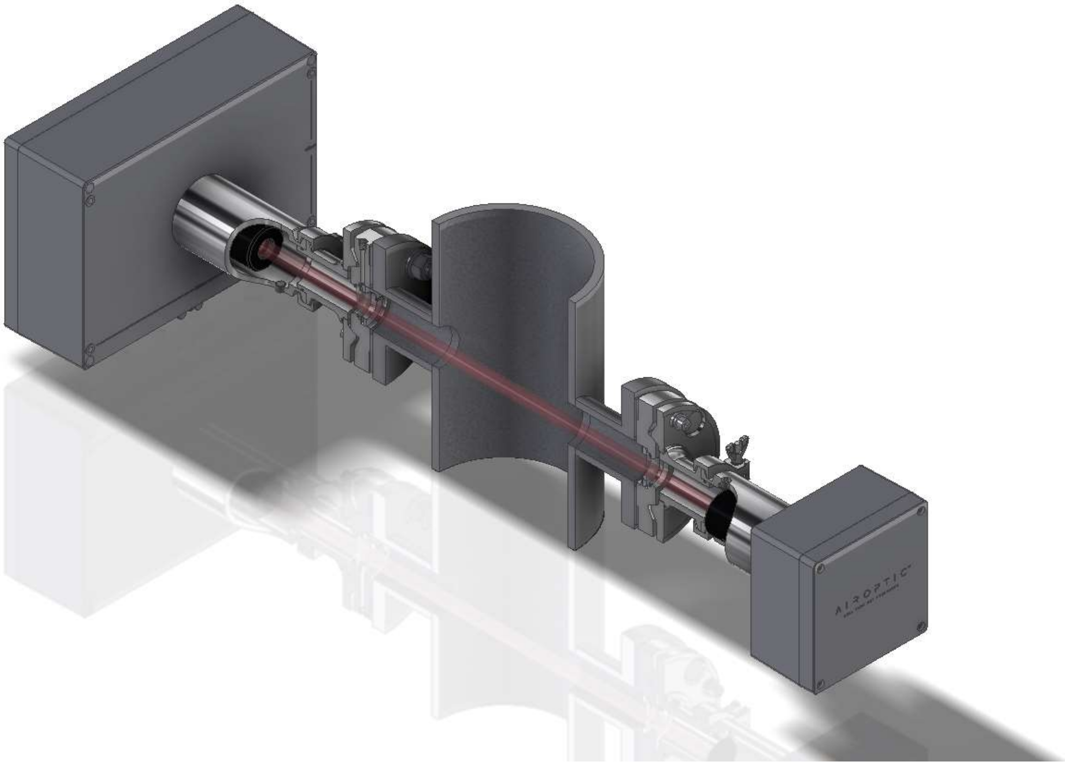

Figure 1. Typical setup of the GasEye Cross Duct SG spectrometer.

2.2. Types of applications

GasEye Cross Duct SG instrument was designed and is used in many specified applications, in industries such as:

- Power industry – monitoring of the combustion process
- Wood board production – operator safety, emission
- Chemical industry
- Cement industry
- Steel industry

2.3. Analyzer arrangement

2.3.1. GasEye Cross Duct SG mechanical assembly

The GasEye Cross Duct SG (Single Gas) analyzer consists of a pair of cross-duct sensors - a central unit with transmitter and a receiver unit. The central unit emits laser radiation directly through the process containing the constituents of interest. The receiver unit collects the radiation on the other side of the process duct. The receiver unit is connected to the transmitter unit by means of a hybrid loop cable (included). The GasEye Cross Duct utilizes an internal in-line reference gas cell or a process gas (e.g. H2O) for real time verification of the calibration status.

Figure 2 shows the GasEye Cross Duct assembly with external mechanical parts description.

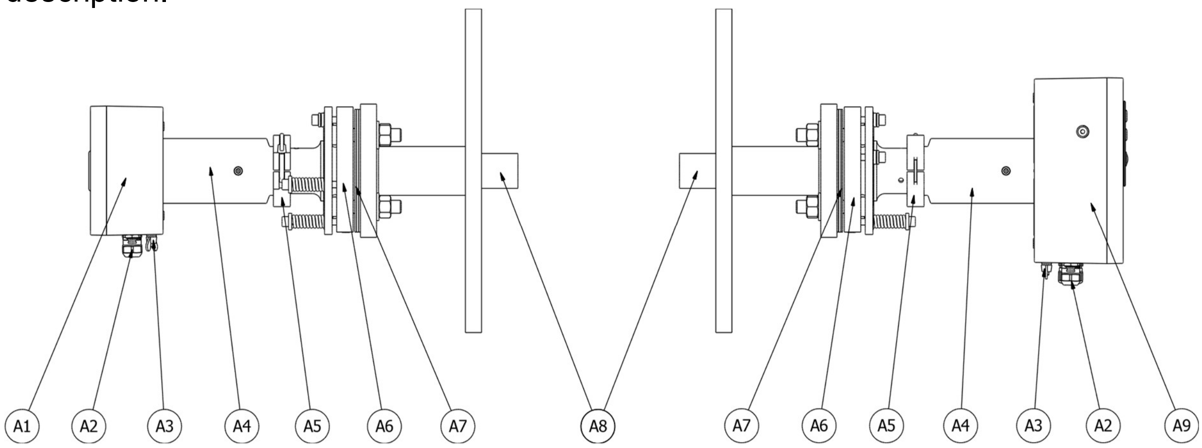

Figure 2. GasEye Cross Duct SG instrument assembly.

ID	Name
A1	Receiver unit housing (GasEye integral part)
A2	Cable glands/ purging connectors
A3	PE connector
A4	Receiver/central unit tube (GasEye integral part)
A5	Sanitary clamp
A6	Alignment flange
A7	Gaskets
A8	Purging tubes
A9	Central unit housing

Table 1. Descriptions of GasEye Cross Duct instrument assembly.

In
Figure 3 the details of each unit's housing are highlighted.

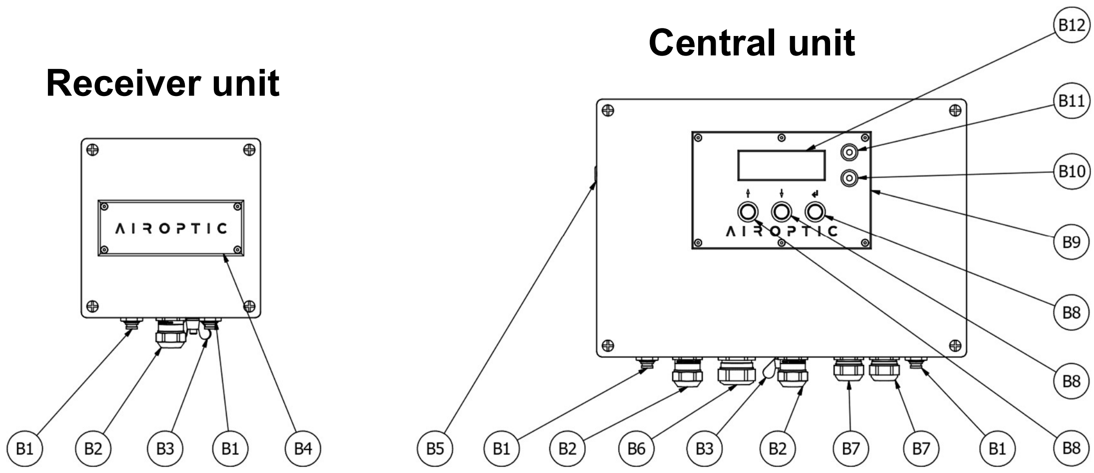

Figure 3. Receiver and transmitter unit drawings.

ID	Name
B1	Purge connector
B2	Cable gland M20
B3	PE connector
B4	Receiver front panel
B5	White LED
B6	Cable gland PG21
B7	Cable gland M20
B8	HMI button
B9	HMI front panel
B10	HMI green LED
B11	HMI red LED
B12	HMI window

Table 2. Descriptions of receiver and transmitter unit.

2.3.2. GasEye Cross Duct Multi Gas (MG) mechanical assembly

The GasEye Cross Duct MG (Multi Gas) analyzer consists of a pair of cross-duct sensors - a transmitter and a receiver unit as well as a central unit. The transmitter unit emits laser radiation directly through the process containing the constituents of interest. The receiver unit collects the radiation on the other side of the process duct. The central unit, located close to transmitter unit (<2 meter) contains analyzer electronics, MMI and I/O. The receiver unit is connected to the central unit by means of a hybrid loop cable (included) and the transmitter unit is connected to the central unit by 2 electrical cables

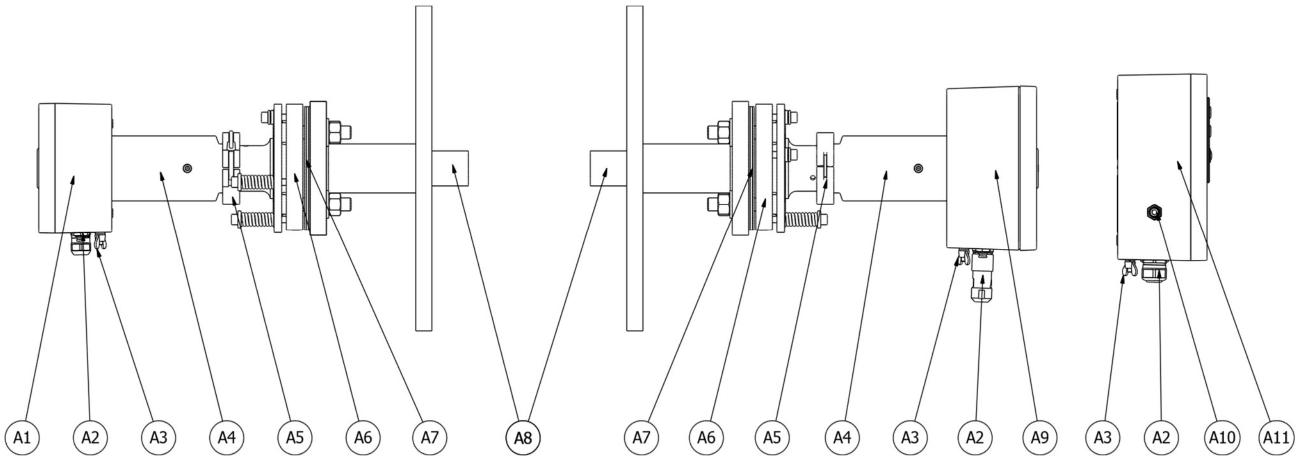

Figure 4. GasEye Cross Duct Multi Gas instrument assembly

ID	Name
A1	Receiver unit housing (GasEye integral part)
A2	Cable glands/ purging connectors
A3	PE connector
A4	Receiver/transmitter unit tube (GasEye integral part)
A5	Sanitary clamp
A6	Alignment flange
A7	Gaskets
A8	Purging tubes
A9	Transmitter unit housing
A10	Purge connector
A11	Central unit housing

Table 3. Descriptions of receiver and transmitter unit.

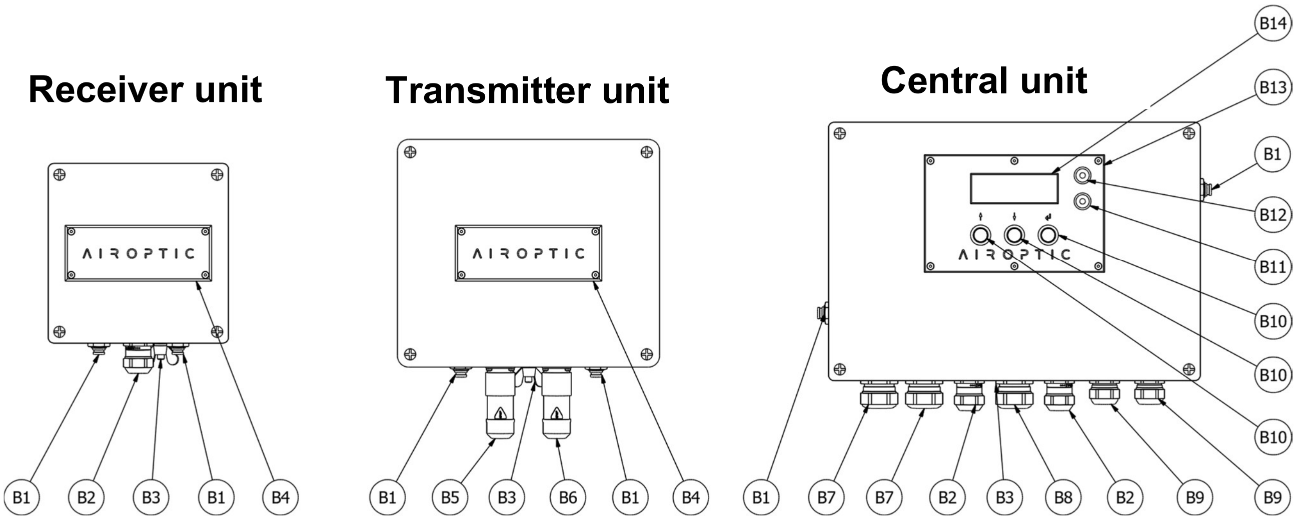

Figure 5. Receiver, transmitter, and central unit drawings.

ID	Name
B1	Purge connector
B2	Cable gland M20
B3	PE connector
B4	Receiver/transmitter front panel
B5	Laser connector M23
B6	Laser connector M23
B7	Cable gland M25
B8	Cable gland PG21
B9	Cable gland M20
B10	HMI button
B11	HMI green LED
B12	HMI red LED
B13	HMI front panel
B14	HMI window

Table 4. Descriptions of receiver, transmitter, and central unit housing assembly.

2.4. Functional description

2.4.1. Principle of operation

GasEye Cross Duct is a laser analyzer that utilizes tunable diode laser (TDL) absorption spectroscopy. The central unit sends a laser light through the process which is detected by the receiver unit mounted on the opposite side of the process. When a gas of interest is present in this process, it will absorb the laser light. The optical power detected in the receiver unit will depend on the concentration of the gas, temperature, pressure and optical pathlength according to Lambert’s Beer law. Thus in order to determine the gas concentration, the analyzer requires information regarding temperature, pressure and optical pathlength. Temperature and pressure signals can be provided by analog inputs, via industrial communication protocols or as manual values via Webserver or HMI. Pathlength needs to be provided by the user via HMI or Webserver.

In the GasEye Cross duct analyzer, the laser wavelength is specifically chosen to match the fingerprint region of the particular gas of interest and is being continuously scanned over the absorption lines(s). Since full spectral information is recovered with very high spectral resolution the analyzer remains immune to foreign gas broadening and is immune to cross-interferences from dust and any other gas constituents in the process.
GasEye cross duct by design can operate in several wavelength regions from near infrared to Mid-Infrared.

3. Technical data

3.1. Design, enclosure

Degree of protection: In accordance with IP65

Process windows: Leak tested and certified in accordance to EN1779:1999 norm.

Instrument dimensions:

SINGLE GAS

Central unit:
Width x height: 330 mm x 230 mm
Length: 350 mm

Receiver:
Width x height: 160 mm x 160 mm
Length: 330 mm

Weight:
Receiver unit: 13 kg

Transmitter unit: 15 kg

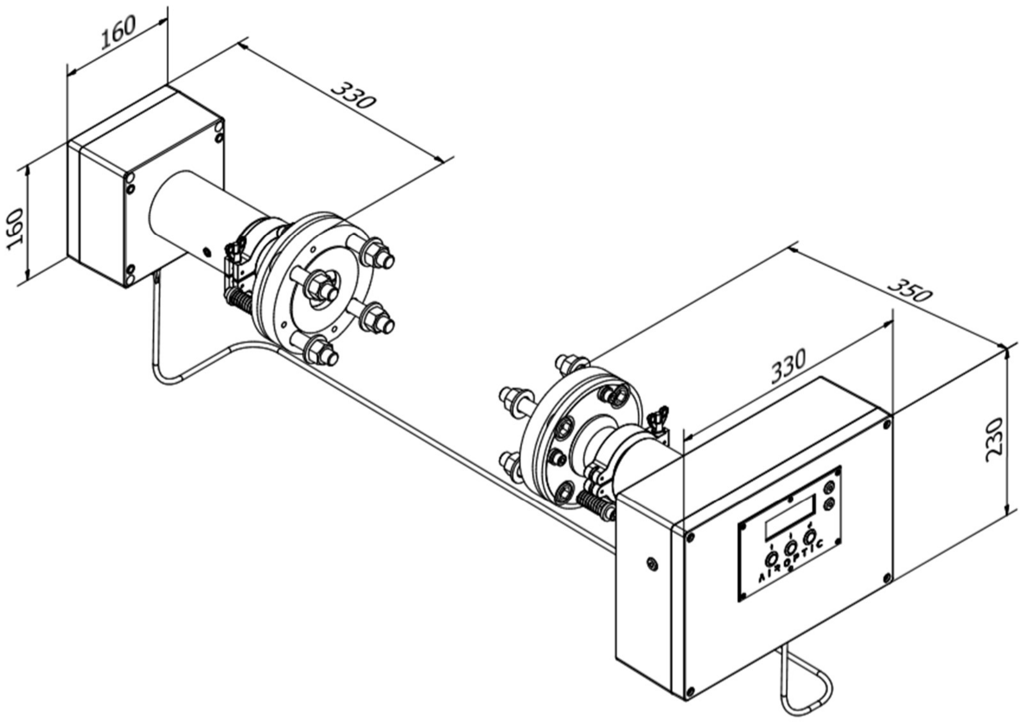

Figure 6. GasEye Cross Duct Single Gas overview.

MULTI GAS

Transmitter:

Width x height: 230 mm x 202 mm
Length: 350 mm

Receiver:

Width x height: 160 mm x 160 mm
Length: 330 mm

Central unit:

Width x height: 330 mm x 230 mm
Length: 110 mm

Weight:

Receiver unit: 13 kg
Transmitter unit: 14 kg
Central unit 6 kg

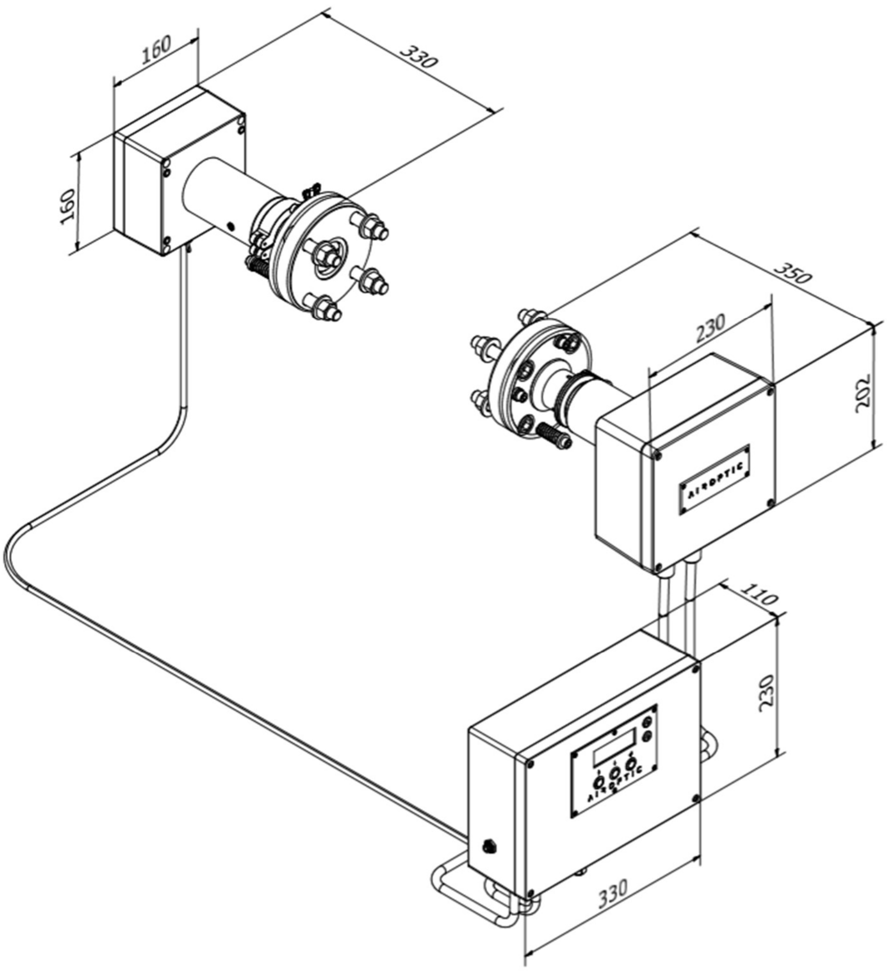

Figure 7. GasEye Cross Duct Multi Gas overview.

3.2. Electrical characteristics

Power input: 24 VDC nominal (19-30 VDC)

Power consumption: < 15VA (single gas)
< 25VA (multi gas)

EMC immunity: In accordance with EN 61326-1

Electric safety: In accordance with 61010-1

3.3. Dynamic performance

Warm-up time: approx. 6 minutes. It takes approximately 60 minutes for the system to be fully operational.

3.4. Electric inputs and outputs

Inputs:
4 x analog input (4 – 20 mA)
8 x digital input (isolated)

Outputs:
4 x analog output (4 – 20 mA, isolated)
8 x digital output (isolated)

WARNING
Analog outputs
*GasEye Cross Duct may have **active** or **passive** analog outputs, depending on the customer requirement. Please ensure that the outputs are handled according to their type. For details, please refer to Chapter 5 of this manual.*

3.5. Customer interface

Ethernet (RJ-45);
WebServer based software for real-time logging of the gas concentration and optical transmission
Windows - based Logger application

3.6. Climatic conditions

Ambient temperature:	-20ºC to +55ºC
Ambient pressure:	800 - 1200 hPa
Ambient humidity:	RH < 99%, non-condensing

3.7. Purging

Sensors purging flow rate:	0.2 – 7 l/min
Process purging flow rate:	5 - 50 l/min for each flange

3.8. Packaging

Each analyzer is shipped in an appropriate box. A stretch foil is used to secure the interior of the box from moisture. There are identification labels on each box which are doubled on the stretch foil. On the outside of the box there are also shipping documents and delivery note.

The interior of the box contains the following items

Analyzer:

Central unit
Receiver unit
Process flanges
Purging tubes
Graphite gaskets
Hybrid loop cable (length according to the POC)
Customer cable
Purging tubing connectors (OD 6 mm)
Flange screws, nuts and washers
Ethernet cable (used for analyzer-to-computer connection)

Documents:

Packing list
Calibration certificate
Analyzer test report
Process flange certificates

Tools:

Wrench size 24
Hex 6 mm
Hex 14 mm
Flat-head screwdriver (for electrical connections)

3.9. Calibration and calibration certificate

The analyzer is calibrated using certified gas sample in the factory. One of the key parameters of the analyzer is its limit of detection (LOD) which determines the lowest measurable concentration. This quantity is estimated for each application and is determined for each device before shipping to our customers. For every GasEYE analyzer we determine the limit of detection during a 12-hour cycle in a climate chamber. The analyzer is placed on a test gas cell and a zero sample is introduced. A zero sample is either nitrogen or dry air to purge out the constituent of interest. The climate chamber temperature is then varied between -20°C to +55°C and the concentration signal is logged, as well as other important analyzer parameters. Based on the concentration reading during the temperature cycle the limit of detection is calculated using the following equation:

$$LOD = 2 * standard\ deviation(gas\ concentration)$$

Limit of detection is usually quantified in ppm x meter units. This allows to easily recalculate the limit of detection for arbitrary path length. For example: Limit of detection for standard carbon monoxide application at room temperature is LOD 0.2 ppm x m. If the process path length is 2.5 meters the actual limit of detection at this distance will be:

$$LOD\ (@\ 2.5\ meters) = \frac{LOD}{Process\ path\ length} = \frac{0.2\ ppm\ x\ m}{2.5\ m} = 0.08\ ppm$$

Before shipment, each analyzer is accompanied with individual calibration certificate, see Figure 8, where all calibration and performance information are given.

AIROPTIC
REAL TIME GAS ANALYZERS

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CALIBRATION CERTIFICATE

Manufacturer:	Airoptic Sp. z o.o.
Address:	Ul. Rubiez 46 B, 61-612 Poznan, Poland
Telephone number:	+48 61 6272 128
E-mail adress:	info@airoptic.pl
Web adress:	www.airoptic.pl

We hereby certify that the instrument mentioned below has been calibrated in accordance with the stated values and conditions.

Product Information:	Gas Analyzer
Application:	In-situ analyzer
Brand name:	**GasEye Cross Duct**
Device number:	DN: CD 21.01.01
Serial number:	CD1000065

Carbon monoxide (CO) calibration has been performed using a certified CO (20 ppm) mixture in nitrogen. Calibration was performed at p=999 mbar and T=23°C and at 2.04 meter long optical path. Span gas concentrations were obtained by diluting the base mixture with nitrogen.

Span gas mixture CO (ppm)	**0.00**	**5.00**	**10.00**
Measured CO (ppm)	0.02	4.99	10.00

Methane (CH4) calibration has been performed using a certified CH4 (100%). Calibration was performed at p=999 mbar and T=23°C and at 2.04 meter long optical path. Span gas concentrations were obtained by diluting the base gas with nitrogen.

Span gas mixture CH4 (ppm)	**0.00**	**70.00**	**100.00**
Measured CH4 (ppm)	0.00	70.10	100.10

Detection limit has been determined during a 12h long test cycle in a climate chamber with zero gas sample (CO 0.00 ppm) and varying ambient temperature between -20°C to +55°C

Carbon monoxide detection limit: 0.14 ppm*m (@23°C)

Calibrated by:
Date:
Signed:

Figure 8. Calibration certificate.

4. Installation

4.1. Safety information

GasEye Cross Duct is classified as a Class 1 laser product. The emitted laser radiation is invisible (near infrared) and not hazardous to an unprotected eye. GasEye Cross Duct has warning labels placed at positions specified in the EN 60825-1:2014-11 norm.

NOTICE	
CLASS 1 LASER PRODUCT	Internal invisible IR laser is a **Class I** product.

WARNING
Heat safety
Some metal parts and piping placed near the sensors might be at elevated temperatures due to high temperature purging - either from steam or from air. To avoid severe burns these parts must either be isolated or equipped with protective metal sheets. Always use protective gloves in the vicinity of such hot parts.

WARNING
Pressure safety
It is possible to mount the GasEye Cross Duct to processes with elevated pressure. Although the window of the process interface is burst-tested up to 4 MPa (40 bar), the customer should define a safety factor appropriate to his application.

WARNING
Electrical safety
*Mounting or unmounting of the instrument must be performed with the power cord **DISCONNECTED.** The power supply must be connected only when the instrument is fully adjusted and secured.*

4.2. Mounting

4.2.1. Mounting conditions

During the operation, the ambient temperature cannot exceed the values stated in the specification. If the unit is exposed to direct solar radiation, ensure that the total temperature will not exceed the maximum permitted temperature. If these conditions cannot be fulfilled the GasEye Cross Duct must be installed in a cabinet with a controlled environment.

CAUTION
Avoid condensation
As condensation is normally a problem when moving the device from outdoor to the inside of a building, the device should be adapted to the new ambient conditions for a couple of hours before starting it.

4.2.2. Preparations

Prior to the installation of receiver and transmitter units the process flanges must be welded in at the measurement point and must be compatible with DN50/PN10-40 with the minimum inner diameter of 50 mm. The flanges must protrude at least 150 mm (maximally 250 mm) from the wall and 25 – 40 mm into the process area. Flange tubes should never be longer than the purge tube which has a standard length of 400 mm.

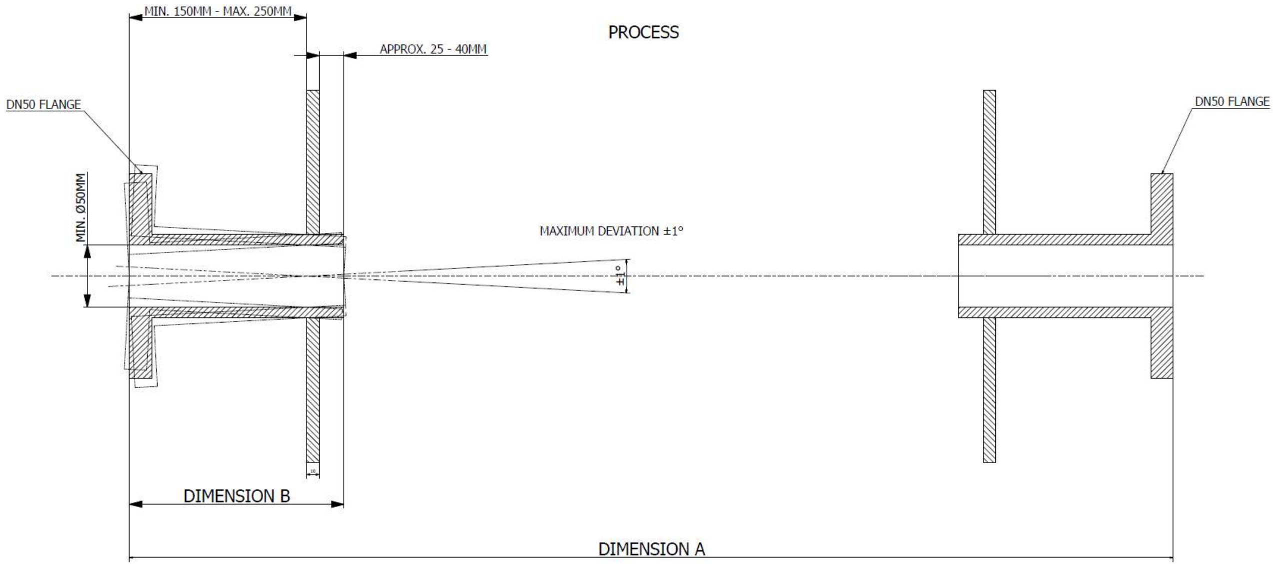


Figure 9. Schematic drawing of the process flange installation.

The central unit (transmitter unit for Multi Gas version) and the receiver unit need to be aligned with respect to the axis of symmetry of the flange.

During the installation of the GasEye Cross Duct instrument, the laser and the photodetector must be aligned to the optical axis of the sensor pair. Note that each sensor has an optical axis of its own which is its axis of symmetry. In addition, the sensor body is at an angle to this axis. The reason for this is that the laser beam passes through two wedged windows before it enters the receiver. Each wedged window will refract the beam at an angle of approximately 1.5°.

4.2.3. Optical path length determination

For proper performance of the instrument it is crucial to determine the correct optical path length. User must enter the actual value of the measuring path length in meters in the GasEye WebServer (Refer to Chapter 8.2 Parameters tab). The measuring path length is defined as the distance between the ends of purging tubes. Please refer to Figure 10 for correct determination of the path length.

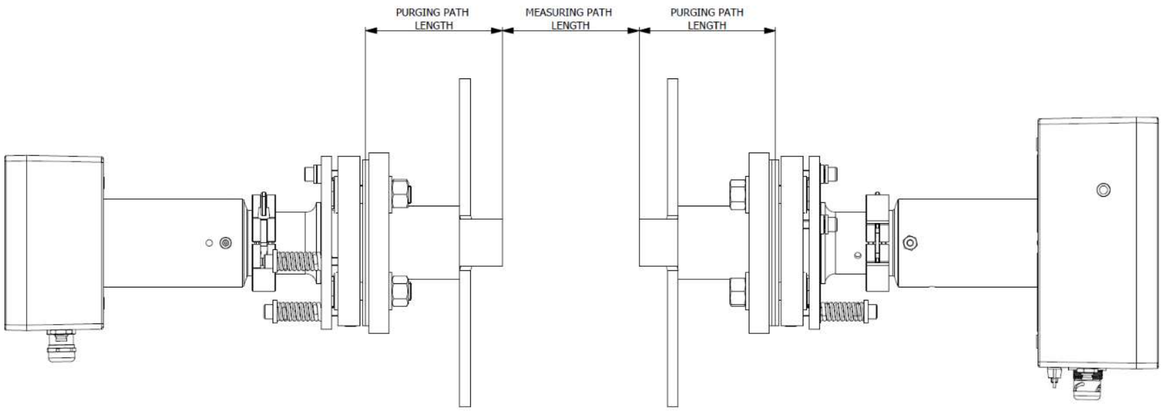


Figure 10. Schematic drawing of the optical path length determination.

4.2.4. Purging tubes

The installation of purging tubes on each side is similar. The purging tube is placed between the customer flange and the process flange. To seal the connection two graphite gaskets are placed on each side of the purging tube. Please refer to Figure 11 for installation details.

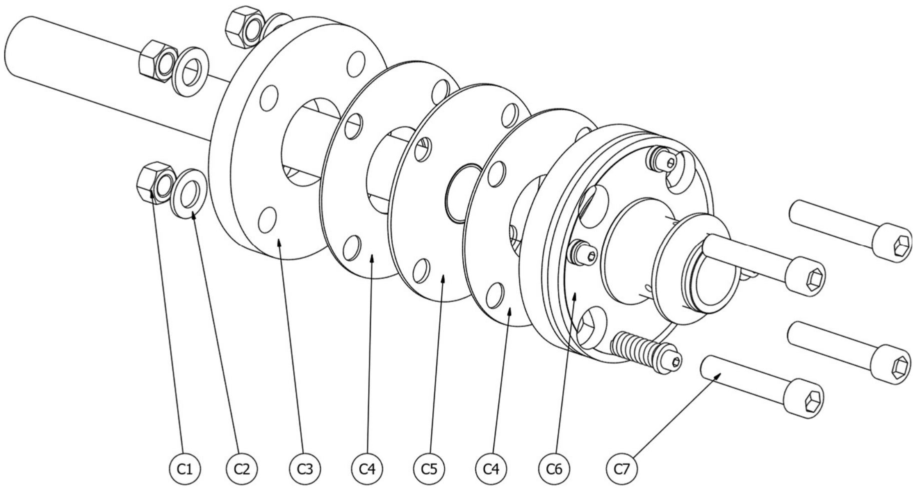


Figure 11. Schematic drawing of purging tube installation.

ID	Name
C1	Nuts
C2	Washers
C3	Process interface
C4	Graphite gasket
C5	Purging tube
C6	Alignment flange
C7	Screws

Table 5. Descriptions of purging tube installation.

4.2.5. Flange installation (3° or 1° wedge window standard version)

1. Put graphite gasket on the purging tube and insert into process flange.

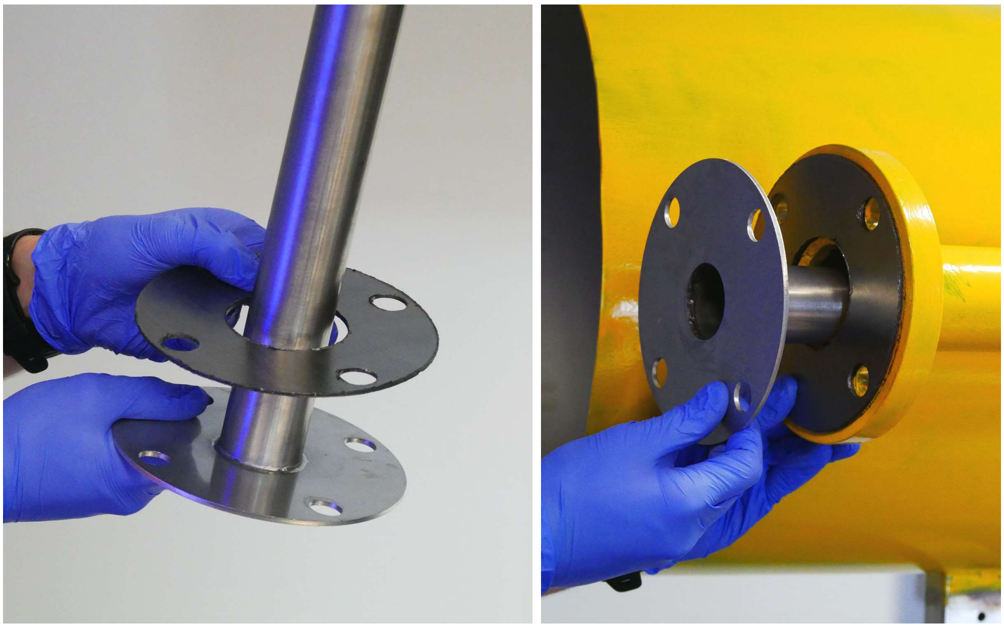


Figure 12. Mounting gasket on the purging tube.

2. Check if the window in flange is clean. The good way to do this is to look through the window on a source of white light or its surroundings. If there is some dust or dirt, it should be cleaned with dry, dustless cloth and then purged with some dry air. Some isopropyl alcohol may also be used.

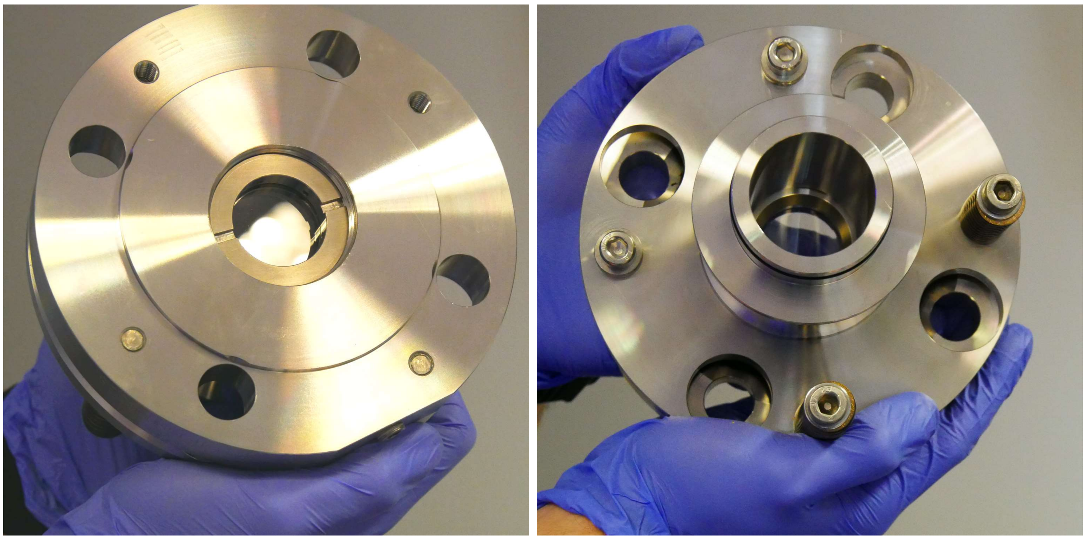


Figure 13. Flange with window.

3. Put M16 screws through flange and mount it on the process flange with another graphite gasket between flange and purging tube.

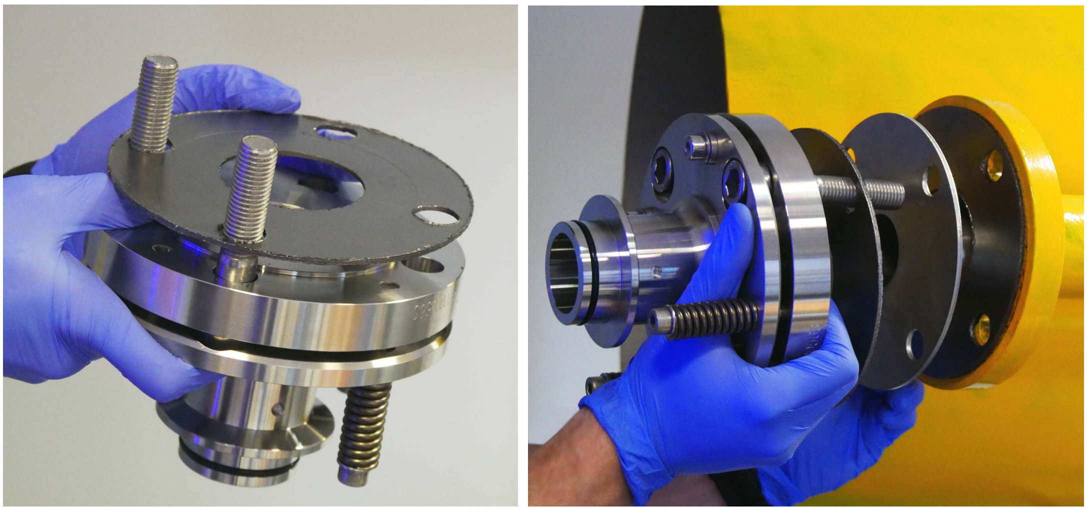


Figure 14. M16 screws mounting.

4. Screw on M16 nuts with pads and tighten them with 14mm hex key and 24mm wrench. Nuts should be tightened with similar torque (around 60-70Nm) to ensure good sealing on the gaskets.

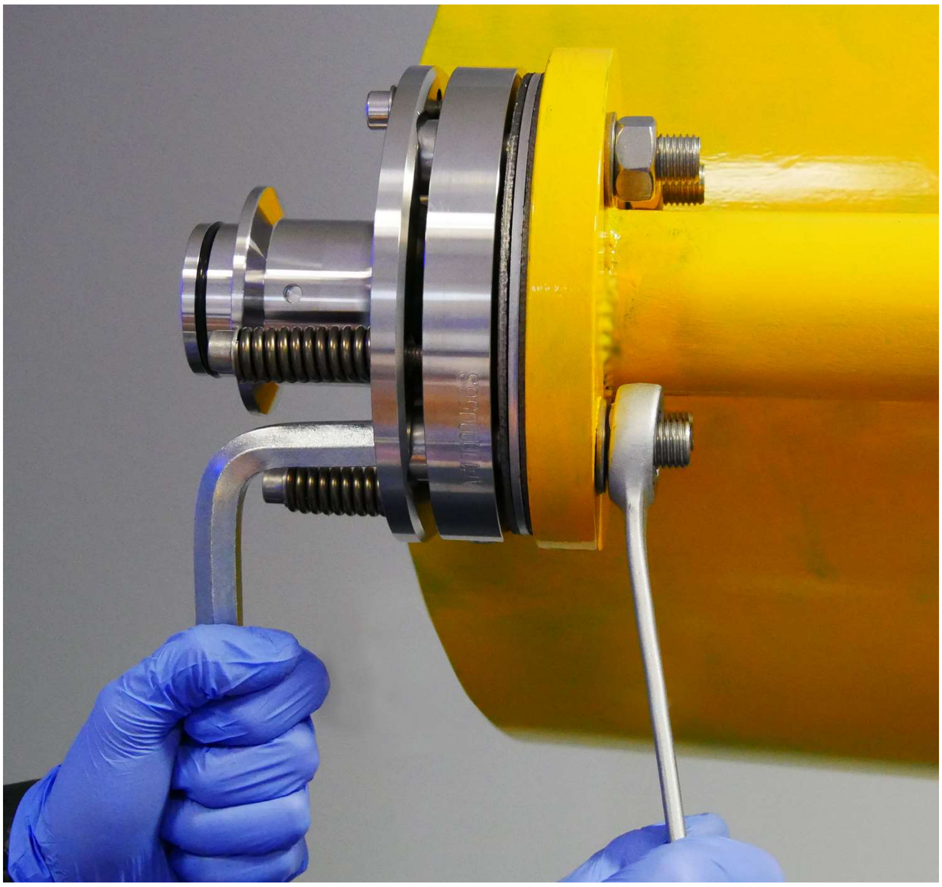


Figure 15. Nuts mounting.

4.2.6. Flange installation (1° wedge window easy-to-clean version "ETC")

1. Put graphite gasket on the purging tube and insert into process flange.

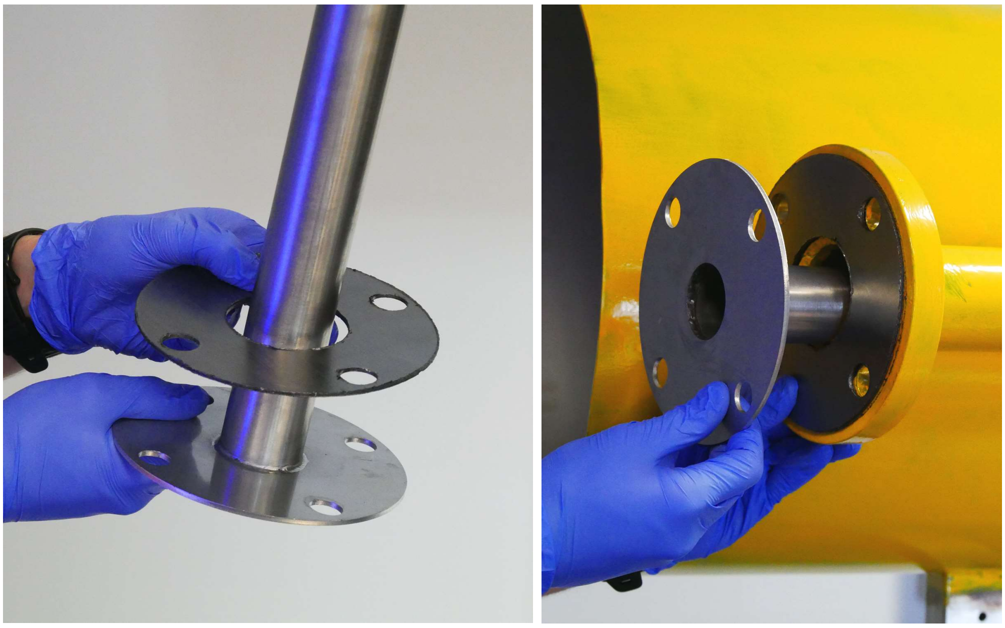


Figure 16. ETC - Mounting gasket on the purging tube.

2. Check if the window in flange is clean. The good way to do this is to look through the window on a source of white light or its surroundings. If there is some dust or dirt, it should be cleaned with dry, dustless cloth and then purged with some dry air. Some isopropyl alcohol may also be used.

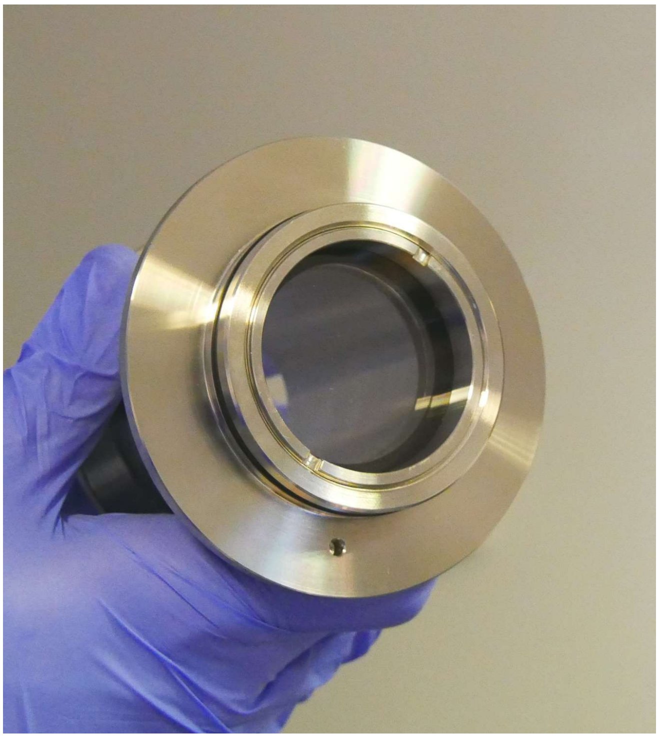


Figure 17. ETC - Flange with window.

3. Mount flange on the process flange with another graphite gasket between flange and purging tube.

Figure 18. ETC - mounting flange on the process flange.

4. Screw on M12 nuts with pads and tighten them with 8mm hex key and 19mm wrench. Nuts should be tightened with similar torque (around 60-70Nm) to nsure good sealing on the gaskets.

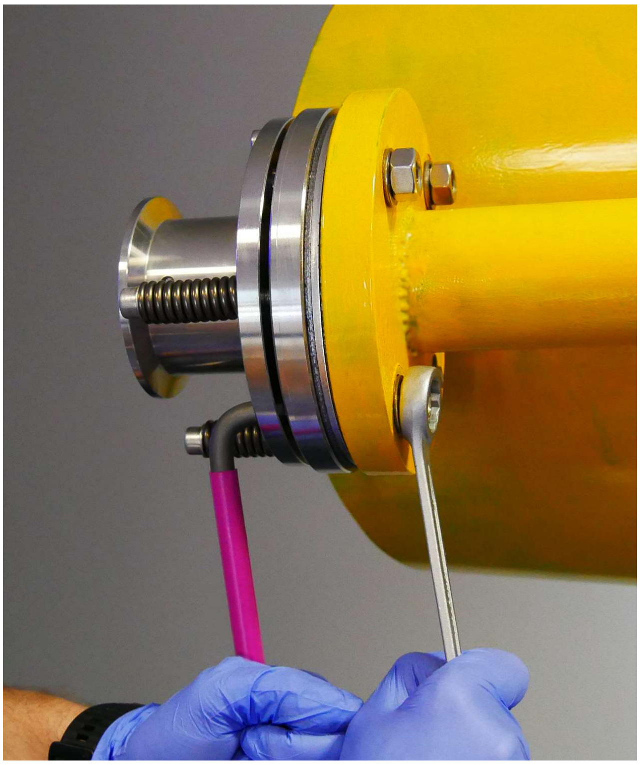


Figure 19. ETC - Nuts mounting.

5. Insert adapter with window into mounted flange. Check if the clocking bolt is on the right position to get into the hole in adapter.

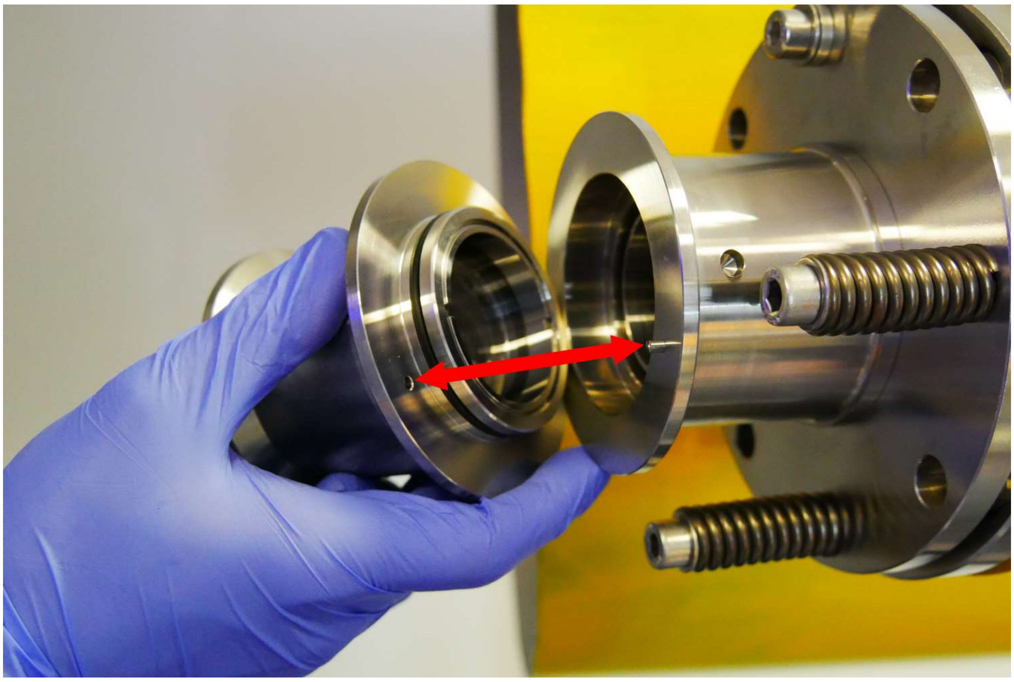


Figure 20. Mounting ETC adapter.

6. Tighten the clamp ring (⌀ 90mm) on the adapter rim.

Figure 21. ETC clamp ring.

4.3. Alignment of GasEye Cross Duct

The transmitter and receiver units must be aligned using two adjustment screws. These screws enable to regulate the axis of symmetry of the transmitter and receiver units and ensure that the laser beam travels properly between them. The receiver/transmitter units are mounted on flanges that have a spherical surface (See figure below) that helps in the alignment procedure.

4.3.1. Alignment kit

The alignment procedure shall be performed using dedicated alignment kit. Alignment kit is an optional accessory and is not a standard item in the analyzer shipping package.

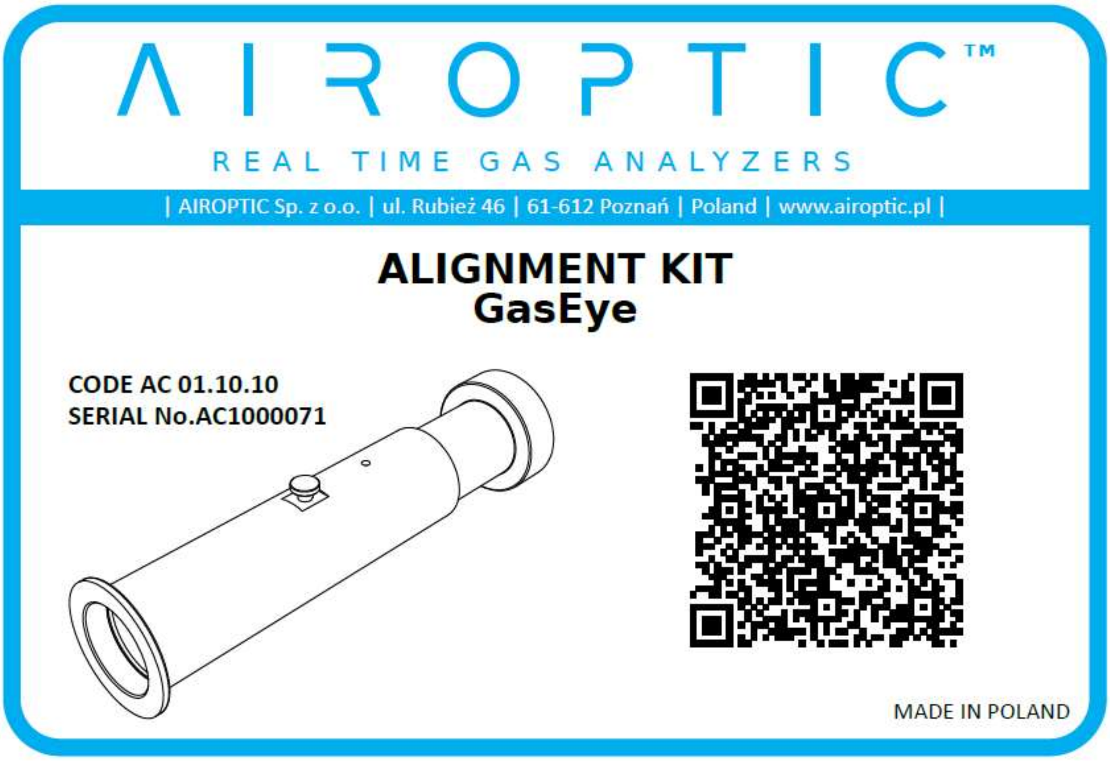


Figure 22. Alignment kit nameplate.

Figure 23. Alignment tool kit interior.

Standard equipment that is found in this kit consists of:

1. Light source (green LED torch)
2. Aiming tool – tool base with fine alignment piece
3. Coarse alignment tool
4. Allen key for adjustment screws (6 mm size)
5. Batteries for LED torch (3xAAA) and dry grease for flange adapter gasket
6. Spare flange adapter gasket
7. Clamp ring

4.3.2. Alignment procedure

The purpose of alignment is to bring the laser light exiting the transmitter to the receiver mounted on the other side of the process site.

Alignment procedure must be performed with high attention to ensure that the instrument will carry the measurements correctly.

The alignment tool consists of a pair of lenses that focuses the light from the light source. The lenses can be moved with respect to each other, hence the spot will differ in size. The optimal focal point is found when the spot seen on the fine aligning piece is smallest possible.

Proper alignment is achieved when the focal spot is in the dedicated point of the fine aligning piece crosshair. Point placement depends on the specific device. The crosshair with optimal aligning point for particular system can be found on a sticker under the analyzer lids (receiver lid or transmitter/central unit lid).

Please check whether the flange windows are clean before mounting alignment kit elements or sensor units. Flange purging is recommended for every installation and should be operational before installation of the flange on the process. This ensures that the windows will remain clean during the installation of the flanges.

CAUTION
When releasing the clamp hold the sensor unit to prevent it from falling!

1. Place the light source in the sleeve and switch it on. Make sure that the light source is operational.

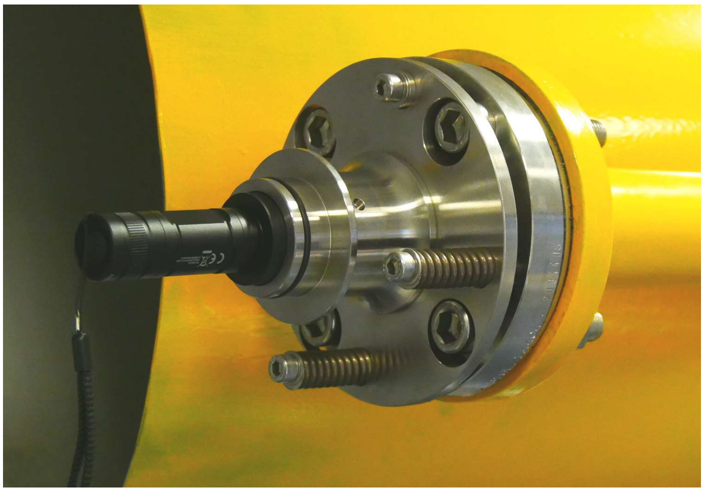


Figure 24. Placing the light source.

2. Proceed to the transmitter side of the instrument.

3. Remove the fine aligning piece from the aiming tool. Loosen the screw on the side of the aiming tool and slide the fine aligning piece out.

Figure 25. Fine aligning piece.

4. Position the aiming piece base on the flange and ensure that the screw on the side of the aiming tool is in line with the purging inlet (on the side of the flange).

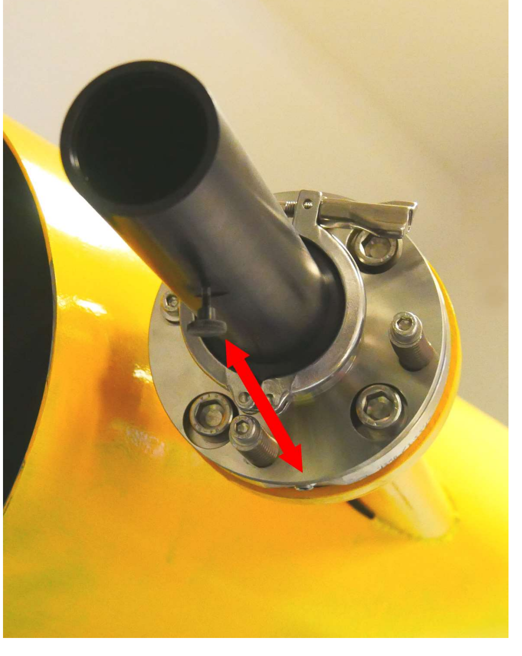


Figure 26. Aiming piece positioning.

5. Tighten the clamp ring on the aiming piece rim.

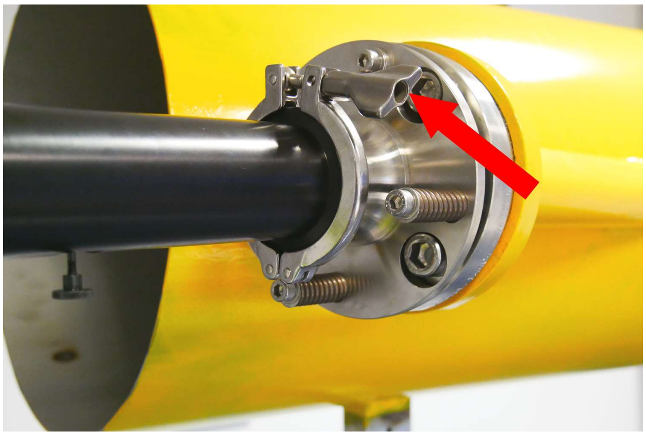


Figure 27. Clamp ring tightening.

6. Place the coarse aligning unit inside of the aiming piece base.

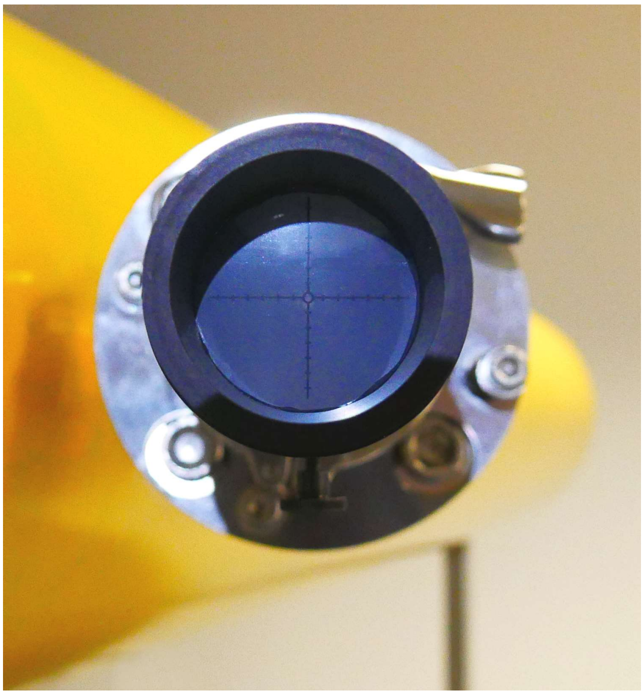


Figure 28. Coarse aligning unit.

7. There should be a light spot visible on the coarse aligning unit screen. If the spot is not visible check whether the light source is switched on.

NOTE! It may be necessary to use a hood to increase the visibility of the spot by reducing the ambient light intensity.

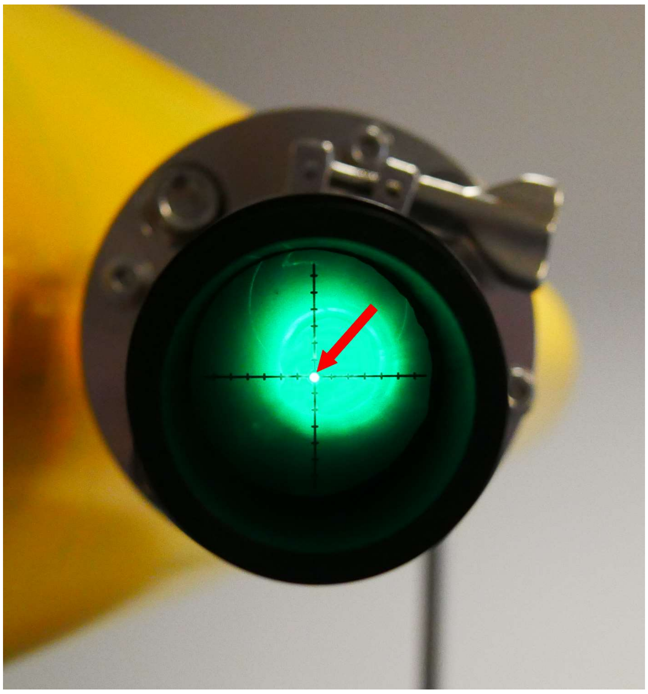


Figure 29. Light spot visibility.

8. By sliding the coarse aligning unit the bright spot may be focused on the screen. Find a position at which the spot becomes the smallest and sharpest.

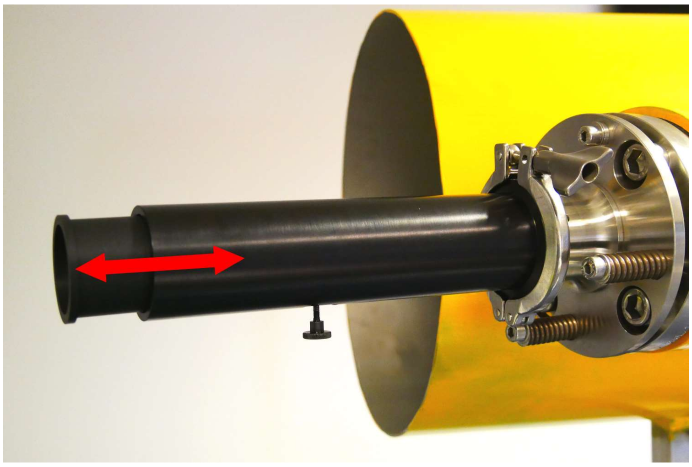


Figure 30. Finding the best spot.

9. Using the provided Allen key, turn the two screws WITHOUT springs until the light spot reaches the center of the crosshair.

NOTE! If at any moment the alignment screws become loose, please tighten the screw with spring on the opposite side.

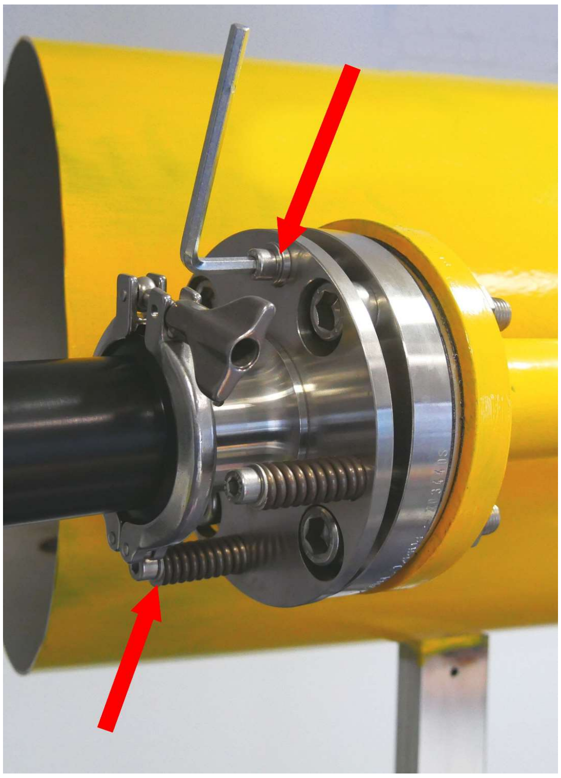


Figure 31. Proper adjusting of the light spot.

10. Replace the coarse aligning unit with the fine aligning unit. Make sure that the crosshair is oriented just like in the picture (in line with the aiming tool screw and the purging inlet in flange).

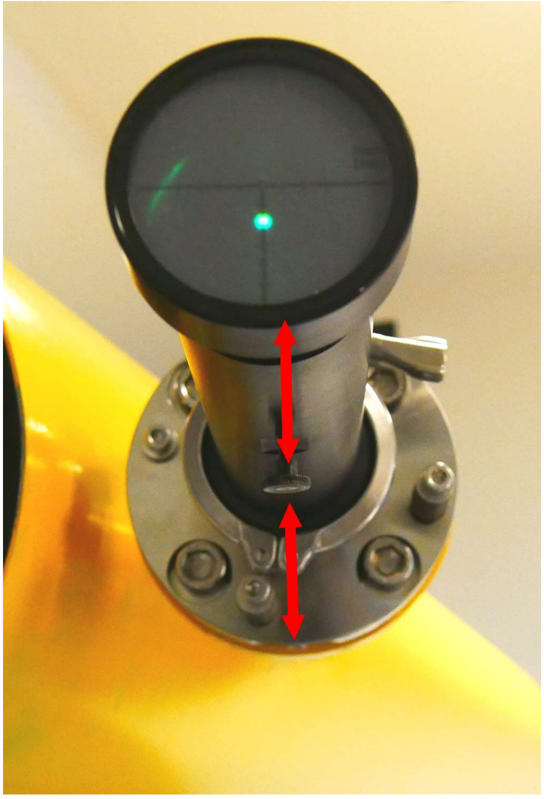


Figure 32. Crosshair orientation.

11. There should be a light spot visible on the fine aligning unit screen. By sliding the fine aligning unit, the bright spot may be focused on the screen. Find a position at which the spot becomes the smallest and sharpest and tighten the screw in the aiming tool.

12. Again, use the provided Allen key to align the light spot in the desired point on the crosshair. The optimal aligning point can be found on the sticker under the analyzer lid (both transmitter/central unit or receiver – see picture below)

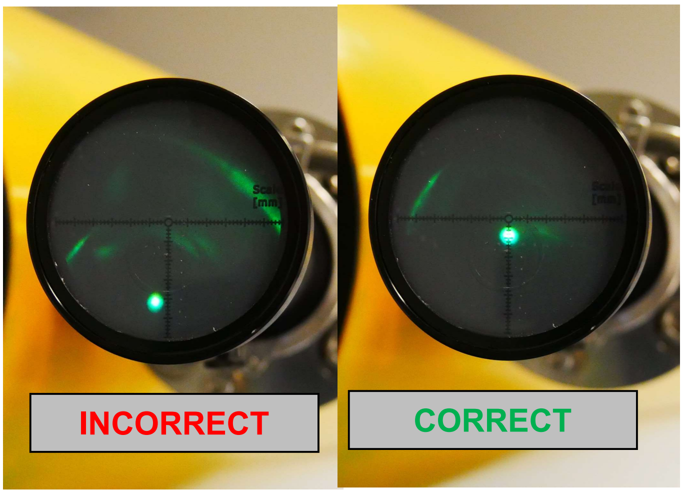


Figure 33. Finding the optimal aligning point.

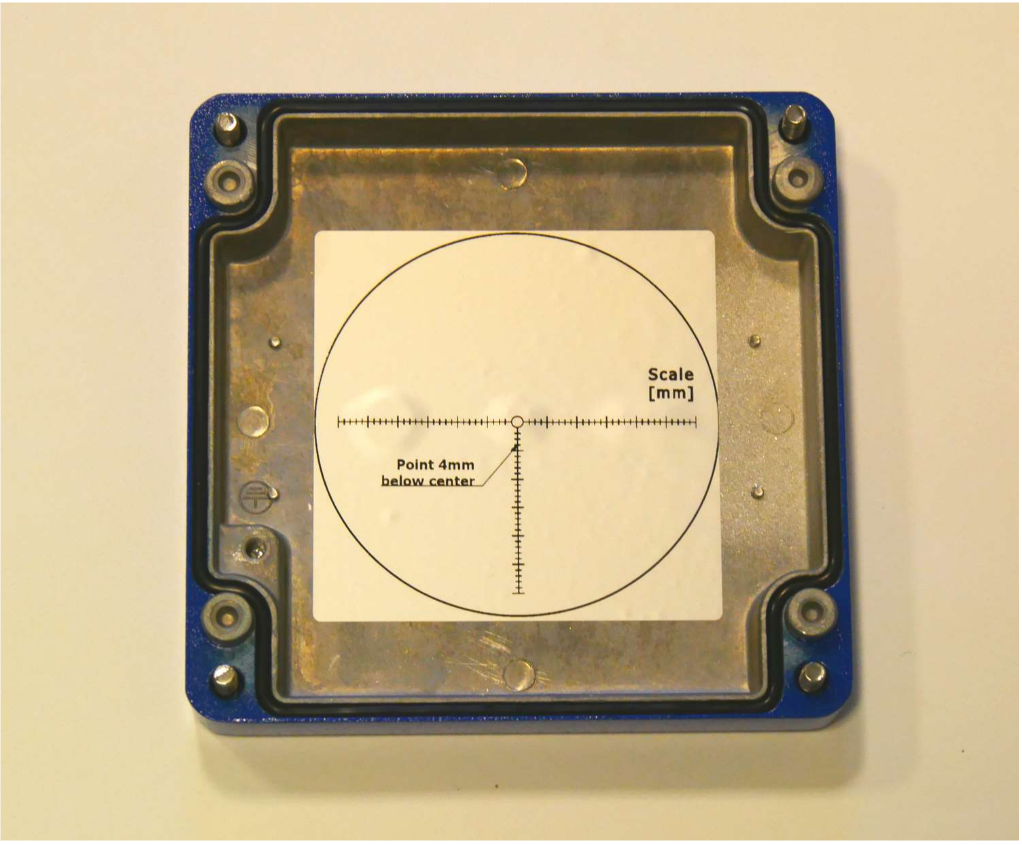


Figure 34. Target aligning point sticker (on the bottom of receiver unit lid).

13. Upon the completion of step 12 proceed with adjustment of the transmitter unit side by swapping places of the light source and the aiming tool and starting from step 4 of the alignment procedure.

The alignment procedure is completed when on the receiver and transmitter sides the light spots are in the optimal aligning point of crosshair for particular analyzer. This alignment should be valid even when the receiver and transmitter units are mounted, dismounted or even when new replacements are installed. However, it is advised to check the alignment prior to each montage.

4.4. Sensor mounting

After completing the flange alignment user may proceed to sensor mounting.

1. Place the transmitter and receiver units on respective sides of the process.

2. Prior to installation ensure that the ring gasket is present on the flange and mount the receiver on the flange.

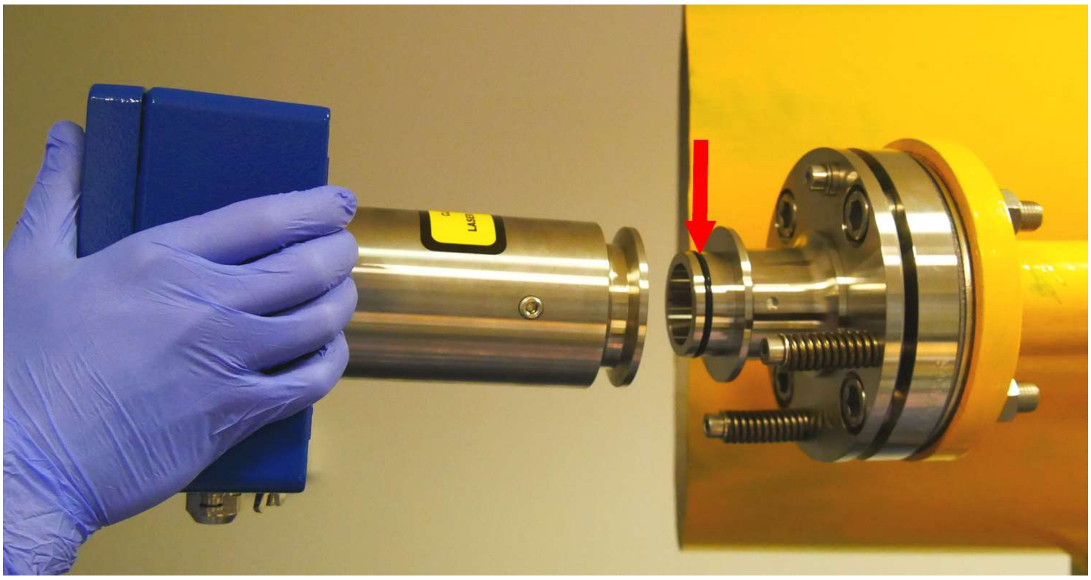


Figure 35. Mounting the receiver on the flange.

3. Make sure the receiver tube is connected properly so the front surface of the tube is aligned to the alignment flange sleeve surface. The connection can be tightened now.

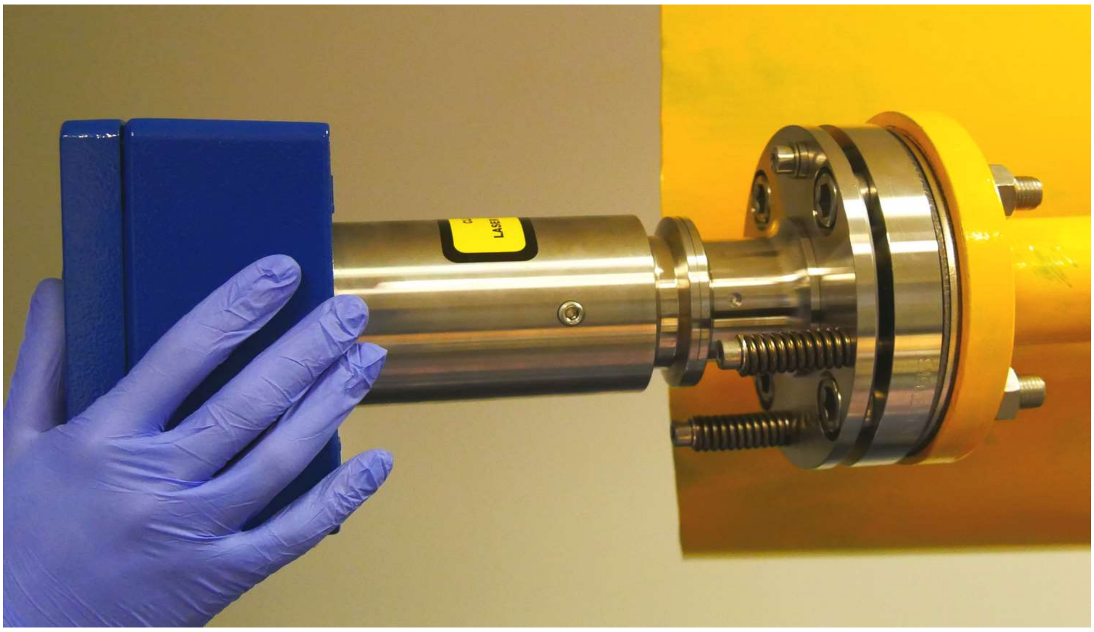


Figure 36. The receiver-flange connection.

4. To tighten the connection place the clamp on the rim of the tube.

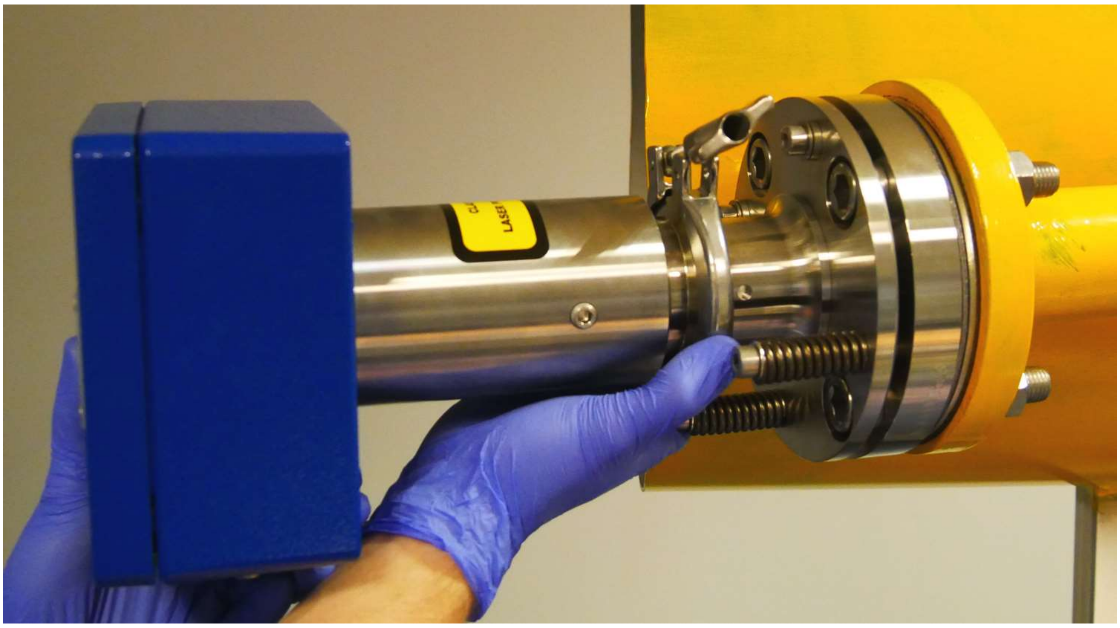


Figure 37. Placing the clamp.

5. Tighten the connection using the clamp screw.

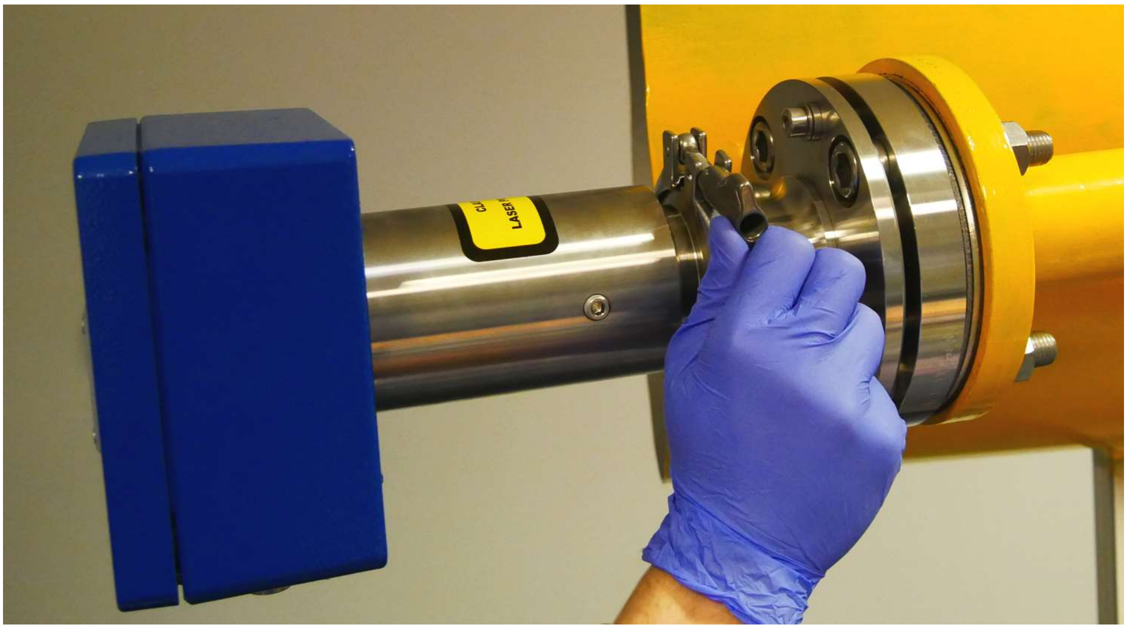


Figure 38. Connection with the clamp screw.

6. Mount the transmitter. Follow the same procedure as for the receiver.
7. The system is now prepared for electrical connections.

4.5. Housing lid opening

Central unit

1. Dismount housing lid of central unit by unscrewing each of the four bolts. Please do it carefully since the lid has connection to boards inside the housing.

2. Separate the lid out of the housing, until the end of wire hinges. Keep horizontal direction (perpendicularly to front side).

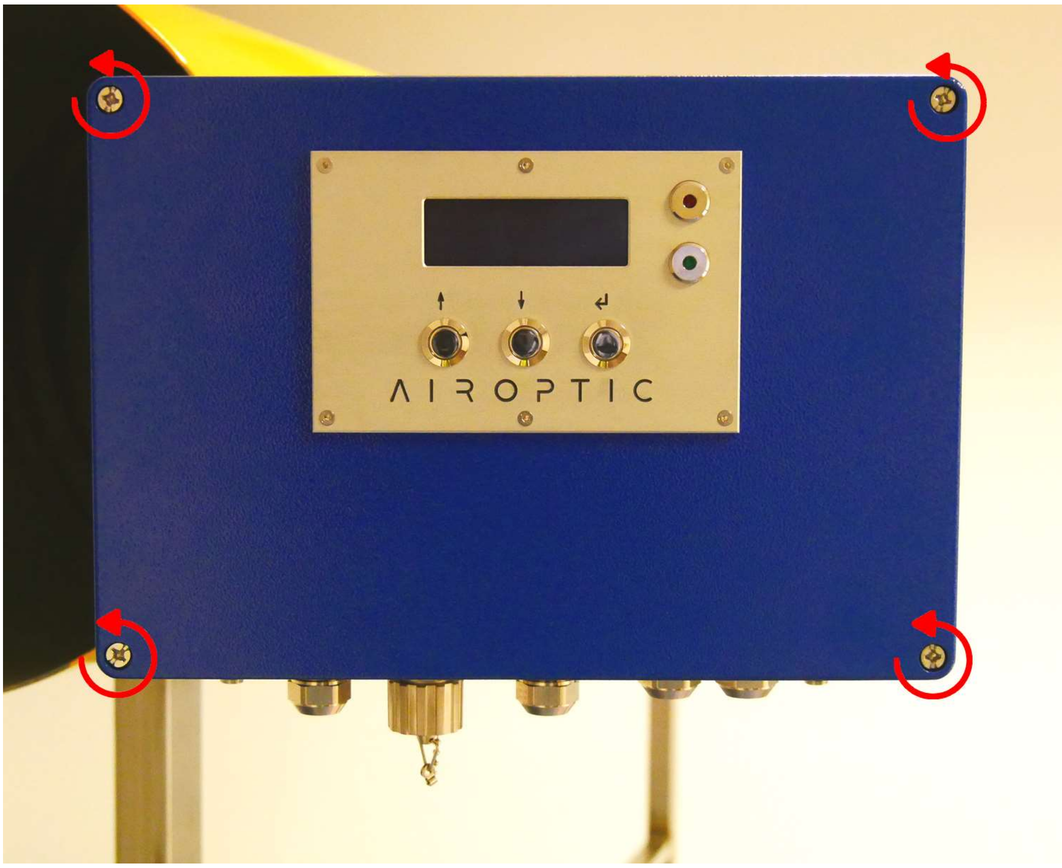
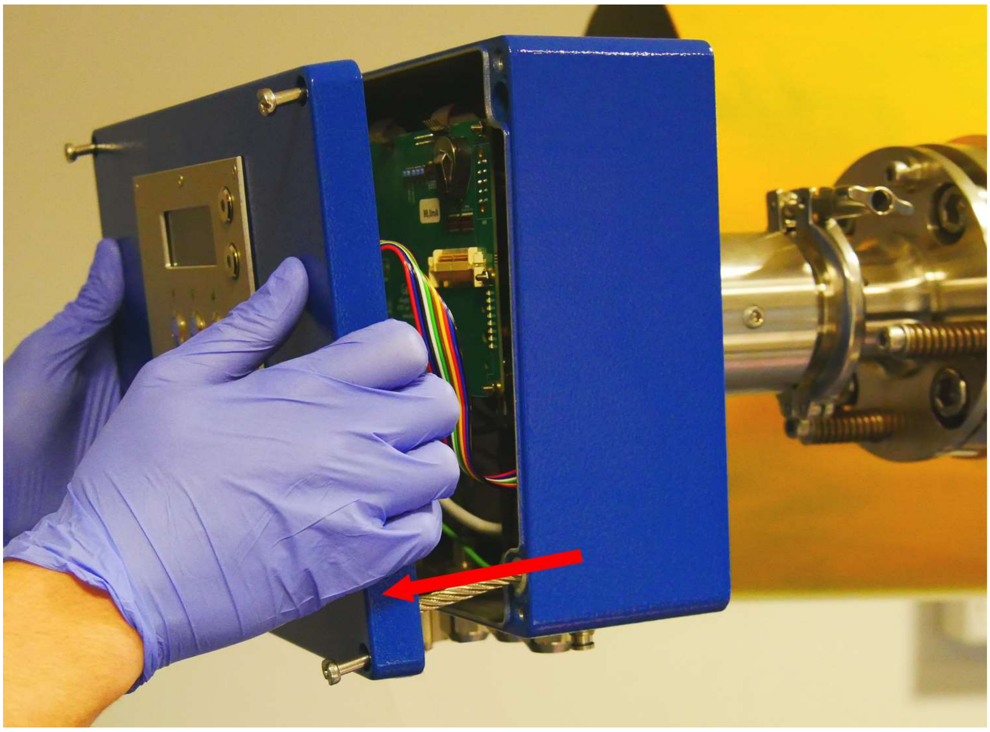


Figure 39. Central unit housing lid bolts

3. Tilt the lid at an angle (maximally 110°) to allow easy access to the components inside the housing. Tilt the lid carefully, do not use too much



strength

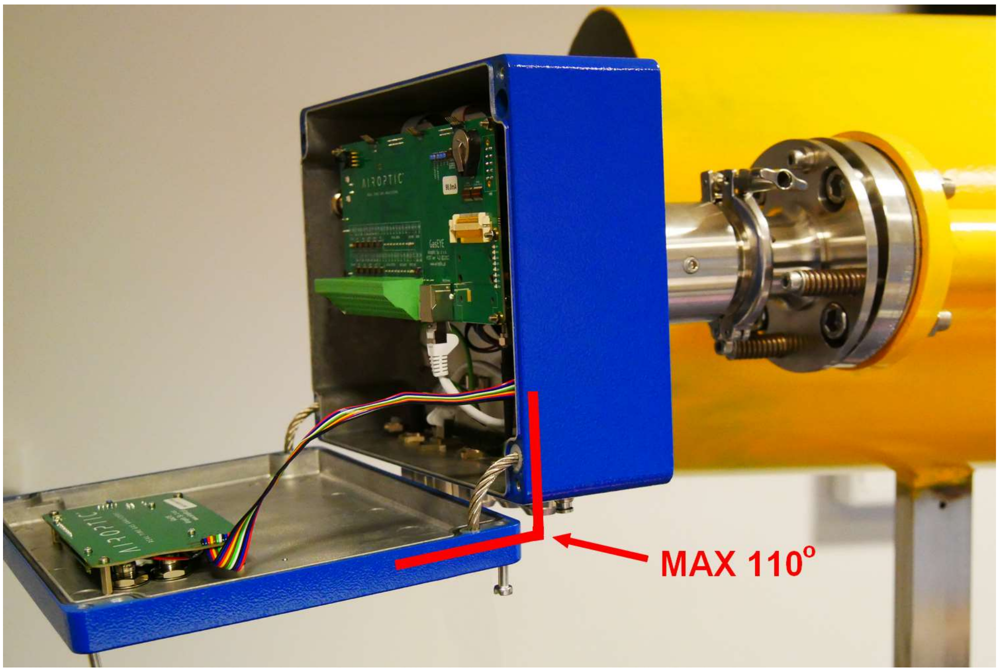


Figure 40. Central unit lid opening.

Figure 41. Maximum angle of central unit lid opening.

Receiver unit

1. Cautiously dismount housing lid by unscrewing each of the four bolts. Do it carefully because receiver unit lid is not attached to the rest of the unit by any other way than the bolts.

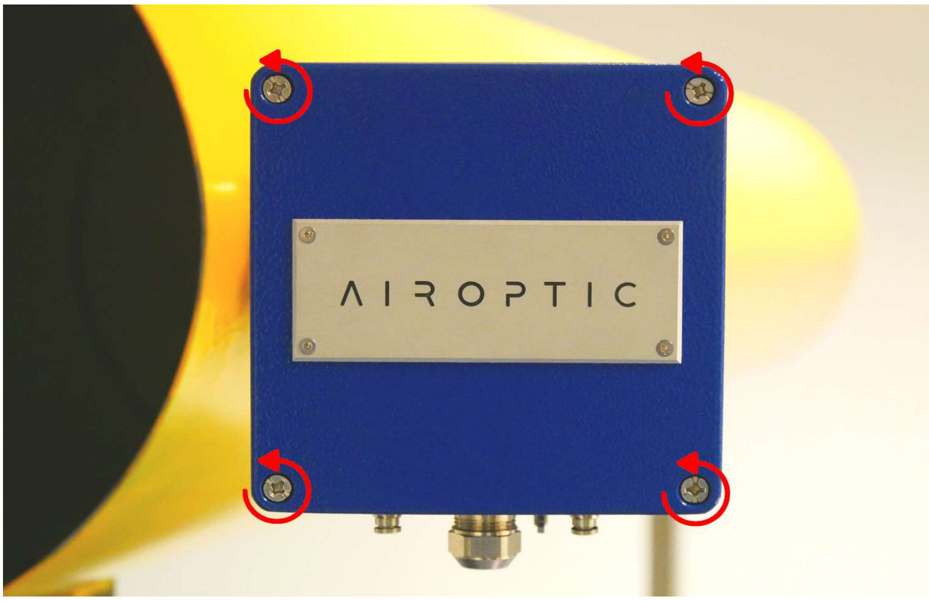


Figure 42. Receiver unit housing lid bolts.

Transmitter unit

1. Cautiously dismount housing lid by unscrewing each of the four bolts. Do it carefully because receiver unit lid is not attached to the rest of the unit by any other way than the bolts.

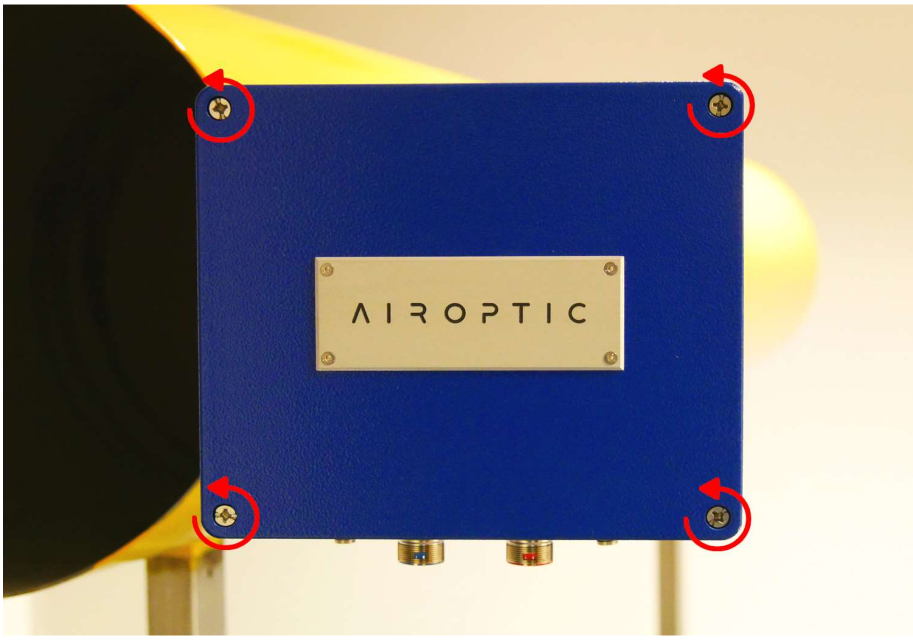


Figure 43. Transmitter unit lid bolts.

5. Electrical installation

5.1. Electrical connections

The GasEye Cross Duct gas analyzer consists of a cross-duct sensors - a central/transmitter unit and a receiver unit. The transmitter unit emits laser radiation directly through the process containing the constituents of interest. The receiver unit collects the radiation on the other side of the process duct. The receiver unit is connected to the central unit by means of a hybrid loop cable.

Standard connections (included) needed for analyzer commissioning are as follows:

- *Customer cable* – used for power supply and analog/digital IO. Customer cable is an electrical cable with 12 x 0.5 mm^2 wires. Standard length is 5 meter (other lengths on request).
- *Hybrid loop cable* – used to connect the receiver unit with the central unit. The hybrid loop cable consists of a fiber optic cable for communication between receiver and the central unit as well as an electrical cable for powering and synchronization with the receiver unit. Standard length is 10 meter (other lengths on request).
- *Ethernet cable* – used for connection of the analyzer with a computer via WebServer. Standard length is 10 meter (other lengths on request).

The connections are shown in Figure 44.

Additional connections for analog or digital signals, as well as Modbus RTU or Add-on module functionality are available depending on the customer requirement.

Electrical characteristics:

- 24 VDC nominal (19 – 30 VDC)
- max. 15W

Available interfaces:

- 4 x analog output 4 – 20 mA (isolated, easy user selection via DIP switch between active/passive mode)
- 4 x analog input 4 – 20 mA (easy user selection via DIP switch between active/passive mode)
- 8 x digital output (isolated)
- 8 x digital input (isolated)
- Human Machine Interface (HMI) – LCD backlight display located on the central unit housing lid
- Ethernet port:
  a) WebServer – system configuration and data acquisition via web browser,
  b) Windows based program – GasEye logger for real time data acquisition,
  c) remote service and diagnostics
- d) USB port – service and diagnostics port
- Optional: Modbus (TCP/IP), Modbus RTU, Profinet, Profibus

Additional build-in features:

- Automatic gain control (AGC): ensures correct gas measurement even at high dust loads resulting in loss of optical transmission down to 0.5%. AGC operates fully automatic with no need for manual adjustment of the signal gain under any process conditions
- Self-calibration features: Internal reference gas compartment is used for closed loop control of the zero and span drift

The system is composed of two units: central unit (with a transmitter) and receiver unit. The receiver unit is connected to the central unit with a hybrid loop cable. The standard loop cable length is 10m (up to 150m). The system is connected to the customer DCS with the customer cable (standard length is 5m). It is also used for powering the device. Ethernet cable is provided for commissioning/service/diagnostic purposes (standard length 10m). System can be fully parametrized and tested via WebServer. Additional cables for industrial protocols must be provided by the customer.

5.1.1. GasEye Cross Duct Single Gas

GasEye Cross Duct Single Gas consists of central unit and receiver unit. See figure below.

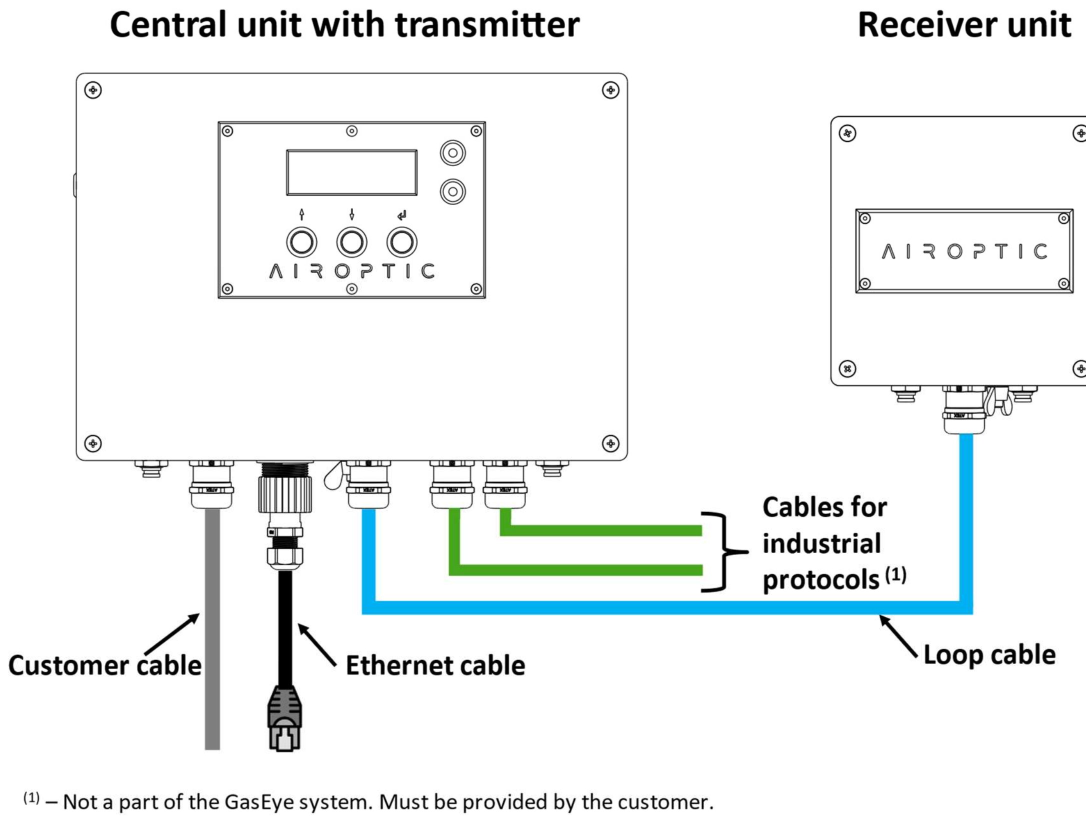
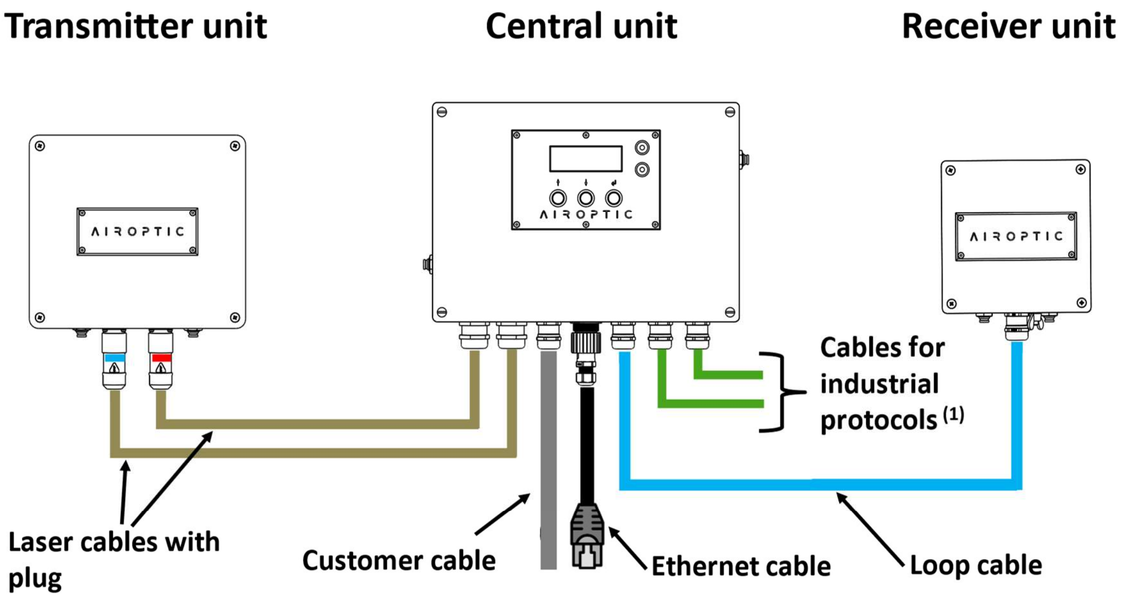


Figure 44. Cross Duct Single Gas electrical connection diagram.

5.1.2. GasEye Cross Duct Multi Gas

GasEye Cross Duct Multi Gas consists of transmitter unit, central unit and receiver unit. See figure below.

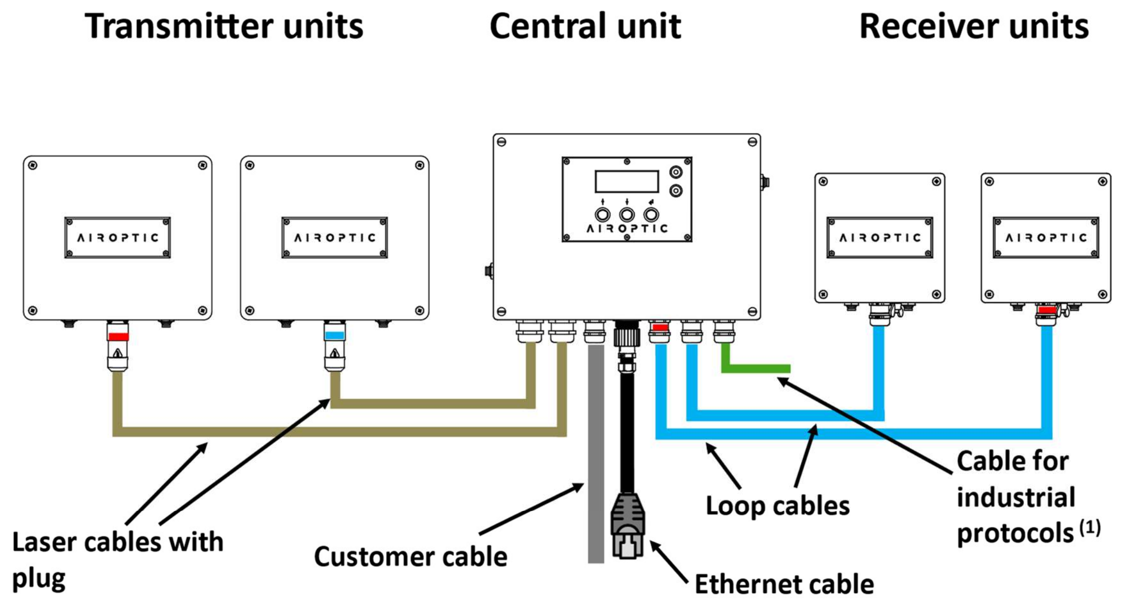


(1) – Not a part of the GasEye system. Must be provided by the customer.

Figure 45. Cross Duct Multi Gas electrical connection diagram.

5.1.3. GasEye Cross Duct Multi Gas Multi Point

The system is composed of two transmitter units, one central unit and two receiver units. See figure below.



(1) – Not a part of the GasEye system. Must be provided by the customer.

Figure 46. Cross Duct Gas Multi Point Electrical Connection diagram.

5.2. Central unit – electrical terminals

The description of the central unit electrical terminals with its functionalities is presented in this chapter.

1. Pressure sensor
2. Electrical terminals
3. USB port
4. Ethernet port for WebServer connection
5. Add-on module interface (optional)
6. Front panel display connection

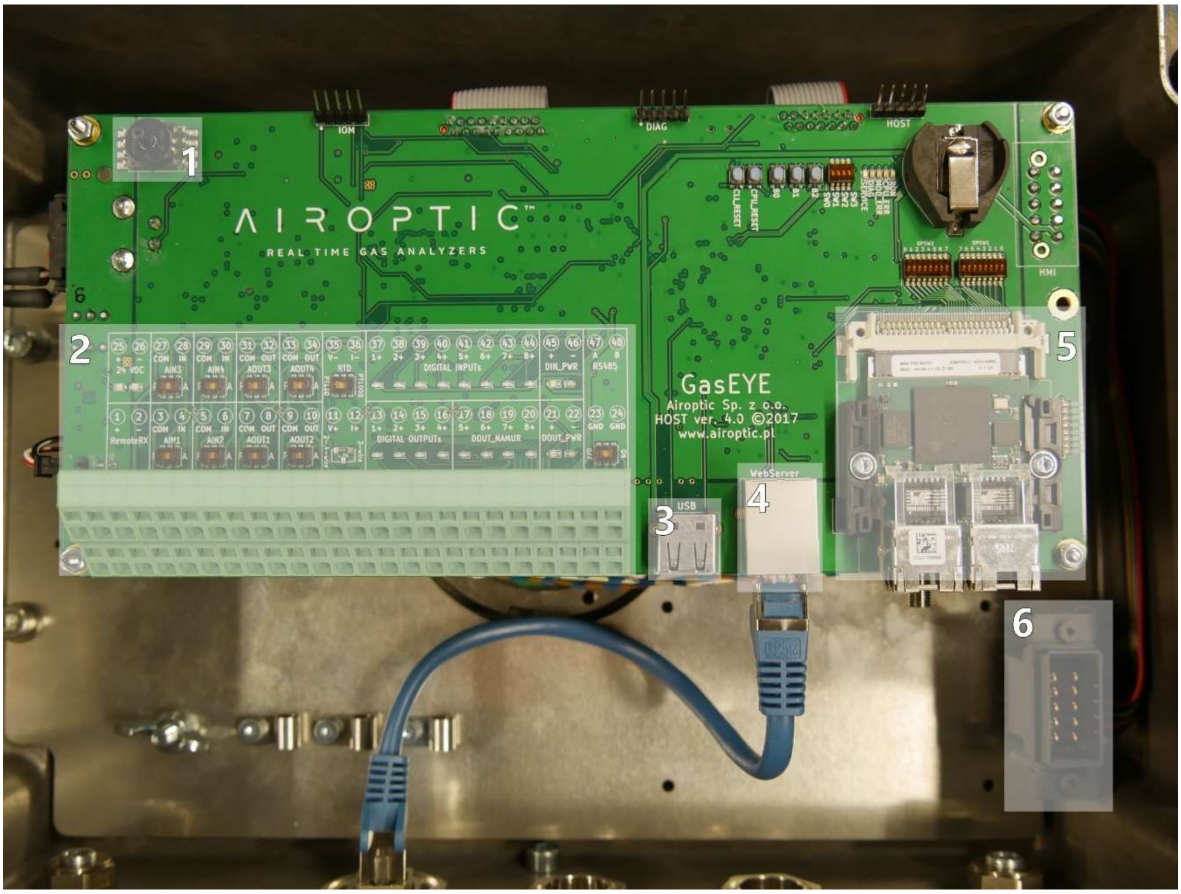


Figure 47. Top view of the HOST board

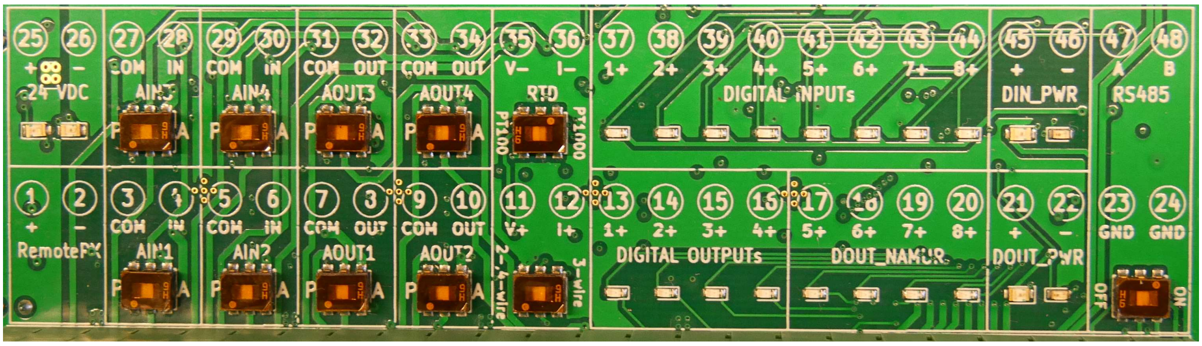


Figure 48. Electrical terminals numbering.

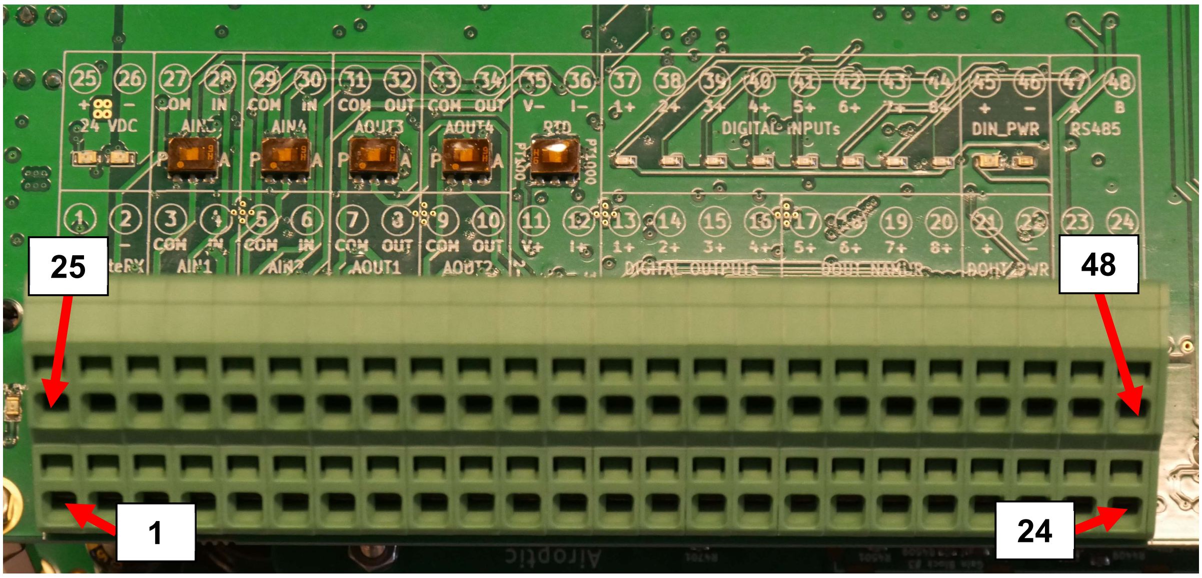


Figure 49. Electrical terminal configuration.

No.	Row	Function	Symbol		Characteristic
1	I	Supply voltage for receiver side	RemoteRX	+	19÷30 VDC (output)
2	I			-	
25	II	Supply voltage	24 VDC	+	19÷30 VDC (input)
26	II			-	
3	I	Analog input 1 (4÷20 mA)	AIN1	COM	19÷30 VDC, 24mA Active/Passive
4	I			IN	
5	I	Analog input 2 (4÷20 mA)	AIN2	COM	19÷30 VDC, 24mA Active/Passive
6	I			IN	
27	II	Analog input 3 (4÷20 mA)	AIN3	COM	19÷30 VDC, 24mA Active/Passive
28	II			IN	
29	II	Analog input 4 (4÷20 mA)	AIN4	COM	19÷30 VDC, 24mA Active/Passive
30	II			IN	
7	I	Analog output 1 (4÷20 mA)	AOUT1	COM	19÷30 VDC, 24mA Active/Passive
8	I			OUT	
9	I	Analog output 2 (4÷20 mA)	AOUT2	COM	19÷30 VDC, 24mA Active/Passive
10	I			OUT	
31	II	Analog output 3 (4÷20 mA)	AOUT3	COM	19÷30 VDC, 24mA Active/Passive
32	II			OUT	
33	II	Analog output 4 (4÷20 mA)	AOUT4	COM	19÷30 VDC, 24mA Active/Passive
34	II			OUT	
11	I	Resistance thermometer input	RTD	V+	PT100/PT1000 2-,3-,4-wire
12	I			I+	
35	II			V-	
36	II			I-	
13	I	Digital outputs 1÷8	DIGITAL OUTPUTs	1+	30VDC, 0.5A Isolated
14	I			2+	
15	I			3+	
16	I			4+	
17	I		DOUT_NAMUR	5+	
18	I			6+	
19	I			7+	
20	I			8+	
21	I	Digital outputs supply voltage	DOUT_PWR	+	
22	I			-	
37	II	Digital inputs 1÷8	DIGITAL INPUTs	1+	30VDC, 0.1A Isolated
38	II			2+	
39	II			3+	
40	II			4+	
41	II			5+	
42	II			6+	
43	II			7+	
44	II			8+	
45	II	Digital inputs supply voltage	DIN_PWR	+	
46	II			-	
23	I	MODBUS RTU	RS485	GND	Isolated
24	I			GND	
47	II			A	
48	II			B	

Table 6. Description of the electrical terminals

5.2.1. Power supply

Specification

Device requirements:

- voltage range: 19÷30 VDC, typ. 24 VDC,
- power consumption: max. 15W / 25W (single / multi gas device).

For proper operation of the device secure adequate power supply.

Connection

Connect the power supply to HOST board P3 terminal. Use the customer cable provided with the device or use a standard cable (shielded cable is preferred) with a maximum wire diameter of 2.5 mm^2 (14AWG). Connect the positive pole of the power supply to the pin 25 and negative pole to the pin 26. Power supply connection diagram is presented at Figure 50.

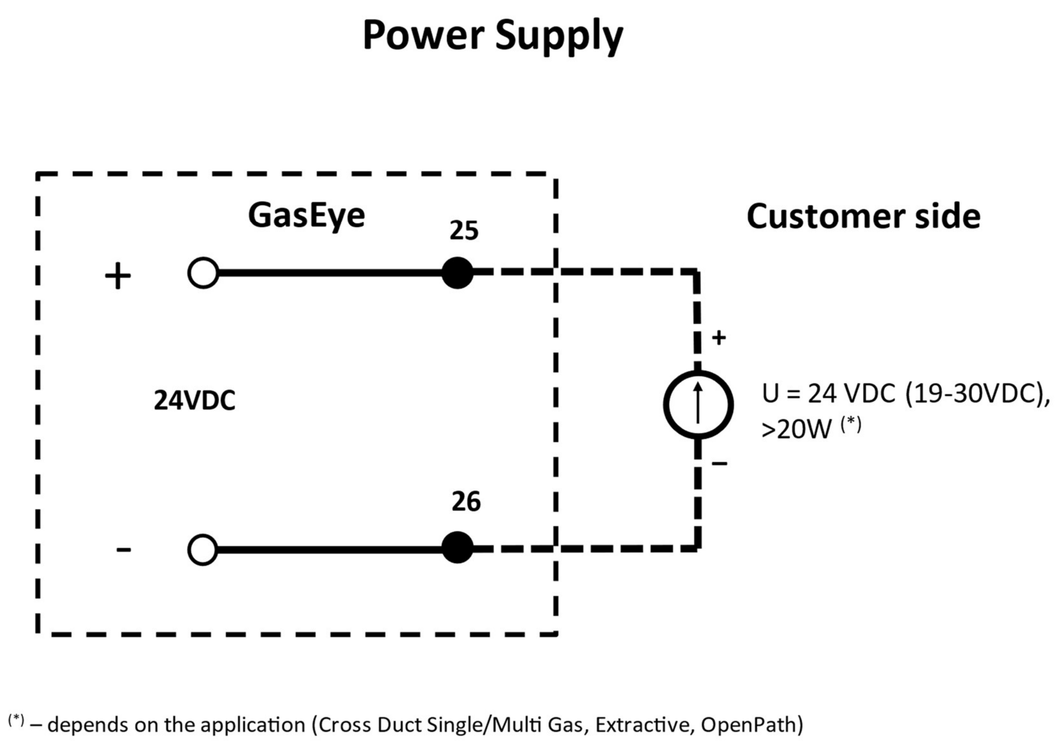


Figure 50. Power supply connection diagram.

Protection

The device is protected by the eFuse with integrated reverse-input polarity protection. The device can withstand positive and negative supply voltages up to ±60 VDC. In case of overvoltage, undervoltage, overcurrent or reverse-input polarity the device is switched off and the red diode on the HOST board (at the 24VDC section) is illuminated.

WARNING
Power supply
The device does not have a power switch! • *Provide a protected circuit breaker in the vicinity of the device at the place of installation.* • *The circuit breaker must be a switch or power switch, and must be labelled as the circuit breaker for the device.* • *At the supply point, the power supply must be isolated from dangerous live cables by double or reinforced insulation in the case of devices with a 24 V supply voltage.*

5.2.2. Analog outputs and inputs

According to the customer preference the analog outputs and inputs can be set as active or passive. Please follow the instructions regarding analog outputs and inputs to avoid faulty operation or damage to the system. Figure 51 presents an overview of the analog input/output dip switches which are found on the electrical panel. Dip switches are used to switch between passive and active. To set analog input or analog output signal to passive, change assigned switch position on position P (Passive). To set analog input or analog output signal to active change assigned switch position on position A (Active).

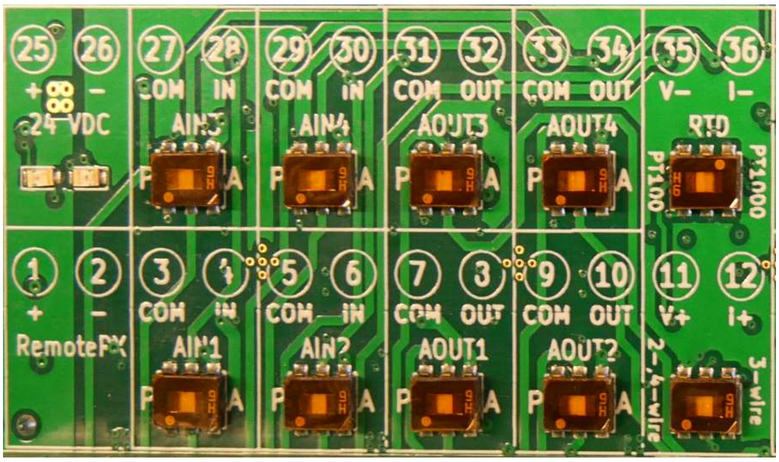


Figure 51. Analog input/output dip switches.

Analog outputs can operate in two modes accordingly to NAMUR NE43 and EN 15267-3:2008. The operation mode can be selected via WebServer in Parameters/AOUT tab. GasEYE device is generated the failure signal at the level of 3.3 mA.

NAMUR NE43 is an international association of process instrumentation user companies that have worked on improving the diagnostic coverage in 4 to 20-mA analog output transmitters to address associated safety issues (Figure 52). NAMUR NE43 provides the guideline for signaling-failure information to the safety-interlock systems over a 4- to 20-mA loop. NAMUR NE43 recommends using 3.8 mA to 20.5 mA as an extended measurement information range. NAMUR NE43 recommends using loop current below 3.6 mA or above 21 mA is in the diagnostic failure information range.

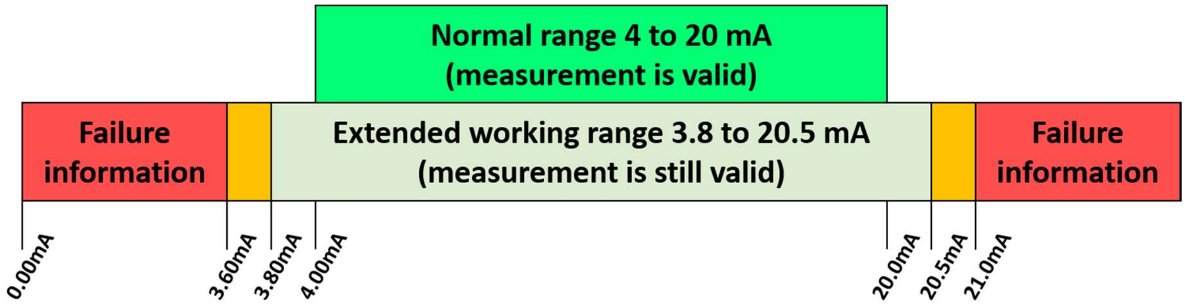


Figure 52. NAMUR NE43 Recommendation.

EN 15267-3:2008 is a European Standard that specifies the performance criteria and test procedures for automated measuring systems that measure gases and particulate matter in, and flow of, the waste gas from stationary sources. This European Standard supports the requirements of particular EU Directives. It provides the detailed procedures covering the QAL1 requirements of EN 14181 and, where required, input data used in QAL3. EN 15267-3:2008 provides the guideline for signaling-failure information to the safety-interlock systems over a 4- to 20-mA loop (Figure 53).

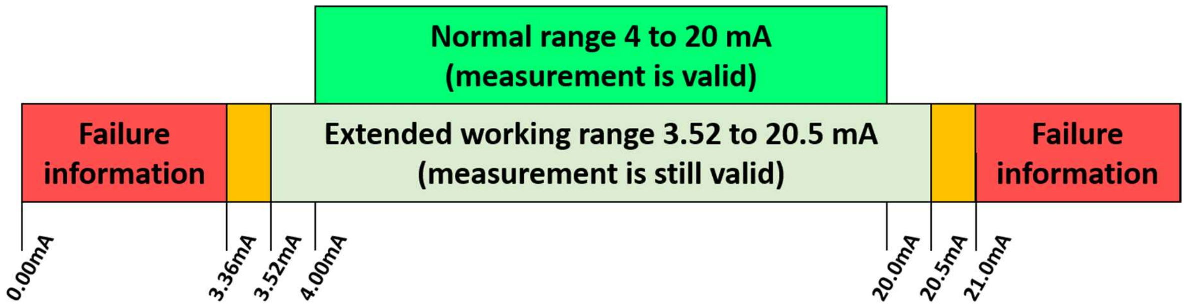


Figure 53. EN 15267-3:2008 Recommendation.

Each analog input and output is individually tested for each GasEYE device using PLC station before the shipment. The report from the tests is generated automatically and is attached to the package.

5.2.3. Active analog outputs

Active analog outputs need no external powering of the output terminal. Please refer to Figure 54 for output signal connection.

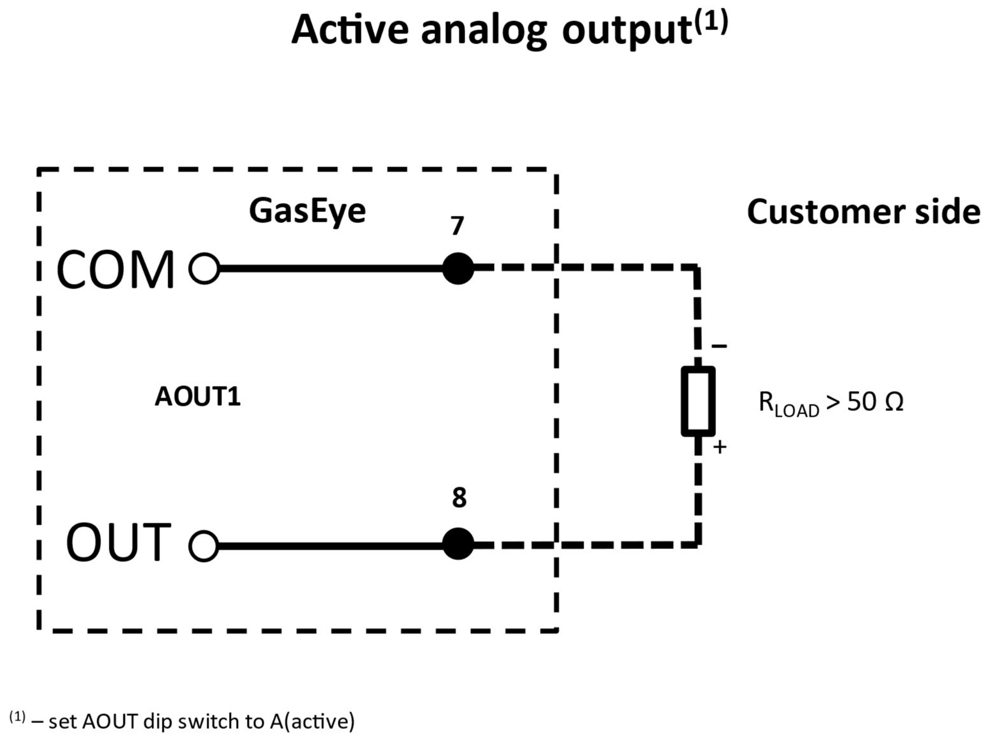


Figure 54. Exemplary usage of active analog output.

R_{LOAD} should be at least **50Ω**

WARNING
Active analog outputs
*GasEye Cross Duct provides supply voltage for the active analog outputs and thus analog outputs **MUST NOT BE** powered externally. Please set the dip switch to Active (A) before powering up the system.*

5.2.4. Passive analog outputs

Passive analog outputs require external powering for operation. Please refer to Figure 55 for output signal connection.

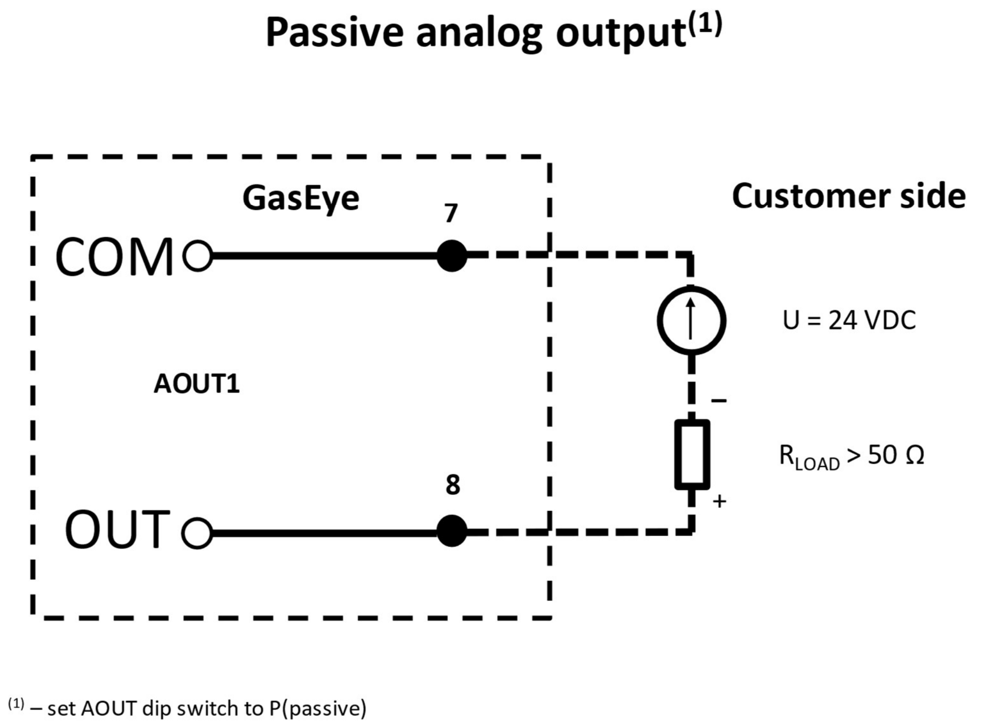


Figure 55. Exemplary usage of passive analog output.

R_{LOAD} should be at least **50Ω**

WARNING
Passive analog outputs
*GasEye Cross Duct does not provide supply voltage for the passive analog outputs, thus they **MUST BE** powered externally. Please set the dip switch to Passive (P) before powering up the system.*

5.2.5. Active analog inputs

Active analog inputs need no external powering of the input terminal. Please refer to Figure 56 for input signal connection.

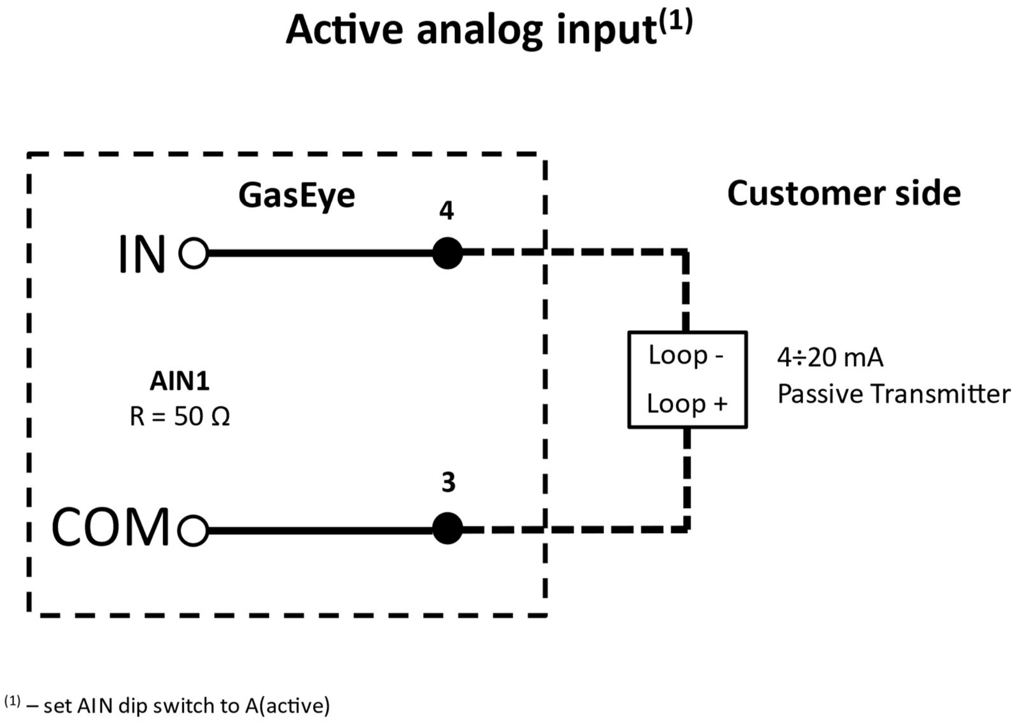


Figure 56. Exemplary usage of active analog input.

WARNING
Active analog inputs
GasEye Cross Duct provides supply voltage for the active analog inputs and thus analog inputs ***MUST NOT BE*** *powered externally. Please set the dip switch to Active (A) before powering up the system.*

5.2.6. Passive analog inputs

Passive analog inputs require external powering for operation. Please refer to Figure 57 for input signal connection.

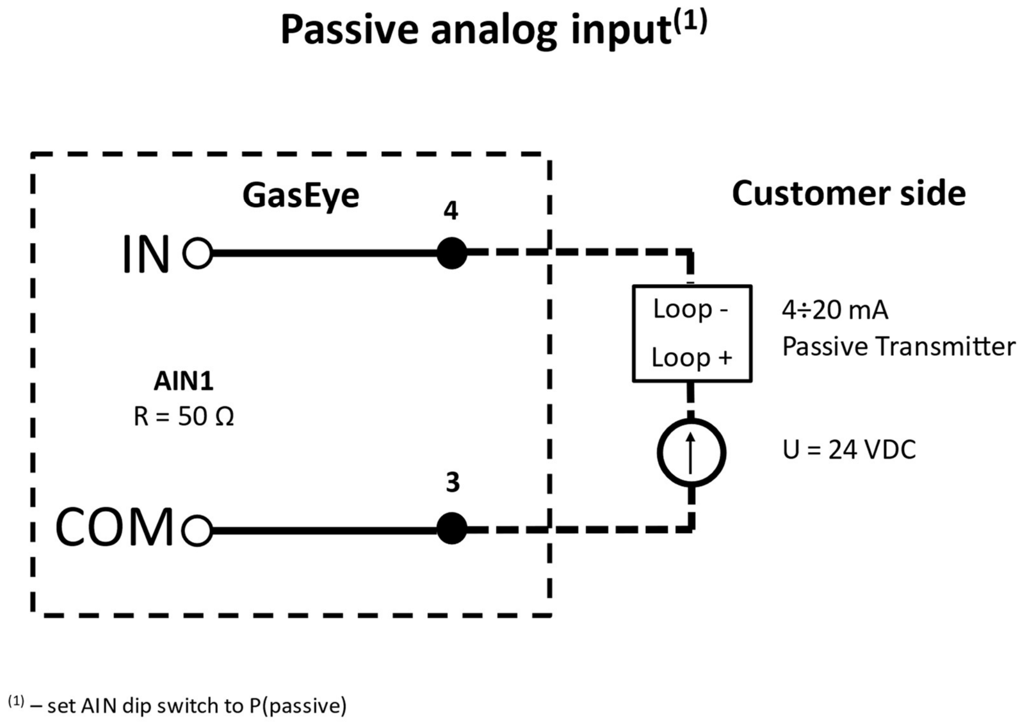


Figure 57. Exemplary usage of passive analog input.

WARNING
Passive analog inputs
*GasEye Cross Duct does not provide supply voltage for the passive analog inputs, thus they **MUST BE** powered externally. Please set the dip switch to Passive (P) before powering up the system.*

5.2.7. DOUT

GasEye system provides 8 high side power switch (MOSFET) based digital outputs. Digital outputs are galvanically isolated from HOST board thus the digital outputs block must be powered externally (pin 21 and 22, 19-30 VDC). Each output can handle current up to 0.5 A. The status of each output is displayed on the HOST board with the blue LED in DOUT section. In the DOUT_PWR section the status of the power supply (green LED -> Power OK, red LED -> Power NOT OK) can be found.

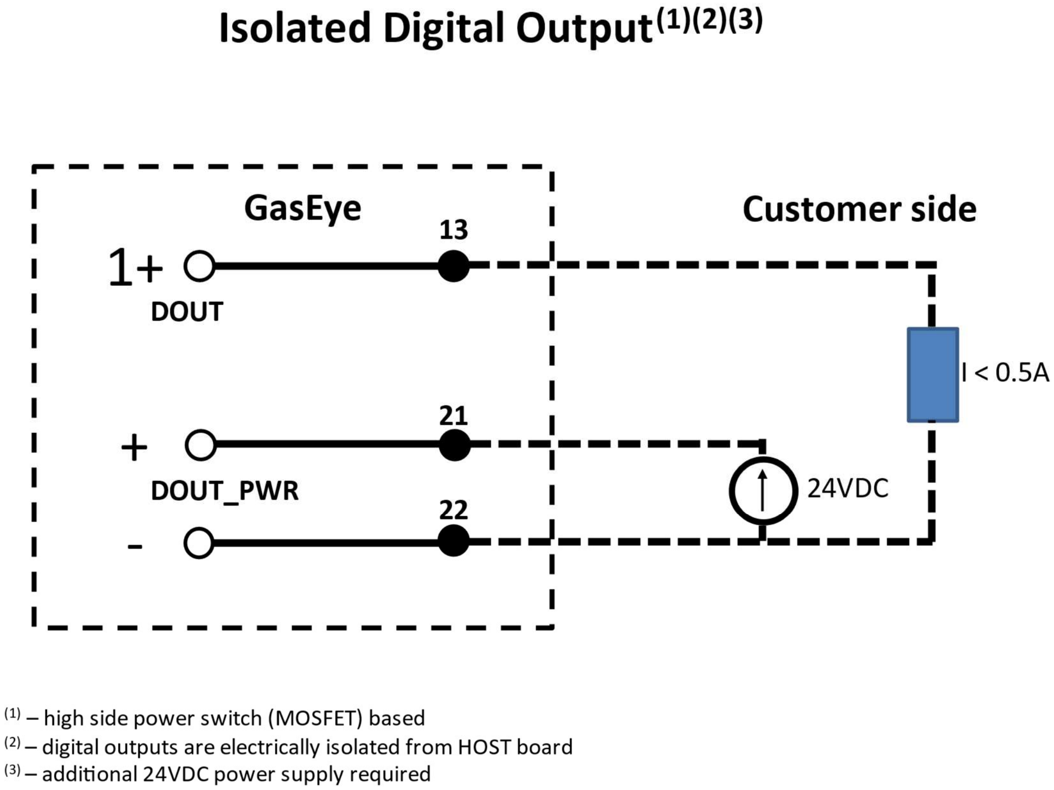


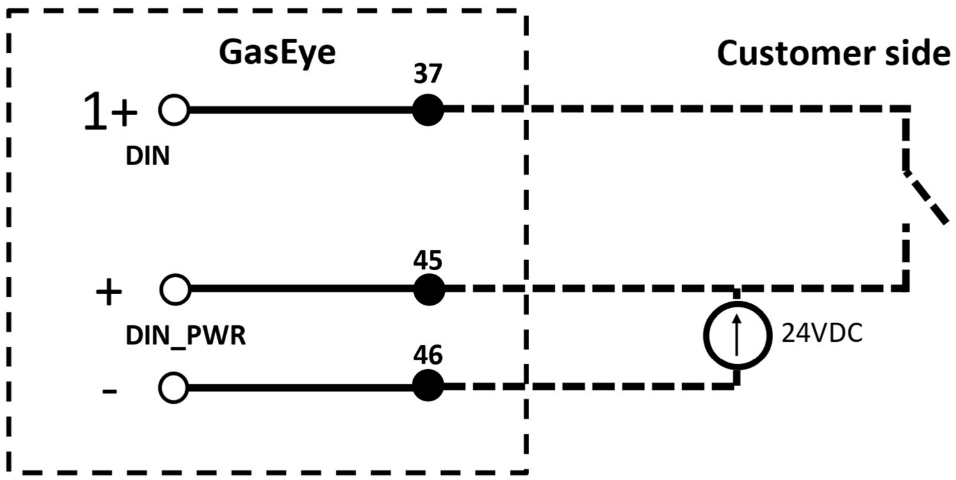
Figure 58. Exemplary usage of digital output.

WARNING
Digital outputs
*GasEye Cross Duct does not provide supply voltage for the digital outputs, thus they **MUST BE** powered externally.*

5.2.8. DIN

GasEye system provides 8 digital inputs. Digital inputs are galvanically isolated from HOST board thus the digital inputs block must be powered externally (pin 45 and 46, 19-30 VDC). The status of each input is displayed on the HOST board with the blue LED in DIN section. In the DIN_PWR section the status of the power supply (green LED -> Power OK, red LED -> Power NOT OK) can be found.

Isolated Digital Input[1][2]



[1] – digital inputs are electrically isolated from HOST board
[2] – additional 24VDC power supply required

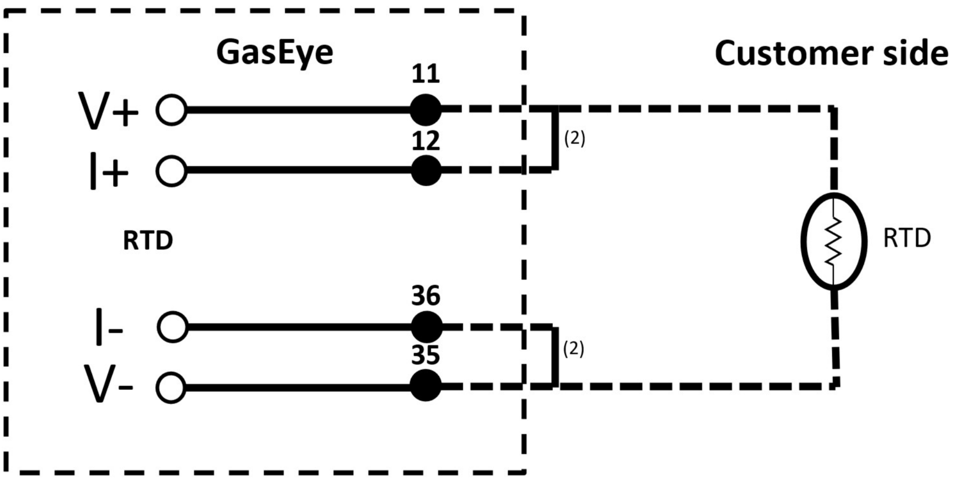
Figure 59. Exemplary usage of digital input.

WARNING
Digital inputs
GasEye Cross Duct does not provide supply voltage for the digital inputs, thus they ***MUST BE*** *powered externally.*

5.2.9. RTD

GasEye system provides the resistance temperature detectors (RTDs) input for measuring the process temperature. The system can be configured with two dip switches to operate with PT100/PT1000 and 2-,3-,4-wire connection. Please refer Figure 60 to Figure 62 for signal connection.

PT100/PT1000 2-wire(1)



(1) – set 2-,4-wire dip switch, set PT100/PT1000 dip switch as required
(2) – external jumper required

Figure 60. Exemplary usage of 2-wire RTD.

WARNING
RTD
2-wire RTD require additional terminal connection, please make the external jumper for 11 and 12 as well for 36 and 35.

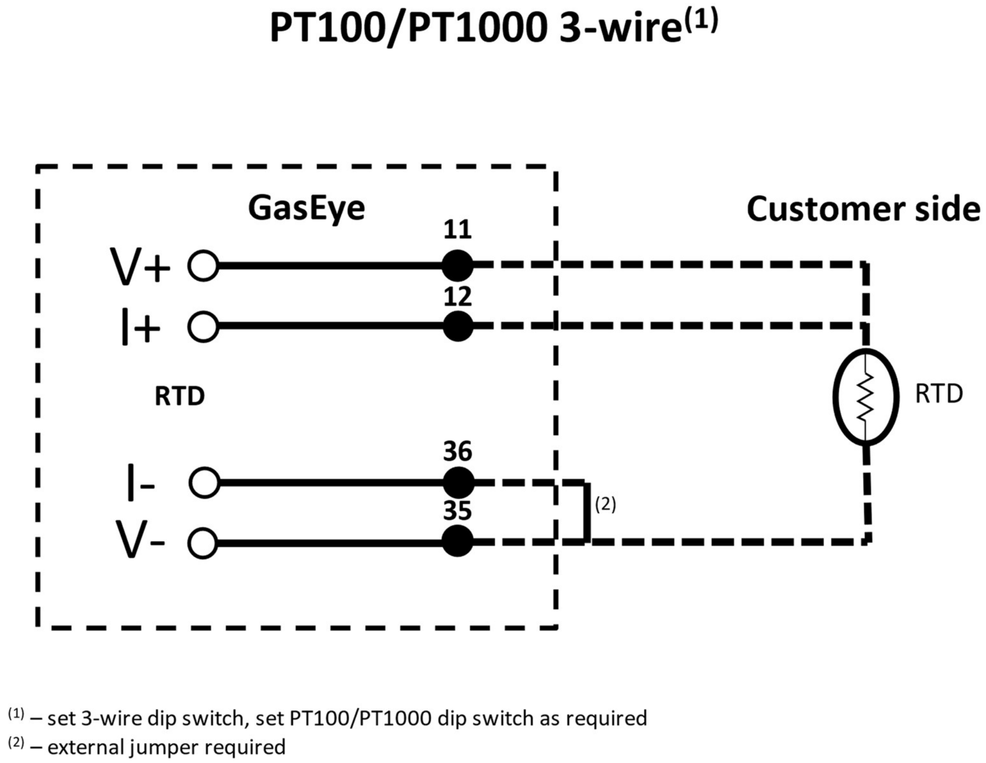


Figure 61. Exemplary usage of 3-wire RTD.

WARNING
RTD
3-wire RTD require additional terminal connection, please make the external jumper for 36 and 35.

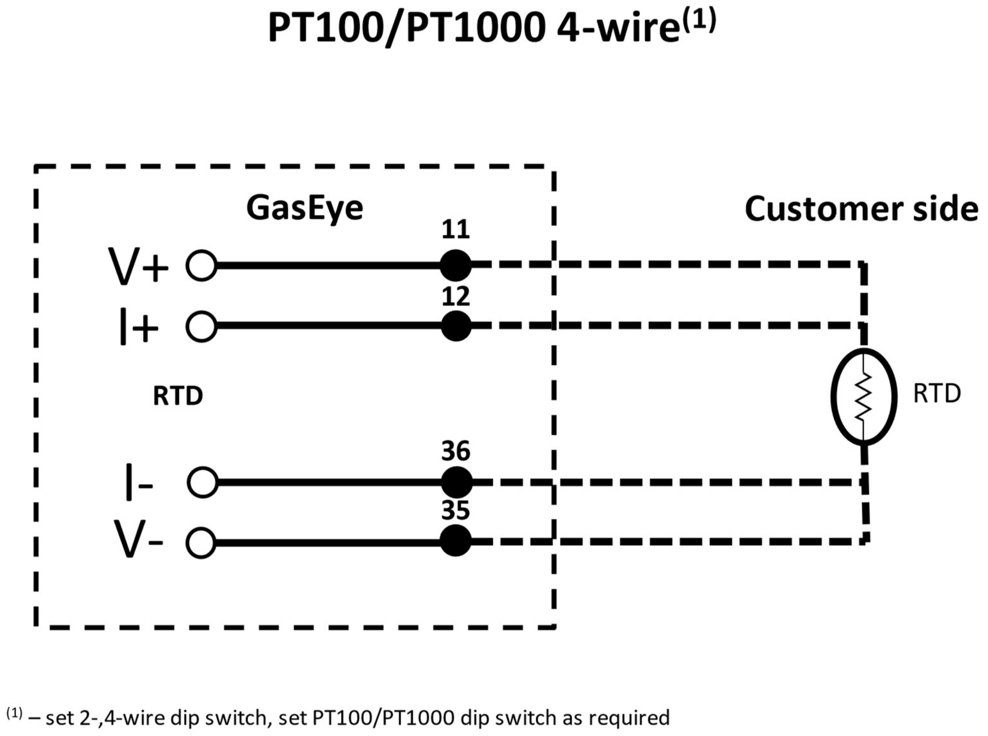


Figure 62. Exemplary usage of 4-wire RTD.

5.3. Loop (hybrid) cable connection

The loop (hybrid) cable is used to connect the Receiver unit with the Central unit. It consists of optical fiber and two electric wires (2x0.5mm^2). For proper operation use only the loop cable supplied by Airoptic. Please refer to Figure 64 for electrical signals connection. Please follow the step-by-step instruction for correct installation.

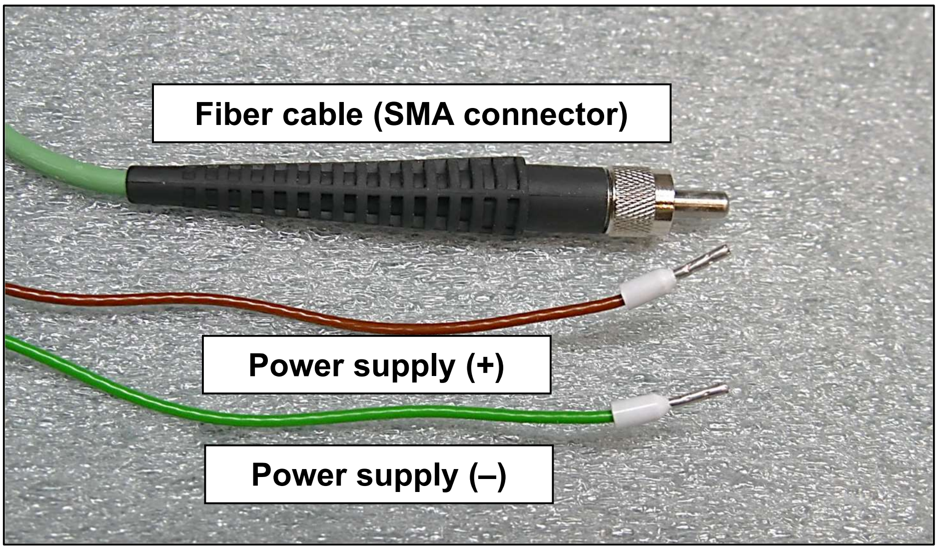


Figure 63. Loop (hybrid) cable.

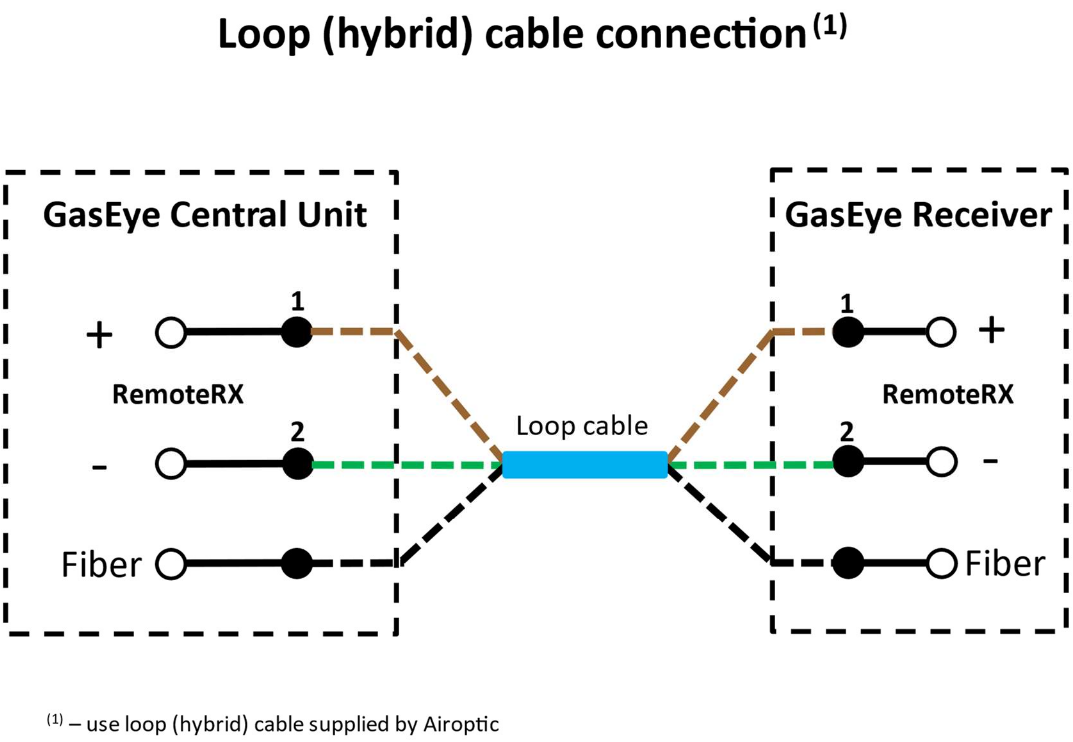


Figure 64. Central unit <-> Receiver connection with loop cable.

5.3.1. Receiver unit – loop cable installation instruction:

1. Cautiously dismount housing lid by unscrewing each of the four bolts.
2. Prepare the hybrid loop cable for connections.

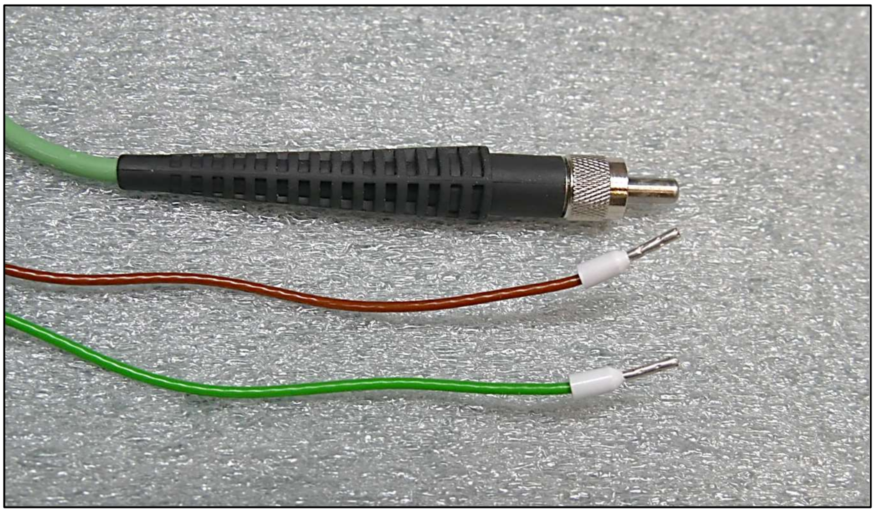


Figure 65. Hybrid loop cable details.

3. Place the sealing nut and the claw on the hybrid loop cable.

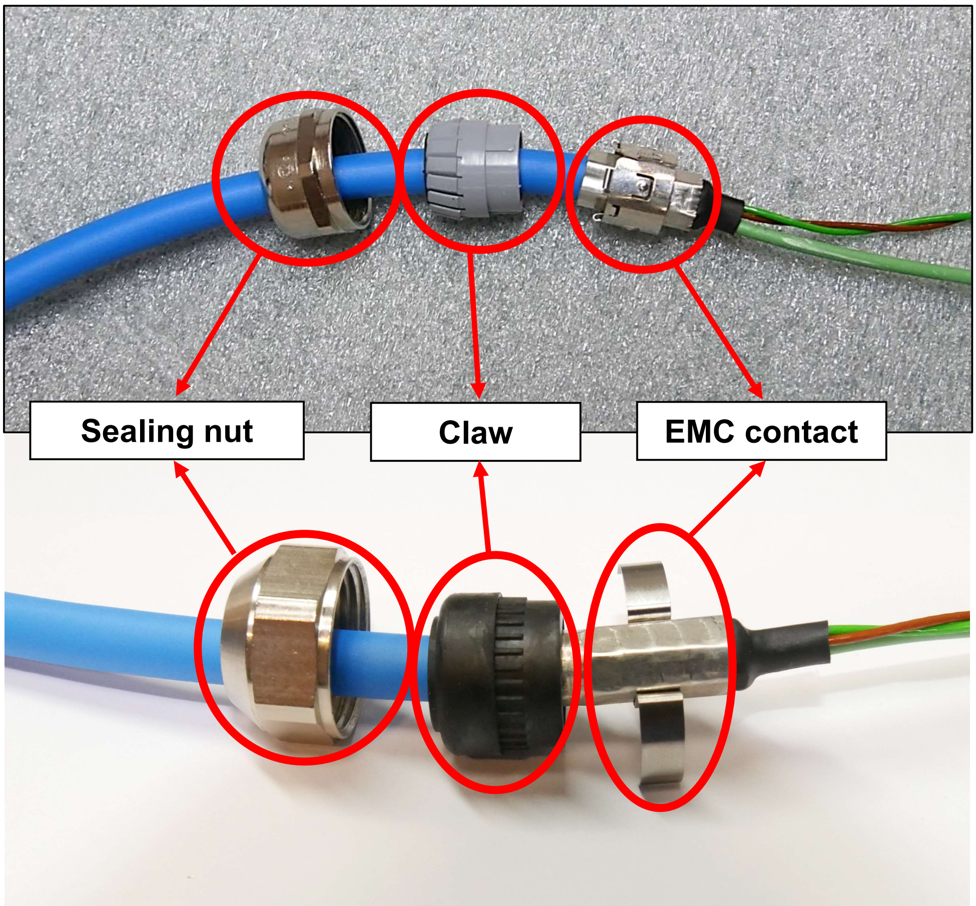


Figure 66. Hybrid loop cable – sealing nut and claw.

4. Ensure that the EMC contact is placed on the aluminum sleeve.

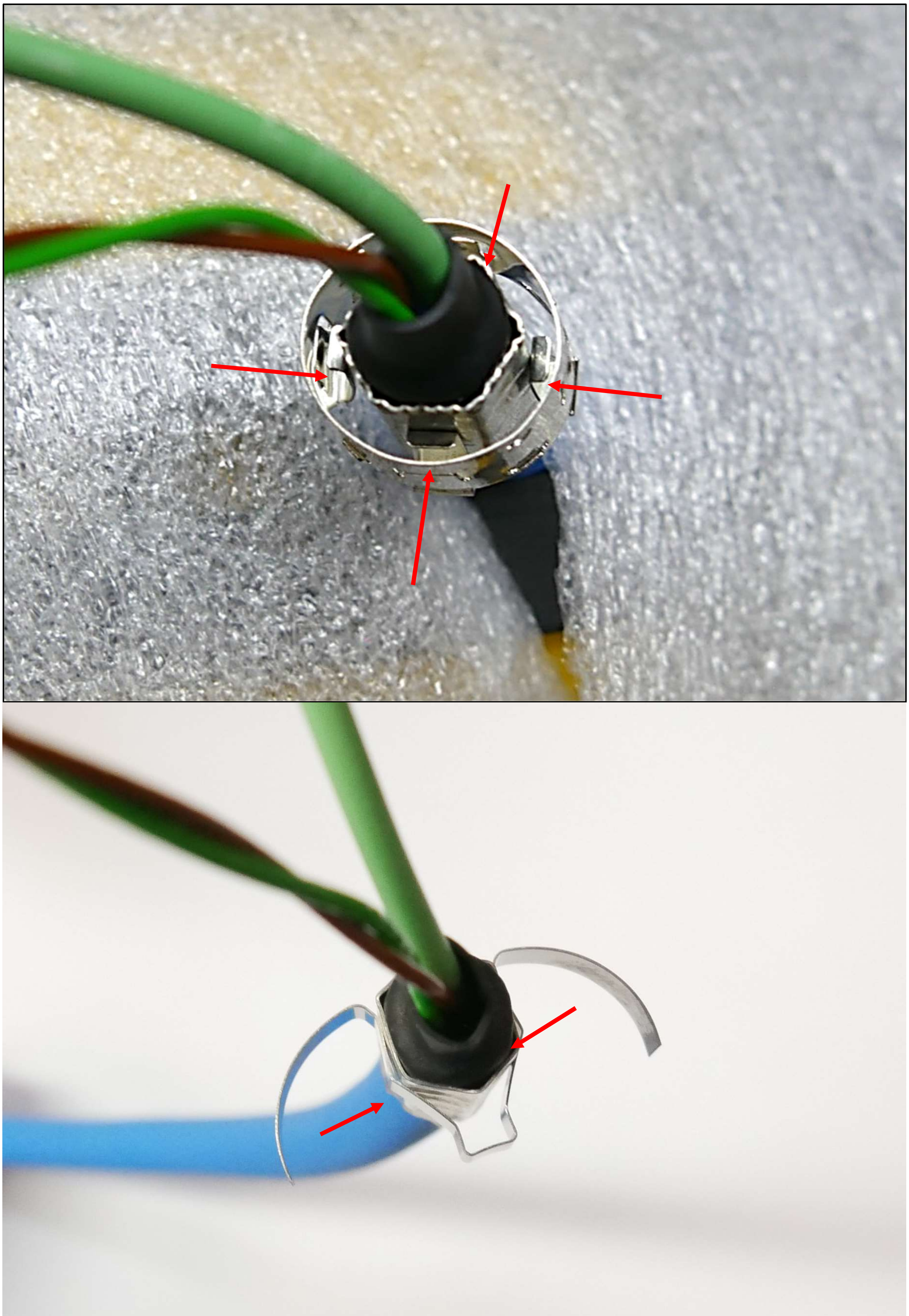


Figure 67. Hybrid loop cable – EMC contact.

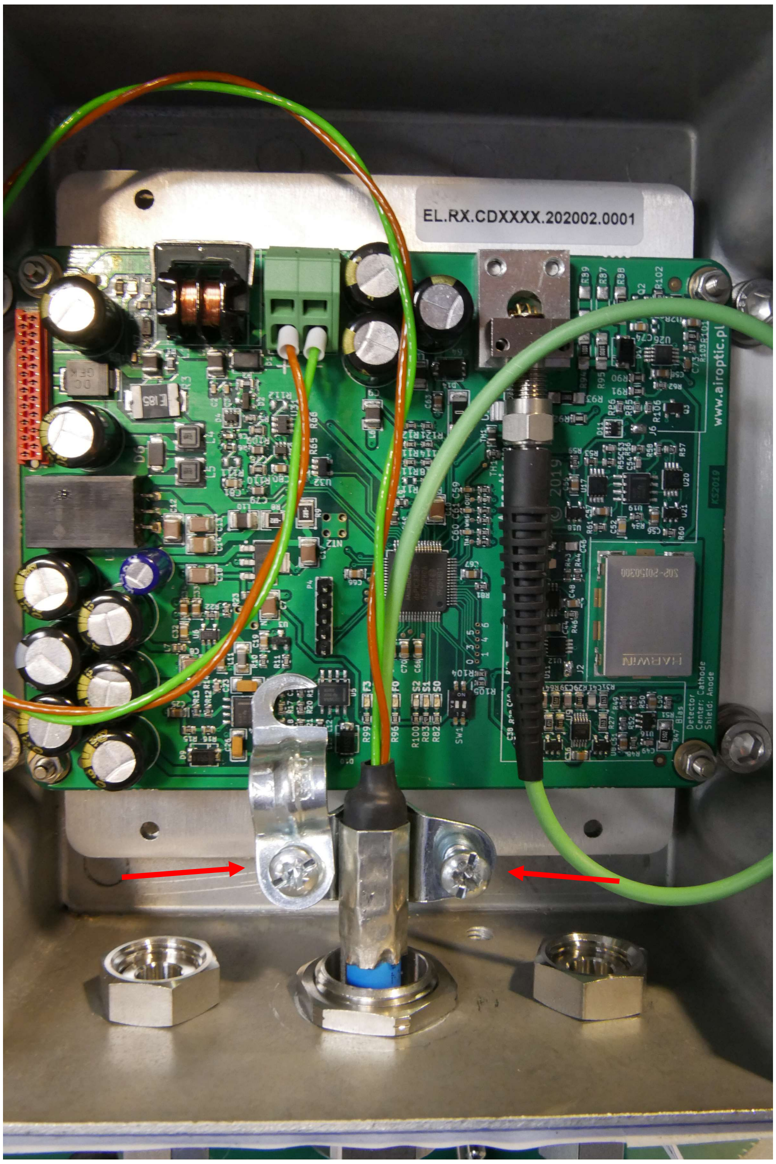


Figure 68. Grounding point for hybrid loop cable (stainless steel glands version)

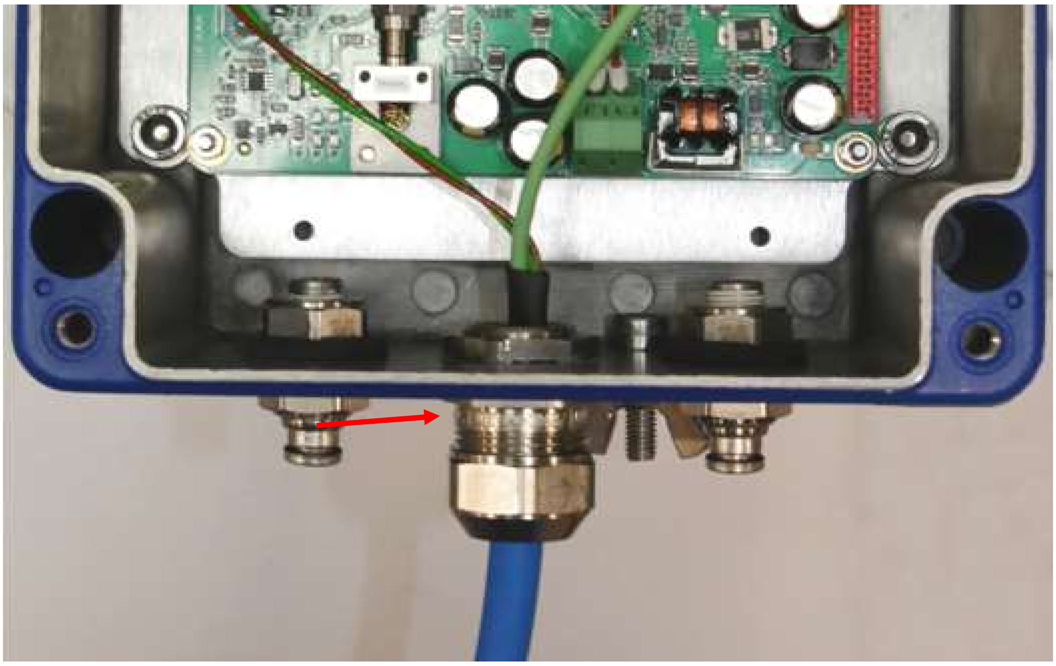


Figure 69. Grounding point for hybrid loop cable (nickel-plated brass glands version). Electrical contact between grounded gland and metal hose on the hybrid loop cable is ensured by the metal EMC contact placed inside the gland.

5. After opening of the receiver side of the instrument you will see the following board.

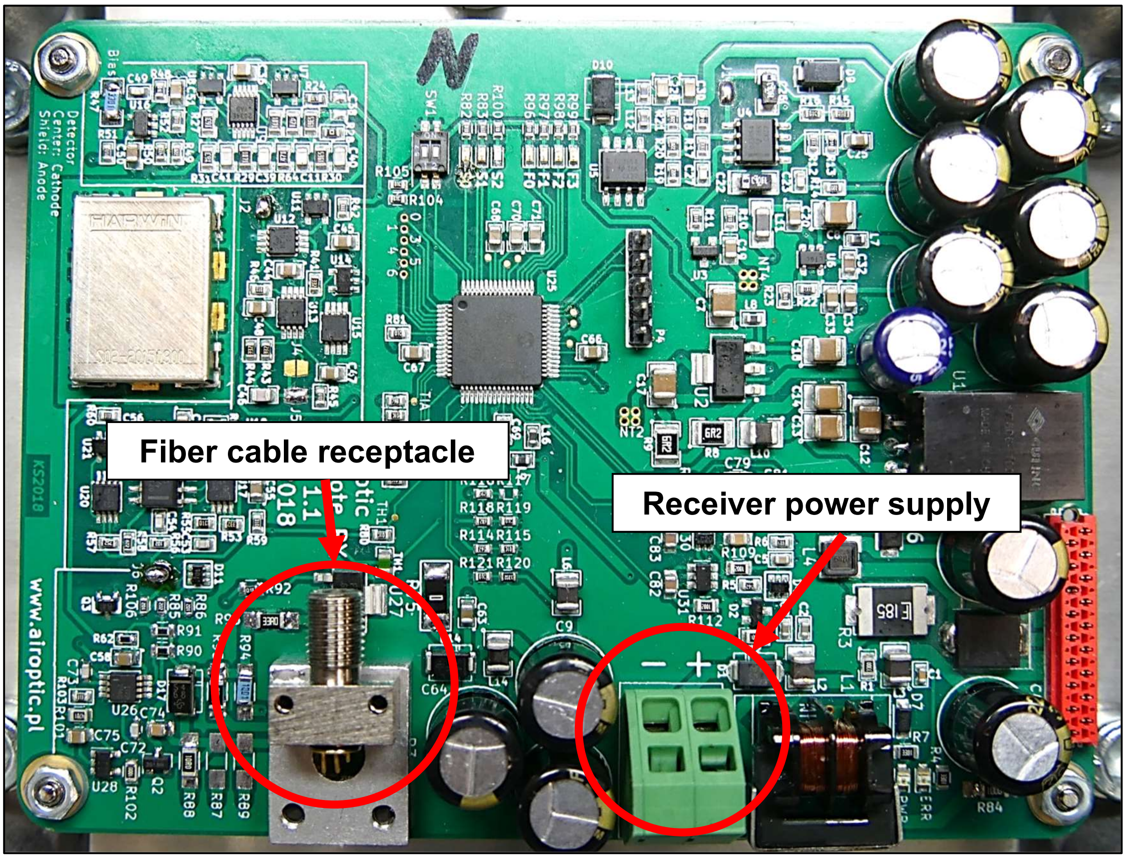


Figure 70. Hybrid loop cable installation.

6. Slide the hybrid loop cable through the gland placed on the bottom side of the receiver.

7. Using the wrench (size 24) tighten the connection. The hybrid loop cable should now be blocked in the gland.

8. Place the fiber cable in the connector. Lock the cable by twisting the nut on the thread.

9. Place the other two wires from the hybrid loop cable in the ports of the receiver power supply terminal
   a. Brown –> **(+)**
   b. Green –> **(-)**

10. When the installation is completed the assembly should look like on the following figure. Close the receiver unit with the lid.

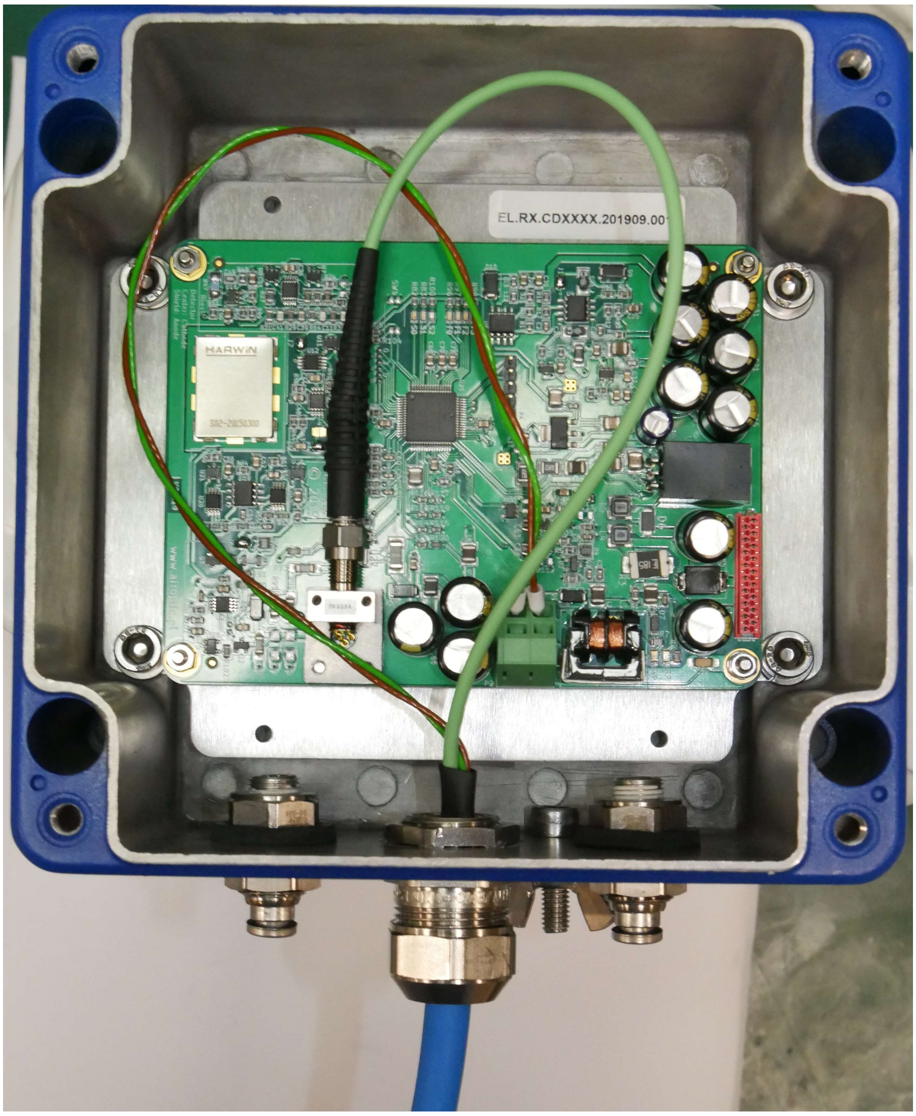


Figure 71. Completed hybrid loop cable installation (nickel-plated brass glands version).

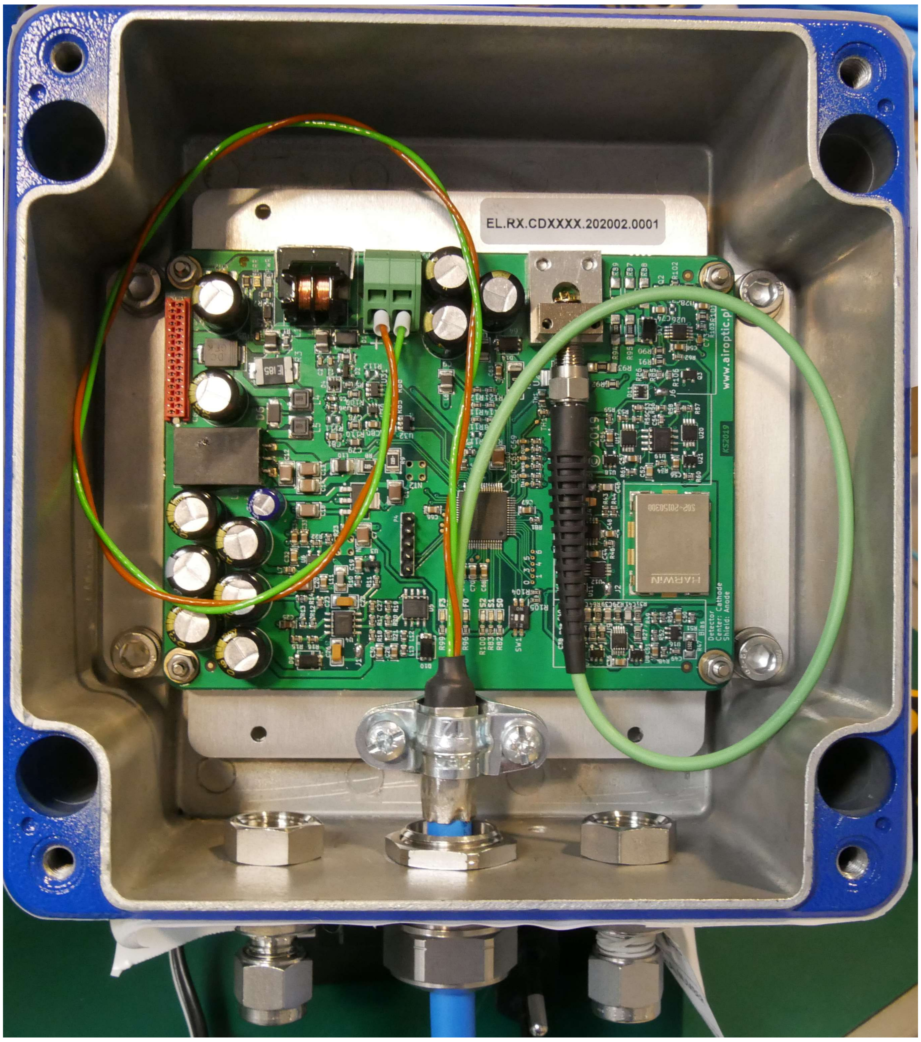


Figure 72. Completed hybrid loop cable installation (stainless steel glands version).

5.3.2. Central unit – loop cable installation instruction:

1. Place the other side of hybrid loop cable in the gland and using two wrenches (size 24) tighten the connection. The hybrid loop cable should now be blocked in the gland. This can be checked by slightly pulling the hybrid loop cable.

2. Place the fiber optic cable in the connector. Lock the cable by twisting the nut on the thread.

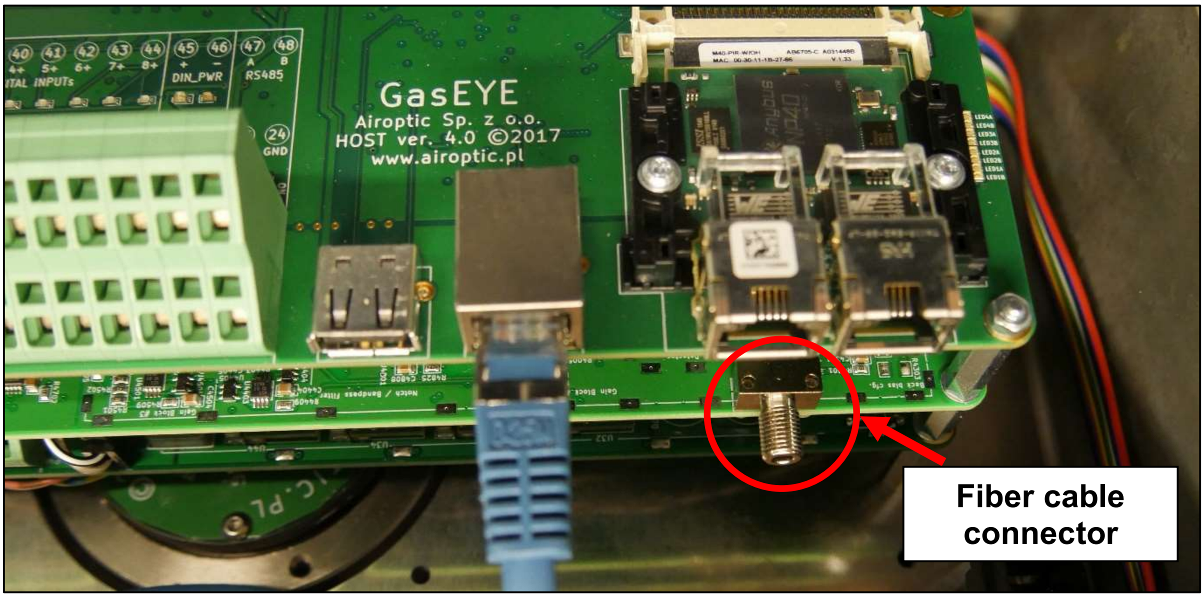


Figure 73. Fiber cable connector (central unit).

3. Place the other two wires from the hybrid loop cable in the ports of the terminal:
   c. Brown –> **1**
   d. Green –> **2**

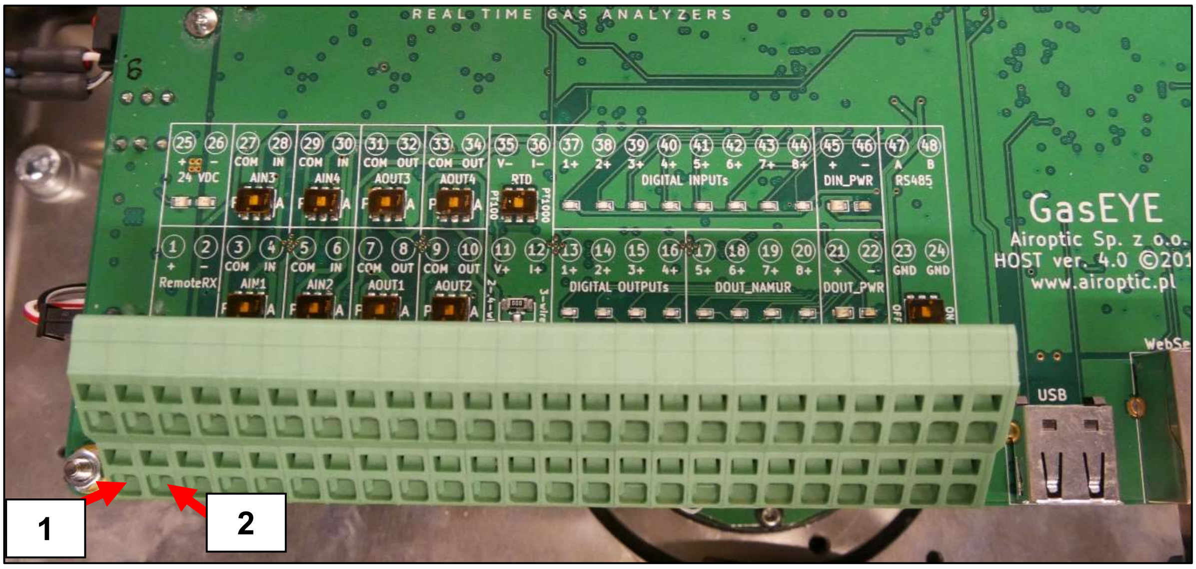


Figure 74. Placing wires from the hybrid loop cable in the terminal.

4. When the installation is completed the assembly should look like on the following figure.

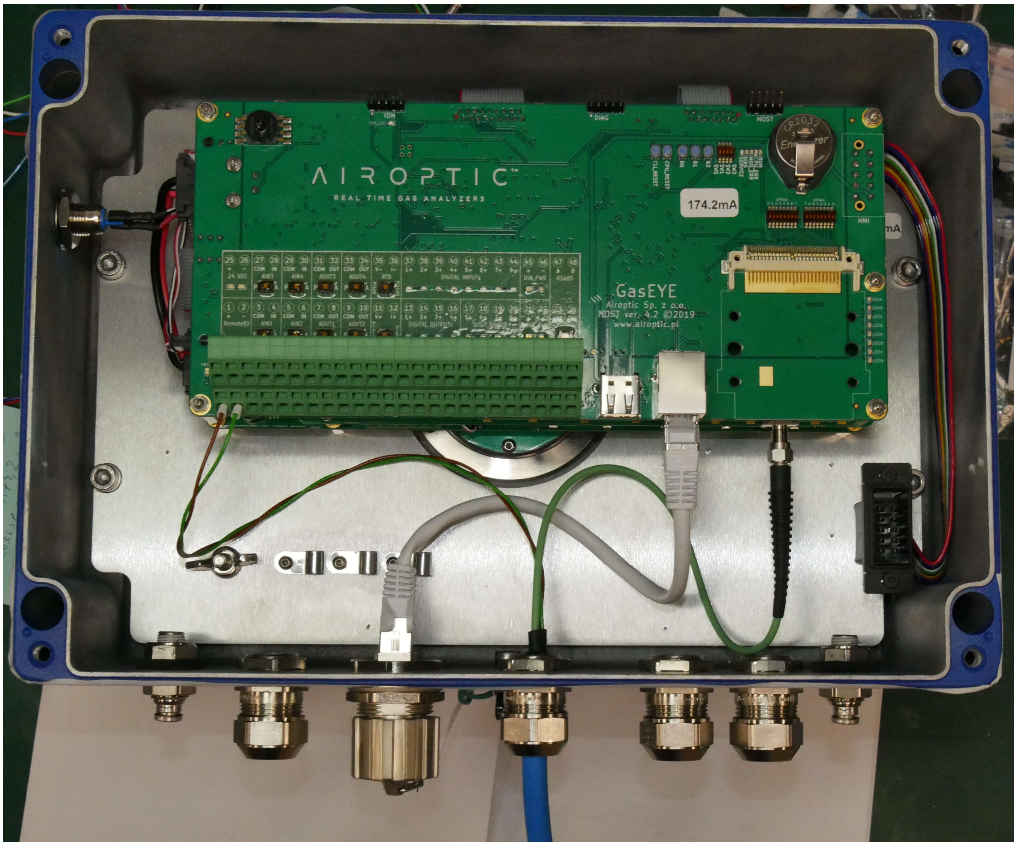


Figure 75. Completed assembly.

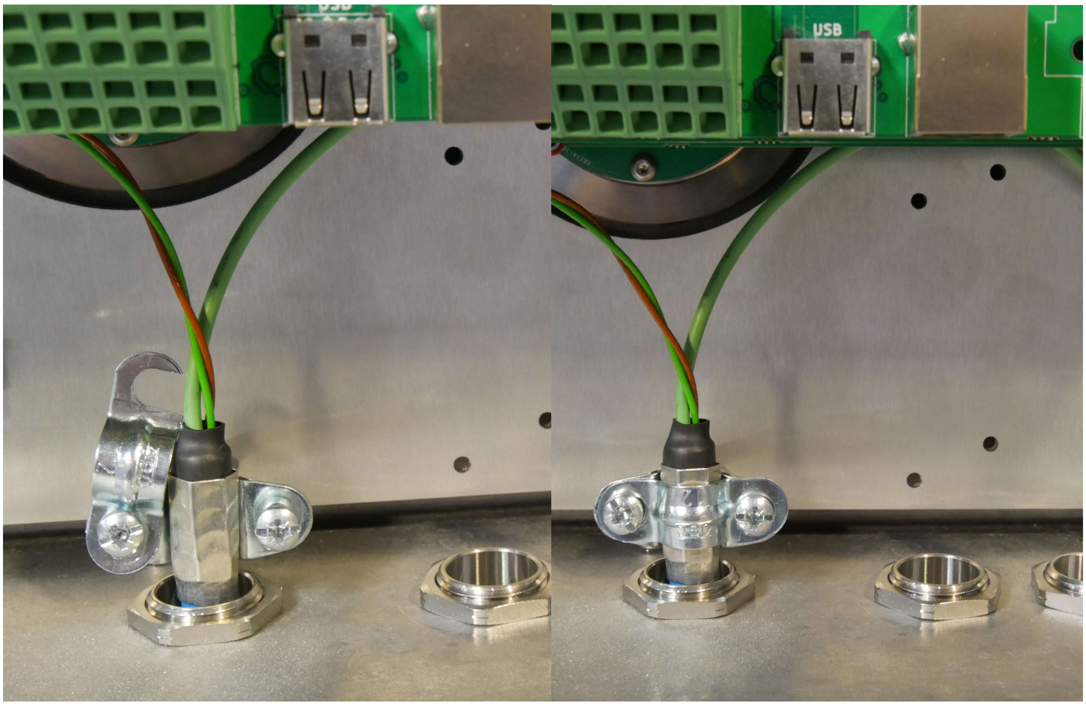


Figure 76. Fiber cable connector grounding (stainless steel glands version).

5.4. Customer cable connection

A separate electrical cable is connected via Power supply and I/O cable gland for powering the analyzer and communication with the customer. Please use the cable with minimum 12 x 0.5mm^2 wires and external diameter between 7-12 mm to fit into the gland. Cable supplied by Airoptic is preferred. Please follow the step-by-step instruction for correct installation.

Figure 77. Customer cable.

5.4.1. Customer cable installation instruction:

1. Cautiously dismount central unit housing lid by unscrewing each of the four bolts.

2. Place the sealing nut and the claw on the customer cable.

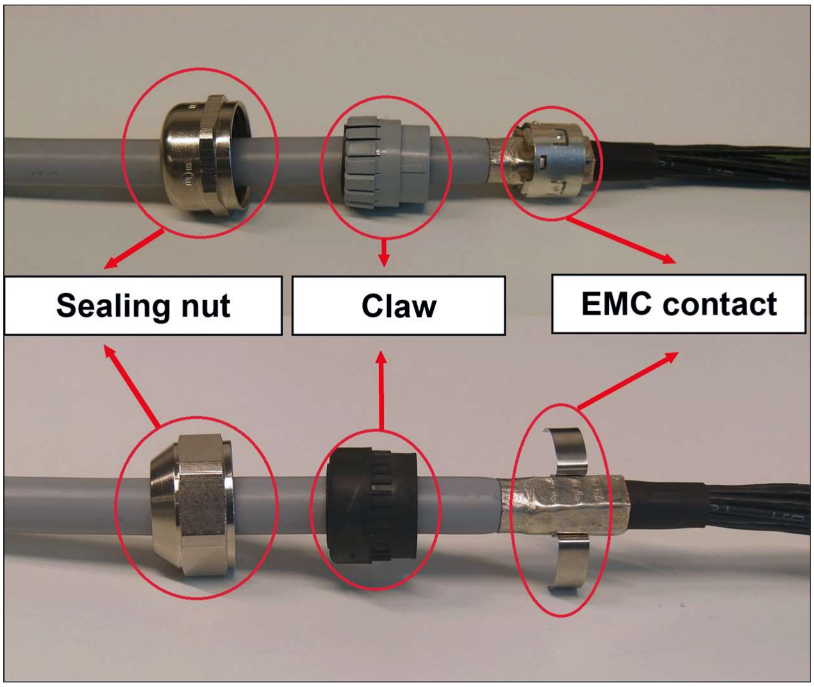


Figure 78. Sealing nut and claw on the customer cable.

3. Ensure that the EMC contact is placed on the aluminum sleeve

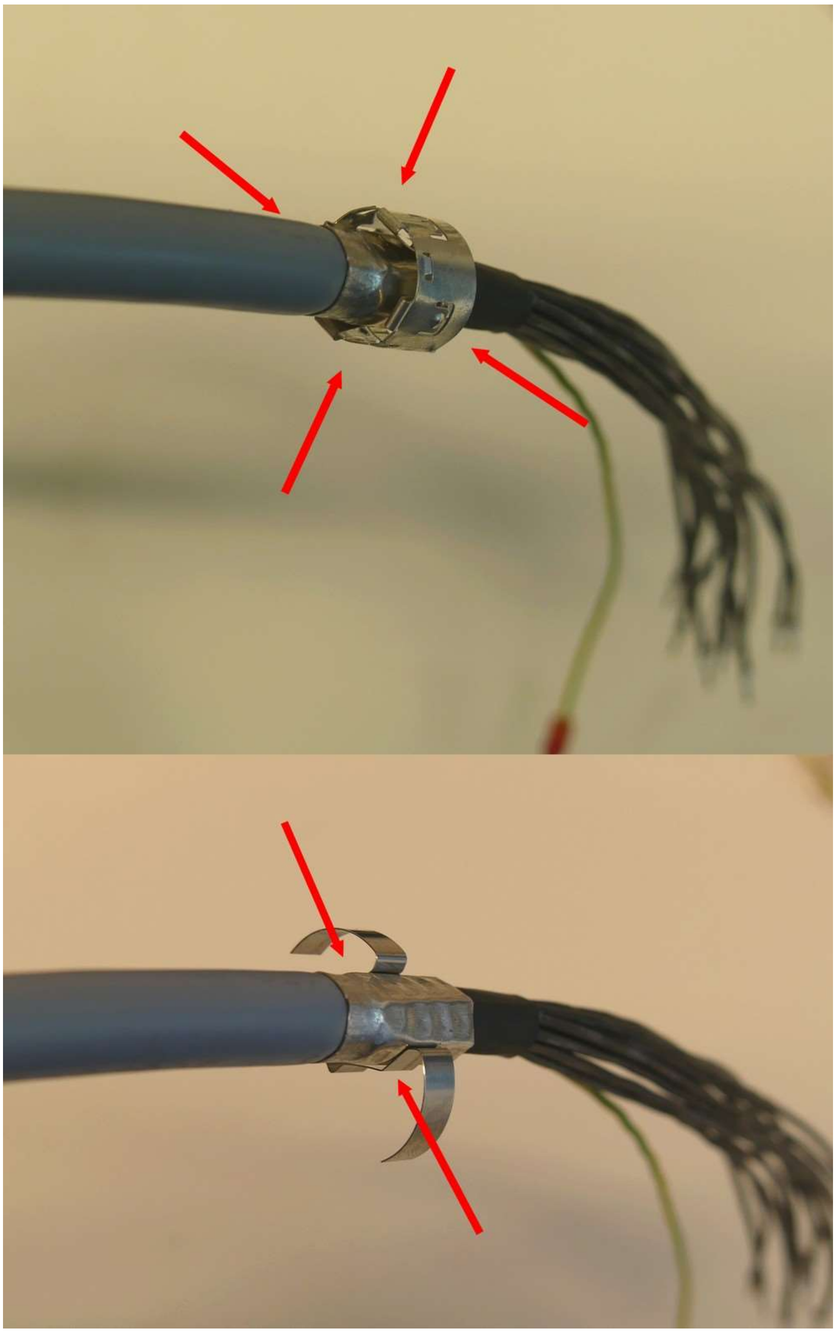


Figure 79. EMC contact.

In case of stainless steel glands version of the analyzer, please mount the customer cable in similar way as on the Figure 76.

4. Slide the customer cable through the gland placed on the bottom side of the central unit.

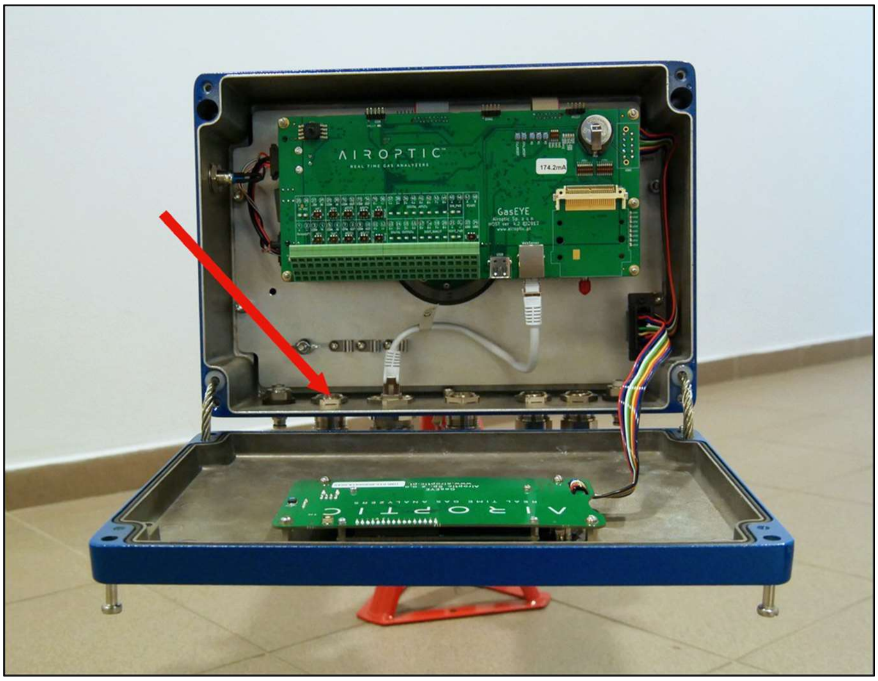


Figure 80. Gland for the customer cable.

5. Using the wrench (size 24) tighten the connection. The customer cable should now be blocked in the gland.

6. Place the PE wire (green-yellow) under the wing nut and tighten it.

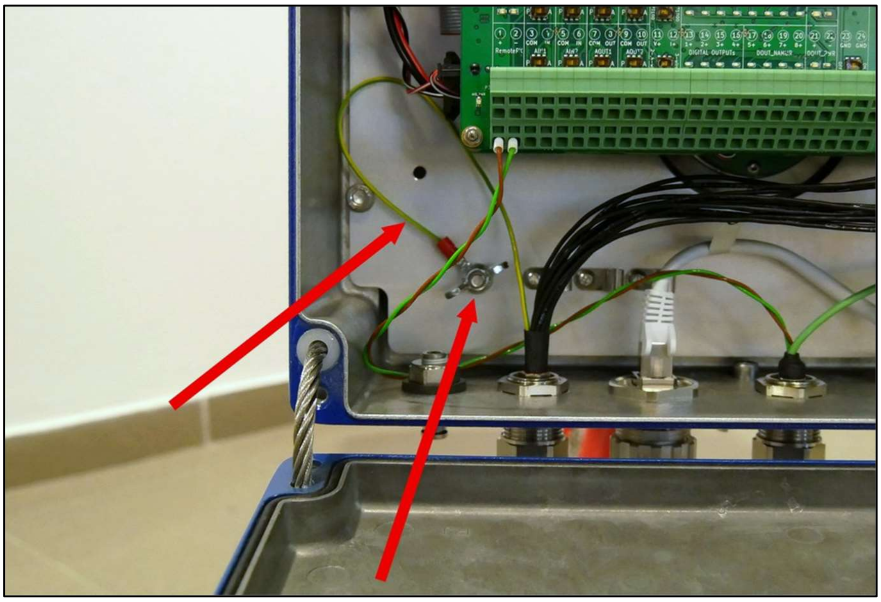


Figure 81. PE wire.

7. Place two black wires in sockets of number 25 and 26 for powering the analyzer. The same wires should be then connected to the 24VDC power supply on the customer side.

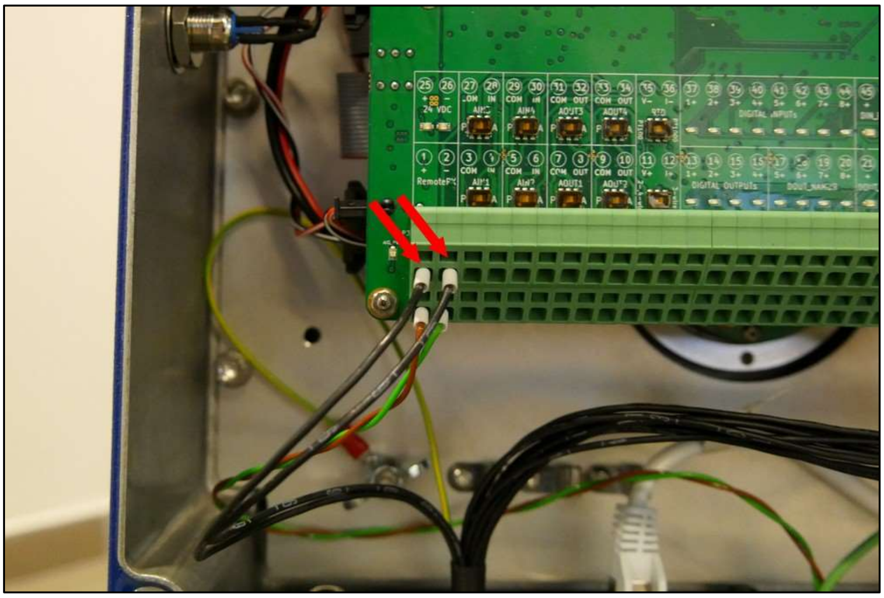


Figure 82. Powering the analyzer.

8. Place other wires in proper sockets for connection with analog and digital inputs/outputs as desired for specific application of the analyzer.

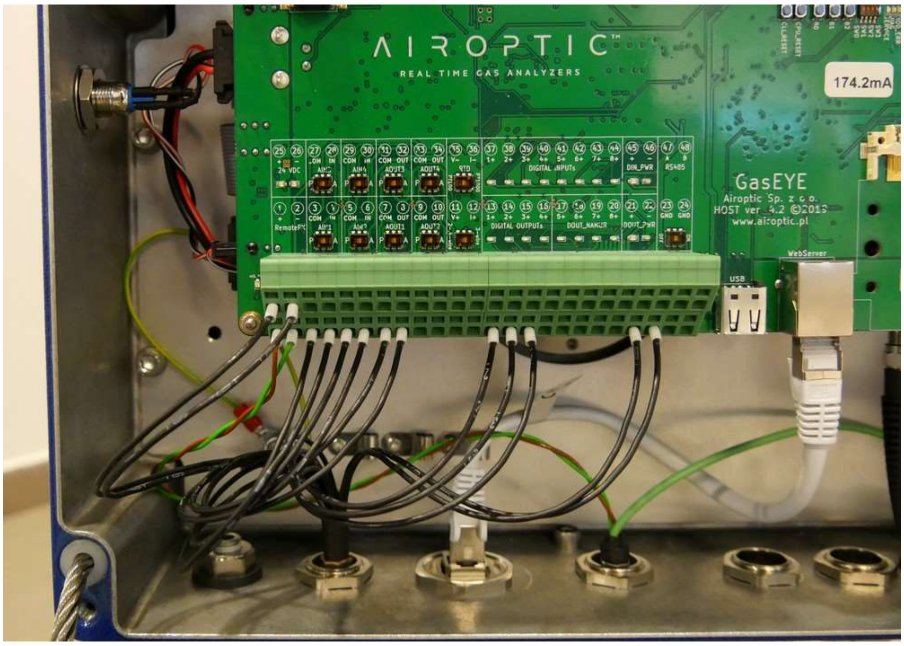


Figure 83. Connection with analog and digital inputs/outputs.

5.5. Ethernet connection

A separate ethernet cable is connected via special gland for communication with the analyzer via webserver. To ensure IP65 use only the ethernet cable supplied by Airoptic. Please follow the step-by-step instruction for correct installation.

Figure 84. Ethernet cable.

5.5.1. Ethernet cable installation instruction:

1. Unscrew ethernet gland cap.

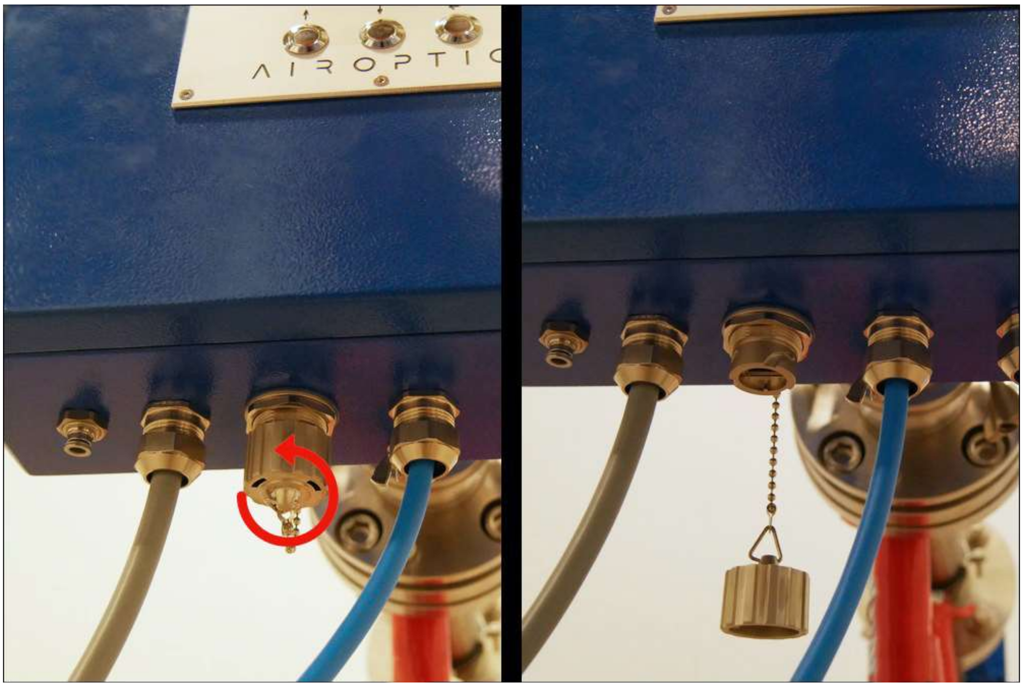


Figure 85. Ethernet gland opening.

2. Put ethernet cable in the gland and twist the nut.

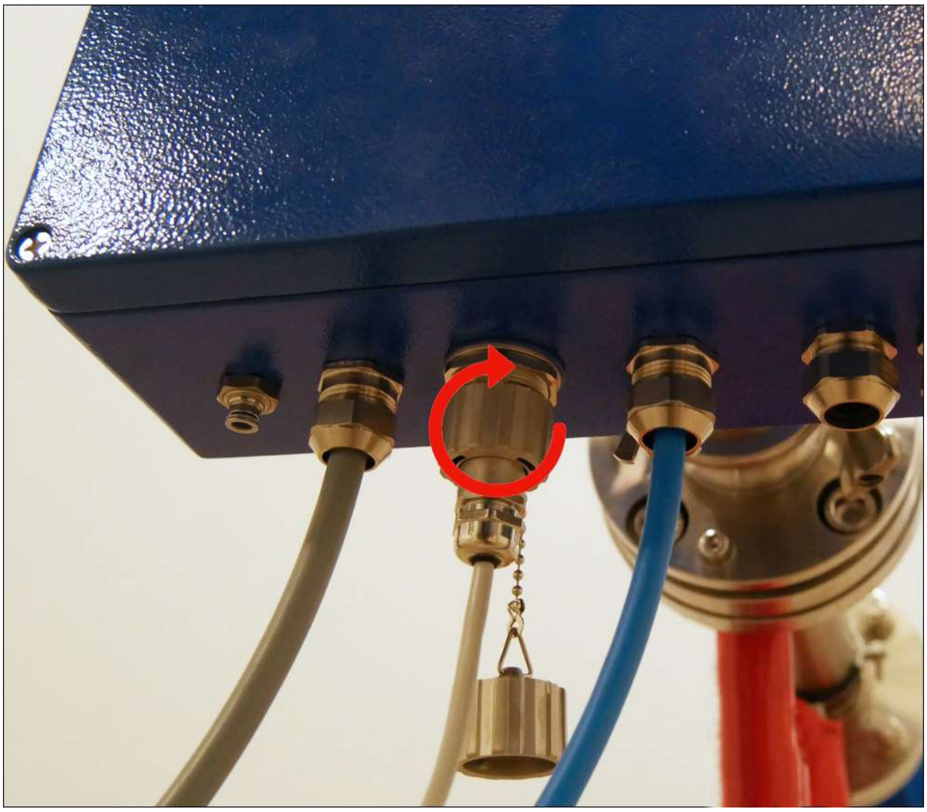


Figure 86. Ethernet gland connection.

3. If the ethernet cable is not used either permanently or temporarily, make sure the gland cap is twisted on, so the ethernet socket and whole central unit housing is sealed.

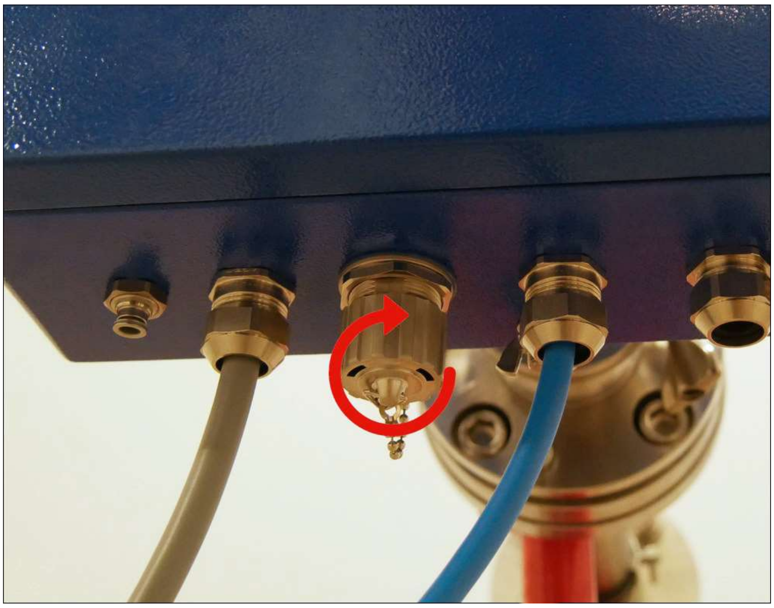


Figure 87. Ethernet gland closing.

5.5.2. Ethernet cable installation instruction (ATEX version):

1. Overview of ethernet cable for ATEX version of analyzer:

Figure 88. Ethernet cable (ATEX version).

2. Put the cable through the gland and connect plug into ethernet socket.

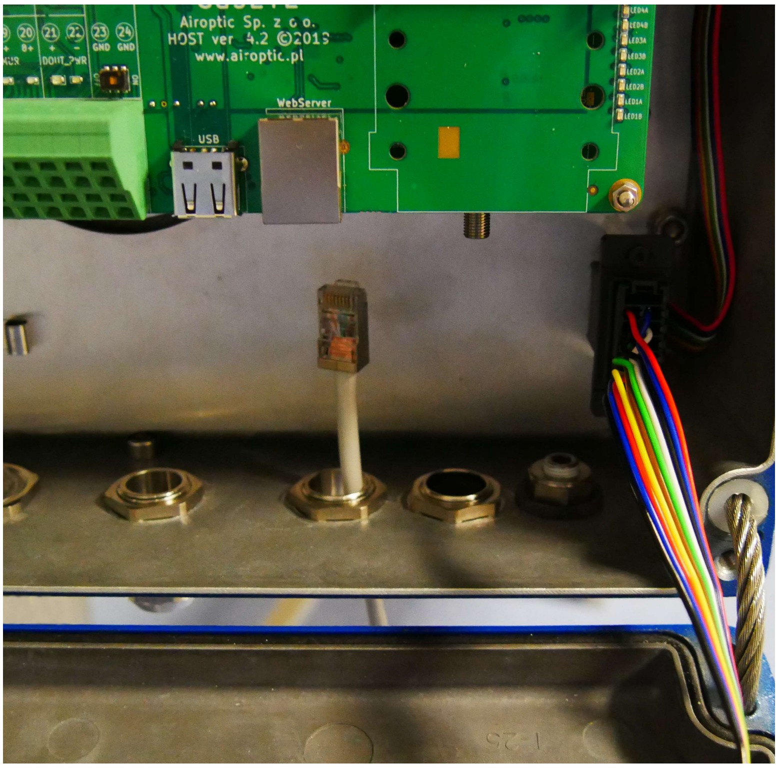


Figure 89. Ethernet cable in gland.

3. Place claw and nut in the gland and twist the nut. Make sure the nut is tightened and the cable is not moving in the gland.

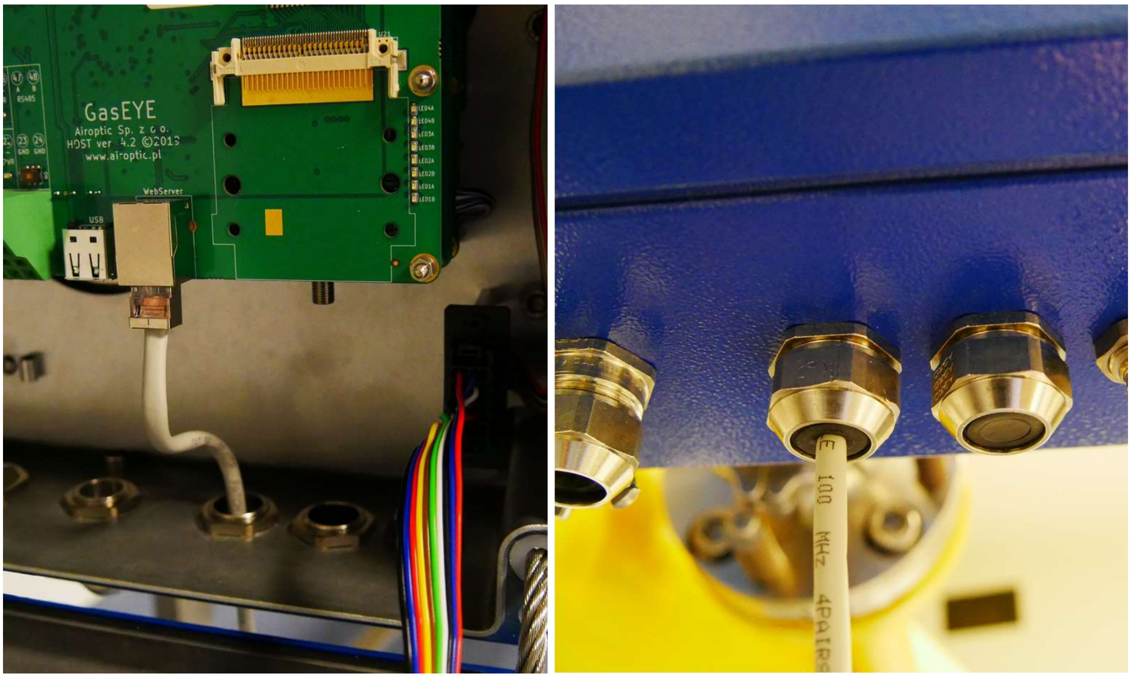


Figure 90. Ethernet cable connection through sealed gland.

5.6. Industrial protocols connection

The GasEye Cross Duct gas analyzer has implemented MODBUS RTU, MODBUS TCP and PROFINET industrial communication protocols. On plant can work only one protocol and it is declared by customer during ordering. Thanks to integrated analyzer software and electronic board with Anybus CompactCom communication module device is very flexible and for special customer requirement additional communication protocols can be quickly implemented.

5.6.1. Modbus RTU (RS485)

Modbus RTU is fully implemented by Airoptic and does not need additional communication module. Device can work in slave mode. Communication parameters are configured by Analyzer web server tool.

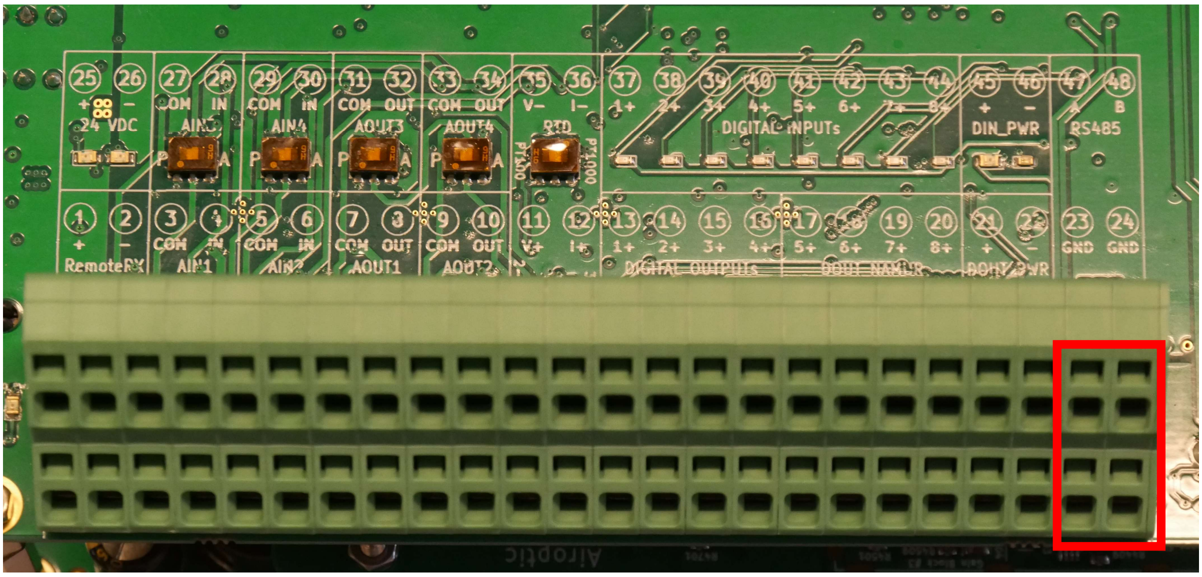


Figure 91. Location RS-485 socket on Analyzer PCB Host 4.X.

1. RS-485 transmission settings

Baud rate: 9600/19200
Stop bits: STOP_BIT_1/ STOP_BIT_2
Parity: NO_PARITY_8_BIT/ EVEN_PARITY_8_BIT/ ODD_PARITY_8_BIT/ NO_PARITY_9_BIT
Flow control: none

2. Modbus byte transmission method

Byte Order: LSB/MSB
Swap: ON/OFF

3. Device Address

Modbus slave device address from 1 to 247 are shown in the Table 7 below.

Table 7. Modbus Input register map (function 0x4).

Register Name	Register address (hex)	Register address (dec)	Comments
PROCESS.TEMPERATURE	0x00	0	16 -bits of floating point value (first part) Process tempetature
	0x01	1	16 -bits of floating point value (second part) Process tempetature
PROCESS.PRESSURE	0x02	2	16 -bits of floating point value (first part) Process pressure
	0x03	3	16 -bits of floating point value (second part) Process pressure
TEMP.CALCULATED	0x04	4	16 -bits of floating point value (first part) Temperature calculate available only in specific configuration
	0x05	5	16 -bits of floating point value (second part) Temperature calculate available only in specific configuration
GAS101.CONCENTRATION	0x06	6	16 -bits of floating point value (first part) Gas concentration
	0x07	7	16 -bits of floating point value (second part) Gas concentration
GAS102.CONCENTRATION	0x08	8	16 -bits of floating point value (first part) Gas concentration
	0x09	9	16 -bits of floating point value (second part) Gas concentration
GAS103.CONCENTRATION	0x0A	10	16 -bits of floating point value (first part) Gas concentration
	0x0B	11	16 -bits of floating point value (second part) Gas concentration
GAS104.CONCENTRATION	0x0C	12	16 -bits of floating point value (first part) Gas concentration

	0x0D	13	16 -bits of floating point value (second part) Gas concentration
	0x0E	14	16 -bits of floating point value (first part) Gas concentration
GAS105.CONCENTRATION	0x0F	15	16 -bits of floating point value (second part) Gas concentration
	0x10	16	16 -bits of floating point value (first part) Gas concentration
GAS106.CONCENTRATION	0x11	17	16 -bits of floating point value (second part) Gas concentration
	0x12	18	16 -bits of floating point value (first part) Gas concentration
GAS107.CONCENTRATION	0x13	19	16 -bits of floating point value (second part) Gas concentration
	0x14	20	16 -bits of floating point value (first part) Gas concentration
GAS108.CONCENTRATION	0x15	21	16 -bits of floating point value (second part) Gas concentration
GAS101.CONSIM	0x16	22	Scaling to integer value (0 - 27648) Gas concentration
GAS102.CONSIM	0x17	23	Scaling to integer value (0 - 27648) Gas concentration
GAS103.CONSIM	0x18	24	Scaling to integer value (0 - 27648) Gas concentration
GAS104.CONSIM	0x19	25	Scaling to integer value (0 - 27648) Gas concentration
GAS105.CONSIM	0x1A	26	Scaling to integer value (0 - 27648) Gas concentration
GAS106.CONSIM	0x1B	27	Scaling to integer value (0 - 27648) Gas concentration
GAS107.CONSIM	0x1C	28	Scaling to integer value (0 - 27648) Gas concentration

GAS108.CONSIM	0x1D	29	Scaling to integer value (0 - 27648) Gas concentration
LASER11.TRANSMISSION	0x1E	30	16 -bits of floating point value (first part) Laser transmission
	0x1F	31	16 -bits of floating point value (second part) Laser transmission
LASER12.TRANSMISSION	0x20	32	16 -bits of floating point value (first part) Laser transmission
	0x21	33	16 -bits of floating point value (second part) Laser transmission
LASER13.TRANSMISSION	0x22	34	16 -bits of floating point value (first part) Laser transmission
	0x23	35	16 -bits of floating point value (second part) Laser transmission
LASER14.TRANSMISSION	0x24	36	16 -bits of floating point value (first part) Laser transmission
	0x25	37	16 -bits of floating point value (second part) Laser transmission
LASER11.TRANSMISSION_SIM	0x26	38	Scaling to integer value (0 - 27648) Laser transmission
LASER12.TRANSMISSION_SIM	0x27	39	Scaling to integer value (0 - 27648) Laser transmission
LASER13.TRANSMISSION_SIM	0x28	40	Scaling to integer value (0 - 27648) Laser transmission
LASER14.TRANSMISSION_SIM	0x29	41	Scaling to integer value (0 - 27648) Laser transmission
FIBER1.TRANSMISSION	0x2A	42	16 -bits of floating point value (first part) Fiber transmission
	0x2B	43	16 -bits of floating point value (second part) Fiber transmission
FIBER2.TRANSMISSION	0x2C	44	16 -bits of floating point value (first part) Fiber transmission
	0x2D	45	16 -bits of floating point value (second part) Fiber transmission

	0x2E	46	16 -bits of floating point value (first part) Detector gain
REMOTERX1.GAIN	0x2F	47	16 -bits of floating point value (second part) Detector gain
	0x30	48	16 -bits of floating point value (first part) Detector gain
REMOTERX2.GAIN	0x31	49	16 -bits of floating point value (second part) Detector gain
	0x32	50	16 -bits of floating point value (first part) Laser gain
LASER1.GAIN_TIA	0x33	51	16 -bits of floating point value (second part) Laser gain
	0x34	52	16 -bits of floating point value (first part) Laser gain
LASER2.GAIN_TIA	0x35	53	16 -bits of floating point value (second part) Laser gain
	0x36	54	16 -bits of floating point value (first part) Laser gain
LASER3.GAIN_TIA	0x37	55	16 -bits of floating point value (second part) Laser gain
	0x38	56	16 -bits of floating point value (first part) Laser gain
LASER4.GAIN_TIA	0x39	57	16 -bits of floating point value (second part) Laser gain
	0x3A	58	16 -bits of floating point value (first part) Laser amplitude reference
TEC0.THL_REF_AMP	0x3B	59	16 -bits of floating point value (second part) Laser amplitude reference
	0x3C	60	16 -bits of floating point value (first part) Laser temperature conditions
TEC0.AMB_TEMPERATURE	0x3D	61	16 -bits of floating point value (second part)

			Laser temperature conditions
	0x3E	62	16 -bits of floating point value (first part) Laser amplitude reference
TEC1.THL_REF_AMP	0x3F	63	16 -bits of floating point value (second part) Laser amplitude reference
	0x40	64	16 -bits of floating point value (first part) Laser temperature conditions
TEC1.AMB_TEMPERATURE	0x41	65	16 -bits of floating point value (second part) Laser temperature conditions
	0x42	66	16 -bits of floating point value (first part) Laser amplitude reference
TEC2.THL_REF_AMP	0x43	67	16 -bits of floating point value (second part) Laser amplitude reference
	0x44	68	16 -bits of floating point value (first part) Laser temperature conditions
TEC2.AMB_TEMPERATURE	0x45	69	16 -bits of floating point value (second part) Laser temperature conditions
	0x46	70	16 -bits of floating point value (first part) Laser amplitude reference
TEC3.THL_REF_AMP	0x47	71	16 -bits of floating point value (second part) Laser amplitude reference
	0x48	72	16 -bits of floating point value (first part) Laser temperature conditions
TEC3.AMB_TEMPERATURE	0x49	73	16 -bits of floating point value (second part) Laser temperature conditions
SYSTEM.STATUS	0x4A	74	System status value 6 system ok
SYSTEM.STARTUP_PROCEDURE	0x4B	75	System startup procedure 0 - Low level platform is not working 1 - Device initialization and memory test 2 - Internal communication check 3 - Automatic gain control calibration procedure 4 - Device parameters check and set

			5 - Lasers temperature stabilization (lasers are off) 6 - Lasers temperature stabilization (lasers are on) 7 - Lasers transmission check 8 - Self-calibration procedure 9 - Concentration measurement check 10 - Normal operation of the device (startup procedure is finished)
SYSTEM.TRANS_MP1_STATUS	0x4C	76	Value 1 ok Value 0 warning
SYSTEM.ERR_CODE	0x4D	77	Reserved - future use
SYSTEM.AIO_ERROR	0x4E	78	Reserved - future use
SYSTEM.DIO_ERROR	0x4F	79	Reserved - future use
SYSTEM.RTD_PRESS_ERROR	0x50	80	Reserved - future use
SYSTEM.ALARM1	0x51	81	Alarm 1
SYSTEM.ALARM2	0x52	82	Alarm 2
SYSTEM.ALARM3	0x53	83	Alarm 3
SYSTEM.ALARM4	0x54	84	Alarm 4
SYSTEM.ALARM5	0x55	85	Alarm 5
SYSTEM.ALARM6	0x56	86	Alarm 6
SYSTEM.ALARM7	0x57	87	Alarm 7
SYSTEM.ALARM8	0x58	88	Alarm 8
SYSTEM.ALARM9	0x59	89	Alarm 9
SYSTEM.ALARM10	0x5A	90	Alarm 10
SYSTEM.CALIB_MODE	0x5B	91	Run in system calibrated mode
AOUT1	0x5C	92	16 -bits of floating point value (first part) Analog output value
	0x5D	93	16 -bits of floating point value (second part) Analog output value
AOUT2	0x5E	94	16 -bits of floating point value (first part) Analog output value
	0x5F	95	16 -bits of floating point value (second part) Analog output value
AOUT3	0x60	96	16 -bits of floating point value (first part) Analog output value
	0x61	97	16 -bits of floating point value (second part) Analog output value

	0x62	98	16 -bits of floating point value (first part) Analog output value
AOUT4	0x63	99	16 -bits of floating point value (second part) Analog output value
	0x64	100	16 -bits of floating point value (first part) Analog scaling input value
AIN1	0x65	101	16 -bits of floating point value (second part) Analog input value
	0x66	102	16 -bits of floating point value (first part) Analog input scaling value
AIN1.VAL	0x67	103	16 -bits of floating point value (second part) Analog input scaling value
AIN1.VALSIM	0x68	104	Scaling to integer value (0 - 27648) Analog input scaling value
	0x69	105	16 -bits of floating point value (first part) Analog input value
AIN2	0x6A	106	16 -bits of floating point value (second part) Analog input value
	0x6B	107	16 -bits of floating point value (first part) Analog input scaling value
AIN2.VAL	0x6C	108	16 -bits of floating point value (second part) Analog input scaling value
AIN2.VALSIM	0x6D	109	Scaling to integer value (0 - 27648) Analog input scaling value
	0x6E	110	16 -bits of floating point value (first part) Analog input value
AIN3	0x6F	111	16 -bits of floating point value (second part) Analog input value
	0x70	112	16 -bits of floating point value (first part) Analog input scaling value
AIN3.VAL	0x71	113	16 -bits of floating point value (second part) Analog input scaling value
AIN3.VALSIM	0x72	114	Scaling to integer value (0 - 27648)

			Analog input scaling value
	0x73	115	16 -bits of floating point value (first part) Analog input value
AIN4	0x74	116	16 -bits of floating point value (second part) Analog input value
	0x75	117	16 -bits of floating point value (first part) Analog input scaling value
AIN4.VAL	0x76	118	16 -bits of floating point value (second part) Analog input scaling value
AIN4.VALSIM	0x77	119	Scaling to integer value (0 - 27648) Analog input scaling value
	0x78	120	16 -bits of floating point value (first part) Temperature sensor value
RTD	0x79	121	16 -bits of floating point value (second part) Temperature sensor value
	0x7A	122	16 -bits of floating point value (first part) Pressure sensor value
AMB_PRESSURE	0x7B	123	16 -bits of floating point value (second part) Pressure sensor value
DOUT	0x7C	124	DOUT & 0x01 – first digital output DOUT & 0x02 – second digital output DOUT & 0x04 – third digital output DOUT & 0x08 – fourth digital output
DIN	0x7D	125	DIN & 0x01 – first digital input DIN & 0x02 – second digital input DIN & 0x04 – third digital input DIN & 0x08 – fourth digital input
PROCESS.TEMP_IS	0x7E	126	Process temperature input signal selection
PROCESS.TEMP_MANUAL_VALUE	0x7F	127	16 -bits of floating point value (first part) Process temperature manual value
	0x80	128	16 -bits of floating point value (second part) Process temperature manual value
PROCESS.PRESS_IS	0x81	129	Process pressure input signal selection

PROCESS.PRESS_SENSOR_TYPE	0x82	130	Pressure sensor type selection (absolute/ gauge)
PROCESS.PRESS_MANUAL_VALUE	0x83	131	16 -bits of floating point value (first part) Process pressure manual value in
	0x84	132	16 -bits of floating point value (second part) Process pressure manual value in
MEAS.PATH_LENGTH_CH1	0x85	133	16 -bits of floating point value (first part) Measuring path length channel 1
	0x86	134	16 -bits of floating point value (second part) Measuring path length channel 1
MEAS.PATH_LENGTH_CH2	0x87	135	16 -bits of floating point value (first part) Measuring path length channel 2
	0x88	136	16 -bits of floating point value (second part) Measuring path length channel 2
MEAS.RESPONSE_TIME_T90	0x89	137	16 -bits of floating point value (first part) Response time (T90) – const for IIR filter
	0x8A	138	16 -bits of floating point value (second part) Response time (T90) – const for IIR filter
GAS101.SPAN_CALIBRATION	0x8B	139	16 -bits of floating point value (first part) Span calibration factor
	0x8C	140	16 -bits of floating point value (second part) Span calibration factor
GAS101.OFFSET	0x8D	141	16 -bits of floating point value (first part) Span offset value
	0x8E	142	16 -bits of floating point value (second part) Span offset value
GAS102.SPAN_CALIBRATION	0x8F	143	16 -bits of floating point value (first part) Span calibration factor
	0x90	144	16 -bits of floating point value (second part) Span calibration factor

GAS102.OFFSET	0x91	145	16 -bits of floating point value (first part) Span offset value
	0x92	146	16 -bits of floating point value (second part) Span offset value
GAS103.SPAN_CALIBRATION	0x93	147	16 -bits of floating point value (first part) Span calibration factor
	0x94	148	16 -bits of floating point value (second part) Span calibration factor
GAS103.OFFSET	0x95	149	16 -bits of floating point value (first part) Span offset value
	0x96	150	16 -bits of floating point value (second part) Span offset value
GAS104.SPAN_CALIBRATION	0x97	151	16 -bits of floating point value (first part) Span calibration factor
	0x98	152	16 -bits of floating point value (second part) Span calibration factor
GAS104.OFFSET	0x99	153	16 -bits of floating point value (first part) Span offset value
	0x9A	154	16 -bits of floating point value (second part) Span offset value
GAS105.SPAN_CALIBRATION	0x9B	155	16 -bits of floating point value (first part) Span calibration factor
	0x9C	156	16 -bits of floating point value (second part) Span calibration factor
GAS105.OFFSET	0x9D	157	16 -bits of floating point value (first part) Span offset value
	0x9E	158	16 -bits of floating point value (second part) Span offset value
GAS106.SPAN_CALIBRATION	0x9F	159	16 -bits of floating point value (first part) Span calibration factor
	0xA0	160	16 -bits of floating point value (second part)

			Span calibration factor
GAS106.OFFSET	0xA1	161	16 -bits of floating point value (first part) Span offset value
	0xA2	162	16 -bits of floating point value (second part) Span offset value
GAS107.SPAN_CALIBRATION	0xA3	163	16 -bits of floating point value (first part) Span calibration factor
	0xA4	164	16 -bits of floating point value (second part) Span calibration factor
GAS107.OFFSET	0xA5	165	16 -bits of floating point value (first part) Span offset value
	0xA6	166	16 -bits of floating point value (second part) Span offset value
GAS108.SPAN_CALIBRATION	0xA7	167	16 -bits of floating point value (first part) Span calibration factor
	0xA8	168	16 -bits of floating point value (second part) Span calibration factor
GAS108.OFFSET	0xA9	169	16 -bits of floating point value (first part) Span offset value
	0xAA	170	16 -bits of floating point value (second part) Span offset value
TEMP.SPAN_CALIBRATION	0xAB	171	16 -bits of floating point value (first part) Span calibration factor
	0xAC	172	16 -bits of floating point value (second part) Span calibration factor
TEMP.OFFSET	0xAD	173	16 -bits of floating point value (first part) Span offset value
	0xAE	174	16 -bits of floating point value (second part) Span offset value
DOUT.DO1	0xAF	175	Signal selection for digital output
DOUT.DO2	0xB0	176	Signal selection for digital output
DOUT.DO3	0xB1	177	Signal selection for digital output
DOUT.DO4	0xB2	178	Signal selection for digital output

AOUT.FORCE_MANUAL_MODE ENABLE	0xB3	179	Force manual mode for all analog outputs
AOUT.SCALE_ENALE	0xB4	180	Enable scaling range for all analog outputs
AOUT.CALIBRATED	0xB5	181	Reserved - future use
AOUT1.SELECT_SIGNAL	0xB6	182	Measurement signal selection for the output
AOUT1.MANUAL_VALUE	0xB7	183	16 -bits of floating point value (first part) Manual mode value in scaling range
	0xB8	184	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT1.SCALE_MIN	0xB9	185	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xBA	186	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT1.SCALE_MAX	0xBB	187	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xBC	188	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT1.A	0xBD	189	16 -bits of floating point value (first part) Reserved - future use
	0xBE	190	16 -bits of floating point value (second part) Reserved - future use
AOUT1.B	0xBF	191	16 -bits of floating point value (first part) Reserved - future use
	0xC0	192	16 -bits of floating point value (second part) Reserved - future use
AOUT2.SELECT_SIGNAL	0xC1	193	Measurement signal selection for the output
AOUT2.MANUAL_VALUE	0xC2	194	16 -bits of floating point value (first part) Manual mode value in scaling range

	0xC3	195	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT2.SCALE_MIN	0xC4	196	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xC5	197	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT2.SCALE_MAX	0xC6	198	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xC7	199	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT2.A	0xC8	200	16 -bits of floating point value (first part) Reserved - future use
	0xC9	201	16 -bits of floating point value (second part) Reserved - future use
AOUT2.B	0xCA	202	16 -bits of floating point value (first part) Reserved - future use
	0xCB	203	16 -bits of floating point value (second part) Reserved - future use
AOUT3.SELECT_SIGNAL	0xCC	204	Measurement signal selection for the output
AOUT3.MANUAL_VALUE	0xCD	205	16 -bits of floating point value (first part) Manual mode value in scaling range
	0xCE	206	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT3.SCALE_MIN	0xCF	207	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xD0	208	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA

AOUT3.SCALE_MAX	0xD1	209	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xD2	210	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT3.A	0xD3	211	16 -bits of floating point value (first part) Reserved - future use
	0xD4	212	16 -bits of floating point value (second part) Reserved - future use
AOUT3.B	0xD5	213	16 -bits of floating point value (first part) Reserved - future use
	0xD6	214	16 -bits of floating point value (second part) Reserved - future use
AOUT4.SELECT_SIGNAL	0xD7	215	Measurement signal selection for the output
AOUT4.MANUAL_VALUE	0xD8	216	16 -bits of floating point value (first part) Manual mode value in scaling range
	0xD9	217	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT4.SCALE_MIN	0xDA	218	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xDB	219	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT4.SCALE_MAX	0xDC	220	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xDD	221	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT4.A	0xDE	222	16 -bits of floating point value (first part) Reserved - future use

	0xDF	223	16 -bits of floating point value (second part) Reserved - future use
AOUT4.B	0xE0	224	16 -bits of floating point value (first part) Reserved - future use
	0xE1	225	16 -bits of floating point value (second part) Reserved - future use
AIN.SCALE_ENABLE	0xE2	226	Enable scaling range for all analog inputs
AIN.CALIBRATED	0xE3	227	Reserved - future use
AIN.MEDIAN	0xE4	228	Number of samples put to median filter
AIN.IIR	0xE5	229	16 -bits of floating point value (first part) Const time value put to IIR filter
	0xE6	230	16 -bits of floating point value (second part) Const time value put to IIR filter
AIN1.SCALE_MIN	0xE7	231	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xE8	232	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN1.SCALE_MAX	0xE9	233	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xEA	234	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN1.A	0xEB	235	16 -bits of floating point value (first part) Reserved - future use
	0xEC	236	16 -bits of floating point value (second part) Reserved - future use
AIN1.B	0xED	237	16 -bits of floating point value (first part) Reserved - future use
	0xEE	238	16 -bits of floating point value (second part)

			Reserved - future use
AIN2.SCALE_MIN	0xEF	239	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xF0	240	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN2.SCALE_MAX	0xF1	241	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xF2	242	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN2.A	0xF3	243	16 -bits of floating point value (first part) Reserved - future use
	0xF4	244	16 -bits of floating point value (second part) Reserved - future use
AIN2.B	0xF5	245	16 -bits of floating point value (first part) Reserved - future use
	0xF6	246	16 -bits of floating point value (second part) Reserved - future use
AIN3.SCALE_MIN	0xF7	247	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0xF8	248	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN3.SCALE_MAX	0xF9	249	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0xFA	250	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN3.A	0xFB	251	16 -bits of floating point value (first part)

			Reserved - future use
	0xFC	252	16 -bits of floating point value (second part) Reserved - future use
AIN3.B	0xFD	253	16 -bits of floating point value (first part) Reserved - future use
	0xFE	254	16 -bits of floating point value (second part) Reserved - future use
AIN4.SCALE_MIN	0xFF	255	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x100	256	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN4.SCALE_MAX	0x101	257	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x102	258	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN4.A	0x103	259	16 -bits of floating point value (first part) Reserved - future use
	0x104	260	16 -bits of floating point value (second part) Reserved - future use
AIN4.B	0x105	261	16 -bits of floating point value (first part) Reserved - future use
	0x106	262	16 -bits of floating point value (second part) Reserved - future use
RTD.MEDIAN	0x107	263	Number of samples put to median filter
RTD.IIR	0x108	264	16 -bits of floating point value (first part) Const time value put to IIR filter
	0x109	265	16 -bits of floating point value (second part) Const time value put to IIR filter

AMB_PRESS.MEDIAN	0x10A	266	Number of samples put to median filter
AMB_PRESS.IIR	0x10B	267	16 -bits of floating point value (first part) Const time value put to IIR filter
	0x10C	268	16 -bits of floating point value (second part) Const time value put to IIR filter
SYSTEM.CALIB_MODE_ENABLE	0x10D	269	Set system to calibrated mode
ALARM1.ENABLE	0x10E	270	Alarm enable/disable
ALARM1.AUTORESET_ENABLE	0x10F	271	Alarm autoreset enable/disable
ALARM1.RESET	0x110	272	Alarm manual reset
ALARM1.NORMAL_STATE	0x111	273	Alarm normal state value
ALARM1.SIGNAL	0x112	274	Alarm signal selection
ALARM1.OPERATOR	0x113	275	Alarm mathematical operator
ALARM1.THRESHOLD	0x114	276	16 -bits of floating point value (first part) Alarm threshold value
	0x115	277	16 -bits of floating point value (second part) Alarm threshold value
ALARM1.HYSTERESIS	0x116	278	16 -bits of floating point value (first part) Alarm hysteresis value
	0x117	279	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM2.ENABLE	0x118	280	Alarm enable/disable
ALARM2.AUTORESET_ENABLE	0x119	281	Alarm autoreset enable/disable
ALARM2.RESET	0x11A	282	Alarm manual reset
ALARM2.NORMAL_STATE	0x11B	283	Alarm normal state value
ALARM2.SIGNAL	0x11C	284	Alarm signal selection
ALARM2.OPERATOR	0x11D	285	Alarm mathematical operator
ALARM2.THRESHOLD	0x11E	286	16 -bits of floating point value (first part) Alarm threshold value
	0x11F	287	16 -bits of floating point value (second part) Alarm threshold value
ALARM2.HYSTERESIS	0x120	288	16 -bits of floating point value (first part) Alarm hysteresis value
	0x121	289	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM3.ENABLE	0x122	290	Alarm enable/disable

ALARM3.AUTORESET_ENABLE	0x123	291	Alarm autoreset enable/disable
ALARM3.RESET	0x124	292	Alarm manual reset
ALARM3.NORMAL_STATE	0x125	293	Alarm normal state value
ALARM3.SIGNAL	0x126	294	Alarm signal selection
ALARM3.OPERATOR	0x127	295	Alarm mathematical operator
ALARM3.THRESHOLD	0x128	296	16 -bits of floating point value (first part) Alarm threshold value
	0x129	297	16 -bits of floating point value (second part) Alarm threshold value
ALARM3.HYSTERESIS	0x12A	298	16 -bits of floating point value (first part) Alarm hysteresis value
	0x12B	299	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM4.ENABLE	0x12C	300	Alarm enable/disable
ALARM4.AUTORESET_ENABLE	0x12D	301	Alarm autoreset enable/disable
ALARM4.RESET	0x12E	302	Alarm manual reset
ALARM4.NORMAL_STATE	0x12F	303	Alarm normal state value
ALARM4.SIGNAL	0x130	304	Alarm signal selection
ALARM4.OPERATOR	0x131	305	Alarm mathematical operator
ALARM4.THRESHOLD	0x132	306	16 -bits of floating point value (first part) Alarm threshold value
	0x133	307	16 -bits of floating point value (second part) Alarm threshold value
ALARM4.HYSTERESIS	0x134	308	16 -bits of floating point value (first part) Alarm hysteresis value
	0x135	309	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM5.ENABLE	0x136	310	Alarm enable/disable
ALARM5.AUTORESET_ENABLE	0x137	311	Alarm autoreset enable/disable
ALARM5.RESET	0x138	312	Alarm manual reset
ALARM5.NORMAL_STATE	0x139	313	Alarm normal state value
ALARM5.SIGNAL	0x13A	314	Alarm signal selection
ALARM5.OPERATOR	0x13B	315	Alarm mathematical operator
ALARM5.THRESHOLD	0x13C	316	16 -bits of floating point value (first part) Alarm threshold value
	0x13D	317	16 -bits of floating point value (second part)

			Alarm threshold value
ALARM5.HYSTERESIS	0x13E	318	16 -bits of floating point value (first part) Alarm hysteresis value
	0x13F	319	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM6.ENABLE	0x140	320	Alarm enable/disable
ALARM6.AUTORESET_ENABLE	0x141	321	Alarm autoreset enable/disable
ALARM6.RESET	0x142	322	Alarm manual reset
ALARM6.NORMAL_STATE	0x143	323	Alarm normal state value
ALARM6.SIGNAL	0x144	324	Alarm signal selection
ALARM6.OPERATOR	0x145	325	Alarm mathematical operator
ALARM6.THRESHOLD	0x146	326	16 -bits of floating point value (first part) Alarm threshold value
	0x147	327	16 -bits of floating point value (second part) Alarm threshold value
ALARM6.HYSTERESIS	0x148	328	16 -bits of floating point value (first part) Alarm hysteresis value
	0x149	329	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM7.ENABLE	0x14A	330	Alarm enable/disable
ALARM7.AUTORESET_ENABLE	0x14B	331	Alarm autoreset enable/disable
ALARM7.RESET	0x14C	332	Alarm manual reset
ALARM7.NORMAL_STATE	0x14D	333	Alarm normal state value
ALARM7.SIGNAL	0x14E	334	Alarm signal selection
ALARM7.OPERATOR	0x14F	335	Alarm mathematical operator
ALARM7.THRESHOLD	0x150	336	16 -bits of floating point value (first part) Alarm threshold value
	0x151	337	16 -bits of floating point value (second part) Alarm threshold value
ALARM7.HYSTERESIS	0x152	338	16 -bits of floating point value (first part) Alarm hysteresis value
	0x153	339	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM8.ENABLE	0x154	340	Alarm enable/disable
ALARM8.AUTORESET_ENABLE	0x155	341	Alarm autoreset enable/disable
ALARM8.RESET	0x156	342	Alarm manual reset

ALARM8.NORMAL_STATE	0x157	343	Alarm normal state value
ALARM8.SIGNAL	0x158	344	Alarm signal selection
ALARM8.OPERATOR	0x159	345	Alarm mathematical operator
ALARM8.THRESHOLD	0x15A	346	16 -bits of floating point value (first part) Alarm threshold value
	0x15B	347	16 -bits of floating point value (second part) Alarm threshold value
ALARM8.HYSTERESIS	0x15C	348	16 -bits of floating point value (first part) Alarm hysteresis value
	0x15D	349	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM9.ENABLE	0x15E	350	Alarm enable/disable
ALARM9.AUTORESET_ENABLE	0x15F	351	Alarm autoreset enable/disable
ALARM9.RESET	0x160	352	Alarm manual reset
ALARM9.NORMAL_STATE	0x161	353	Alarm normal state value
ALARM9.SIGNAL	0x162	354	Alarm signal selection
ALARM9.OPERATOR	0x163	355	Alarm mathematical operator
ALARM9.THRESHOLD	0x164	356	16 -bits of floating point value (first part) Alarm threshold value
	0x165	357	16 -bits of floating point value (second part) Alarm threshold value
ALARM9.HYSTERESIS	0x166	358	16 -bits of floating point value (first part) Alarm hysteresis value
	0x167	359	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM10.ENABLE	0x168	360	Alarm enable/disable
ALARM10.AUTORESET_ENABLE	0x169	361	Alarm autoreset enable/disable
ALARM10.RESET	0x16A	362	Alarm manual reset
ALARM10.NORMAL_STATE	0x16B	363	Alarm normal state value
ALARM10.SIGNAL	0x16C	364	Alarm signal selection
ALARM10.OPERATOR	0x16D	365	Alarm mathematical operator
ALARM10.THRESHOLD	0x16E	366	16 -bits of floating point value (first part) Alarm threshold value
	0x16F	367	16 -bits of floating point value (second part) Alarm threshold value

ALARM10.HYSTERESIS	0x170	368	16 -bits of floating point value (first part) Alarm hysteresis value
	0x171	369	16 -bits of floating point value (second part) Alarm hysteresis value
HMI.PASSWORD	0x172	370	HMI pin need to change parameters from HMI panel (value range 0-9999)

Table 8. Scaling to integer value example (0-27648).

System		Gas Concentration	Transmission	AI	AO	Description
Integer	Hexadecimal	0 ppm to 10 ppm	0% to 100%	4mA to 20mA	4mA to 20mA	
32767	7FFF	11.851 ppm	118.51 %	22.96 mA	22.96 mA	Overflow
32512	7F00					
32511	7EFF	11.759 ppm	117.59 %	22.81 mA	22.81 mA	Overshoot range
27649	6C01					
27648	6C00	10 ppm	100 %	20 mA	20 mA	Nominal range
20736	5100	7.5 ppm	75 %	16 mA	16 mA	
1	0001	0.00036 ppm	0.0036 %	4 mA + 578.7 nA	4 mA + 578.7 nA	
0	0000	0 ppm	0 %	4 mA	4 mA	
-1	FFFF					Undershoot range
-4864	ED00	-1.759 ppm		1.185 mA	1.185 mA	
-4865	ECFF					Underflow
-32768	8000					

Table 9. Holding Registers (Function 0x3 0x6 0x10).

Register Name	Register address (hex)	Register address (dec)	Comments
PROCESS.TEMP_IS	0x00	0	Process temperature input signal selection
PROCESS.TEMP_MANUAL_VALUE	0x01	1	16 -bits of floating point value (first part) Process temperature manual value
	0x02	2	16 -bits of floating point value (second part) Process temperature manual value
PROCESS.PRESS_IS	0x03	3	Process pressure input signal selection
PROCESS.PRESS_SENSOR_TYPE	0x04	4	Pressure sensor type selection (absolute/ gauge)

PROCESS.PRESS_MANUAL_VALUE	0x05	5	16 -bits of floating point value (first part) Process pressure manual value in
	0x06	6	16 -bits of floating point value (second part) Process pressure manual value in
MEAS.PATH_LENGTH_CH1	0x07	7	16 -bits of floating point value (first part) Measuring path length channel 1
	0x08	8	16 -bits of floating point value (second part) Measuring path length channel 1
MEAS.PATH_LENGTH_CH2	0x09	9	16 -bits of floating point value (first part) Measuring path length channel 2
	0x0A	10	16 -bits of floating point value (second part) Measuring path length channel 2
MEAS.RESPONSE_TIME_T90	0x0B	11	16 -bits of floating point value (first part) Response time (T90) – const for IIR filter
	0x0C	12	16 -bits of floating point value (second part) Response time (T90) – const for IIR filter
GAS101.SPAN_CALIBRATION	0x0D	13	16 -bits of floating point value (first part) Span calibration factor
	0x0E	14	16 -bits of floating point value (second part) Span calibration factor
GAS101.OFFSET	0x0F	15	16 -bits of floating point value (first part) Span offset value
	0x10	16	16 -bits of floating point value (second part) Span offset value
GAS102.SPAN_CALIBRATION	0x11	17	16 -bits of floating point value (first part) Span calibration factor
	0x12	18	16 -bits of floating point value (second part) Span calibration factor
GAS102.OFFSET	0x13	19	16 -bits of floating point value (first part) Span offset value

	0x14	20	16 -bits of floating point value (second part) Span offset value
GAS103.SPAN_CALIBRATION	0x15	21	16 -bits of floating point value (first part) Span calibration factor
	0x16	22	16 -bits of floating point value (second part) Span calibration factor
GAS103.OFFSET	0x17	23	16 -bits of floating point value (first part) Span offset value
	0x18	24	16 -bits of floating point value (second part) Span offset value
GAS104.SPAN_CALIBRATION	0x19	25	16 -bits of floating point value (first part) Span calibration factor
	0x1A	26	16 -bits of floating point value (second part) Span calibration factor
GAS104.OFFSET	0x1B	27	16 -bits of floating point value (first part) Span offset value
	0x1C	28	16 -bits of floating point value (second part) Span offset value
GAS105.SPAN_CALIBRATION	0x1D	29	16 -bits of floating point value (first part) Span calibration factor
	0x1E	30	16 -bits of floating point value (second part) Span calibration factor
GAS105.OFFSET	0x1F	31	16 -bits of floating point value (first part) Span offset value
	0x20	32	16 -bits of floating point value (second part) Span offset value
GAS106.SPAN_CALIBRATION	0x21	33	16 -bits of floating point value (first part) Span calibration factor
	0x22	34	16 -bits of floating point value (second part) Span calibration factor
GAS106.OFFSET	0x23	35	16 -bits of floating point value (first part)

			Span offset value
	0x24	36	16 -bits of floating point value (second part) Span offset value
GAS107.SPAN_CALIBRATION	0x25	37	16 -bits of floating point value (first part) Span calibration factor
	0x26	38	16 -bits of floating point value (second part) Span calibration factor
GAS107.OFFSET	0x27	39	16 -bits of floating point value (first part) Span offset value
	0x28	40	16 -bits of floating point value (second part) Span offset value
GAS108.SPAN_CALIBRATION	0x29	41	16 -bits of floating point value (first part) Span calibration factor
	0x2A	42	16 -bits of floating point value (second part) Span calibration factor
GAS108.OFFSET	0x2B	43	16 -bits of floating point value (first part) Span offset value
	0x2C	44	16 -bits of floating point value (second part) Span offset value
TEMP.SPAN_CALIBRATION	0x2D	45	16 -bits of floating point value (first part) Span calibration factor
	0x2E	46	16 -bits of floating point value (second part) Span calibration factor
TEMP.OFFSET	0x2F	47	16 -bits of floating point value (first part) Span offset value
	0x30	48	16 -bits of floating point value (second part) Span offset value
DOUT.DO1	0x31	49	Signal selection for digital output
DOUT.DO2	0x32	50	Signal selection for digital output
DOUT.DO3	0x33	51	Signal selection for digital output
DOUT.DO4	0x34	52	Signal selection for digital output
AOUT.FORCE_MANUAL_MODE ENABLE	0x35	53	Force manual mode for all analog outputs

AOUT.SCALE_ENALE	0x36	54	Enable scaling range for all analog outputs
AOUT.CALIBRATED	0x37	55	Reserved - future use
AOUT1.SELECT_SIGNAL	0x38	56	Measurement signal selection for the output
AOUT1.MANUAL_VALUE	0x39	57	16 -bits of floating point value (first part) Manual mode value in scaling range
	0x3A	58	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT1.SCALE_MIN	0x3B	59	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x3C	60	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT1.SCALE_MAX	0x3D	61	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x3E	62	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT1.A	0x3F	63	16 -bits of floating point value (first part) Reserved - future use
	0x40	64	16 -bits of floating point value (second part) Reserved - future use
AOUT1.B	0x41	65	16 -bits of floating point value (first part) Reserved - future use
	0x42	66	16 -bits of floating point value (second part) Reserved - future use
AOUT2.SELECT_SIGNAL	0x43	67	Measurement signal selection for the output
AOUT2.MANUAL_VALUE	0x44	68	16 -bits of floating point value (first part) Manual mode value in scaling range

	0x45	69	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT2.SCALE_MIN	0x46	70	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x47	71	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT2.SCALE_MAX	0x48	72	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x49	73	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT2.A	0x4A	74	16 -bits of floating point value (first part) Reserved - future use
	0x4B	75	16 -bits of floating point value (second part) Reserved - future use
AOUT2.B	0x4C	76	16 -bits of floating point value (first part) Reserved - future use
	0x4D	77	16 -bits of floating point value (second part) Reserved - future use
AOUT3.SELECT_SIGNAL	0x4E	78	Measurement signal selection for the output
AOUT3.MANUAL_VALUE	0x4F	79	16 -bits of floating point value (first part) Manual mode value in scaling range
	0x50	80	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT3.SCALE_MIN	0x51	81	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA

	0x52	82	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT3.SCALE_MAX	0x53	83	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x54	84	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT3.A	0x55	85	16 -bits of floating point value (first part) Reserved - future use
	0x56	86	16 -bits of floating point value (second part) Reserved - future use
AOUT3.B	0x57	87	16 -bits of floating point value (first part) Reserved - future use
	0x58	88	16 -bits of floating point value (second part) Reserved - future use
AOUT4.SELECT_SIGNAL	0x59	89	Measurement signal selection for the output
AOUT4.MANUAL_VALUE	0x5A	90	16 -bits of floating point value (first part) Manual mode value in scaling range
	0x5B	91	16 -bits of floating point value (second part) Manual mode value in scaling range
AOUT4.SCALE_MIN	0x5C	92	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x5D	93	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AOUT4.SCALE_MAX	0x5E	94	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA

	0x5F	95	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AOUT4.A	0x60	96	16 -bits of floating point value (first part) Reserved - future use
	0x61	97	16 -bits of floating point value (second part) Reserved - future use
AOUT4.B	0x62	98	16 -bits of floating point value (first part) Reserved - future use
	0x63	99	16 -bits of floating point value (second part) Reserved - future use
AIN.SCALE_ENABLE	0x64	100	Enable scaling range for all analog inputs
AIN.CALIBRATED	0x65	101	Reserved - future use
AIN.MEDIAN	0x66	102	Number of samples put to median filter
AIN.IIR	0x67	103	16 -bits of floating point value (first part) Const time value put to IIR filter
	0x68	104	16 -bits of floating point value (second part) Const time value put to IIR filter
AIN1.SCALE_MIN	0x69	105	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x6A	106	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN1.SCALE_MAX	0x6B	107	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x6C	108	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN1.A	0x6D	109	16 -bits of floating point value (first part) Reserved - future use

	0x6E	110	16 -bits of floating point value (second part) Reserved - future use
AIN1.B	0x6F	111	16 -bits of floating point value (first part) Reserved - future use
	0x70	112	16 -bits of floating point value (second part) Reserved - future use
AIN2.SCALE_MIN	0x71	113	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x72	114	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN2.SCALE_MAX	0x73	115	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x74	116	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN2.A	0x75	117	16 -bits of floating point value (first part) Reserved - future use
	0x76	118	16 -bits of floating point value (second part) Reserved - future use
AIN2.B	0x77	119	16 -bits of floating point value (first part) Reserved - future use
	0x78	120	16 -bits of floating point value (second part) Reserved - future use
AIN3.SCALE_MIN	0x79	121	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x7A	122	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN3.SCALE_MAX	0x7B	123	16 -bits of floating point value (first part)

			Scaling range value corresponds to 20 mA
	0x7C	124	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN3.A	0x7D	125	16 -bits of floating point value (first part) Reserved - future use
	0x7E	126	16 -bits of floating point value (second part) Reserved - future use
AIN3.B	0x7F	127	16 -bits of floating point value (first part) Reserved - future use
	0x80	128	16 -bits of floating point value (second part) Reserved - future use
AIN4.SCALE_MIN	0x81	129	16 -bits of floating point value (first part) Scaling range value corresponds to 4 mA
	0x82	130	16 -bits of floating point value (second part) Scaling range value corresponds to 4 mA
AIN4.SCALE_MAX	0x83	131	16 -bits of floating point value (first part) Scaling range value corresponds to 20 mA
	0x84	132	16 -bits of floating point value (second part) Scaling range value corresponds to 20 mA
AIN4.A	0x85	133	16 -bits of floating point value (first part) Reserved - future use
	0x86	134	16 -bits of floating point value (second part) Reserved - future use
AIN4.B	0x87	135	16 -bits of floating point value (first part) Reserved - future use
	0x88	136	16 -bits of floating point value (second part) Reserved - future use

RTD.MEDIAN	0x89	137	Number of samples put to median filter
RTD.IIR	0x8A	138	16 -bits of floating point value (first part) Const time value put to IIR filter
	0x8B	139	16 -bits of floating point value (second part) Const time value put to IIR filter
AMB_PRESS.MEDIAN	0x8C	140	Number of samples put to median filter
AMB_PRESS.IIR	0x8D	141	16 -bits of floating point value (first part) Const time value put to IIR filter
	0x8E	142	16 -bits of floating point value (second part) Const time value put to IIR filter
SYSTEM.CALIB_MODE_ENABLE	0x8F	143	Set system to calibrated mode
ALARM1.ENABLE	0x90	144	Alarm enable/disable
ALARM1.AUTORESET_ENABLE	0x91	145	Alarm autoreset enable/disable
ALARM1.RESET	0x92	146	Alarm manual reset
ALARM1.NORMAL_STATE	0x93	147	Alarm normal state value
ALARM1.SIGNAL	0x94	148	Alarm signal selection
ALARM1.OPERATOR	0x95	149	Alarm mathematical operator
ALARM1.THRESHOLD	0x96	150	16 -bits of floating point value (first part) Alarm threshold value
	0x97	151	16 -bits of floating point value (second part) Alarm threshold value
ALARM1.HYSTERESIS	0x98	152	16 -bits of floating point value (first part) Alarm hysteresis value
	0x99	153	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM2.ENABLE	0x9A	154	Alarm enable/disable
ALARM2.AUTORESET_ENABLE	0x9B	155	Alarm autoreset enable/disable
ALARM2.RESET	0x9C	156	Alarm manual reset
ALARM2.NORMAL_STATE	0x9D	157	Alarm normal state value
ALARM2.SIGNAL	0x9E	158	Alarm signal selection
ALARM2.OPERATOR	0x9F	159	Alarm mathematical operator
ALARM2.THRESHOLD	0xA0	160	16 -bits of floating point value (first part) Alarm threshold value
	0xA1	161	16 -bits of floating point value (second part)

			Alarm threshold value
ALARM2.HYSTERESIS	0xA2	162	16 -bits of floating point value (first part) Alarm hysteresis value
	0xA3	163	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM3.ENABLE	0xA4	164	Alarm enable/disable
ALARM3.AUTORESET_ENABLE	0xA5	165	Alarm autoreset enable/disable
ALARM3.RESET	0xA6	166	Alarm manual reset
ALARM3.NORMAL_STATE	0xA7	167	Alarm normal state value
ALARM3.SIGNAL	0xA8	168	Alarm signal selection
ALARM3.OPERATOR	0xA9	169	Alarm mathematical operator
ALARM3.THRESHOLD	0xAA	170	16 -bits of floating point value (first part) Alarm threshold value
	0xAB	171	16 -bits of floating point value (second part) Alarm threshold value
ALARM3.HYSTERESIS	0xAC	172	16 -bits of floating point value (first part) Alarm hysteresis value
	0xAD	173	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM4.ENABLE	0xAE	174	Alarm enable/disable
ALARM4.AUTORESET_ENABLE	0xAF	175	Alarm autoreset enable/disable
ALARM4.RESET	0xB0	176	Alarm manual reset
ALARM4.NORMAL_STATE	0xB1	177	Alarm normal state value
ALARM4.SIGNAL	0xB2	178	Alarm signal selection
ALARM4.OPERATOR	0xB3	179	Alarm mathematical operator
ALARM4.THRESHOLD	0xB4	180	16 -bits of floating point value (first part) Alarm threshold value
	0xB5	181	16 -bits of floating point value (second part) Alarm threshold value
ALARM4.HYSTERESIS	0xB6	182	16 -bits of floating point value (first part) Alarm hysteresis value
	0xB7	183	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM5.ENABLE	0xB8	184	Alarm enable/disable
ALARM5.AUTORESET_ENABLE	0xB9	185	Alarm autoreset enable/disable
ALARM5.RESET	0xBA	186	Alarm manual reset

ALARM5.NORMAL_STATE	0xBB	187	Alarm normal state value
ALARM5.SIGNAL	0xBC	188	Alarm signal selection
ALARM5.OPERATOR	0xBD	189	Alarm mathematical operator
ALARM5.THRESHOLD	0xBE	190	16 -bits of floating point value (first part) Alarm threshold value
	0xBF	191	16 -bits of floating point value (second part) Alarm threshold value
ALARM5.HYSTERESIS	0xC0	192	16 -bits of floating point value (first part) Alarm hysteresis value
	0xC1	193	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM6.ENABLE	0xC2	194	Alarm enable/disable
ALARM6.AUTORESET_ENABLE	0xC3	195	Alarm autoreset enable/disable
ALARM6.RESET	0xC4	196	Alarm manual reset
ALARM6.NORMAL_STATE	0xC5	197	Alarm normal state value
ALARM6.SIGNAL	0xC6	198	Alarm signal selection
ALARM6.OPERATOR	0xC7	199	Alarm mathematical operator
ALARM6.THRESHOLD	0xC8	200	16 -bits of floating point value (first part) Alarm threshold value
	0xC9	201	16 -bits of floating point value (second part) Alarm threshold value
ALARM6.HYSTERESIS	0xCA	202	16 -bits of floating point value (first part) Alarm hysteresis value
	0xCB	203	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM7.ENABLE	0xCC	204	Alarm enable/disable
ALARM7.AUTORESET_ENABLE	0xCD	205	Alarm autoreset enable/disable
ALARM7.RESET	0xCE	206	Alarm manual reset
ALARM7.NORMAL_STATE	0xCF	207	Alarm normal state value
ALARM7.SIGNAL	0xD0	208	Alarm signal selection
ALARM7.OPERATOR	0xD1	209	Alarm mathematical operator
ALARM7.THRESHOLD	0xD2	210	16 -bits of floating point value (first part) Alarm threshold value
	0xD3	211	16 -bits of floating point value (second part) Alarm threshold value

ALARM7.HYSTERESIS	0xD4	212	16 -bits of floating point value (first part) Alarm hysteresis value
	0xD5	213	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM8.ENABLE	0xD6	214	Alarm enable/disable
ALARM8.AUTORESET_ENABLE	0xD7	215	Alarm autoreset enable/disable
ALARM8.RESET	0xD8	216	Alarm manual reset
ALARM8.NORMAL_STATE	0xD9	217	Alarm normal state value
ALARM8.SIGNAL	0xDA	218	Alarm signal selection
ALARM8.OPERATOR	0xDB	219	Alarm mathematical operator
ALARM8.THRESHOLD	0xDC	220	16 -bits of floating point value (first part) Alarm threshold value
	0xDD	221	16 -bits of floating point value (second part) Alarm threshold value
ALARM8.HYSTERESIS	0xDE	222	16 -bits of floating point value (first part) Alarm hysteresis value
	0xDF	223	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM9.ENABLE	0xE0	224	Alarm enable/disable
ALARM9.AUTORESET_ENABLE	0xE1	225	Alarm autoreset enable/disable
ALARM9.RESET	0xE2	226	Alarm manual reset
ALARM9.NORMAL_STATE	0xE3	227	Alarm normal state value
ALARM9.SIGNAL	0xE4	228	Alarm signal selection
ALARM9.OPERATOR	0xE5	229	Alarm mathematical operator
ALARM9.THRESHOLD	0xE6	230	16 -bits of floating point value (first part) Alarm threshold value
	0xE7	231	16 -bits of floating point value (second part) Alarm threshold value
ALARM9.HYSTERESIS	0xE8	232	16 -bits of floating point value (first part) Alarm hysteresis value
	0xE9	233	16 -bits of floating point value (second part) Alarm hysteresis value
ALARM10.ENABLE	0xEA	234	Alarm enable/disable
ALARM10.AUTORESET_ENABLE	0xEB	235	Alarm autoreset enable/disable
ALARM10.RESET	0xEC	236	Alarm manual reset
ALARM10.NORMAL_STATE	0xED	237	Alarm normal state value

ALARM10.SIGNAL	0xEE	238	Alarm signal selection
ALARM10.OPERATOR	0xEF	239	Alarm mathematical operator
ALARM10.THRESHOLD	0xF0	240	16 -bits of floating point value (first part) Alarm threshold value
	0xF1	241	16 -bits of floating point value (second part) Alarm threshold value
ALARM10.HYSTERESIS	0xF2	242	16 -bits of floating point value (first part) Alarm hysteresis value
	0xF3	243	16 -bits of floating point value (second part) Alarm hysteresis value
HMI.PASSWORD	0xF4	244	HMI pin need to change parameters from HMI panel (value range 0-9999)

5.6.2. Modbus TCP

Modbus TCP is an Anybus CompactCom module integrated with Analyzer. Communication parameters are configured by Analyzer web server tool (only TCP PORT number is static).
TCP port number: 502

Modbus register map is common for RTU/TCP and is describe in previous chapter.

5.6.3. Profinet

Profinet is Anybus CompactCom module integrated with Analyzer. Communication parameters are configured by Analyzer web server tool.
Data transmitted by protocol are describe in Modbus RTU chapter and can be find in GSDML configuration file deliver with device.

5.6.4. Add-on module

Mechanical connection of the ABCC-M40 module to the PCB board GasEye Host ver. 4.X.

Elements of the ABCC-M40 module:

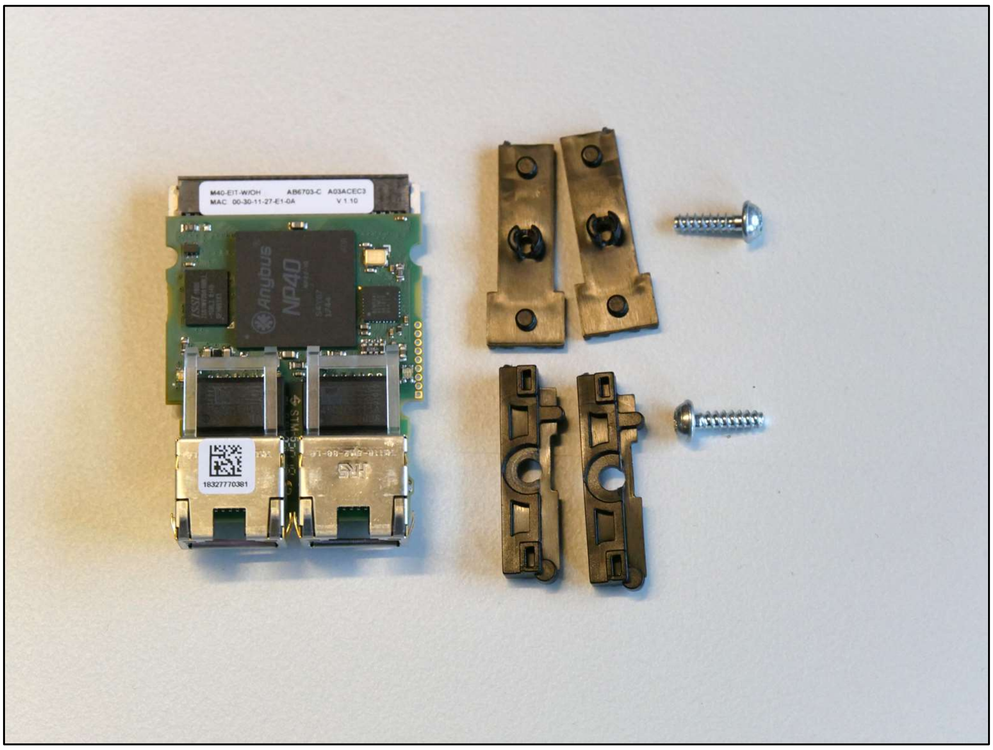


Figure 92. Elements of the ABCC-M40 module.

Steps to plug the ABCC-M40 module into the PCB GasEye Host board are presented on the pictures below:

1. Locate the slot reserved for ABCC-M40 on the GasEye Host PCB board.

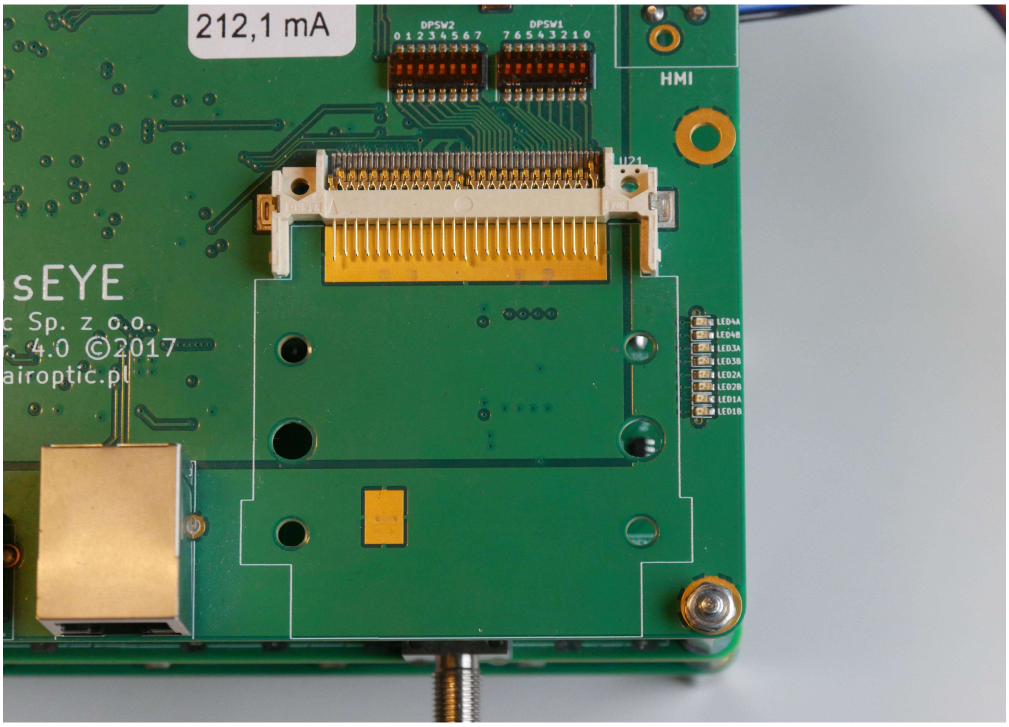


Figure 93. ABCC-M40 slot.

2. Insert two supports as presented on the picture below.

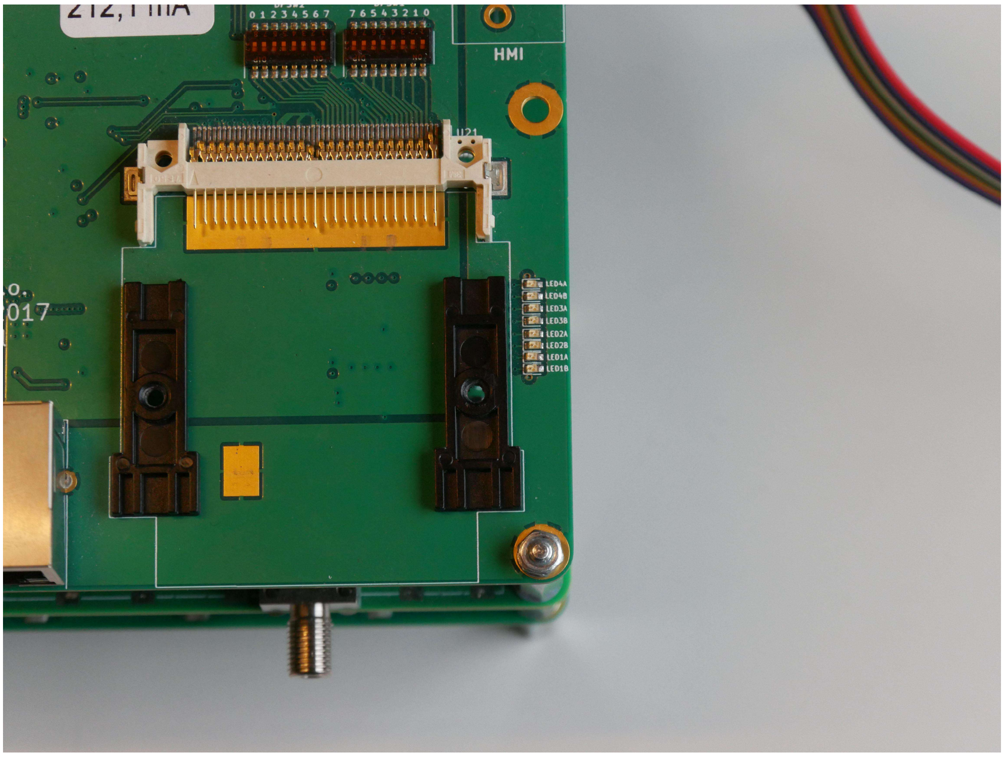


Figure 94. Supports inserting.

3. Plug the ABCC-M40 module to the socket.

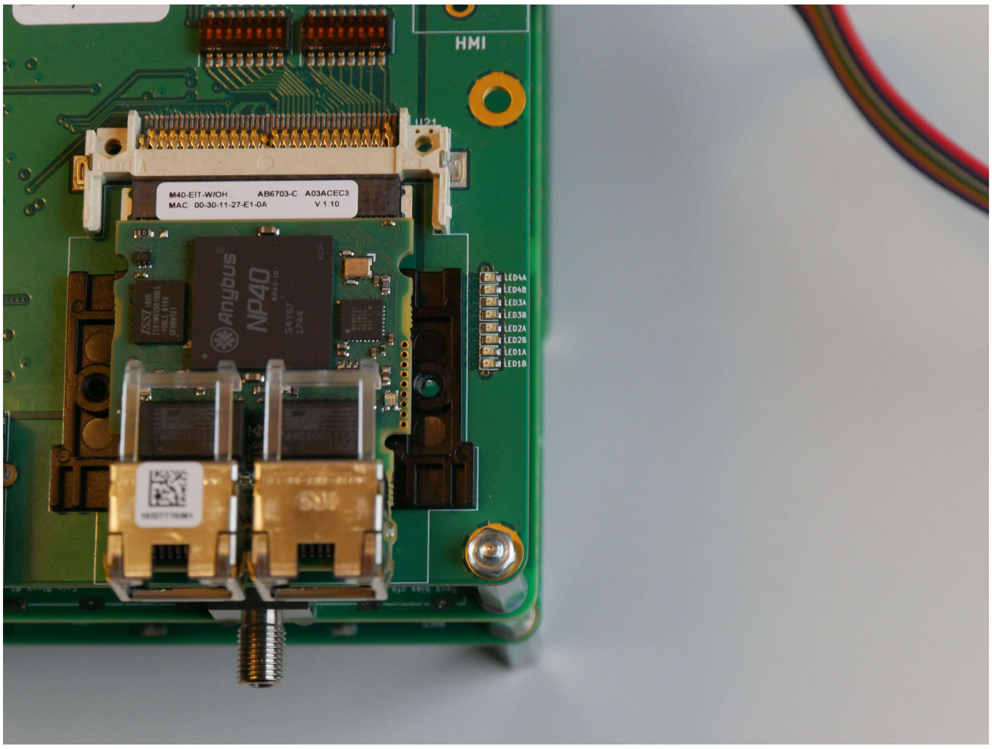


Figure 95. Plugging the ABCC-M40 module.

4. Put the overlay and screw it with the support using two screws

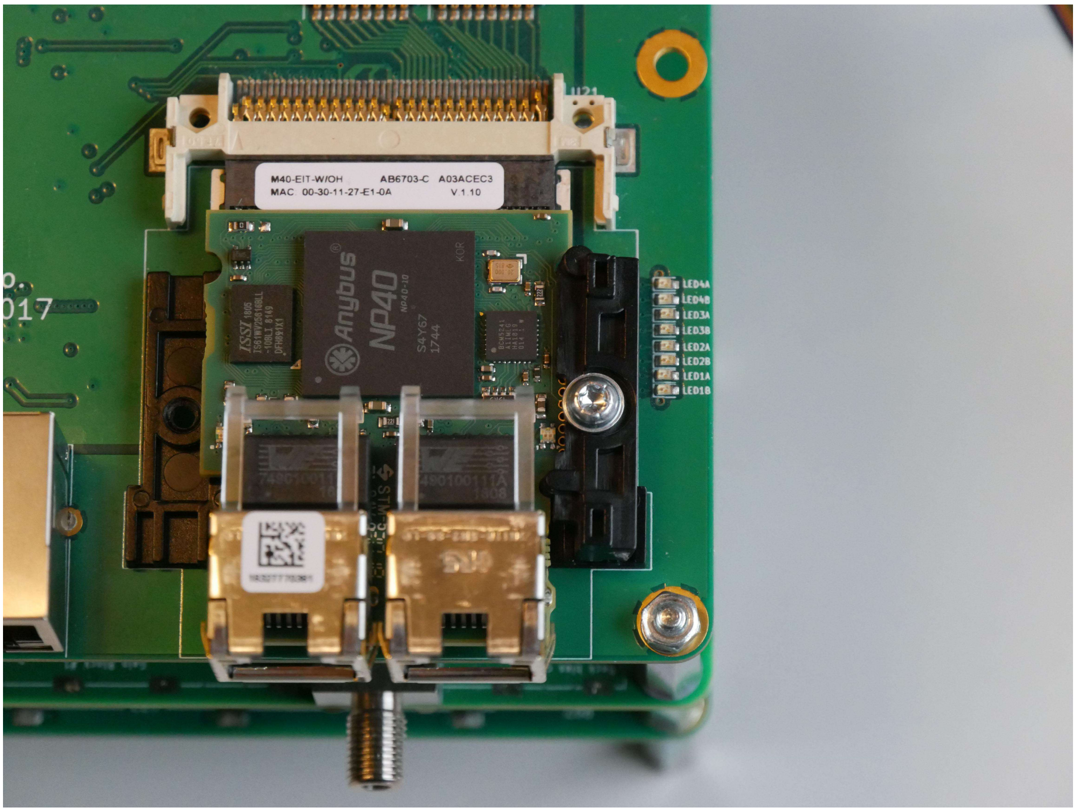


Figure 96. Putting the overlay 1/2.

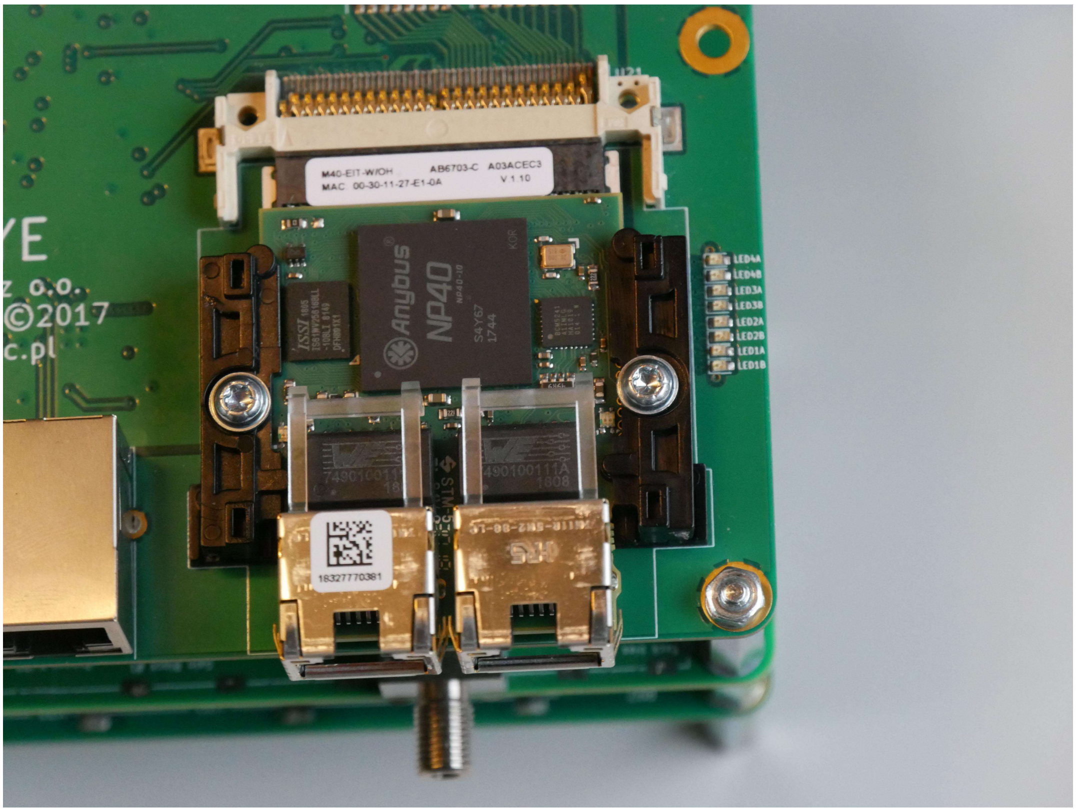


Figure 97. Putting the overlay 2/2.

6. Startup procedure

The startup procedure (SUP) is started each time the device is powered on or restarted via WebServer or by the reset button. During startup procedure the device is performing the internal diagnostics and checking the laser optical transmission. Startup procedure steps are shown in Table 10. The startup procedure takes about 3 to 5 minutes. Actual start-up procedure number can be checked on the HMI (as SUP) or via WebServer (Measurements/System/SYSTEM.STARTUP_PROCEDURE).

Startup Procedure Number (SUP)	Information
0	Low level platform is not working
1	Device initialization and memory test
2	Internal communication check
3	Automatic gain control calibration procedure
4	Device parameters check and set
5	Lasers temperature stabilization (lasers are off)
6	Lasers temperature stabilization (lasers are on)
7	Lasers transmission check
8	Self-calibration procedure
9	Concentration measurement check
10	Normal operation of the device (startup procedure is finished)

Table 10. Startup procedure (SUP) steps.

If the startup procedure (SUP) stopped at the step below 10 for more than 5 minutes, please refer to the SUP troubleshooting steps table below.

Startup Procedure Number (SUP)	Troubleshooting
0 to 6	Internal error occurred. Please contact Airoptic.
7	No/Low optical transmission. Please check the cleanliness of the process windows and/or the flange alignment.
8 to 9	Self-calibration procedure error. Please check the device specification (device is used out of the specification and/or the process gas is required for reference purposes).
10	Normal operation of the device.

Table 11. Startup procedure (SUP) troubleshooting steps.

7. HMI – front panel display

On the lid of the transmitter unit there is an LCD display, which allows monitoring of pre-defined measurements and editing essential parameters. The user can access and toggle between the menu positions using the buttons that are placed beneath the display.

7.1. Overview

Front panel of device has an alphanumerical display 4x20 (4 rows 20 columns), three buttons and two LEDs (Figure).

Figure 98. Front panel display.

Upon connection of the power supply the display will light up and show a welcome message with host version which is followed by the Main Menu page. During the start-up procedure the red LED will flash until the procedure is completed. It takes approximately 6 minutes to complete the initialization.

Figure 99. Welcome message with Host software version.

7.2. Menu

The user has access to the menu from the HMI level. The user can display measurements, parameters and IOs (Inputs/Outputs). The menu structure looks as follows.

Main Menu

- Settings
  - Network Settings
    - IP address
    - Mask
    - Gateway
  - Parameters
    - Optical path length 1 (Path1)
    - Optical path length 2 (Path2)
    - T90
- Diagnostic
  - HMI version
  - Host version
- Measurements
  - Gas 1
  - Gas 2
  - Gas 3
  - Gas 4
  - Gas 5
  - Gas 6
  - Gas 7
  - Gas 8
  - Temperature calculated (TEMCAL)
  - Fiber 1 transmission (F1TR)
  - Fiber 2 transmission (F2TR)
  - Remote RX1 gain (RX1G)
  - Remote RX2 gain (RX2G)
  - Process temperature (PrTemp)
  - Process pressure (PrPres)
  - Laser1 transmission (Trans1)
  - Laser2 transmission (Trans2)
  - Laser3 transmission (Trans3)
  - Laser4 transmission (Trans4)
  - System startup procedure (SUP)
  - Reference 1 (REF1)
  - Reference 2 (REF2)
  - Reference 3 (REF3)
  - Reference 4 (REF4)
- Analog input
  - Analog input 1
  - Analog input 2
  - Analog input 3
  - Analog input 4
- Analog output
  - Analog output 1
  - Analog output 2
  - Analog output 3
  - Analog output 4

Figure 100. Main menu overview.

7.2.1. SETTINGS

Subcategories “Network settings” and “Parameters” can be selected.

Figure 101. Front panel display – subcategories.

NETWORK SETTINGS

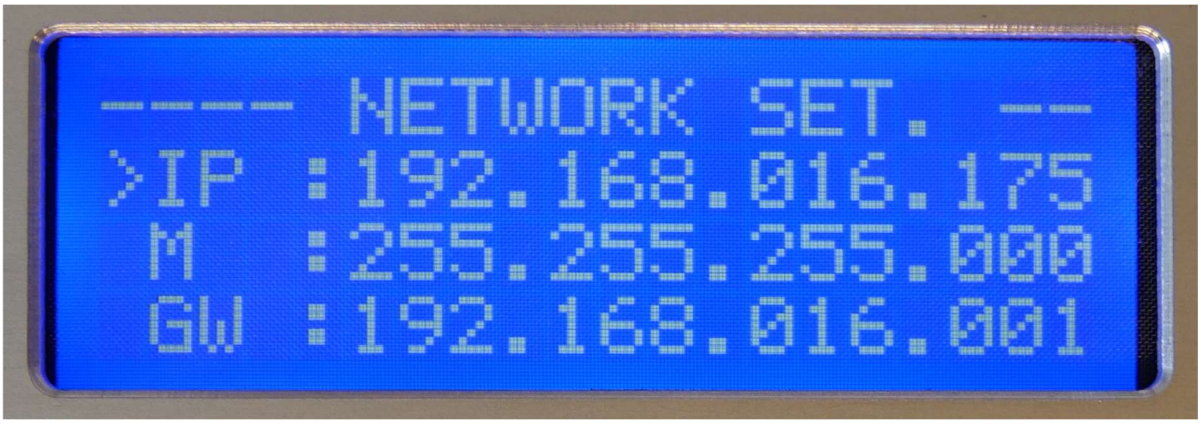


Figure 102. Front panel display - network settings.

Items in this category can be edited.

IP	IP address of the device
M	Subnet mask
GW	IP address of the gateway

PARAMETERS

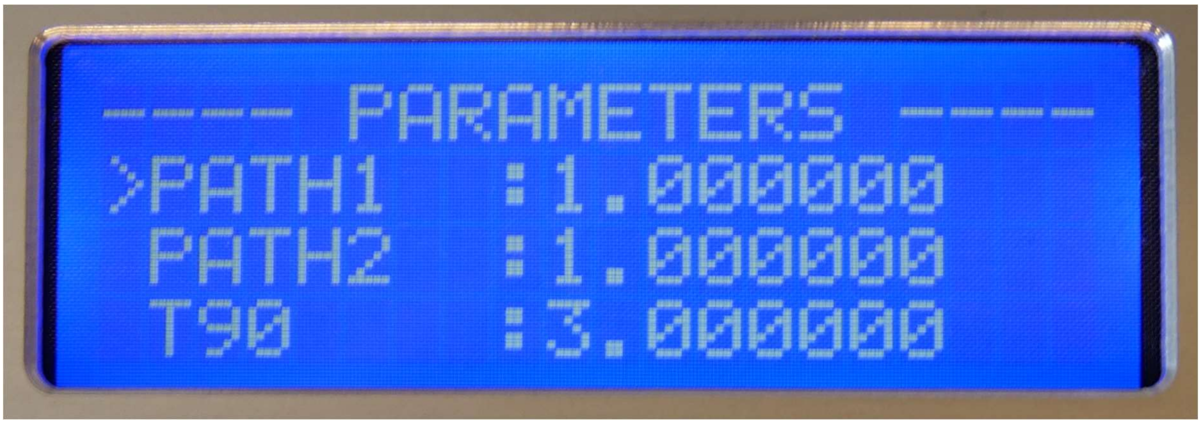


Figure 103. Front panel display - parameters.

Items in this category can be edited.

PATH1	The path 1 length value (unit: meter)
PATH2	The path 2 length value (unit: meter)
T90	Averaging time for concentration measurement (unit: second)

7.2.2. DIAGNOSTIC

In this category we can read the HMI and HOST version

Figure 104. Front panel display - diagnostic.

Items in this category are read-only.

HMI ver	HMI version
Host ver	Host version

7.2.3. MEASUREMENTS

Items in this category are read-only.

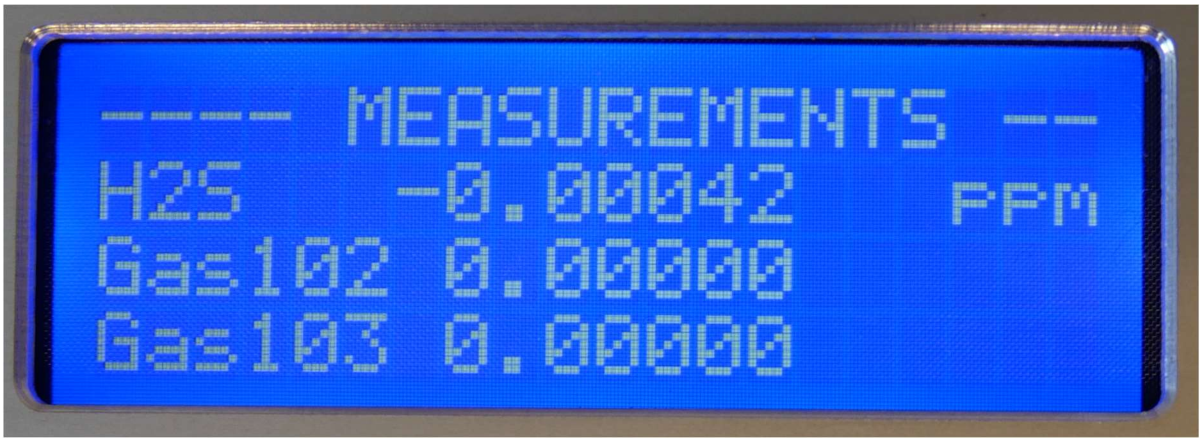


Figure 105. Front panel display – measurements GAS 1-3.

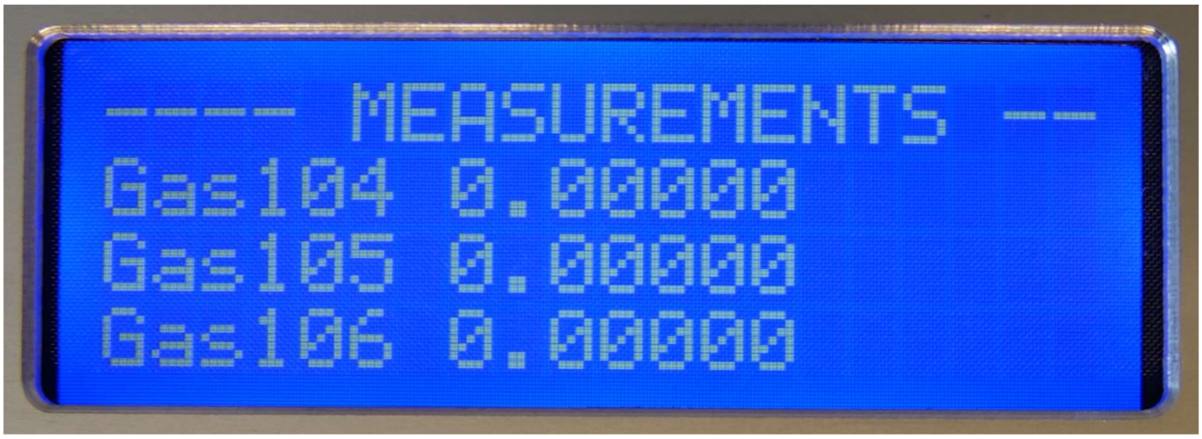


Figure 106. Front panel display – measurements GAS 4-6.

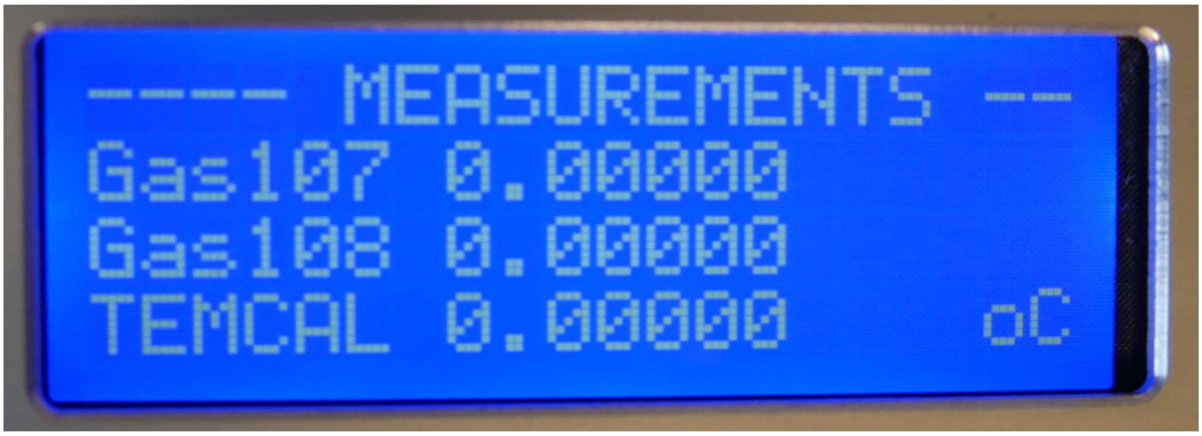


Figure 107. Front panel display – measurements GAS 7-8, TEMCAL.

GAS1-8 (e.g. O2, HCL, HCHO)	Displays the concentration value for up to eight gases
TEMCAL	Calculated process temperature (unit: degree Celsius)

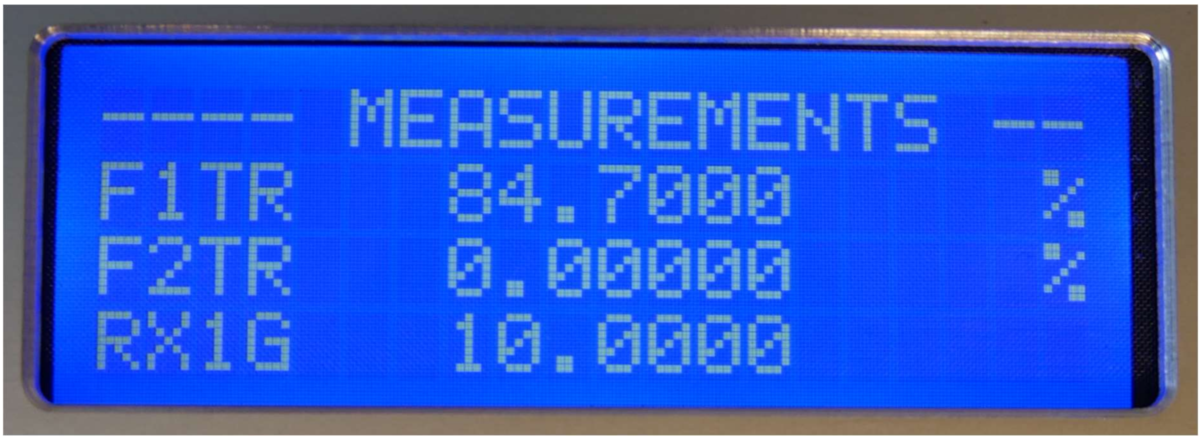


Figure 108. Front panel display – measurements F1TR, F2TR, RX1G.

F1TR	Displays transmission of fiber 1
F2TR	Displays transmission of fiber 2
RX1G	Fiber 1 remote RX gain

Figure 109. Front panel display – measurements RX2G, PrTemp, PrPres.

RX2G	Fiber 2 remote RX gain
PrTemp	Process temperature (unit: degree Celsius)
PrPres	Process pressure (unit: mbar)

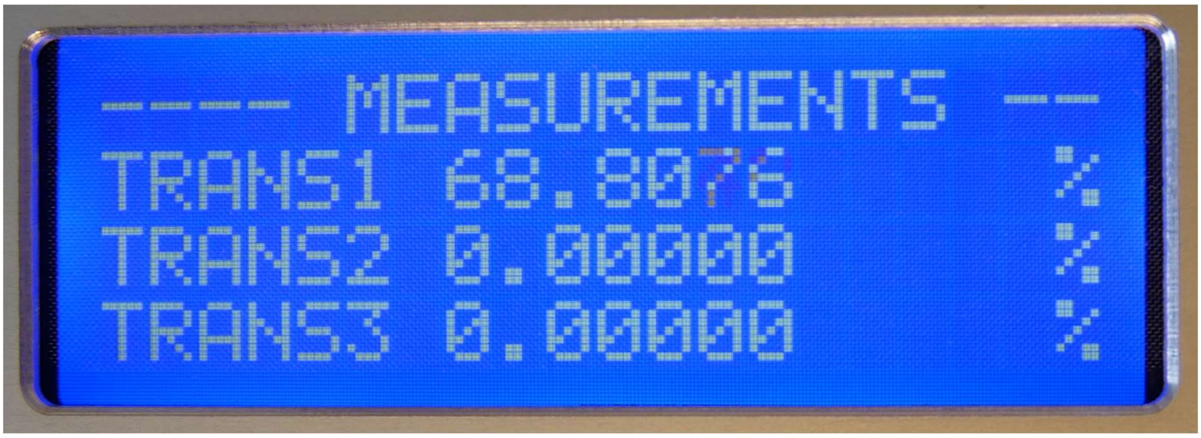


Figure 110. Front panel display – measurements TRANS1-3.

TRANS1	Transmission of Laser 1
TRANS2	Transmission of Laser 2
TRANS3	Transmission of Laser 3

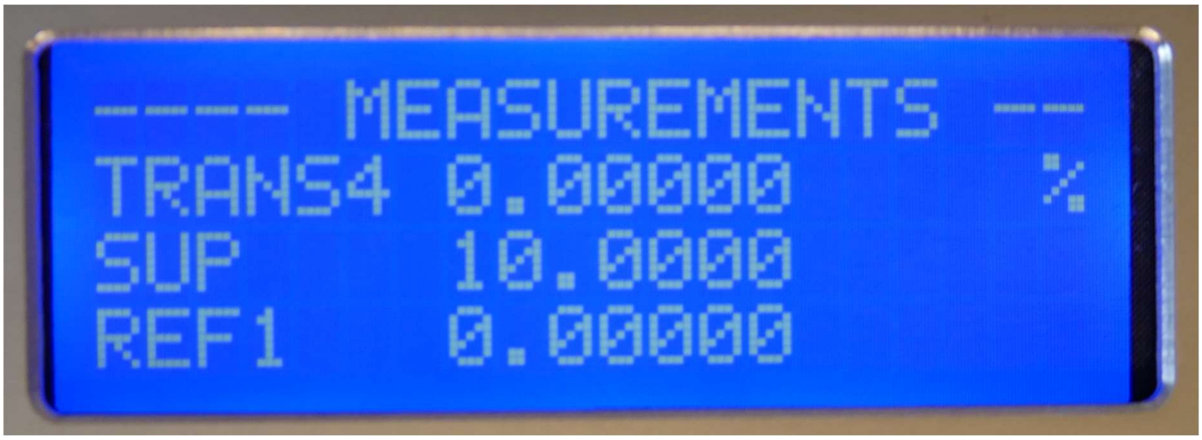


Figure 111. Front panel display – measurements TRANS4, SUP, REF1.

TRANS4	Transmission of Laser 4
SUP	Startup Procedure Number
REF1	Displays the reference signal 1 value

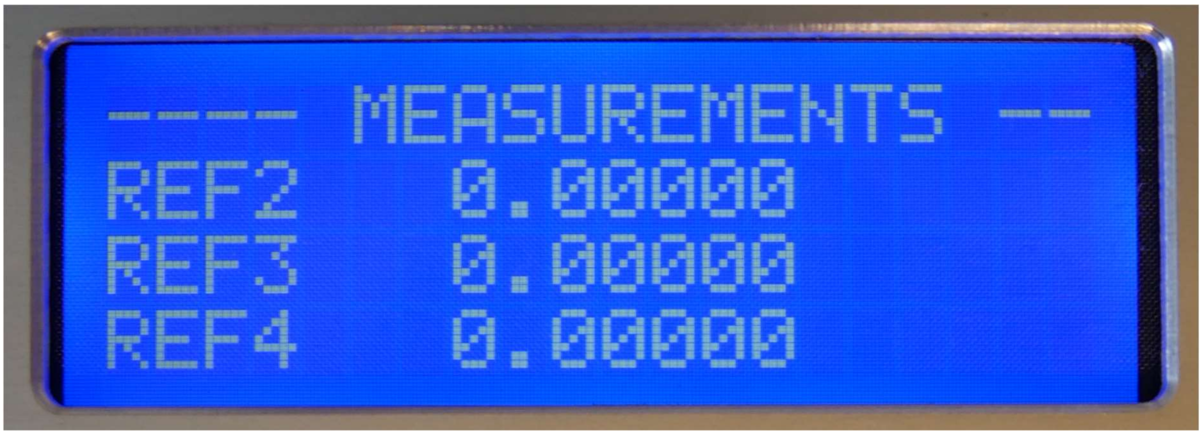


Figure 112. Front panel display – measurements REF2-4.

REF2	Displays the reference signal 2 value
REF3	Displays the reference signal 3 value
REF4	Displays the reference signal 4 value

7.2.4. ANALOG INPUT

Items in this category can be edited.

Figure 113. Front panel display – analog input AIN1-3.

Figure 114. Front panel display – analog input AIN4.

AIN1	Scaled value from Analog Input 1
AIN2	Scaled value from Analog Input 2
AIN3	Scaled value from Analog Input 3
AIN4	Scaled value from Analog Input 4

7.2.5. ANALOG OUTPUT

Items in this category can be edited.

Figure 115. Front panel display – analog output AOUT1-3.

Figure 116. Front panel display - analog output AOUT4.

AOUT1	Scaled value from Analog Output 1
AOUT2	Scaled value from Analog Output 2
AOUT3	Scaled value from Analog Output 3
AOUT4	Scaled value from Analog Output 4

7.3. Signals

GREEN LED	RED LED	Description
ON	OFF	System OK
ON (FLASHING)	OFF	Low transmission OR/AND low reference signal
OFF	ON	System error
OFF	ON (FLASHING)	Start-up procedure

Table 12. Front panel display - signals.

7.4. Buttons

Buttons provide signals from user to the HMI. Buttons function depends on which mode currently is

Button \ Mode		NORMAL	EDIT	PASSWORD
↑	Up	Move up	Increment blinking digit	Increment blinking digit
↓	Down	Move down	Decrement blinking digit	Decrement blinking digit
↲	Enter	Select item	Go to next field	Go to next digit field
↲	Enter (hold)	Return to higher menu level	Confirm changes	Confirm the typed in password

Table 13. Front panel display - buttons.

7.5. Editing parameters

1. Go to parameters menu and select the desired item with Enter button.

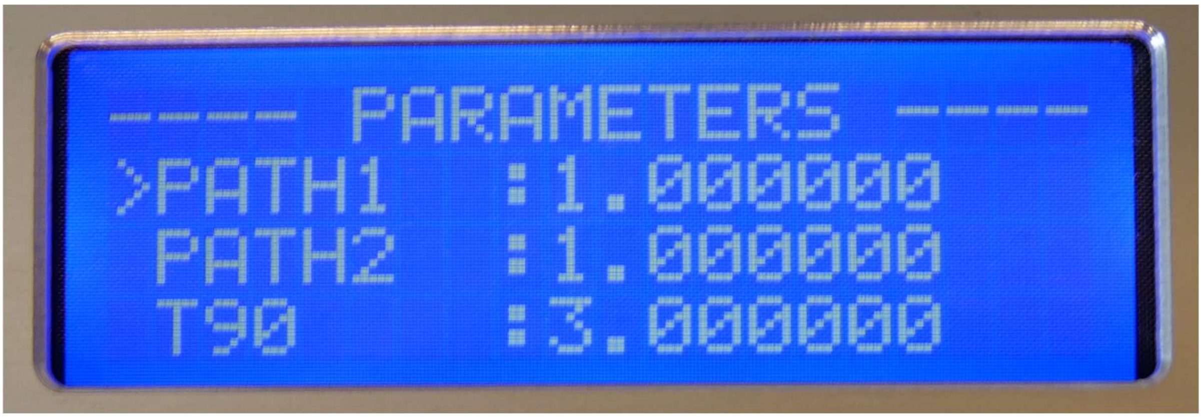


Figure 117. Front panel display – Parameter selection.

2. Password request should appear. Standard password is: **2552**

Figure 118. Front panel display – Password request.

3. Type password and hold Enter button to confirm, or just press Enter button when the cursor is on the last digit – then password validation status shall appear. Press Enter to return to the Parameters category.

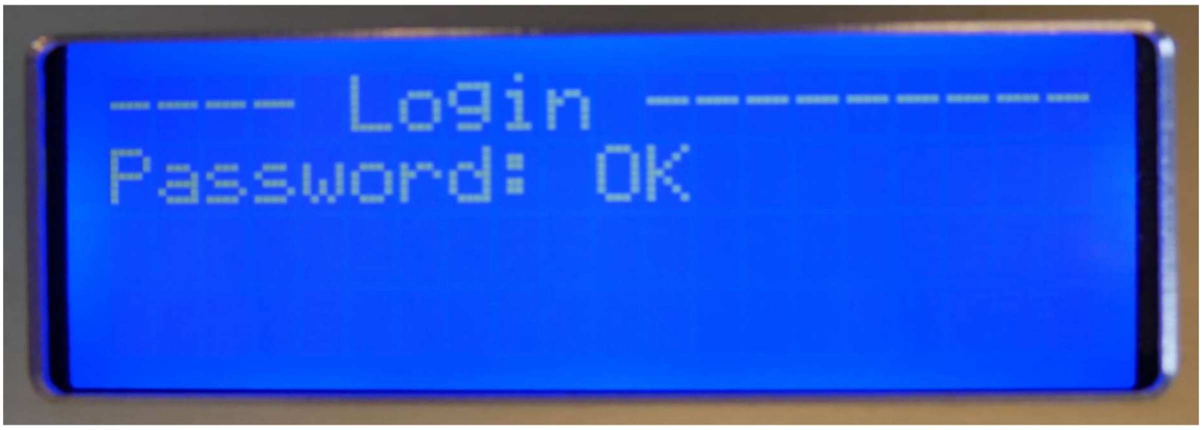


Figure 119. Front panel display – Password confirmation.

4. If password was correct, select the desired item again, and press Enter. Now, the selected parameter is in edition mode. With using UP/DOWN change value at certain position and with pressing ENTER button change input position. Set parameter holding ENTER button.

Figure 120. Front panel display – Editing parameters.

5. There will show ask for confirmation of changing parameter. Select “Yes”, “No” or “repeat config” and press ENTER button.

Figure 121. Front panel display – Confirmation of new parameters.

6. Parameter was changed successfully.

7.6. Editing network settings

Network settings can be changed in the NETWORK SETTINGS category.

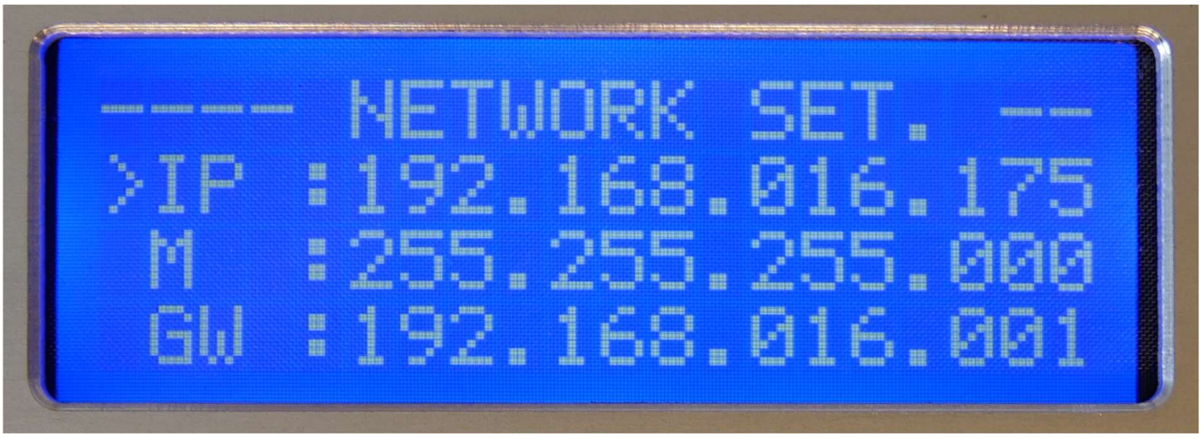


Figure 122. Front panel display - Editing network settings.

IP, subnet mask, and gateway address configuration are similar to usual parameter editing but holding Enter button quits editing mode without saving. To confirm the changes, press Enter when the cursor is on the last digit, and select “Yes”, “No”, or “repeat config”.

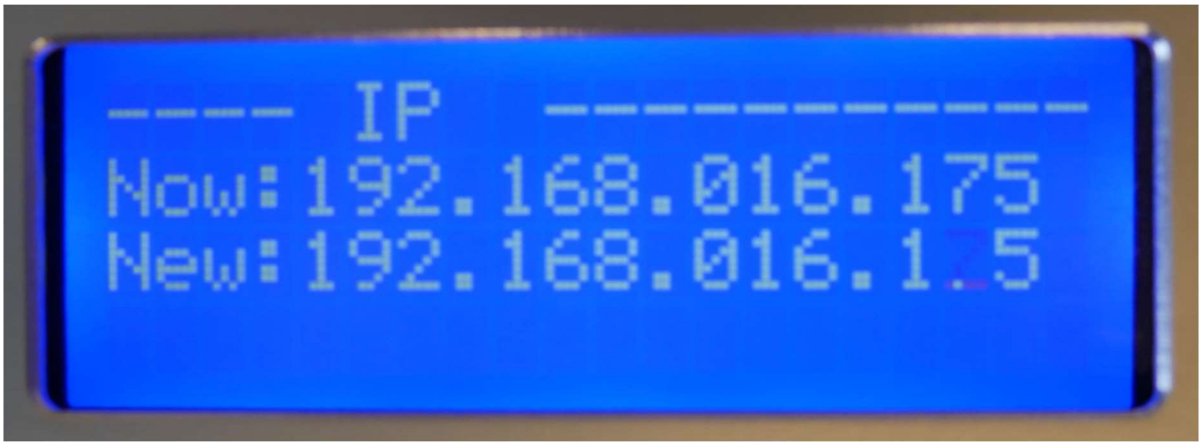


Figure 123. Front panel display – Editing IP address

Figure 124. Front panel display – IP address confirmation

7.7. Editing AIN/AOUT scaling

When is needed to change scale of AINx/AOUTx select in Analog Input/Output menu item to edit and enter password if prompted.

Figure 125. Front panel display - AIN/AOUT editing.

After item selection, a dialog with min and max values opens.

Figure 126. Front panel display – Editing analog input parameters.

Holding the Enter button for the first time moves the cursor from Min value to the Max value. After holding the Enter button for the second time a confirmation dialog appears. Select “Yes”, “No”, or “repeat config”.

Figure 127. Front panel display – Confirmation of analog input parameters.

After confirmation, the new value of parameter is set.

8. WebServer application

The WebServer application allows to monitor the GasEye Cross Duct measurements i.e. transmission value which is necessary to properly adjust the instrument.

8.1. Establishing communication with the instrument

In order to establish the communication of the instrument with the computer the user have to properly setup IP configuration. Please follow the steps below (based on Microsoft Windows 10 operating system):

1. Open Network and Internet settings.

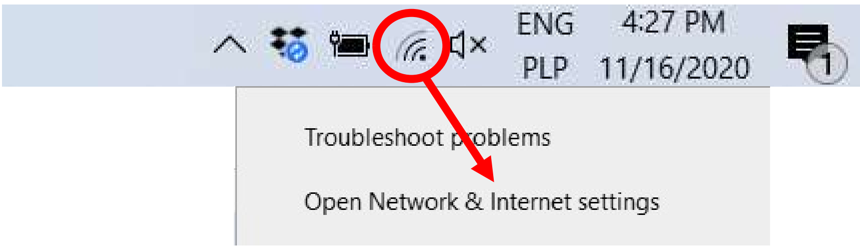


Figure 128. Network settings icon

2. Access the Adapter settings by clicking on the "Ethernet" connection.

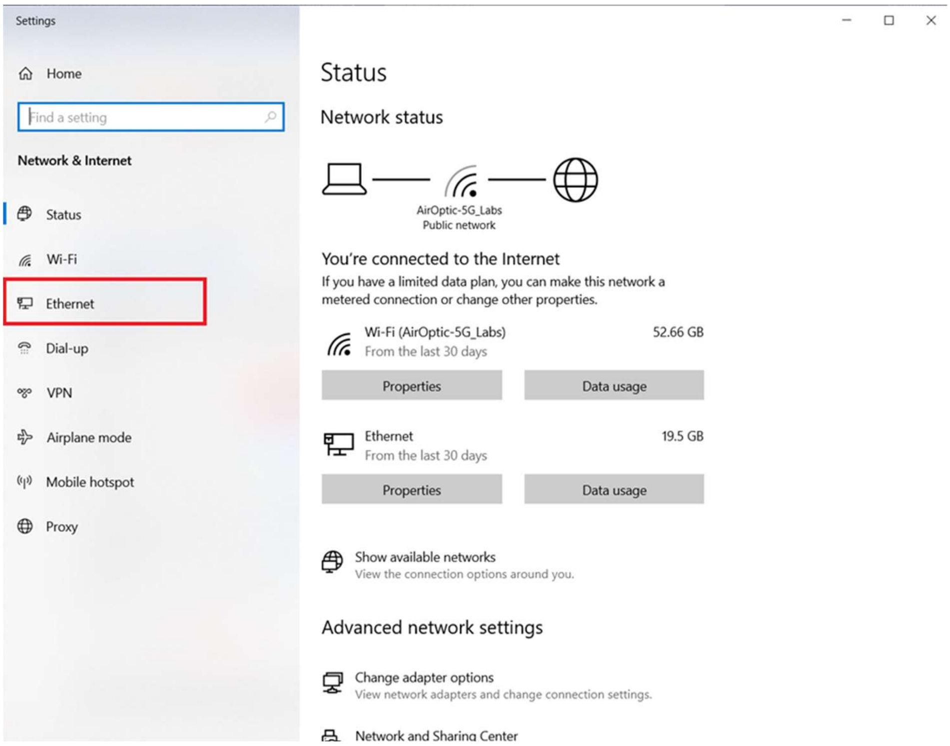


Figure 129. Network status window.

3. Open the Adapter options by clicking “Change adapter options”.

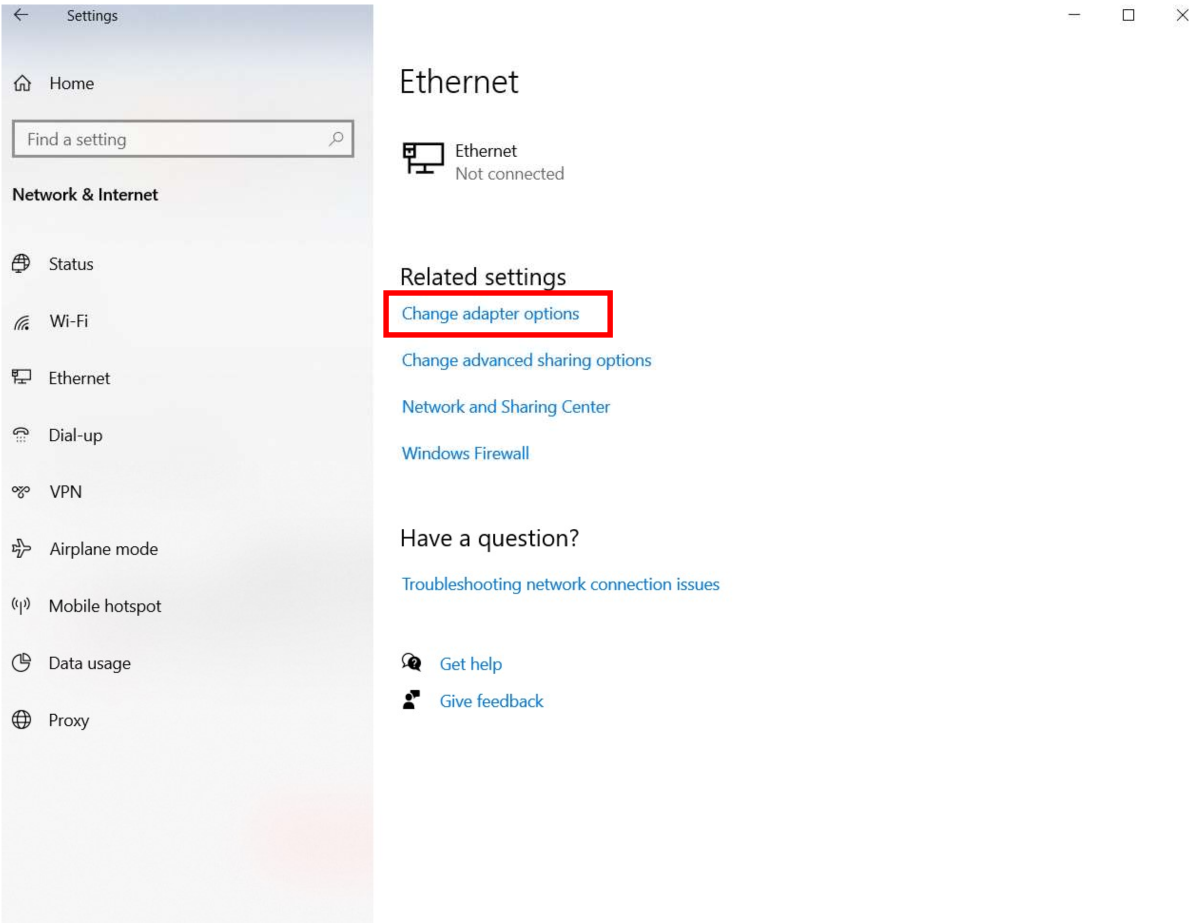


Figure 130. Ethernet settings window.

4. Open the Ethernet status window.

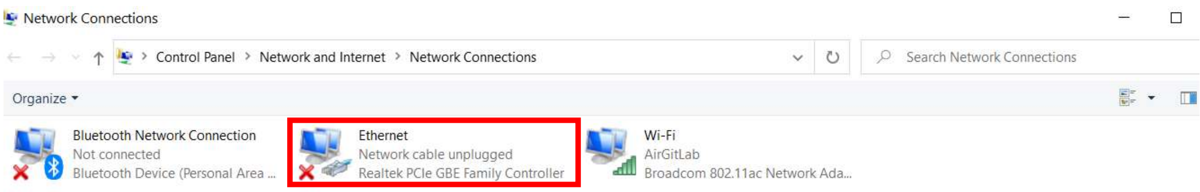


Figure 131. Network connections window.

5. Open Properties of a Ethernet Connection.

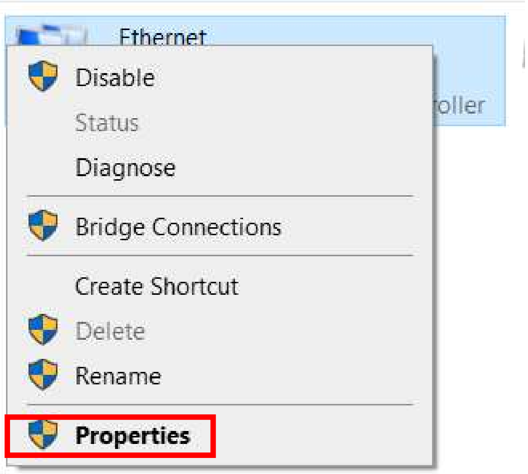


Figure 132. Ethernet connection properties.

6. Select IPv4 Internet Protocol and click on the Properties.

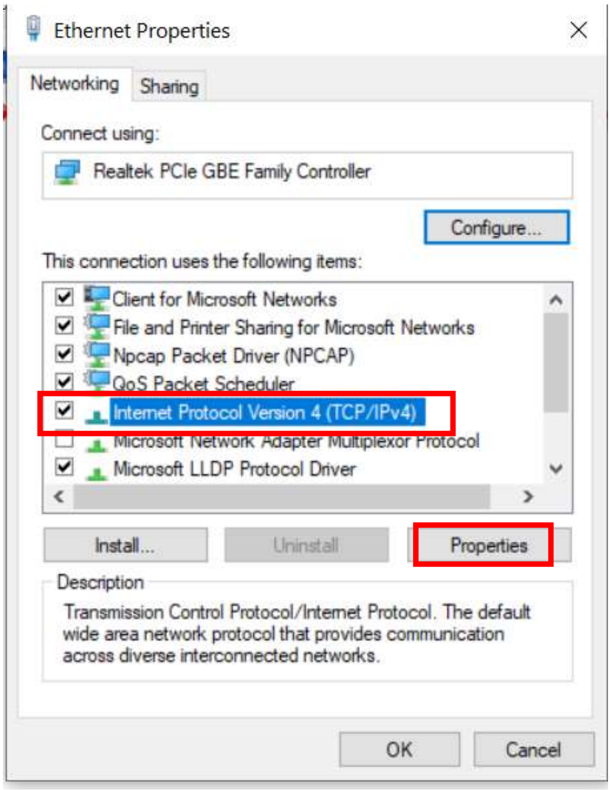


Figure 133. IPv4 Internet Protocol selection.

7. Select “Use the following IP address:”

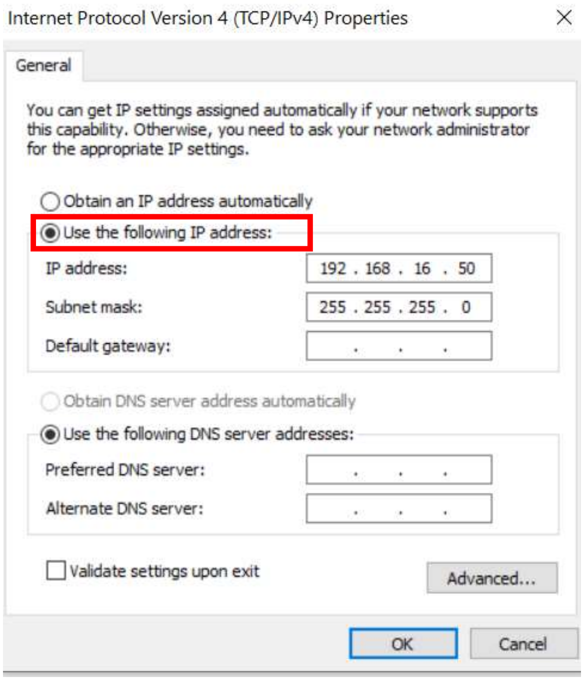


Figure 134. IP address selection.

8. Type in:

   IP address: 192.168.16.100;
   Subnet mask: 255.255.255.0

   and apply changes.

9. Open an internet browser (preferably Mozilla Firefox).
10. Type in 192.168.16.xx (IP depends on the specific instrument model).
11. If the Ethernet connection is established the WebServer application shall open.

8.2. User access level

User access level to the WebServer is the most basic access type.

If the connection is established successfully it is possible to log in to the WebServer application.

We can find the IP address of the device in front panel display (more information in point 7.2.1). We can also check the device number on the sticker on the transmitter (Figure 135).

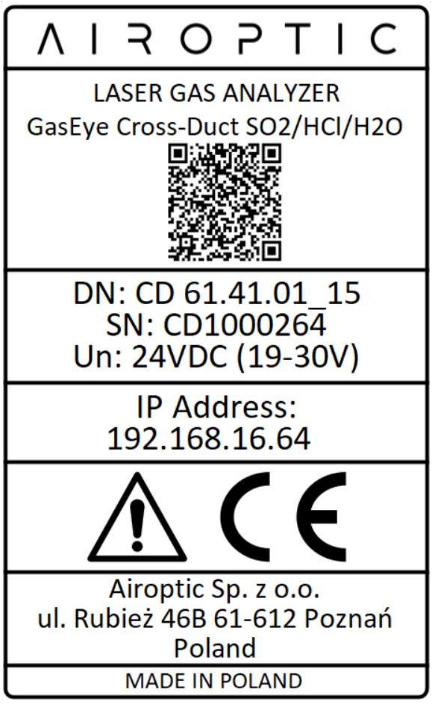


Figure 135. The sticker on the transmitter.

After typing in the IP address in the web browser a Login panel shall appear (Figure 136). To log in provide the following information (**case sensitive!**):

Account: GasEYE
Password: #pi3.14

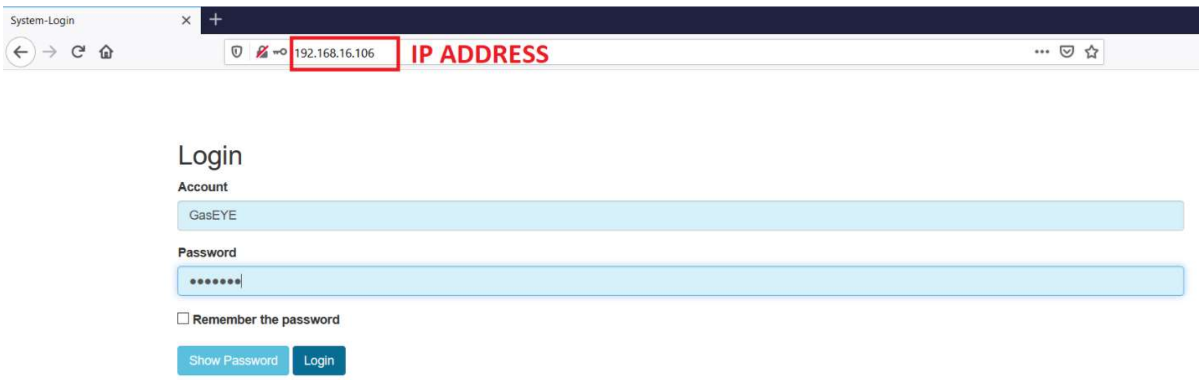


Figure 136. WebServer login page.

There are five tabs from the left on main bar possible for User access type:

- **Measurements**
- **Parameters**
- **Settings**
- **Factory config**
- **About**

Figure 137. User access level – main bar 1/2.

In the upper right corner of the window logout button can be found:

- **Reboot**
- **Logout (User)**

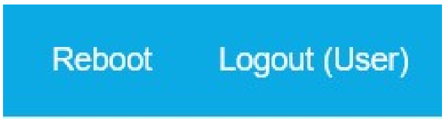


Figure 138. User access level – main bar 2/2.

8.3. Measurement tab

Drop-down menu will appear when clicking on the **Measurements.**

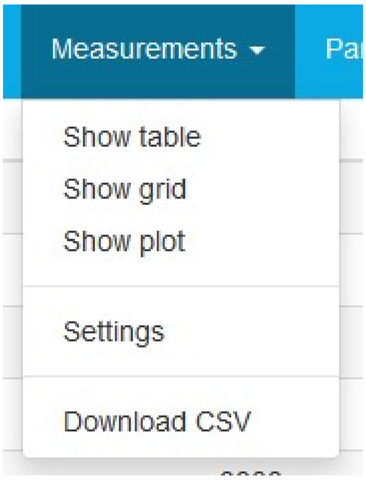


Figure 139. Webserver application - Measurement tab.

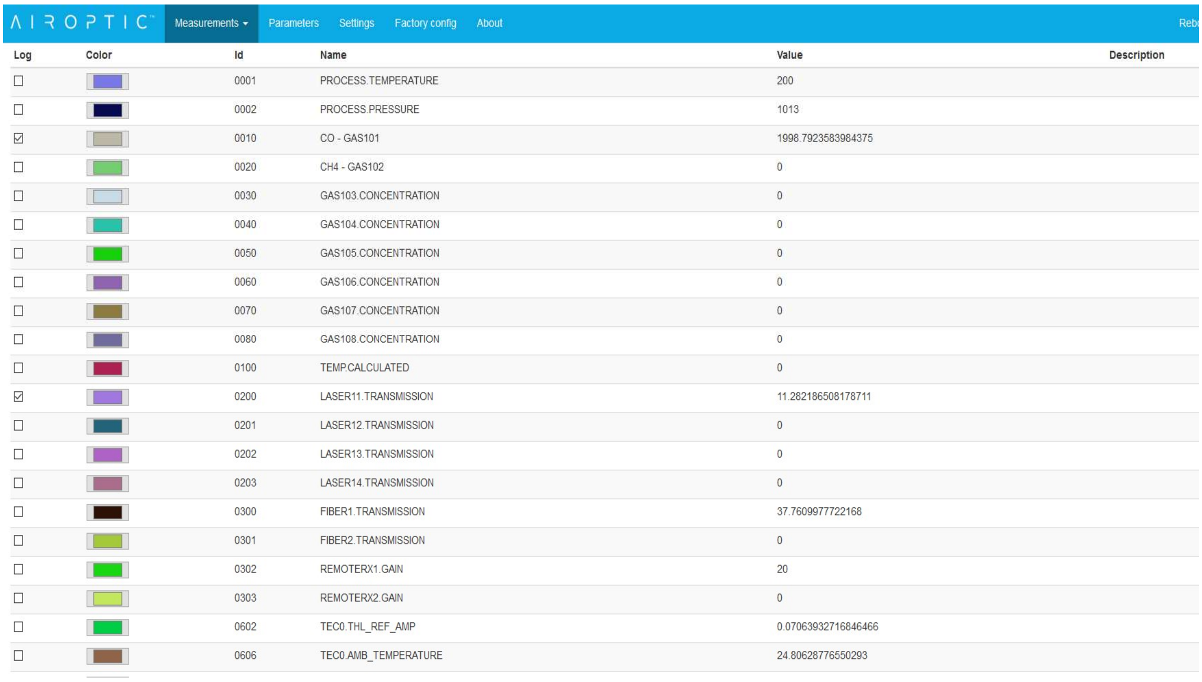
In the Measurement tab there are five functionalities that are accessible by clicking the respective field.

Table 14. Measurement window functionalities.

Show table	Shows table with the variables acquired from the instrument. User can choose which one are plotted by ticking a box next to the demanded variable description.
Show grid	Shows grid with the measurements. Their visibility is not affected by user choice in the table.
Show plot	Activates plot of the variables chosen from the table.
Settings	Opens measurement settings menu.
Download CSV	User may download measurements chosen in the table and save it in a comma-separated (*.csv) format.

8.3.1. Show Table

When Show table is active all analyzer measurements are presented by table view and the user may choose which variables are plotted (when switch to Show plot view) by ticking/unticking the ***Log*** box (See ***Figure 140***). The user may also change the ***Colour*** of the plotted line by clicking on the color box associated with variable.



Log	Color	Id	Name	Value	Description
☐		0001	PROCESS.TEMPERATURE	200	
☐		0002	PROCESS.PRESSURE	1013	
☑		0010	CO - GAS101	1998.7923583984375	
☐		0020	CH4 - GAS102	0	
☐		0030	GAS103.CONCENTRATION	0	
☐		0040	GAS104.CONCENTRATION	0	
☐		0050	GAS105.CONCENTRATION	0	
☐		0060	GAS106.CONCENTRATION	0	
☐		0070	GAS107.CONCENTRATION	0	
☐		0080	GAS108.CONCENTRATION	0	
☐		0100	TEMP.CALCULATED	0	
☑		0200	LASER11.TRANSMISSION	11.282186508178711	
☐		0201	LASER12.TRANSMISSION	0	
☐		0202	LASER13.TRANSMISSION	0	
☐		0203	LASER14.TRANSMISSION	0	
☐		0300	FIBER1.TRANSMISSION	37.7609977722168	
☐		0301	FIBER2.TRANSMISSION	0	
☐		0302	REMOTERX1.GAIN	20	
☐		0303	REMOTERX2.GAIN	0	
☐		0602	TEC0.THL_REF_AMP	0.07063932716846466	
☐		0606	TEC0.AMB_TEMPERATURE	24.80628776550293	

Figure 140. Measurements Show table view.

Log	Color	Id	Name	Value	Description
☑		0001	PROCESS.TEMPERATURE	200	
☐		0002	PROCESS.PRESSURE	1013	
☑		0010	CO - GAS101	0	
☐		0020	CH4 - GAS102	0.05690891295671463	
☐		0030	GAS103.CONCENTRATION	0	
☐		0040	GAS104.CONCENTRATION	0	
☐		0050	GAS105.CONCENTRATION	0	

Figure 141. Excerpt from Measurement Table.

8.3.2. Show Grid

The measurements may be presented in a grid view. In this view mode measurements are group into groups and subgroups and additional left menu appear to choose subgroups to present. (Subgroups can by hide/show by clicking on the group name – black font).

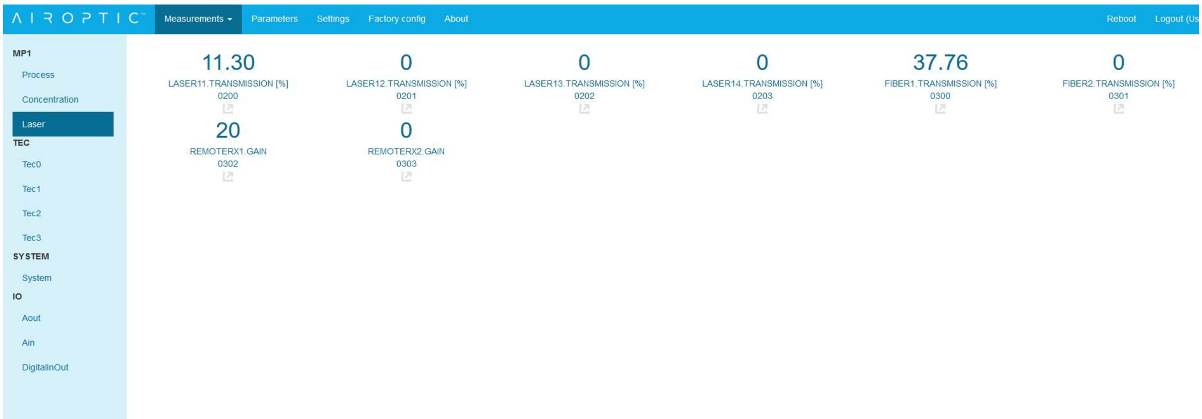


Figure 142. Measurements Show grid view.

In grid mode everyone measurement can by presented in new screen by "clicking" icon .

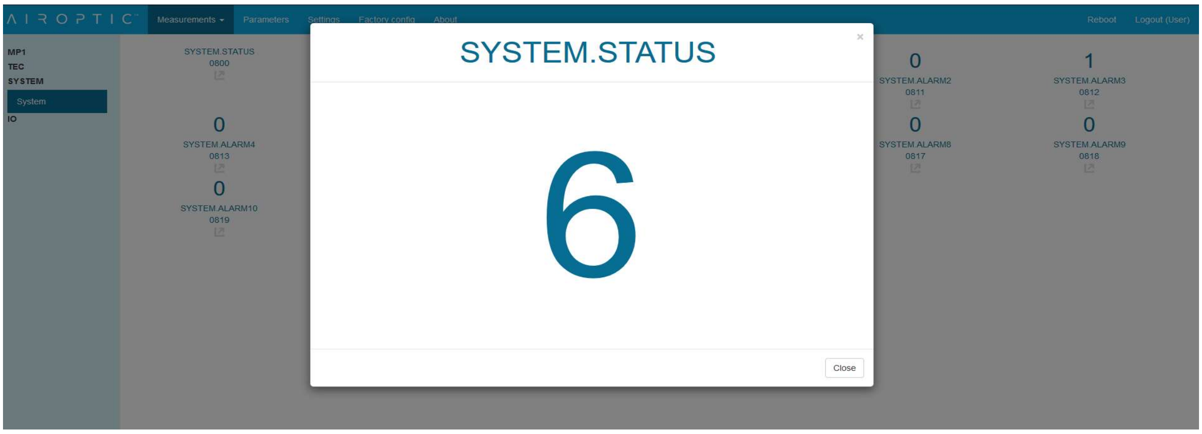


Figure 143. Present measurement value in separate screen.

In grid view some measurements can be mark by NC or Err flag. NC flag mean that measurement is not connected or not used in configuration. Err flag mean that error is detected on measurement.

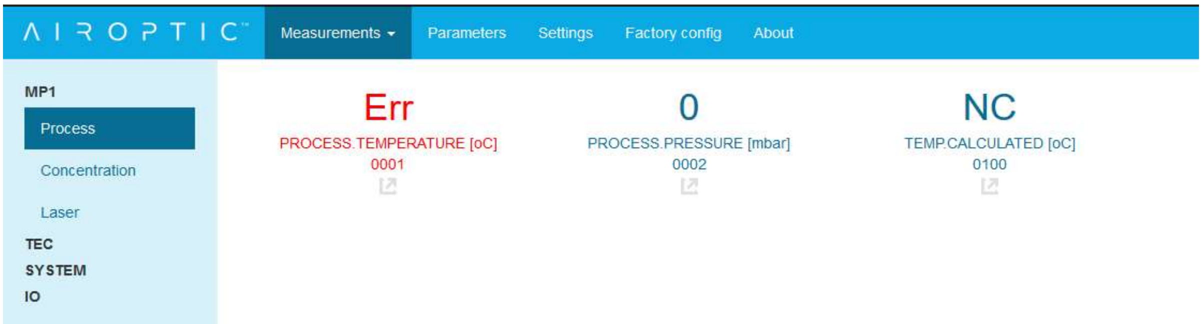


Figure 144. Presented data with additional flag detected.

8.3.1. Show Plot

With variables chosen in the table view the user may visually present the measurements in a form of a plot.

Figure 145. Plot Window.

In the Table 15 below the functionalities of the Plot Window are described.

	Toggle between start/stop of the measurement. By clicking stop the acquiring is paused and the data is preserved. Upon resuming, by clicking Start, the measurement logging continues from the last recorded data point.
	Clears the memory and deletes all of the recorded data. Prior to clicking this button, it is advised to save your measurements! Data loss is irreversible!
	User can define sample time in milliseconds. This parameter dictates how often the data will be acquired from the instrument.

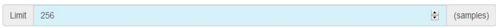
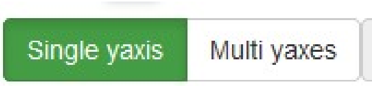
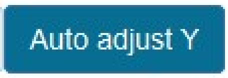
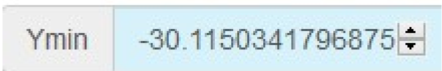
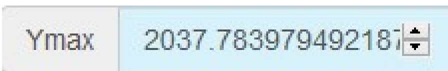
	User can define how many samples will be stored in the hardware during the session. When the sample limit is reached the oldest logged data points will be overwritten and the log will continue.
	Toggle between single yaxis/Multi yaxes. This option applies when more than one measurement is chosen from the table to be plotted.
	For Multi yaxes mode user can choose which y-axis is main for the plot drawing.
	Automatically adjusts the y-axis limits to fit the plot inside the plot window. The action is instantaneous and is not recurring.
	Manual y-axis minimum value.
	Manual y-axis maximum value.

Table 15. Plot Window functionalities.

8.3.2. Settings

In the Settings window, the user can choose the sample time (in milliseconds) and limit of the sample points to be plotted (log points). It is not recommended to exceed the limit of 100,000 points

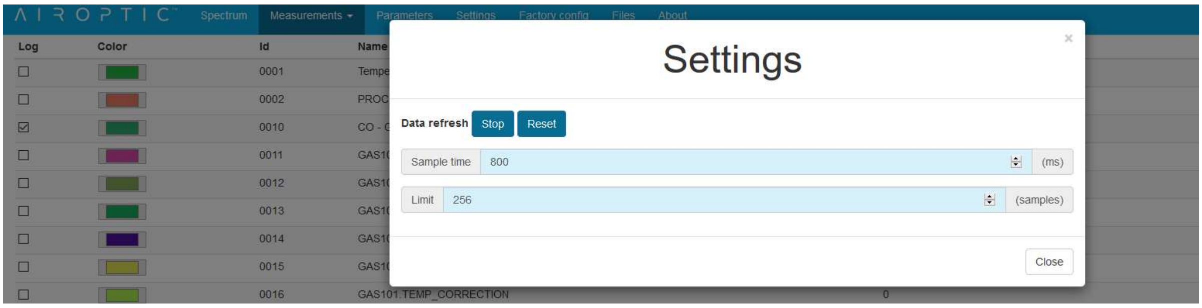


Figure 146. Modal window Settings.

8.3.3. Measurement Groups

There are four groups on the left side panel:

- MP1
- TEC
- SYSTEM
- IO

8.3.3.1. MP1 -> Process

Submodule display basic process environment measurements.

Process measurements	
Name	**Description**
PROCESS.TEMPERATURE	Process temperature set by Parameters->MP1->Process
PROCESS.PRESSURE	Process temperature set by Parameters->MP1->Process
TEMP.CALCULATED	Only applicable in oxygen analyzers on special request

Table 16. Process measurement list.

Figure 147. Process measurements window.

8.3.3.2. MP1 -> Concentration

Submodule display gases concentration.

Concentration measurements	
Name	**Description**
GAS101.CONCENTRATION	Gas concentration
GAS102.CONCENTRATION	Gas concentration
GAS103.CONCENTRATION	Gas concentration
GAS104.CONCENTRATION	Gas concentration
GAS105.CONCENTRATION	Gas concentration
GAS106.CONCENTRATION	Gas concentration
GAS107.CONCENTRATION	Gas concentration
GAS108.CONCENTRATION	Gas concentration

Table 17. Concentration measurement list.

Figure 148. Concentration measurements window.

8.3.3.3. MP1 -> Laser

Submodule display transmission quality (power) between Transmitter and Receiver.

Laser measurements	
Name	**Description**
LASER11.TRANSMISSION	Laser transmission quality
LASER12.TRANSMISSION	Laser transmission quality
LASER13.TRANSMISSION	Laser transmission quality
LASER14.TRANSMISSION	Laser transmission quality
FIBER1. TRANSMISSION	Loop cable transmission
FIBER2. TRANSMISSION	Loop cable transmission
REMOTERX1.GAIN	Remote receiver gain 1
REMOTERX2.GAIN	Remote receiver gain 2

Table 18. Laser measurement list.

Figure 149. Laser measurements window.

8.3.3.4. TEC -> Tec0

Submodule display measurement from first laser temperature control module.

Laser measurements	
Name	**Description**
TEC0.THL_REF_AMP	Reference gas amplitude
TEC0.AMB_TEMPERATURE	Laser ambient temperature

Table 19. Laser measurement list – Laser1 temperature control module.

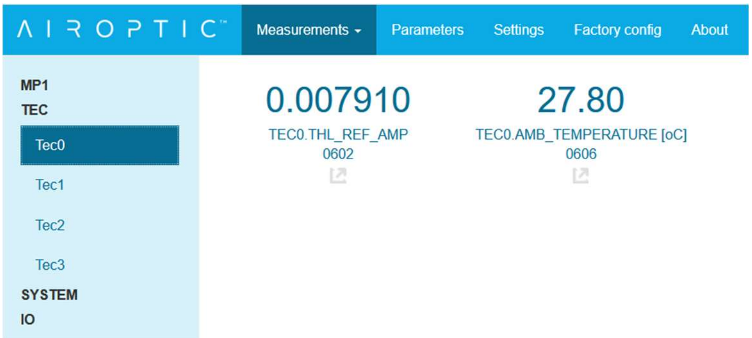


Figure 150. Laser temperature control module measurements window – Laser1.

8.3.3.5. TEC -> Tec1

Submodule display measurement from second laser temperature control module.

Laser measurements	
Name	**Description**
TEC1.THL_REF_AMP	Reference gas amplitude
TEC1.AMB_TEMPERATURE	Laser ambient temperature

Table 20. Laser measurement list – Laser2 temperature control module.

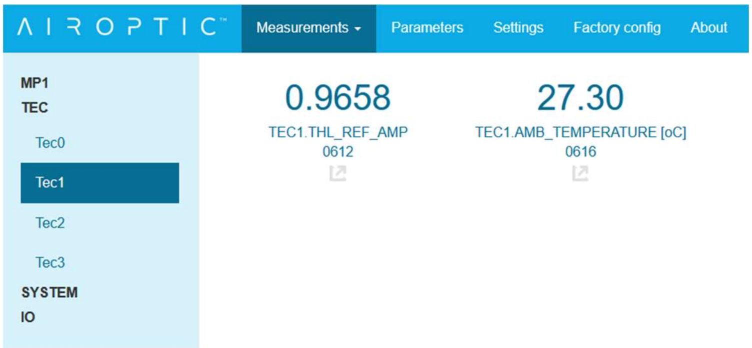


Figure 151. Laser temperature control module measurements window – Laser2.

8.3.3.6. TEC -> Tec2

Submodule display measurement from third laser temperature control module.

Laser measurements	
Name	**Description**
TEC2.THL_REF_AMP	Reference gas amplitude
TEC2.AMB_TEMPERATURE	Laser ambient temperature

Table 21. Laser measurement list – Laser3 temperature control module.

Figure 152. Laser temperature control module measurements window - Laser3.

8.3.3.7. TEC -> Tec3

Submodule display measurement from fourth laser temperature control module.

Laser measurements	
Name	**Description**
TEC3.THL_REF_AMP	Reference gas amplitude
TEC3.AMB_TEMPERATURE	Laser ambient temperature

Table 22. Laser measurement list – Laser4 temperature control module.

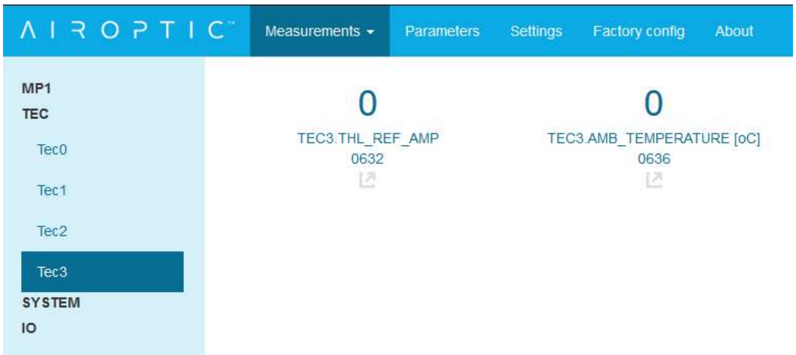


Figure 153. Laser temperature control module measurements window - Laser4.

8.3.3.8. System -> System

Submenu display system health.

System measurements	
Name	**Description**
SYSTEM.STATUS	6 – system ready
SYSTEM.STARTUP_PROCEDURE	Values described in page **Error! Bookmark not defined.**
SYSTEM.TRANS_MP1_STATUS	1 - laser is working properly 0 – warning
SYSTEM.ALARM 1	Status value for alarm 1
SYSTEM.ALARM 2	Status value for alarm 2
SYSTEM.ALARM 3	Status value for alarm 3
SYSTEM.ALARM 4	Status value for alarm 4
SYSTEM.ALARM 5	Status value for alarm 5
SYSTEM.ALARM 6	Status value for alarm 6
SYSTEM.ALARM 7	Status value for alarm 7
SYSTEM.ALARM 8	Status value for alarm 8
SYSTEM.ALARM 9	Status value for alarm 9
SYSTEM.ALARM 10	Status value for alarm 10

Table 23. System measurement list.

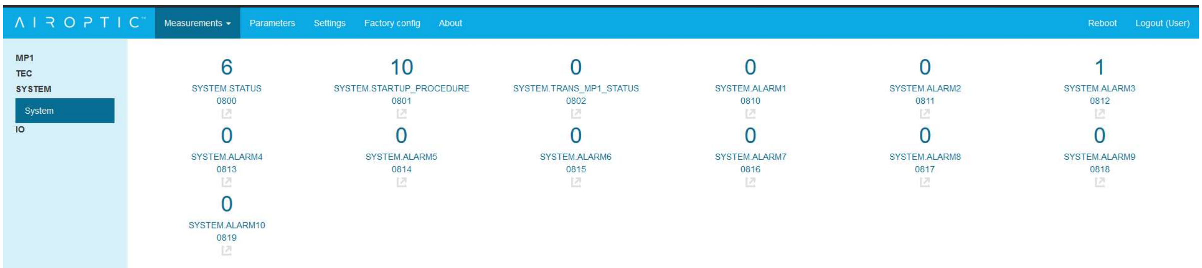


Figure 154. System measurements window.

8.3.3.9. IO -> Aout (Analog output measurement)

Submenu display 4 analog output channels set values

Analog outputs measurements	
Name	**Description**
AOUT1	Output value for analog output 1
AOUT2	Output value for analog output 2
AOUT3	Output value for analog output 3
AOUT4	Output value for analog output 4

Table 24. Analog outputs measurements list.

Figure 155. Analog output measurements window.

8.3.3.10. IO -> Ain (Analog input measurement)

Submenu display 4 analog input channels.

Analog inputs measurements	
Name	**Description**
AIN1	Raw analog input value measured in mA
AIN1.VAL	Scaled value according to configuration set in Parameters->Ain
AIN2	Raw analog input value measured in mA
AIN2.VAL	Scaled value according to configuration set in Parameters->Ain
AIN3	Raw analog input value measured in mA
AIN3.VAL	Scaled value according to configuration set in Parameters->Ain
AIN4	Raw analog input value measured in mA
AIN4.VAL	Scaled value according to configuration set in Parameters->Ain
RTD	Temperature read from resistance sensor (PT100/PT1000)

AMB_PRESSURE	Ambient pressure read from sensor put on host board

Table 25. Analog inputs measurements list.

Figure 156. Analog input measurements window

8.3.3.11. IO -> DigitalInOut

Submenu display 8 digital inputs and 8 digital outputs values.

Digital inputs/outputs measurements	
Name	**Description**
DOUT1	Output value for digital output pin 1
DOUT2	Output value for digital output pin 2
DOUT3	Output value for digital output pin 3
DOUT4	Output value for digital output pin 4
DOUT5	Output value for digital output pin 5
DOUT6	Output value for digital output pin 6
DOUT7	Output value for digital output pin 7
DOUT8	Output value for digital output pin 8
DIN1	Input value for digital input pin 1
DIN2	Input value for digital input pin 2
DIN3	Input value for digital input pin 3
DIN4	Input value for digital input pin 4
DIN5	Input value for digital input pin 5
DIN6	Input value for digital input pin 6
DIN7	Input value for digital input pin 7
DIN8	Input value for digital input pin 8

Table 26. Digital inputs/outputs measurements list.

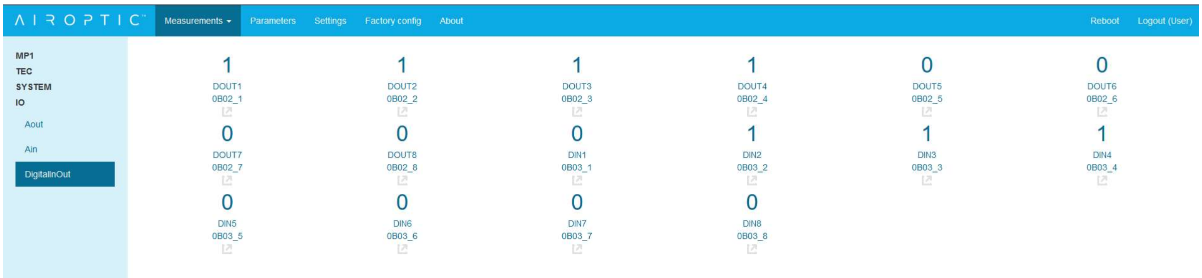


Figure 157. Digital input and output measurements window.

8.4. Parameters tab

In the User access mode it is possible to access and edit various parameters, see Figure 158.

If external temperature or pressure signals are fed into the analog ports they need to be configured in this tab. Analog output signals can also be extracted from the instrument and shall be configured in the Parameters tab. By default, there are signals assigned to the analog inputs/outputs.

If other configuration than the default is needed, please use the respective fields to define the required signal. **For detailed information about each of the parameters please refer to the full list in the Appendix 1.**

Please note that for the proper measurement of the concentration the user must provide the actual path length determined at the installation site (in meters).

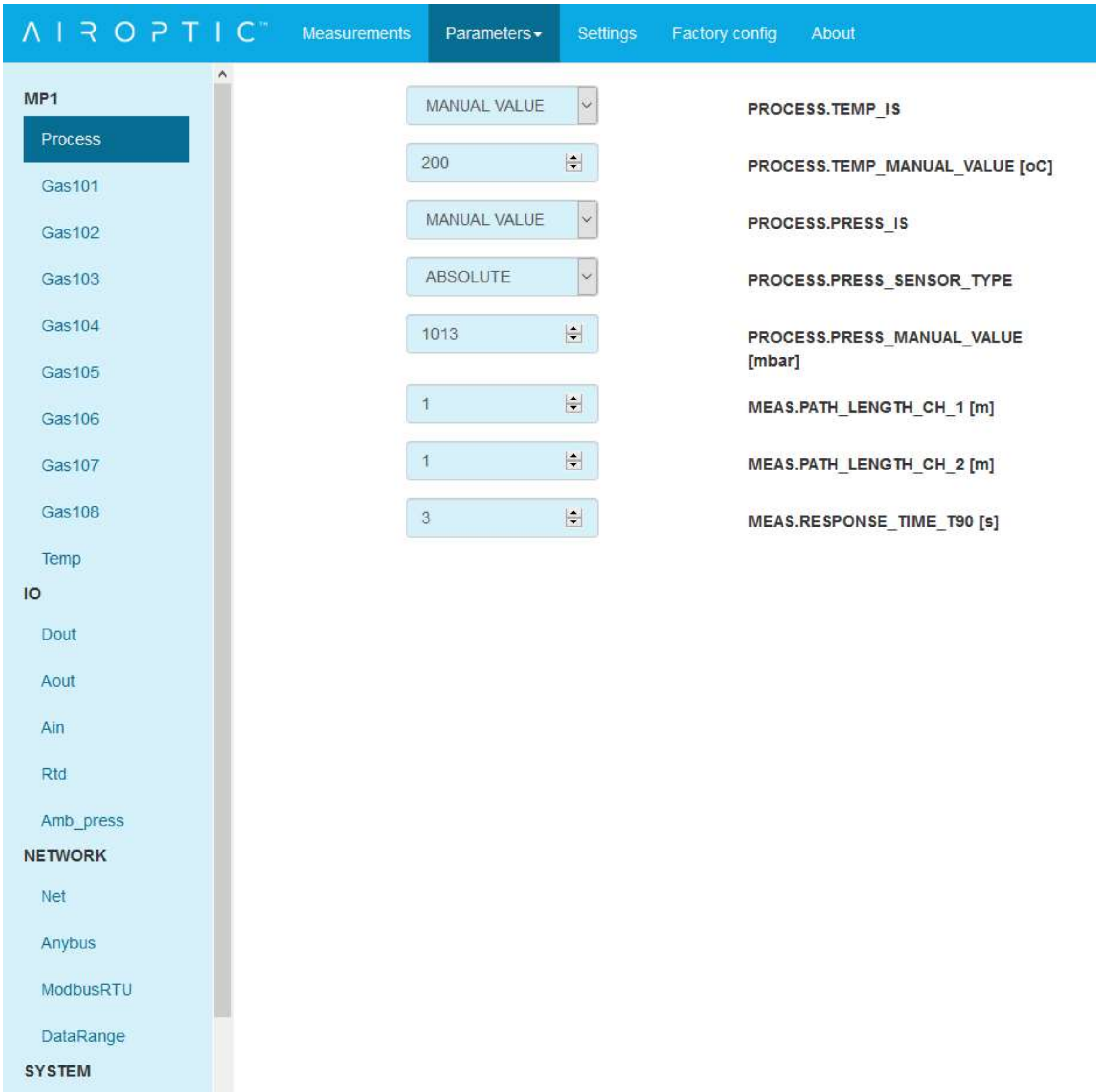


Figure 158. Process parameters window

In order to change the value or setting of chosen parameter the user shall click on the field that intends to change i.e. optical path length. By clicking on the light blue box the edition mode is activated. The value is changed by typing in the new value.

To apply changes click on the **Send** button that will appear next to the edited field. The same method applies to a drop-down menu changes. Dark blue background indicates that the value has been changed but has not been applied yet.

If changes where made the **Send&Save** button becomes active. By clicking it the changes are permanently stored in the analyzer firmware.

Drop-down menu will appear when clicking on the **Parameters.**

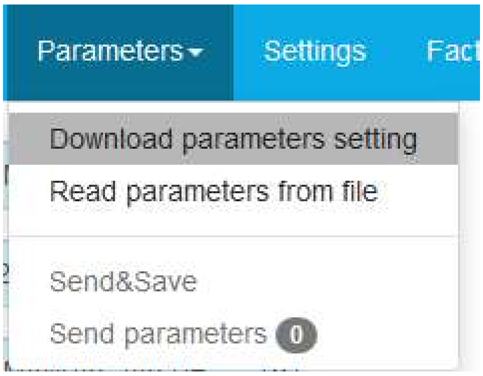


Figure 159. Webserver application - parameters Window.

Download parameters setting	Current parameter list can be downloaded to a *.txt file.
Read parameters from file	Previously saved parameter list can be read from a *.txt file.
Send & Save	Current parameter list is saved and sent to the instrument.
Send parameters	All parameters that have been changed are sent at once. Number in oval indicates the number of parameters that will be applied.

Table 27. Parameter Window functionalities.

8.4.1. Parameter groups

There are four main groups visible on the left panel:

- MP1
- IO
- NETWORK
- SYSTEM

8.4.1.1. MP1 -> Process (Process environment configuration)

Process parameters	
Name	**Description**
PROCESS.TEMP_IS	Select temperature sensor source. (Table)
PROCESS.TEMP_USER_VALUE	Temperature value in manual mode
PROCESS.PRESS_IS	Select pressure sensor source (Table)
PROCESS.PRESS_SENSOR_TYPE	Select sensor pressure type (Table)
PROCESS.PRESS_USER_VALUE	Pressure value in manual mode
MEAS.PATH_LENGTH_CH_1	Length between transmitter and receiver
MEAS.PATH_LENGTH_CH_2	Length between transmitter and receiver
MEAS.RESPONSE_TIME_T90	Time response for infinite impulse filter

Temperature sensor source	
Name	**Description**
MANUAL VALUE	Value is set manually by user from WebServer interface.
AIN1 AIN2 AIN3 AIN4	Temperature sensor is connect to analog input socket
AIN-RTD	Resistance temperature sensor
INDUSTRY_PROTOCOL	Temperature is send by industry protocol
TEMP.CALCULATED	Only applicable in oxygen analyzers on special request

TCU1.P1_TEMPERATURE TCU1.P2_TEMPERATURE TCU1.P3_TEMPERATURE TCU1.P4_TEMPERATURE TCU1.P5_TEMPERATURE TCU1.P6_TEMPERATURE TCU1.P7_TEMPERATURE TCU1.P8_TEMPERATURE TCU2.P1_TEMPERATURE TCU2.P2_TEMPERATURE TCU2.P3_TEMPERATURE TCU2.P4_TEMPERATURE TCU2.P5_TEMPERATURE TCU2.P6_TEMPERATURE TCU2.P7_TEMPERATURE TCU2.P8_TEMPERATURE	Extractive devices only (not applicable in Cross Duct)

Table 28. Temperature sensor source list.

Pressure sensor source	
Name	**Description**
MANUAL VALUE	Value is set manually by user from WebServer interface.
AIN1 AIN2 AIN3 AIN4	Pressure sensor is connect to analog input socket
AMBIENT-PRESSURE	Pressure is get from build-in sensor
INDUSTRY_PROTOCOL	Pressure is send by industry protocol
PCU1 PCU2 PCU3 PCU4	Extractive devices only (not applicable in Cross Duct)

Table 29. Pressure sensor source list.

Pressure sensor type	
Name	**Description**
ABSOLUTE	Absolute pressure sensor
GAUGE	Gauge pressure sensor

Table 30. Pressure sensor type list.

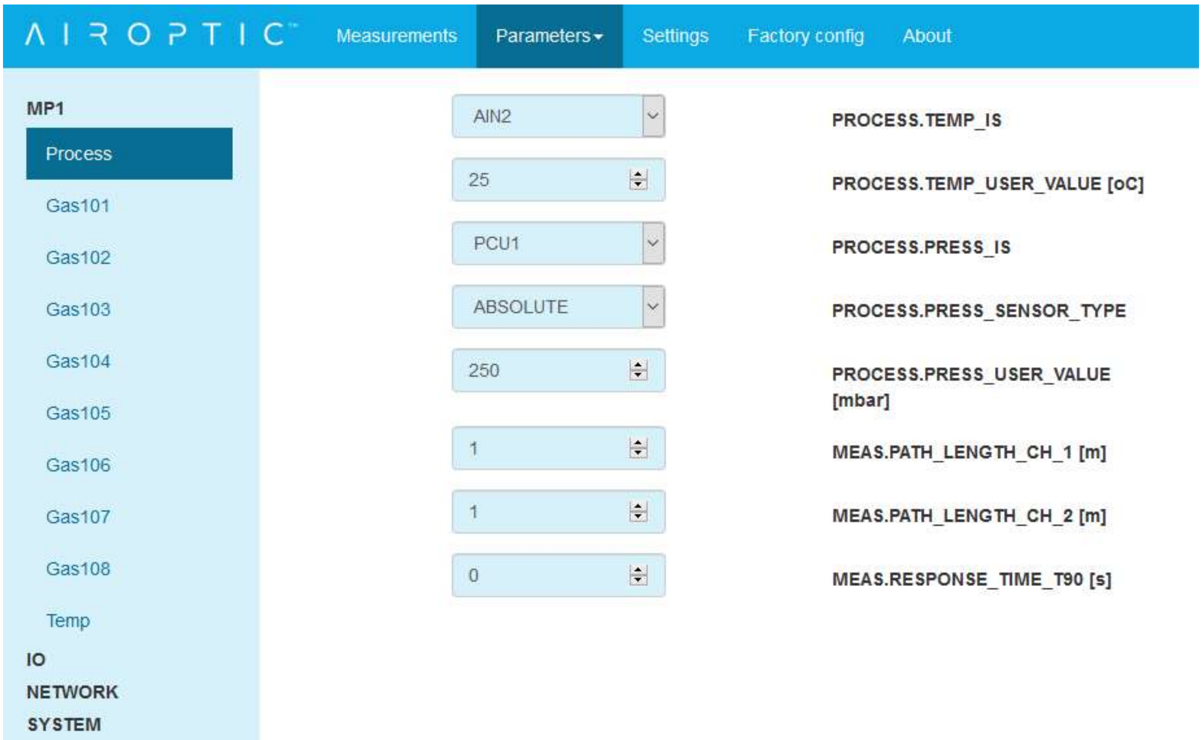


Figure 160. Process parameters window

8.4.1.2. MP1 -> Gas101

Gas parameters	
Name	**Description**
GAS101.SPAN_CALIBRATION	Multiplier of the measured concentration GAS101. 1 – factory value of multiplier
GAS101.OFFSET	Offset from measured concentration GAS101

Table 31. GAS101 parameters list.

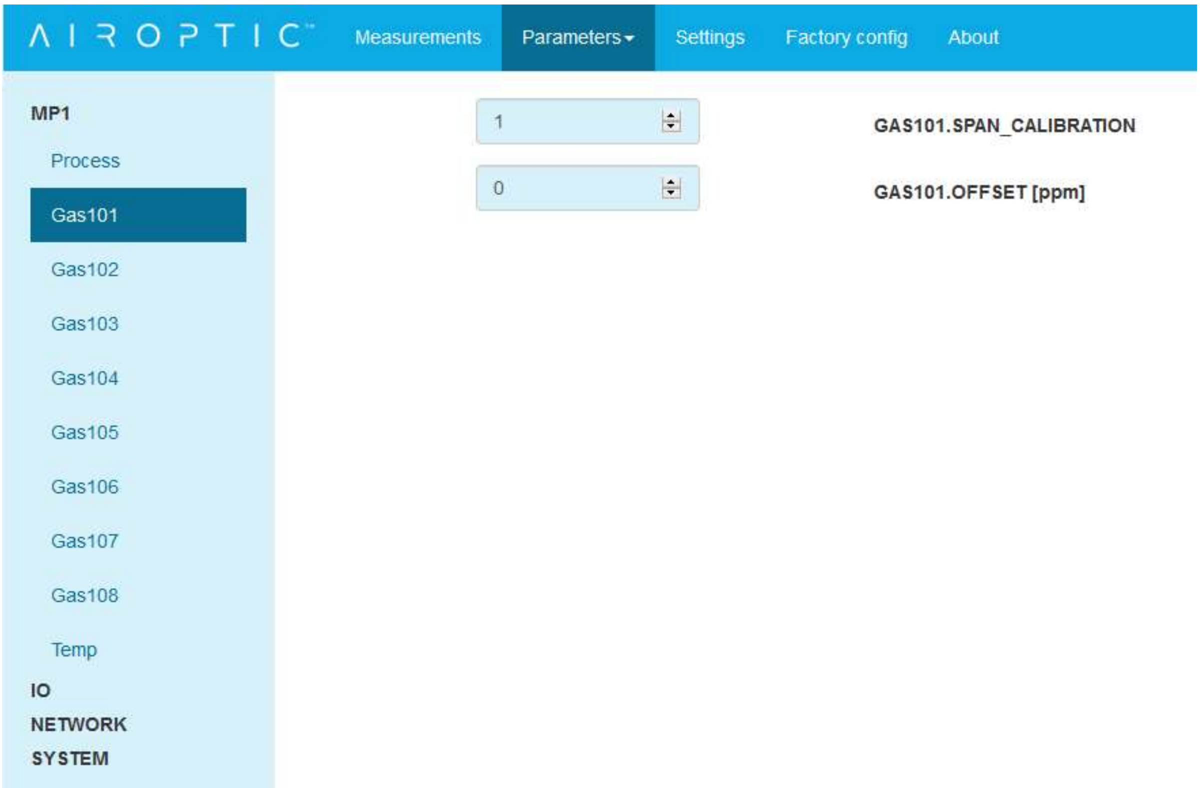


Figure 161. GAS101 parameters window

8.4.1.3. MP1 -> Gas102

Gas parameters	
Name	**Description**
GAS102.SPAN_CALIBRATION	Multiplier of the measured concentration GAS102. 1 – factory value of multiplier
GAS102.OFFSET	Offset from measured concentration GAS102 value

Table 32. GAS102 parameters list.

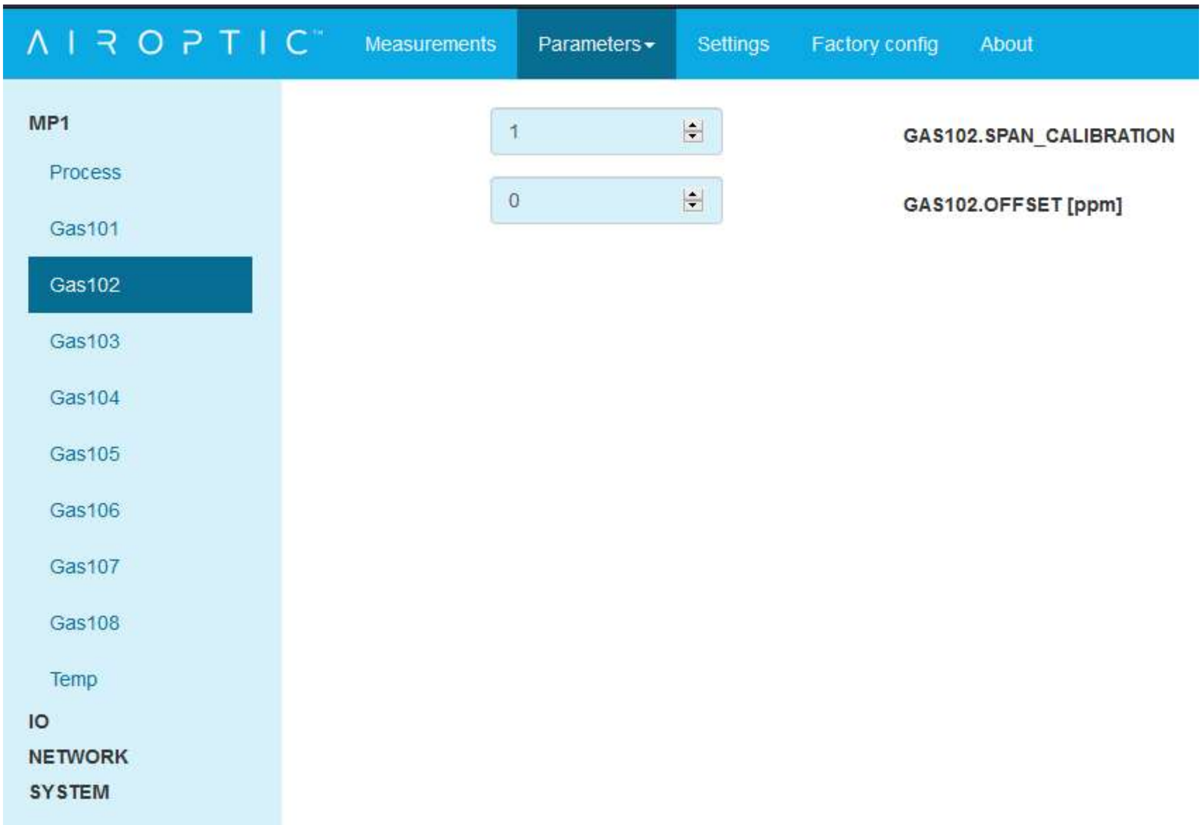


Figure 162. GAS102 parameters window.

8.4.1.4. MP1 -> Gas103

Gas parameters	
Name	**Description**
GAS103.SPAN_CALIBRATION	Multiplier of the measured concentration GAS103. 1 – factory value of multiplier
GAS103.OFFSET	Offset from measured concentration GAS103 value

Table 33. GAS103 parameters list.

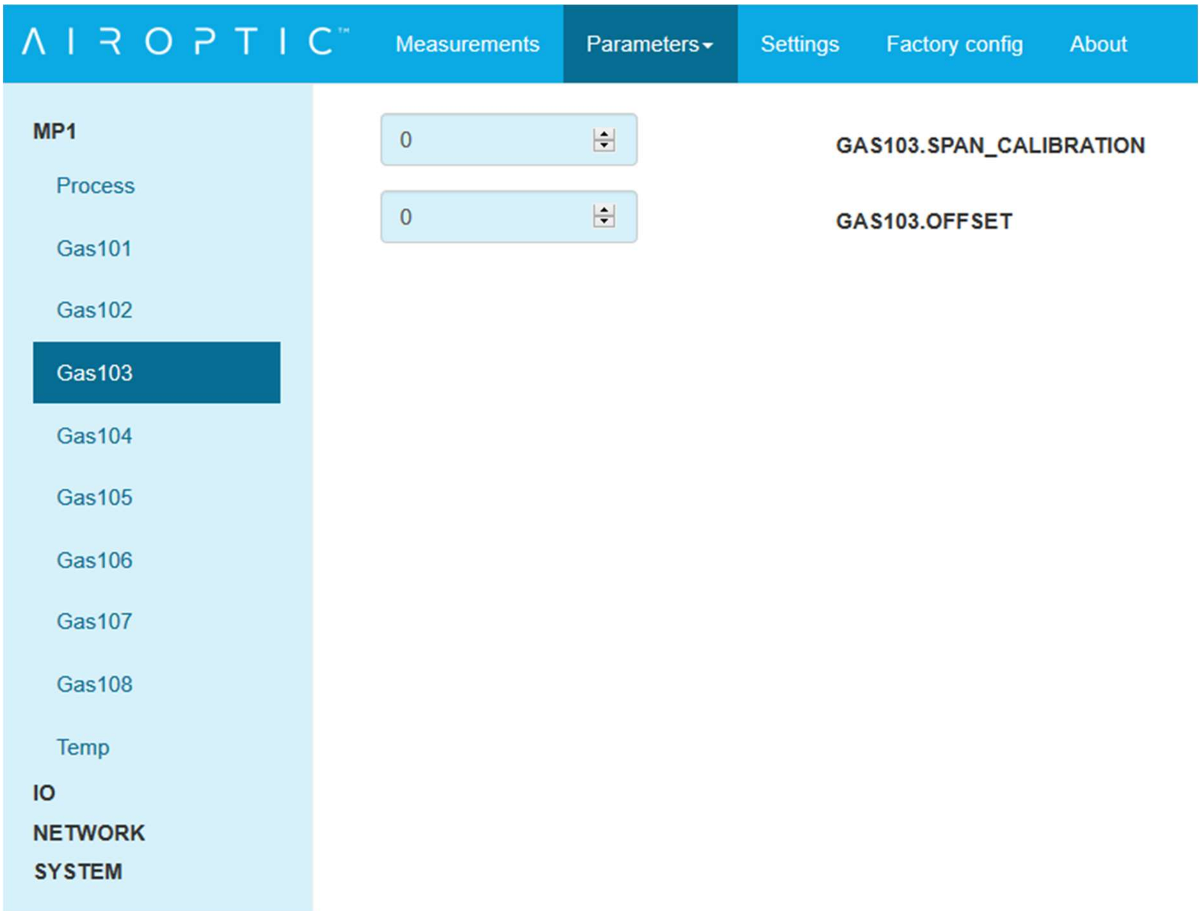


Figure 163. GAS103 parameters window

8.4.1.5. MP1 -> Gas104

Gas parameters	
Name	**Description**
GAS104.SPAN_CALIBRATION	Multiplier of the measured concentration GAS104. 1 – factory value of multiplier
GAS104.OFFSET	Offset from measured concentration GAS104 value

Table 34. GAS104 parameters list.

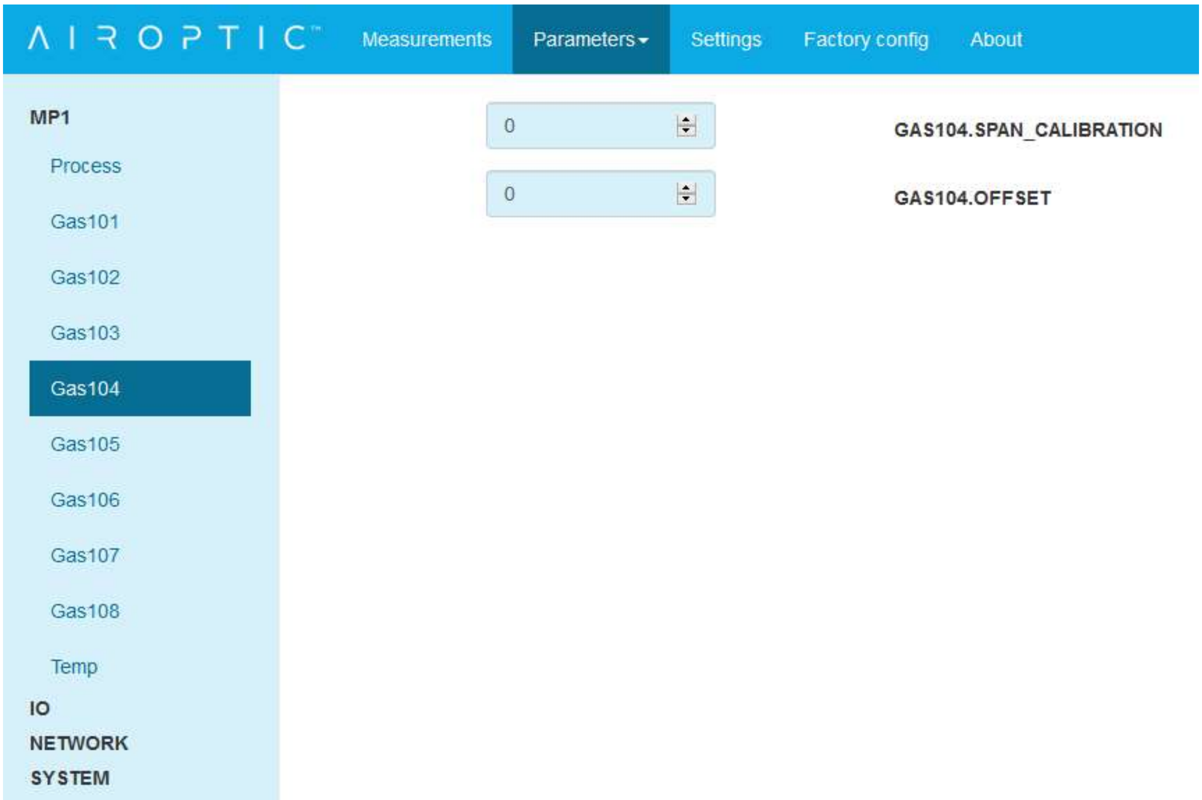


Figure 164. GAS104 parameters window

8.4.1.6. MP1 -> Gas105

Gas parameters	
Name	**Description**
GAS105.SPAN_CALIBRATION	Multiplier of the measured concentration GAS105. 1 – factory value of multiplier
GAS105.OFFSET	Offset from measured concentration GAS105 value

Table 35. GAS105 parameters list.

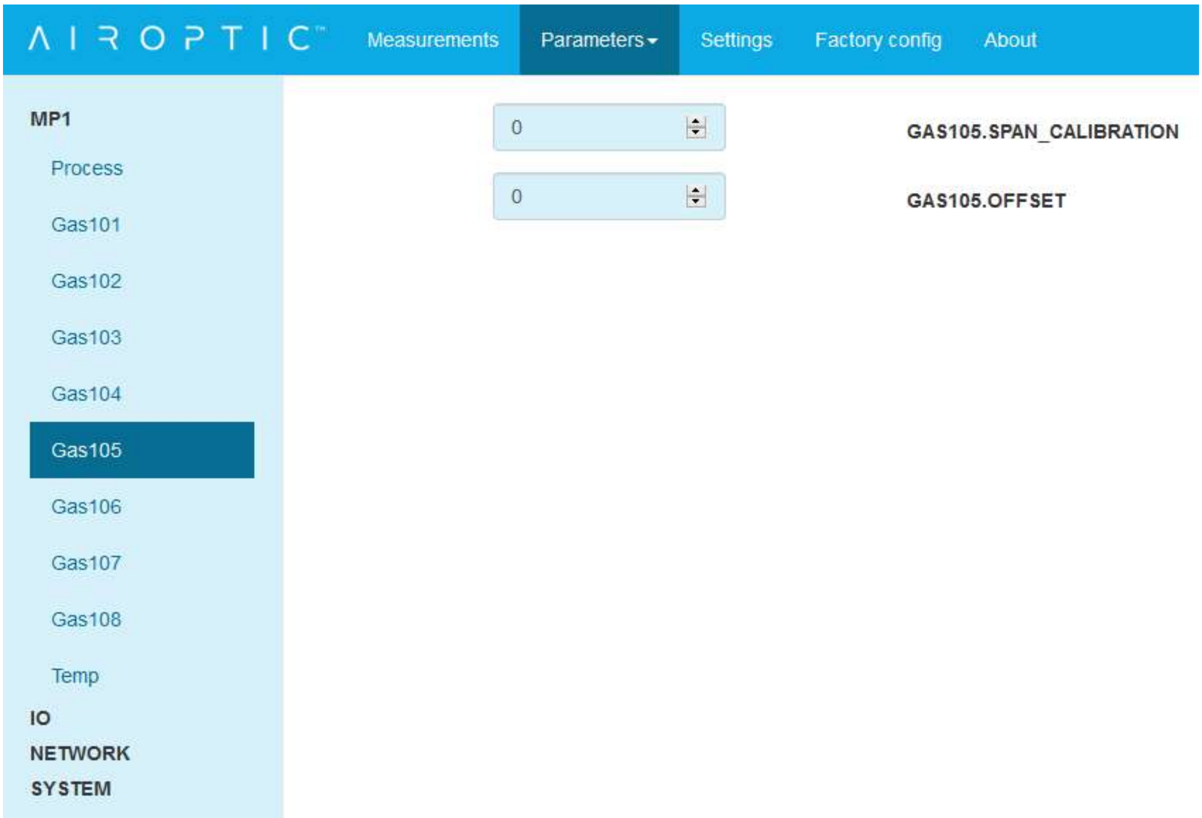


Figure 165. GAS105 parameters window.

8.4.1.7. MP1 -> Gas106

Gas parameters	
Name	**Description**
GAS106.SPAN_CALIBRATION	Multiplier of the measured concentration GAS106. 1 – factory value of multiplier
GAS106.OFFSET	Offset from measured concentration GAS106 value

Table 36. GAS106 parameters list.

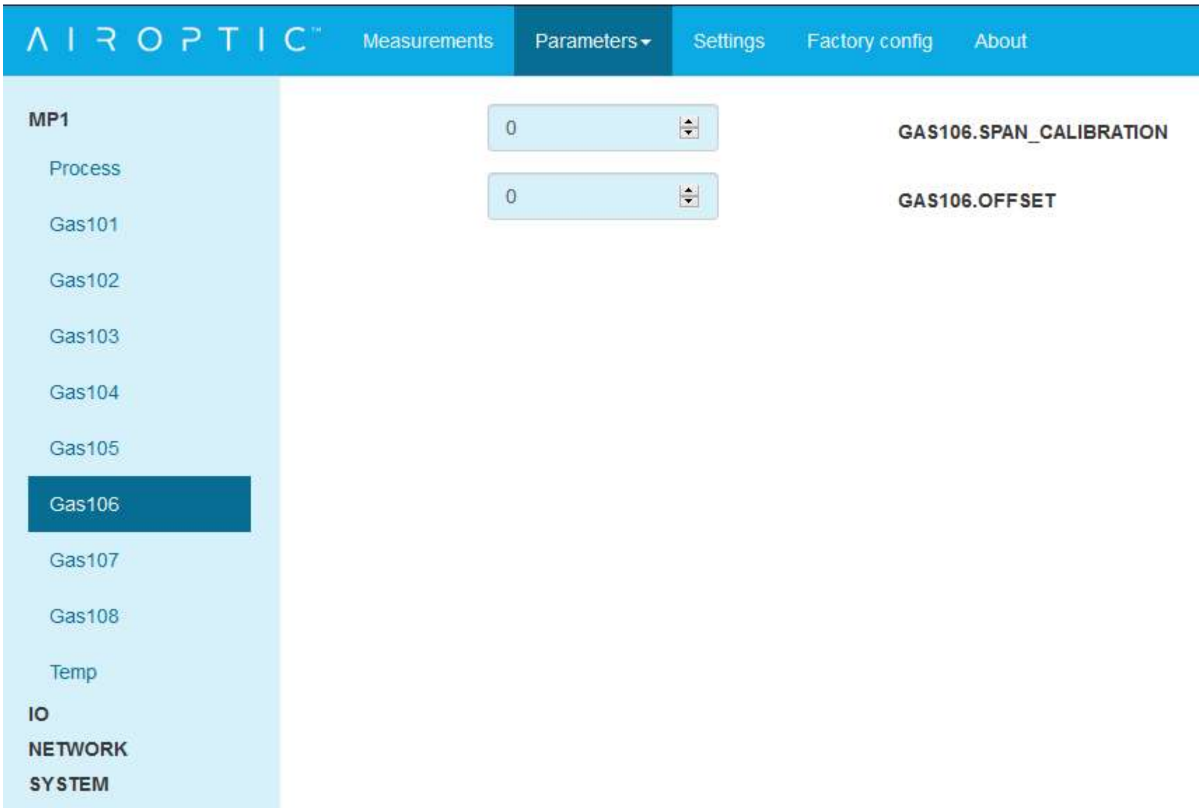


Figure 166. GAS106 parameters window

8.4.1.8. MP1 -> Gas107

Gas parameters	
Name	**Description**
GAS107.SPAN_CALIBRATION	Multiplier of the measured concentration GAS107. 1 – factory value of multiplier
GAS107.OFFSET	Offset from measured concentration GAS107 value

Table 37. GAS107 parameters list.

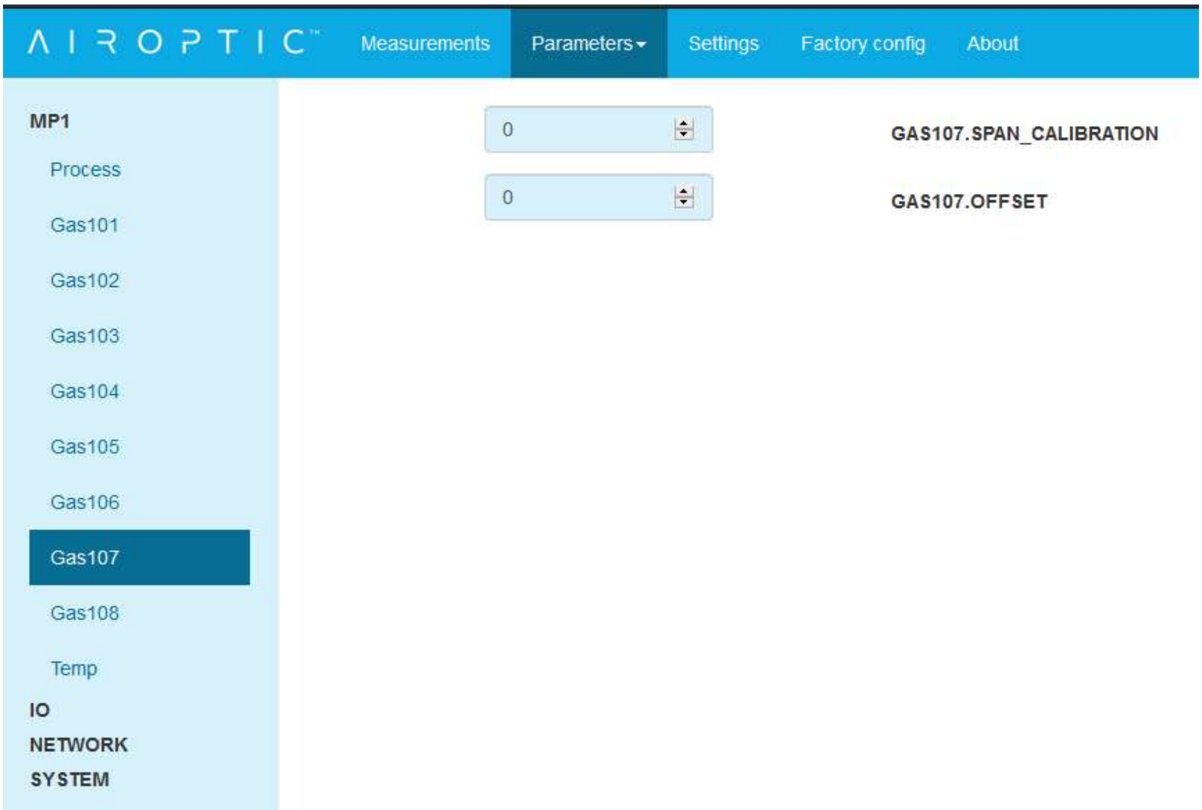


Figure 167. GAS107 parameters window.

8.4.1.9. MP1 -> Gas108

Gas parameters	
Name	**Description**
GAS108.SPAN_CALIBRATION	Multiplier of the measured concentration GAS108. 1 – factory value of multiplier
GAS108.OFFSET	Offset from measured concentration GAS108 value

Table 38. GAS108 parameters list.

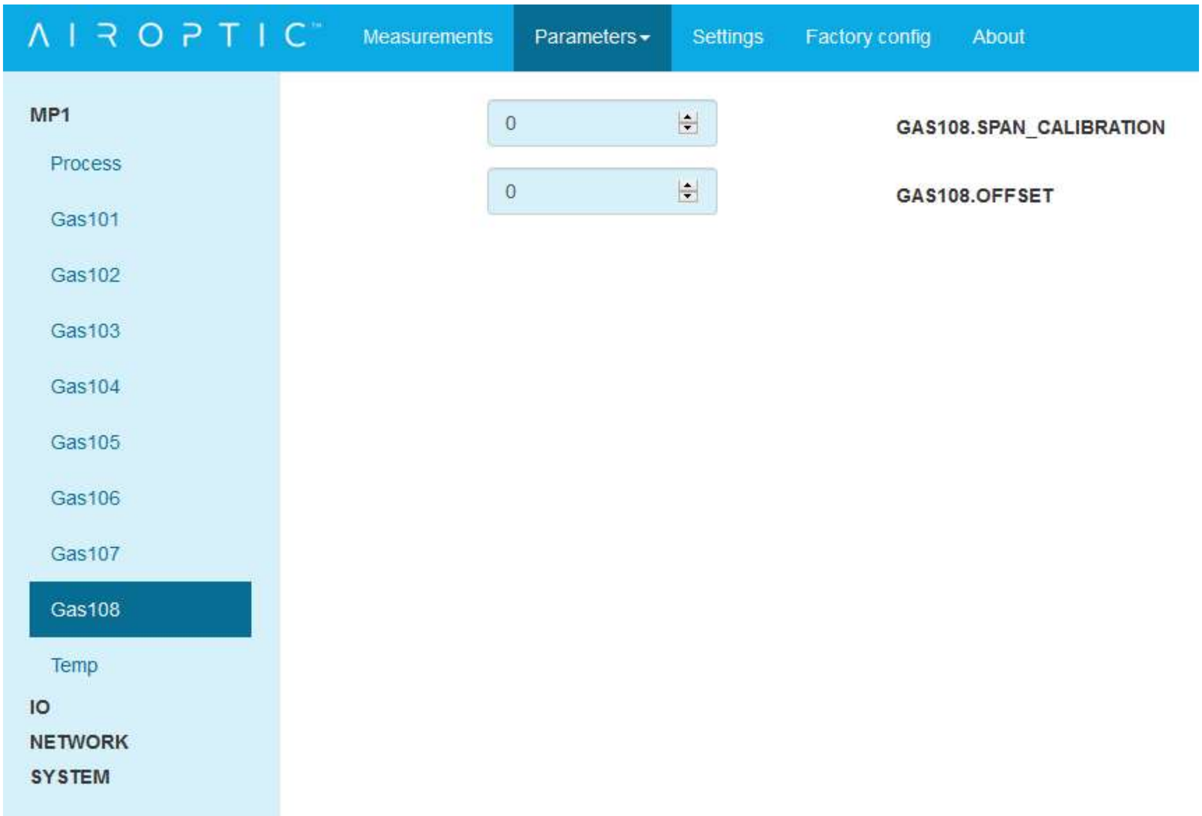


Figure 168. GAS108 parameters window.

8.4.1.10. MP1 -> Temp

Temperature parameters	
Name	**Description**
TEMP.SPAN_CALIBRATION	Multiplier of the measured temperature. 1 – factory value of multiplier
TEMP.OFFSET	Offset from measured temperature

Table 39. Temperature parameters list.

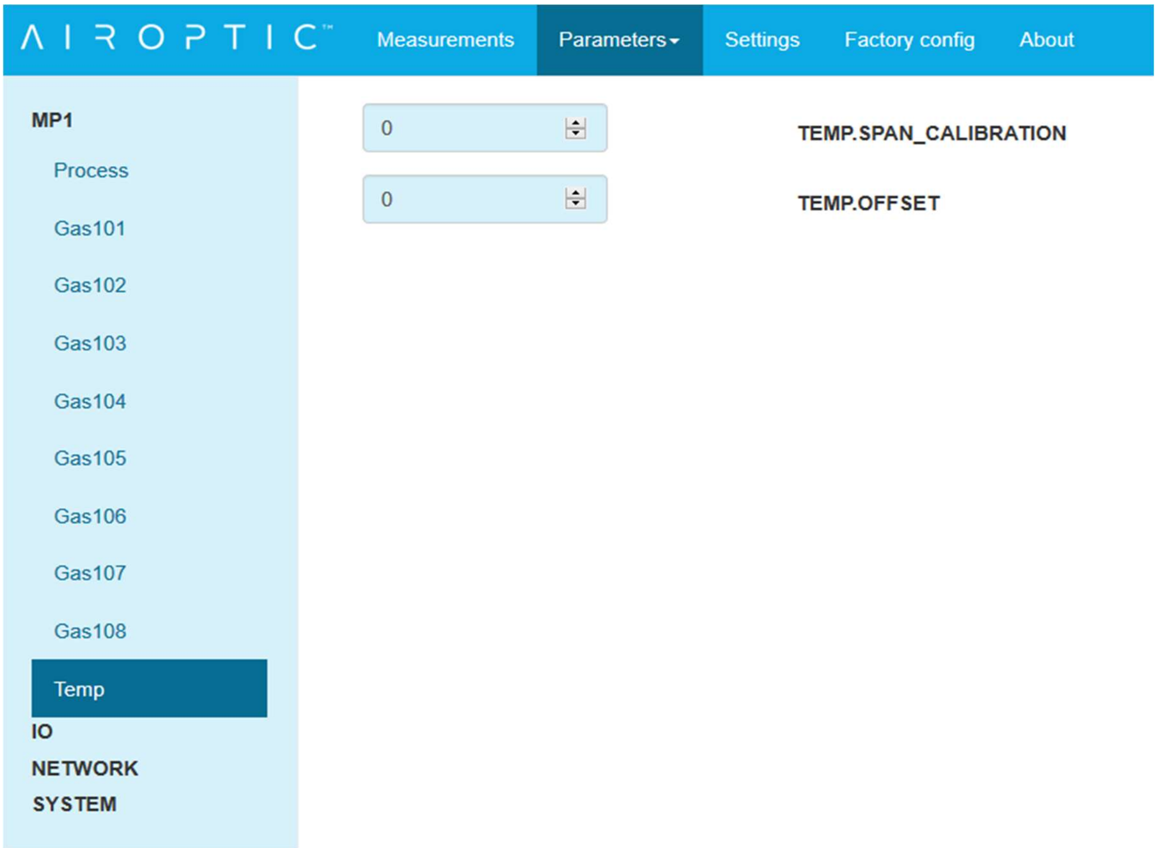


Figure 169. Temperature parameters window.

8.4.1.11. IO -> Dout (Digital output operating mode configuration)

Digital outputs parameters	
Name	**Description**
DOUT.DO1	Configuration of first digital output (Available operating mode see Table)
DOUT.DO2	Configuration of second digital output (Available operating mode see Table)
DOUT.DO3	Configuration of third digital output (Available operating mode see Table)
DOUT.DO4	Configuration of forth digital output (Available operating mode see Table)
DOUT.DO5	Configuration of fifth digital output (Available operating mode see Table)
DOUT.DO6	Configuration of sixth digital output (Available operating mode see Table)
DOUT.DO7	Configuration of seventh digital output (Available operating mode see Table)
DOUT.DO8	Configuration of eight digital output (Available operating mode see Table)

Table 40. Digital outputs list.

Select digital output operating mode	
Name	**Description**
ON	Set the digital output to high.
OFF	Set the digital output to low.
SYSTEM STATUS	Set the digital output to high when system status is 6. Signals the correct operation of the system.
TRANSMISSION STATUS	Set the digital output to high when transmission status is 1. Signals correct laser transmission.
SYSTEM_ALARM1 SYSTEM_ALARM2 SYSTEM_ALARM3 SYSTEM_ALARM4 SYSTEM_ALARM5 SYSTEM_ALARM6 SYSTEM_ALARM7 SYSTEM_ALARM8 SYSTEM_ALARM9 SYSTEM_ALARM10	Set the digital output to opposite when condition from specific alarm occurs
ALARM_PUMP1 ALARM_PUMP2 ALARM_PUMP3 ALARM_PUMP4	Extractive devices only (not applicable in Cross Duct) Set the digital output to high when is a pump error
RED_LASER_ON	Open path devices only

Table 41. Digital output operating mode list.

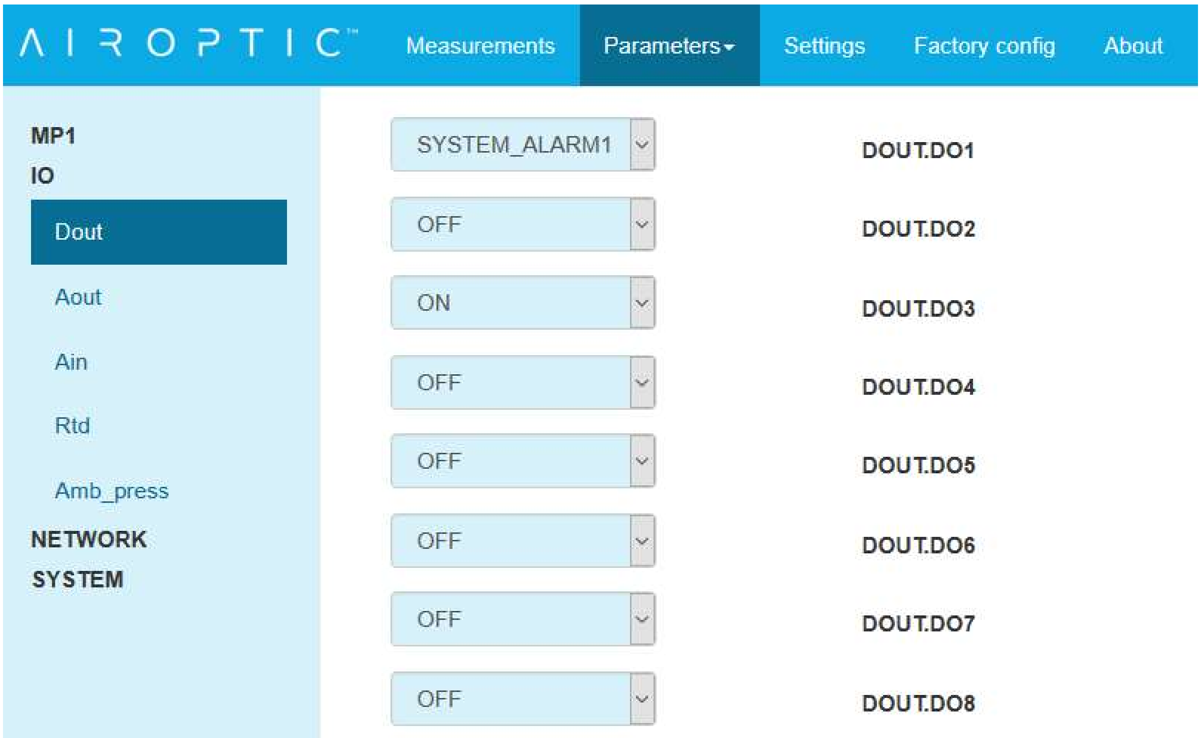


Figure 170. Dout parameters window.

8.4.1.12. IO -> Aout (Analog output configuration)

Analog value is scaled to a defined range and set to the specific output.
Formula used to calculate output value:

$$Aout = 4 + \frac{MANUAL\_VALUE - SCALE\_MIN}{SCALE\_MAX - SCALE\_MIN} * 16$$

Analog outputs parameters	
Name	**Description**
AOUT.FORCE_MANUAL_ MODE_ENABLE	Switch all analog output channels to manual mode ignoring SELECT_SIGNAL value
AOUT.SCALE_ENABLE	Enable/disable calculation of scaling value from range SCALE_MIN, SCALE_MAX (formula above)
AOUT.CALIBRATED	Enable/disable calibration factors

AOUT.MIN_OUT_RANGE	Signaling out of available range on analog output (more information can be find on Figure 51)
AOUT1.SELECT_SIGNAL	Measurement convert to analog output value. Available measurement are presented in Table XXX
AOUT1.MANUAL_VALUE	Analog value set by user (available when SELECT_SIGNAL is selected or when FORCE_MANUAL_MODE_ENABLE is set)
AOUT1.SCALE_MIN	Set scale minimum on first output (equivalent 4mA on output)
AOUT1.SCALE_MAX	Set scale maximum on first output (equivalent 20mA on output)
AOUT1.A	Calibration factor A on first output (y=Ax+B)
AOUT1.B	Calibration factor B on first output (y=Ax+B)
AOUT2.SELECT_SIGNAL	Measurement convert to analog output value. Available measurement are presented in table XXX
AOUT2.MANUAL_VALUE	Analog value set by user (available when SELECT_SIGNAL is selected or when FORCE_MANUAL_MODE_ENABLE is set)
AOUT2.SCALE_MIN	Set scale minimum on second output (equivalent 4mA on output)
AOUT2.SCALE_MAX	Set scale maximum on second output (equivalent 20mA on output)
AOUT2.A	Calibration factor A on second output (y=Ax+B)
AOUT2.B	Calibration factor B on second output (y=Ax+B)
AOUT3.SELECT_SIGNAL	Measurement convert to analog output value. Available measurement are presented in table XXX
AOUT3.MANUAL_VALUE	Analog value set by user (available when SELECT_SIGNAL is selected or when

	FORCE_MANUAL_MODE_ENABLE is set)
AOUT3.SCALE_MIN	Set scale minimum on third output (equivalent 4mA on output)
AOUT3.SCALE_MAX	Set scale maximum on third output (equivalent 20mA on output)
AOUT3.A	Calibration factor A on third output (y=Ax+B)
AOUT3.B	Calibration factor B on third output (y=Ax+B)
AOUT4.SELECT_SIGNAL	Measurement convert to analog output value. Available measurement are presented in table XXX
AOUT4.MANUAL_VALUE	Analog value set by user (available when SELECT_SIGNAL is selected or when FORCE_MANUAL_MODE_ENABLE is set)
AOUT4.SCALE_MIN	Set scale minimum on fourth output (equivalent 4mA on output)
AOUT4.SCALE_MAX	Set scale maximum on fourth output (equivalent 20mA on output)
AOUT4.A	Calibration factor A on fourth output (y=Ax+B)
AOUT4.B	Calibration factor B on fourth output (y=Ax+B)

Table 42. Analog outputs list.

Analog output select signals	
Name	**Description**
MANUAL MODE	Value is set by user
GAS101.CONCENTRATION GAS102.CONCENTRATION GAS103.CONCENTRATION GAS104.CONCENTRATION GAS105.CONCENTRATION GAS106.CONCENTRATION GAS107.CONCENTRATION GAS108.CONCENTRATION	Gas concentration (Measurement id: 0010) Gas concentration (Measurement id: 0020) Gas concentration (Measurement id: 0030) Gas concentration (Measurement id: 0040) Gas concentration (Measurement id: 0050) Gas concentration (Measurement id: 0060) Gas concentration (Measurement id: 0070) Gas concentration (Measurement id: 0080)
LASER11.TRANSMISSION LASER12.TRANSMISSION LASER13.TRANSMISSION LASER14.TRANSMISSION	Laser transmission (Measurement id: 0200) Laser transmission (Measurement id: 0201) Laser transmission (Measurement id: 0202) Laser transmission (Measurement id: 0203)
TEMP.CALCULATED	Temperature calculated – only applicable in oxygen analyzers on special request (Measurement id 0100)
PROCESS.TEMP	Process temperature (Measurement id: 0001)
PROCESS.PRESSURE	Process pressure (Measurement id: 0002)

Table 43. Analog output select signals list.

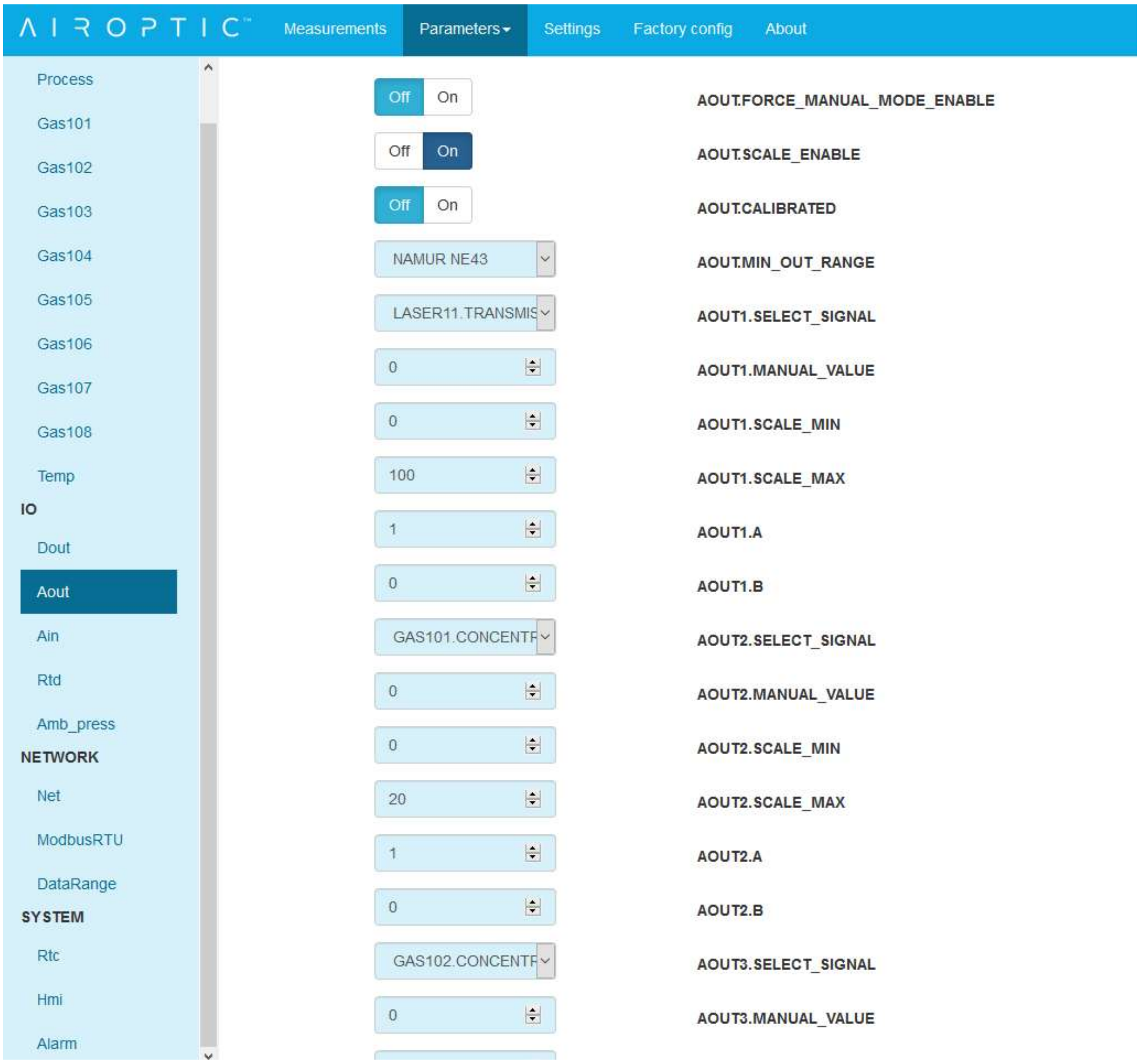


Figure 171. Aout parameters window.

8.4.1.13. IO -> Ain (Analog input configuration)

Analog inputs parameters	
Name	**Description**
AIN.SCALE_ENABLE	Enable/disable calculation of scaling value from range SCALE_MIN, SCALE_MAX
AIN.CALIBRATED	Enable/disable calibration factors
AIN.IIR	Time response for infinite impulse filter

AIN1.SCALE_MIN	Set scale minimum on first input (equivalent 4mA on input)
AIN1.SCALE_MAX	Set scale maximum on first input (equivalent 20mA on input)
AIN1.A	Calibration factor A on first input (y=Ax+B)
AIN1.B	Calibration factor B on first input (y=Ax+B)
AIN2.SCALE_MIN	Set scale minimum on second input (equivalent 4mA on input)
AIN2.SCALE_MAX	Set scale maximum on second input (equivalent 20mA on input)
AIN2.A	Calibration factor A on second input (y=Ax+B)
AIN2.B	Calibration factor B on second input (y=Ax+B)
AIN3.SCALE_MIN	Set scale minimum on third input (equivalent 4mA on input)
AIN3.SCALE_MAX	Set scale maximum on third input (equivalent 20mA on input)
AIN3.A	Calibration factor A on third input (y=Ax+B)
AIN3.B	Calibration factor B on third input (y=Ax+B)
AIN4.SCALE_MIN	Set scale minimum on third input (equivalent 4mA on input)
AIN4.SCALE_MAX	Set scale maximum on third input (equivalent 20mA on input)
AIN4.A	Calibration factor A on third input (y=Ax+B)
AIN4.B	Calibration factor B on third input (y=Ax+B)

Table 44. Analog inputs parameters list.

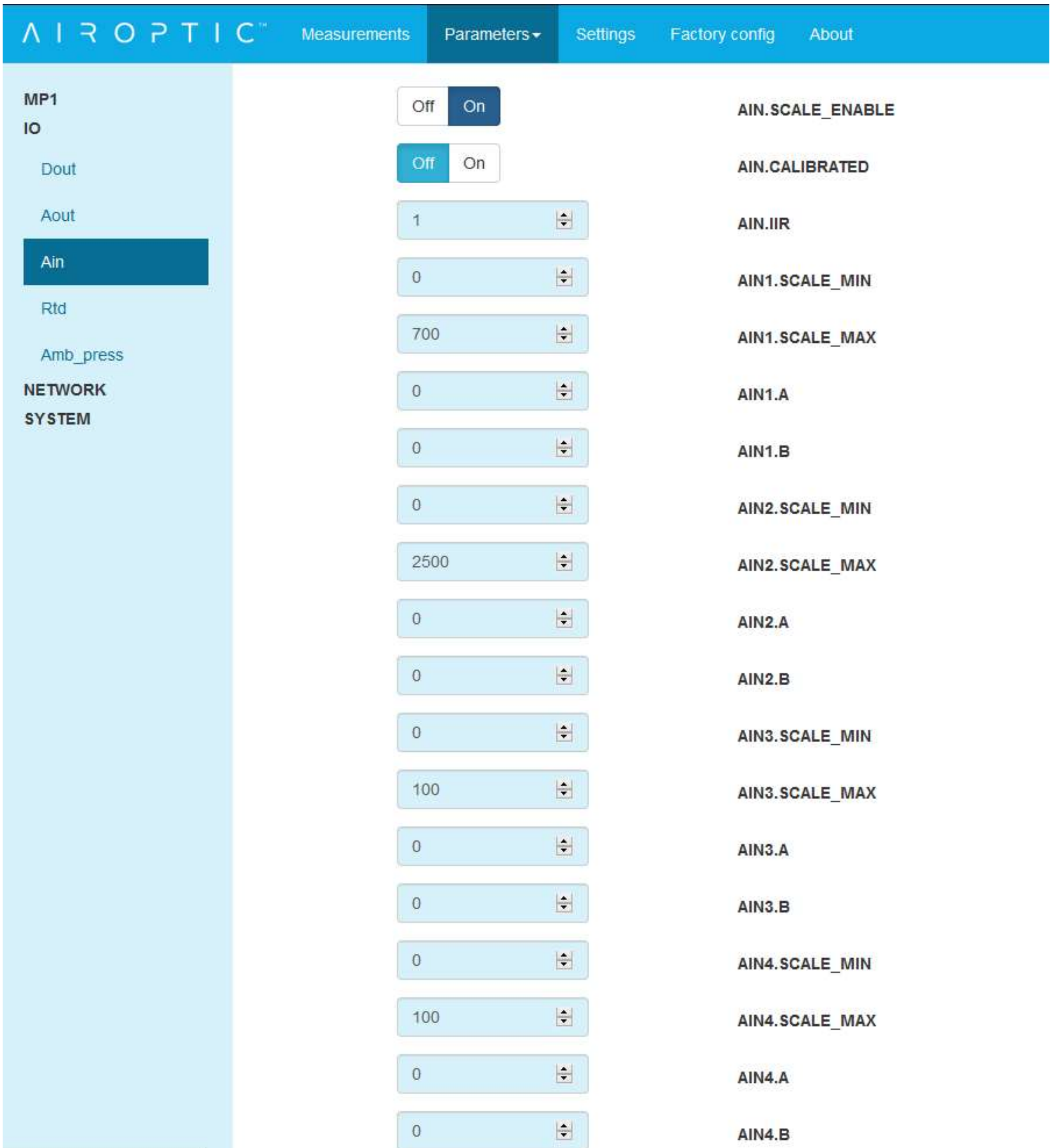


Figure 172. Ain parameters window.

8.4.1.14. IO -> Rtd (Resistance temperature sensor configuration)

Resistance temperature sensor parameters	
Name	**Description**
RTD.IIR	Time response for infinite impulse filter

Table 45. Resistance temperature sensor parameters list.

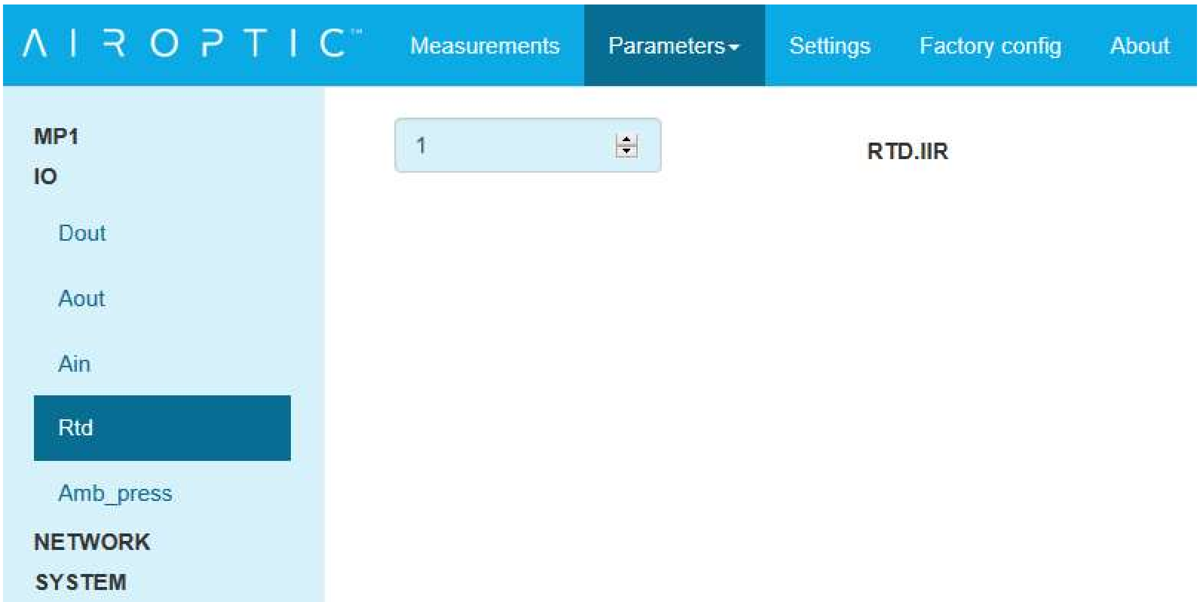


Figure 173. Resistance temperature detector window.

8.4.1.15. IO -> Amb_press (Ambient pressure sensor configuration)

Ambient pressure sensor parameters	
Name	**Description**
AMB_PRESS.IIR	Time response for infinite impulse filter

Table 46. Ambient pressure sensor parameters list.

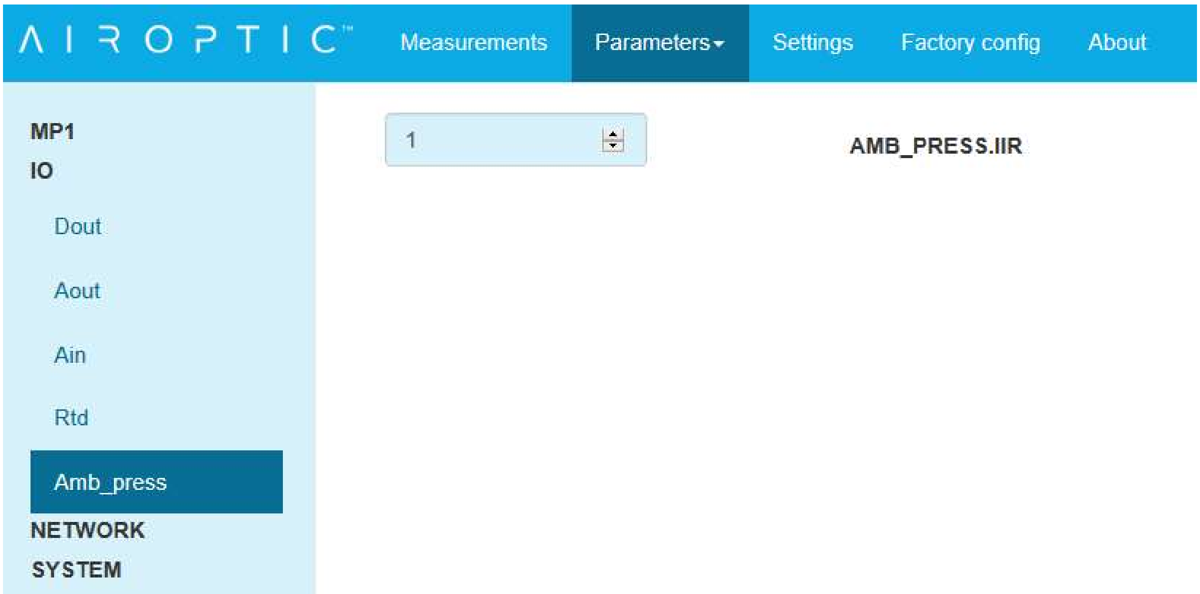


Figure 174. Ambient pressure sensor window.

8.4.1.16. NETWORK -> Net (Service ethernet port configuration)

Service ethernet port parameters	
Name	**Description**
NET.SYSTEM_IP_ADDRESS	Service address IP of device
NET.SYSTEM_IP_MASK	Network IP mask
NET.GATEWAY_IP_ADDR	Address of gateway
NET.STREAM_ENABLE	Enable UDP stream to log data by PC GasEYE logger application
NET.STREAM_IP_ADDR	IP address of UDP stream (PC GasEYE logger address)
NET.STREAM_UDP_PORT	UDP stream port (PC GasEYE logger)
NET.STREAM_INTERVAL	Stream frames interval
NET.BROADCAST_STATUS	GasEYE identification broadcast frame
NET.STREAM_BRODCAST_UDP_PORT	Identification broadcast UDP port

Table 47. Service ethernet port parameters list.

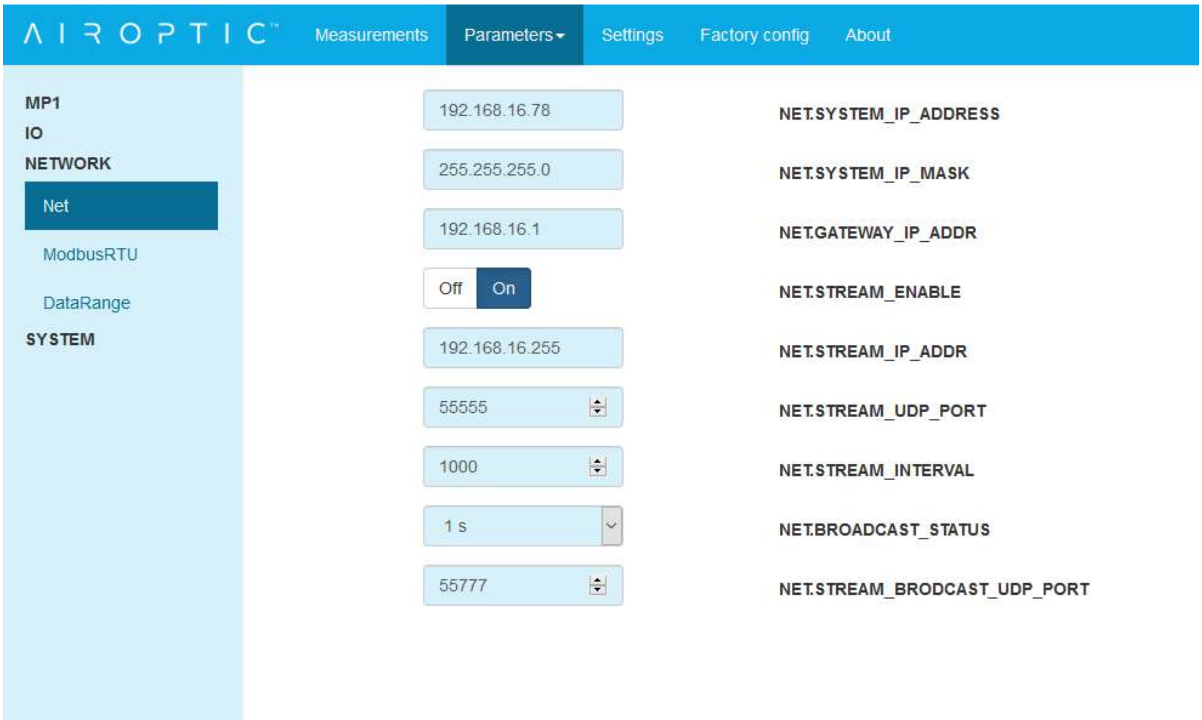


Figure 175. Service ethernet port configuration window.

8.4.1.17. NETWORK -> ModbusRTU (Modbus slave transmission configuration)

Modbus RTU parameters	
Name	**Description**
MBUS.BAUD_RATE	Baud rate 9600/19200
MBUS.STOP_BITS	Stop bits STOP_BIT_1/ STOP_BIT_2
MBUS.PARITY	NO_PARITY_8_BIT/EVEN_PARITY_8_BIT/ ODD_PARITY_8_BIT/NO_PARITY_9_BIT
MBUS.ADDR	Modbus device address
MBUS.BORDER	Byte order
MBUS.SWAP	Swap register
MBUS.MAP	Show device Modbus register map

Table 48. Service ethernet port parameters list.

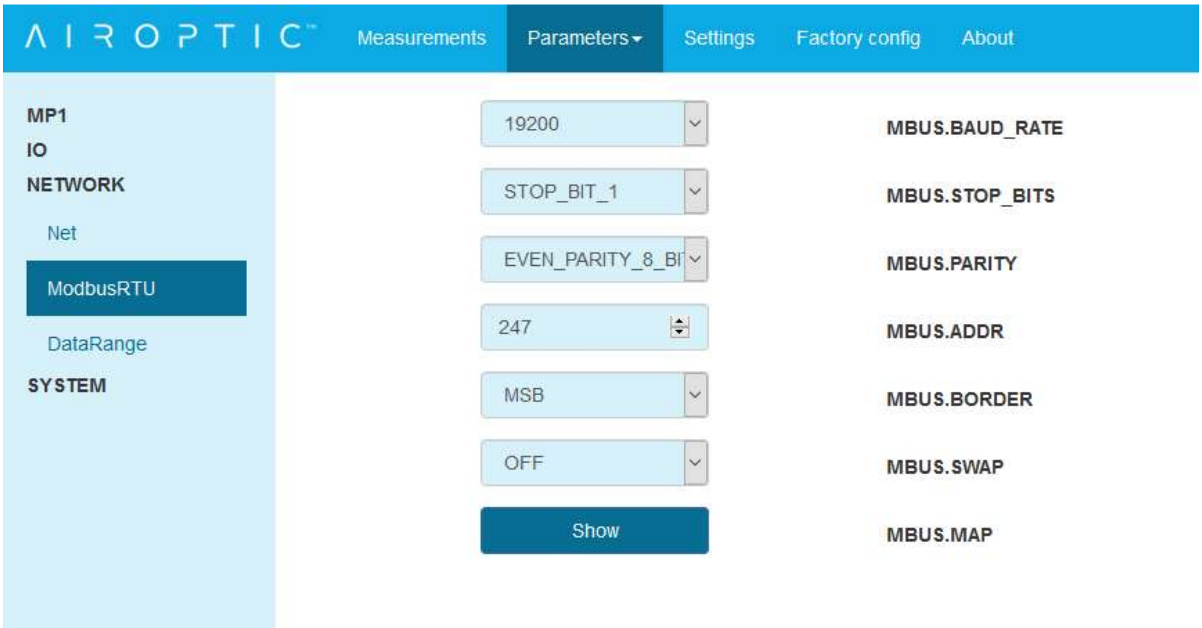


Figure 176. Modbus RTU configuration window.

8.4.1.18. NETWORK -> DataRange

Measured gases concentration can be re-calculated from floating point value to 16 bit integer and send this value by additional protocol register if main system can not work with floating point values.

Data range parameters	
Name	**Description**
GAS101.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS101.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS102.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS102.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS103.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS103.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS104.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS104.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS105.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS105.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS106.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS106.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS107.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value

GAS107.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value
GAS108.SCALE_MIN	Minimum gas concentration value use to recalculate floating point to 16 bit integer value
GAS108.SCALE_MAX	Maximum gas concentration value use to recalculate floating point to 16 bit integer value

Table 49. Data range parameters list.

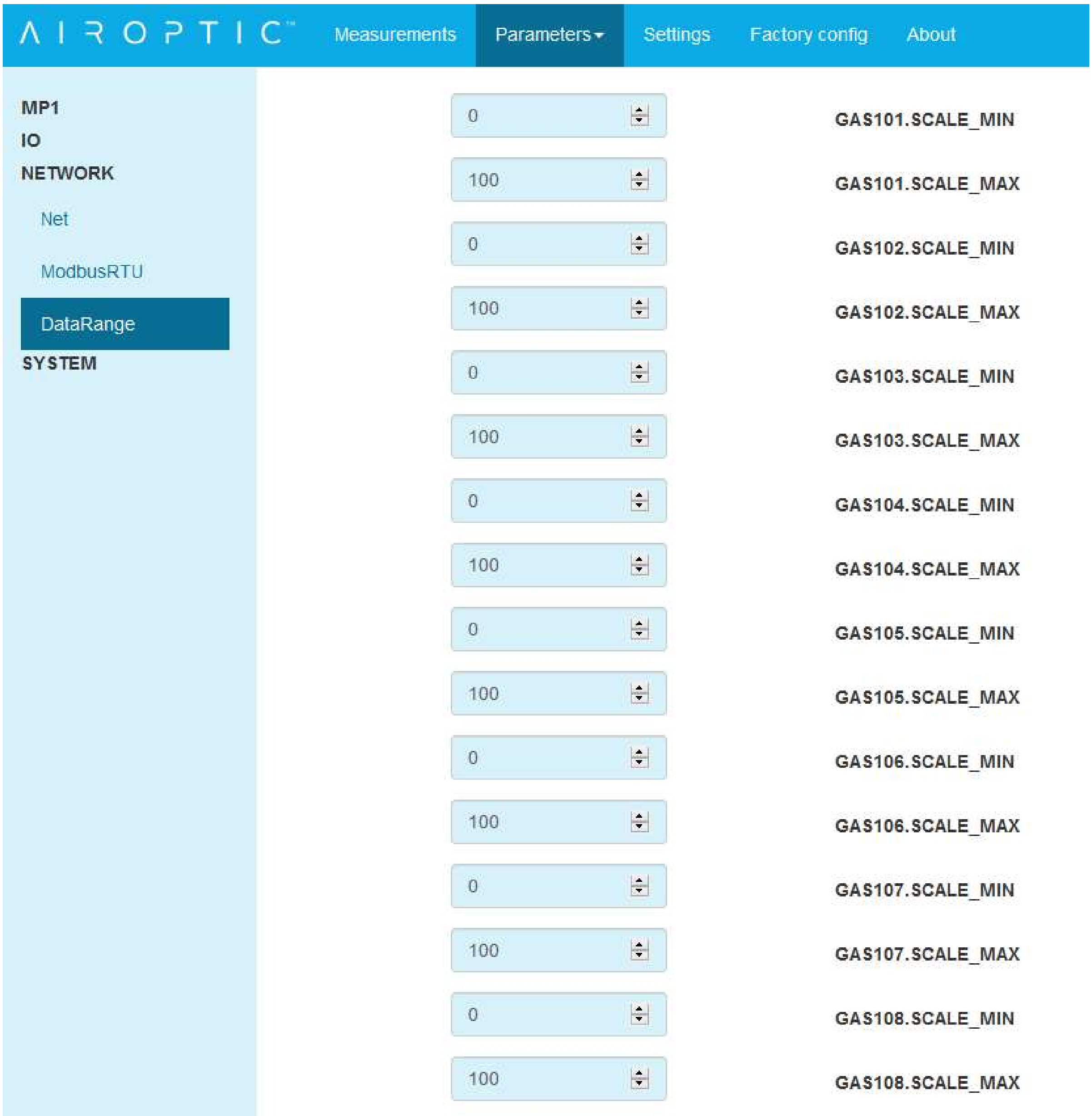


Figure 177. Data range configuration window.

8.4.1.19. SYSTEM -> Rtc (Real time clock configuration)

Real time clock parameters	
Name	**Description**
RTC.YEAR	Actual year
RTC.MONTH	Actual month
RTC.DAY	Actual day
RTC.HOUR	Hour of the day
RTC.MINUTE	Minute of the day
RTC.SECOND	Second of the day
RTC.SET	Set new date and time to analyzer

Table 50. Real time clock parameters list.

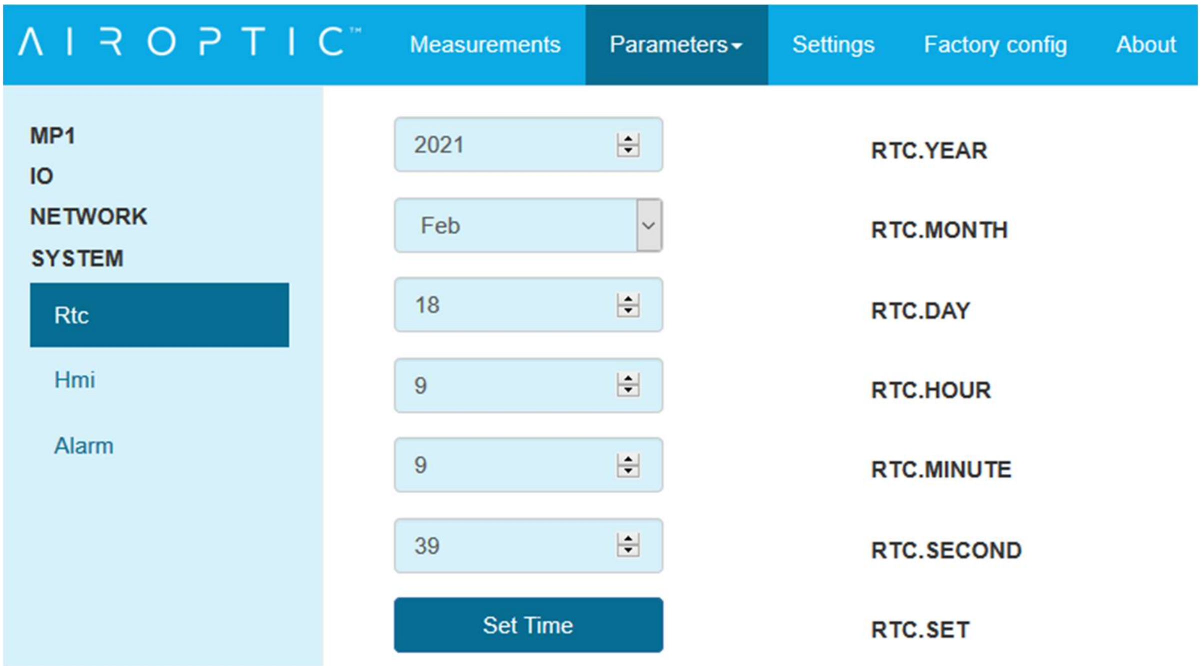


Figure 178. Rtc parameters window.

8.4.1.20. SYSTEM -> Hmi (Human-Machine Interface configuration)

HMI parameters	
Name	**Description**
HMI.PASSWORD	Set pin (4-digits) to protect device against unauthorized change parameters by HMI

Table 51. HMI parameters list.

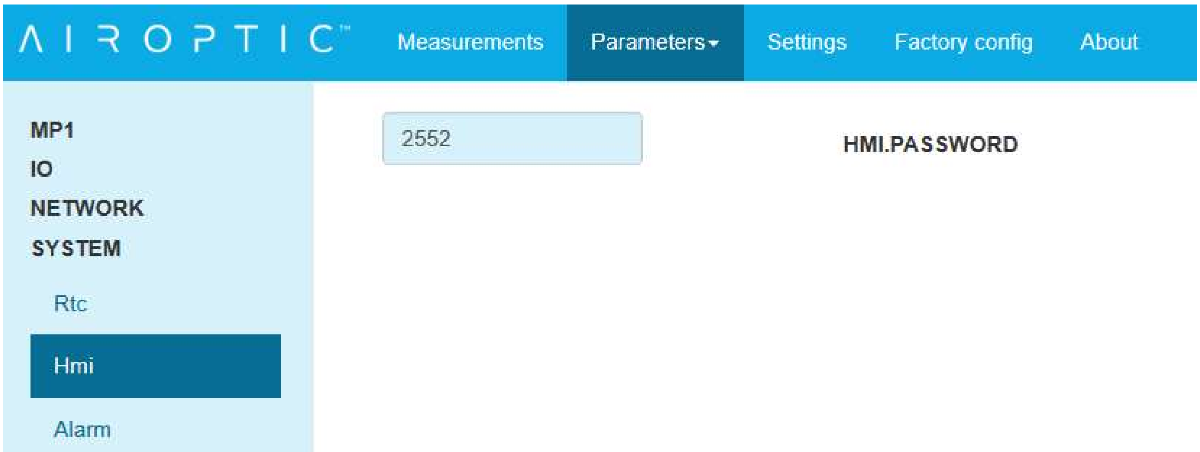


Figure 179. Hmi parameter window.

8.4.1.21. SYSTEM -> Alarm

Alarm configuration window allow user to configure up to 10 self-defined alarms

Alarm parameters	
Name	**Description**
ALARM1.ENABLE	On – alarm on Off – alarm off
ALARM1.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM1.RESET	On – reset alarm manually
ALARM1.NORMAL_STATE	Low or high normal state selectable
ALARM1.SIGNAL	Selection of the signal that will be checked
ALARM1.OPERATOR	Determining condition (>;<;>=;<=)
ALARM1.THRESHOLD	Value for condition
ALARM1.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM2.ENABLE	On – alarm on Off – alarm off
ALARM2.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM2.RESET	On – reset alarm manually
ALARM2.NORMAL_STATE	Low or high normal state selectable
ALARM2.SIGNAL	Selection of the signal that will be checked
ALARM2.OPERATOR	Determining condition (>;<;>=;<=)
ALARM2.THRESHOLD	Value for condition
ALARM2.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM3.ENABLE	On – alarm on Off – alarm off

ALARM3.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM3.RESET	On – reset alarm manually
ALARM3.NORMAL_STATE	Low or high normal state selectable
ALARM3.SIGNAL	Selection of the signal that will be checked
ALARM3.OPERATOR	Determining condition (>;<;>=;<=)
ALARM3.THRESHOLD	Value for condition
ALARM3.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM4.ENABLE	On – alarm on Off – alarm off
ALARM4.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM4.RESET	On – reset alarm manually
ALARM4.NORMAL_STATE	Low or high normal state selectable
ALARM4.SIGNAL	Selection of the signal that will be checked
ALARM4.OPERATOR	Determining condition (>;<;>=;<=)
ALARM4.THRESHOLD	Value for condition
ALARM4.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM5.ENABLE	On – alarm on Off – alarm off
ALARM5.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM5.RESET	On – reset alarm manually
ALARM5.NORMAL_STATE	Low or high normal state selectable
ALARM5.SIGNAL	Selection of the signal that will be checked
ALARM5.OPERATOR	Determining condition (>;<;>=;<=)
ALARM5.THRESHOLD	Value for condition
ALARM5.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM6.ENABLE	On – alarm on Off – alarm off
ALARM6.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM6.RESET	On – reset alarm manually
ALARM6.NORMAL_STATE	Low or high normal state selectable
ALARM6.SIGNAL	Selection of the signal that will be checked
ALARM6.OPERATOR	Determining condition (>;<;>=;<=)
ALARM6.THRESHOLD	Value for condition
ALARM6.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM7.ENABLE	On – alarm on Off – alarm off

ALARM7.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM7.RESET	On – reset alarm manually
ALARM7.NORMAL_STATE	Low or high normal state selectable
ALARM7.SIGNAL	Selection of the signal that will be checked
ALARM7.OPERATOR	Determining condition (>;<;>=;<=)
ALARM7.THRESHOLD	Value for condition
ALARM7.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM8.ENABLE	On – alarm on Off – alarm off
ALARM8.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM8.RESET	On – reset alarm manually
ALARM8.NORMAL_STATE	Low or high normal state selectable
ALARM8.SIGNAL	Selection of the signal that will be checked
ALARM8.OPERATOR	Determining condition (>;<;>=;<=)
ALARM8.THRESHOLD	Value for condition
ALARM8.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM9.ENABLE	On – alarm on Off – alarm off
ALARM9.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM9.RESET	On – reset alarm manually
ALARM9.NORMAL_STATE	Low or high normal state selectable
ALARM9.SIGNAL	Selection of the signal that will be checked
ALARM9.OPERATOR	Determining condition (>;<;>=;<=)
ALARM9.THRESHOLD	Value for condition
ALARM9.HYSTERESIS	Moves the auto reset boundary by the given value
ALARM10.ENABLE	On – alarm on Off – alarm off
ALARM10.AUTORESET_ENABLE	The alarm will automatically reset when condition disappear
ALARM10.RESET	On – reset alarm manually
ALARM10.NORMAL_STATE	Low or high normal state selectable
ALARM10.SIGNAL	Selection of the signal that will be checked
ALARM10.OPERATOR	Determining condition (>;<;>=;<=)
ALARM10.THRESHOLD	Value for condition
ALARM10.HYSTERESIS	Moves the auto reset boundary by the given value

Table 52. Alarm parameters list.

Alarm signals list	
Name	**Description**
GAS101.CONCENTRATION GAS102.CONCENTRATION GAS103.CONCENTRATION GAS104.CONCENTRATION GAS105.CONCENTRATION GAS106.CONCENTRATION GAS107.CONCENTRATION GAS108.CONCENTRATION	Gas concentration (Measurement id: 0010) Gas concentration (Measurement id: 0020) Gas concentration (Measurement id: 0030) Gas concentration (Measurement id: 0040) Gas concentration (Measurement id: 0050) Gas concentration (Measurement id: 0060) Gas concentration (Measurement id: 0070) Gas concentration (Measurement id: 0080)
TEMP.CALCULATED	Temperature calculated – only applicable in oxygen analyzers on special request (Measurement id 0100)
LASER11.TRANSMISSION LASER12.TRANSMISSION LASER13.TRANSMISSION LASER14.TRANSMISSION	Laser transmission (Measurement id: 0200) Laser transmission (Measurement id: 0201) Laser transmission (Measurement id: 0202) Laser transmission (Measurement id: 0203)
FIBER1.TRANSMISSION FIBER2.TRANSMISSION	Transmission with RX module Transmission with RX module
PROCESS.TEMP	Process temperature (Measurement id: 0001)
PROCESS.PRESSURE	Process pressure (Measurement id: 0002)

Table 53. Alarm signals list.

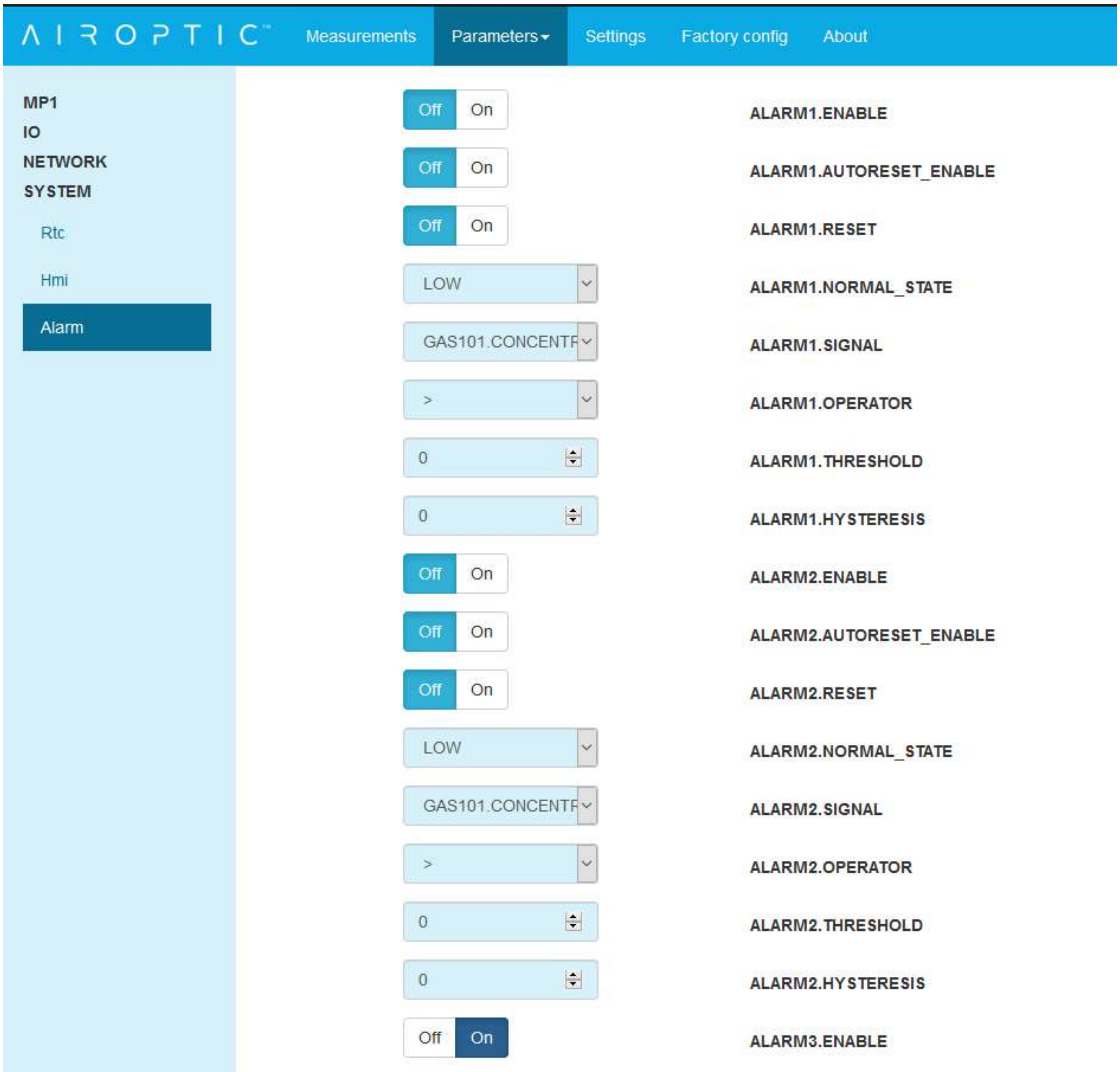


Figure 180. Alarm parameters window.

8.5. Settings tab

Drop-down menu will appear when clicking on the **Settings.**

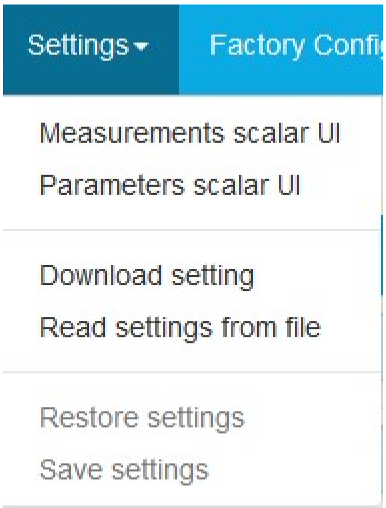


Figure 181. WebServer application - settings window.

Measurement scalar UI	View measurement aliases and units.
Parameters scalar UI	View parameters aliases and units.
Download settings	Download to PC txt file with measurement and parameters aliases and unit type.
Read settings from file	Read txt file with measurements and parameters aliases and unit type.
Restore settings	Restore settings from non volatile memory
Save settings	Send data to device and put dem in non volatile memory

Table 54. Settings window functionalities.

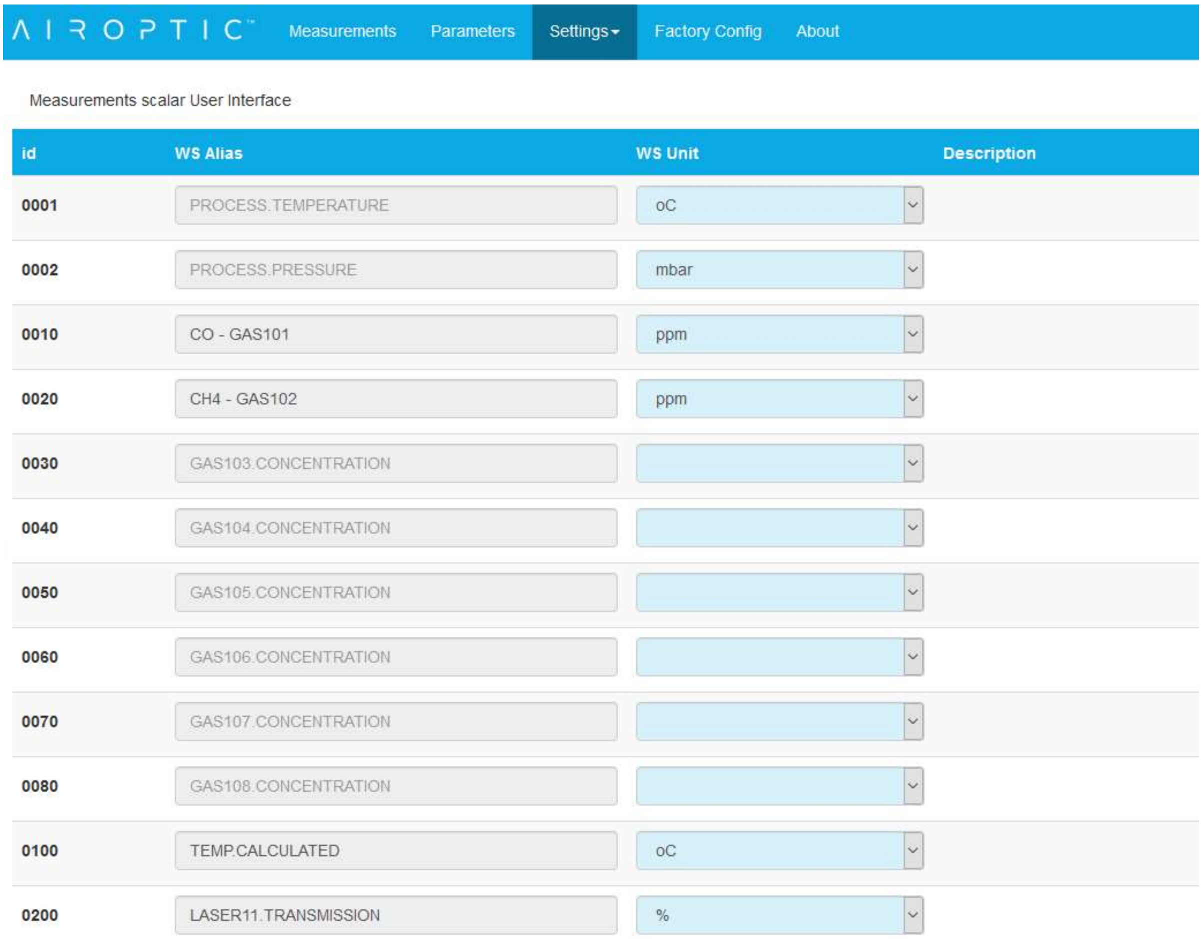


Figure 182. Settings window.

In order to change the unit of chosen parameter or measurement the user shall click on the field that intends to change i.e. optical path length. By select one of available unit type.

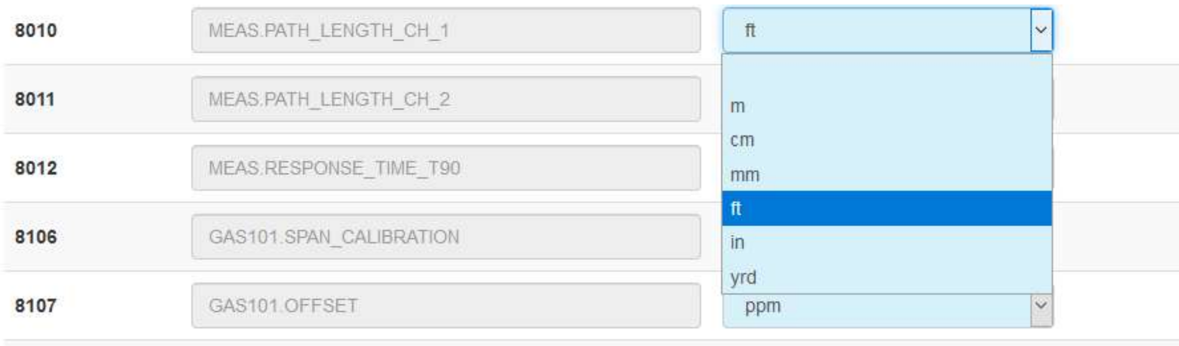


Figure 183. Settings window - making changes.

To apply changes, click on the **Send** button that will appear next to the edited field.

Figure 184. Settings window – applying changes.

8.6. Factory Config tab

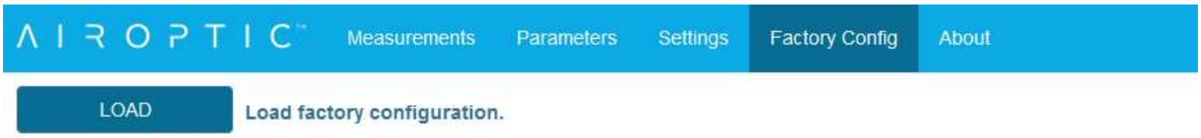
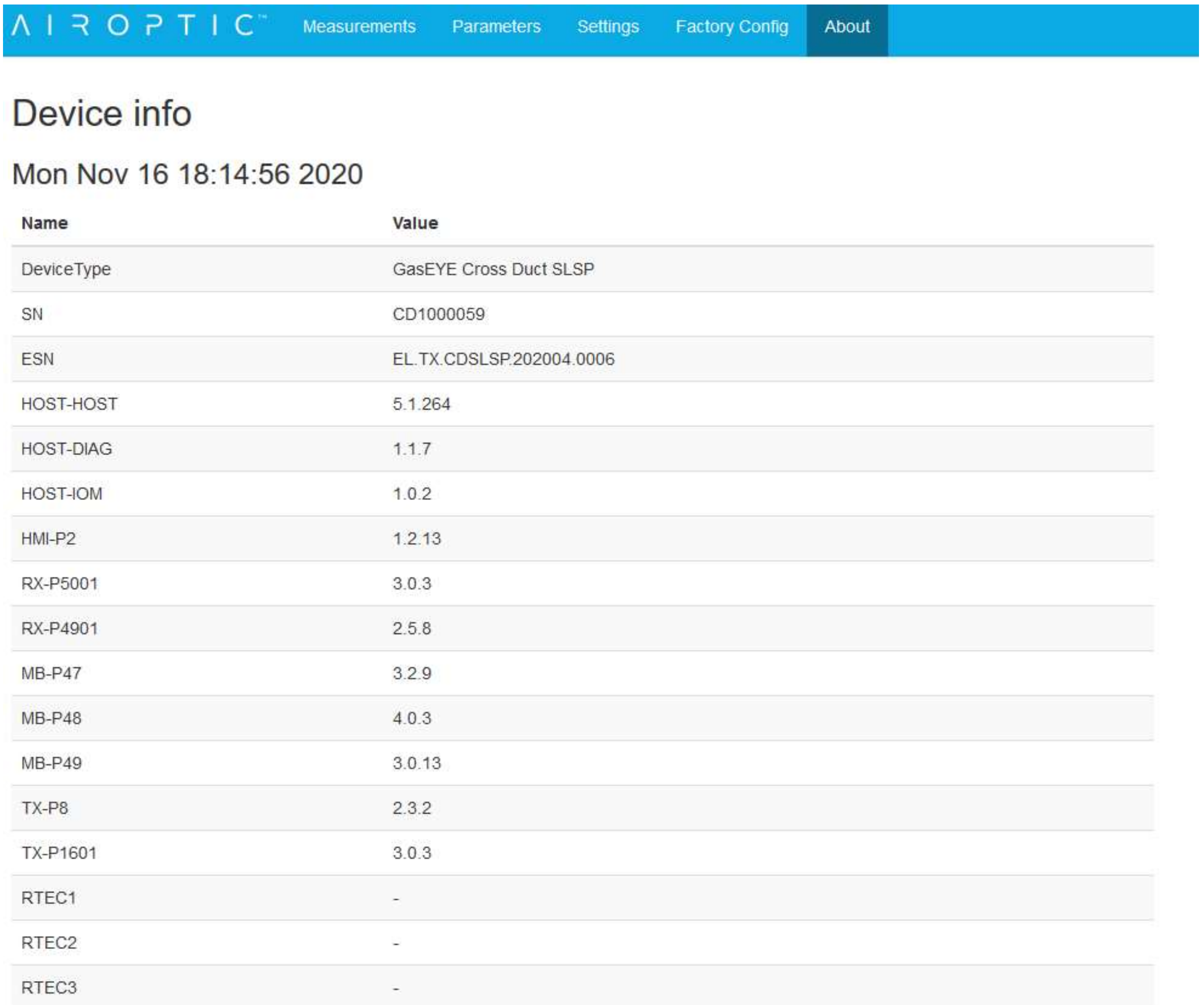


Figure 185. Factory config window.

Attention: Use LOAD button only if you are sure with you want to do. This option return device to factory settings. All user settings will be lost.

8.7. About tab

This page presents device firmware version.



Device info

Mon Nov 16 18:14:56 2020

Name	Value
DeviceType	GasEYE Cross Duct SLSP
SN	CD1000059
ESN	EL.TX.CDSLSP.202004.0006
HOST-HOST	5.1.264
HOST-DIAG	1.1.7
HOST-IOM	1.0.2
HMI-P2	1.2.13
RX-P5001	3.0.3
RX-P4901	2.5.8
MB-P47	3.2.9
MB-P48	4.0.3
MB-P49	3.0.13
TX-P8	2.3.2
TX-P1601	3.0.3
RTEC1	-
RTEC2	-
RTEC3	-

Figure 186. Device information page.

9. Purging (non-ATEX)

If there is need to remove any gas contaminants from inside of the instrument it may be purged using gases, such as air or nitrogen. Process purging is recommended for every installation to prevent flange windows clogging.

Purge tubings diameter should be 6 mm.

Recommended process purging gas flow (for each process flange): 10 – 50 l/min
Purging gas flow for tubes and housings: 0.5 – 5 l/min

There are three possible areas where purging may be introduced:

- Receiver/transmitter/central unit case
- Receiver/transmitter tube
- Process side

It is crucial to ensure that the purging gas does not contain any constituents of interest since it will affect the measurement and instrument stability. When using compressed air for purging please ensure that the air is dry and oil-free (according to ISO 8573-1, recommended Class 2 or 3). Bad quality of purging gas may affect the measurement or even damage the analyzer.

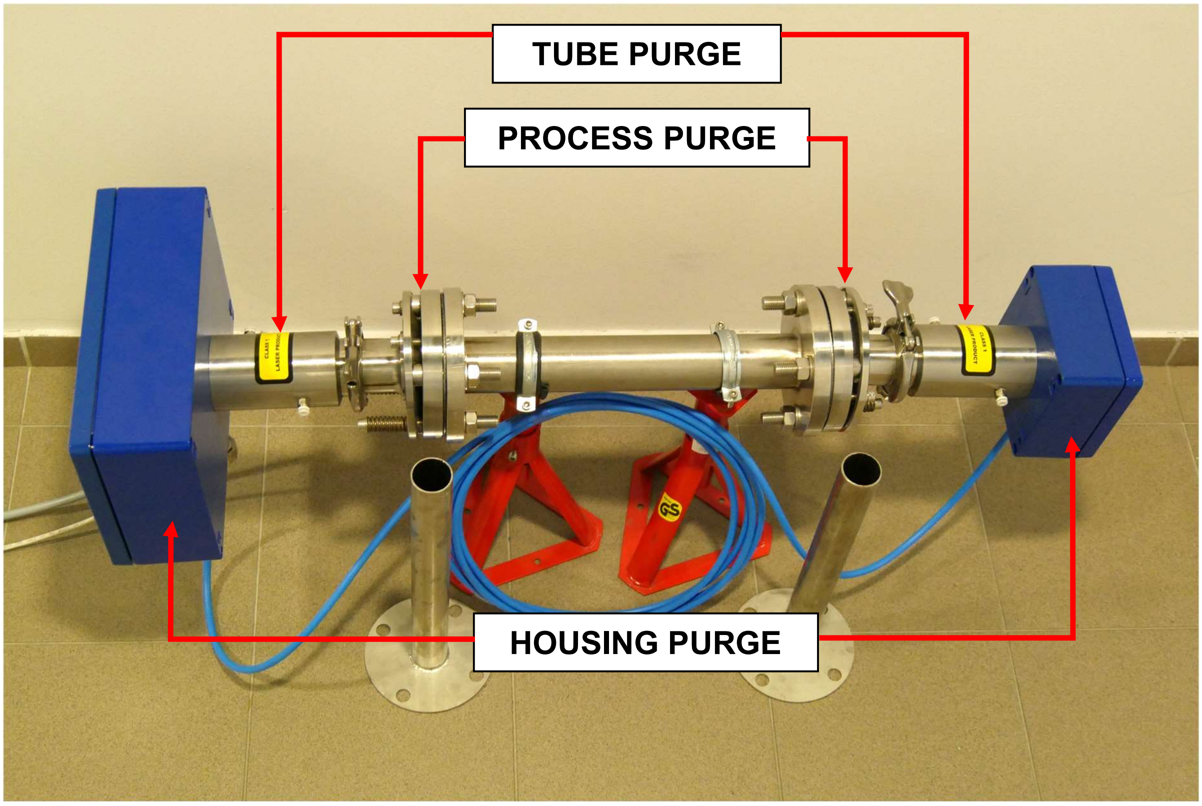


Figure 187. Overview of the purging areas.

9.1. Housing purging (optional)

GasEye Cross Duct instrument allows purging of the interior of the electronics housing. It is possible by using inlets/outlets that are found on the bottom side of each unit (See figure below).

9.1.1. Single Gas

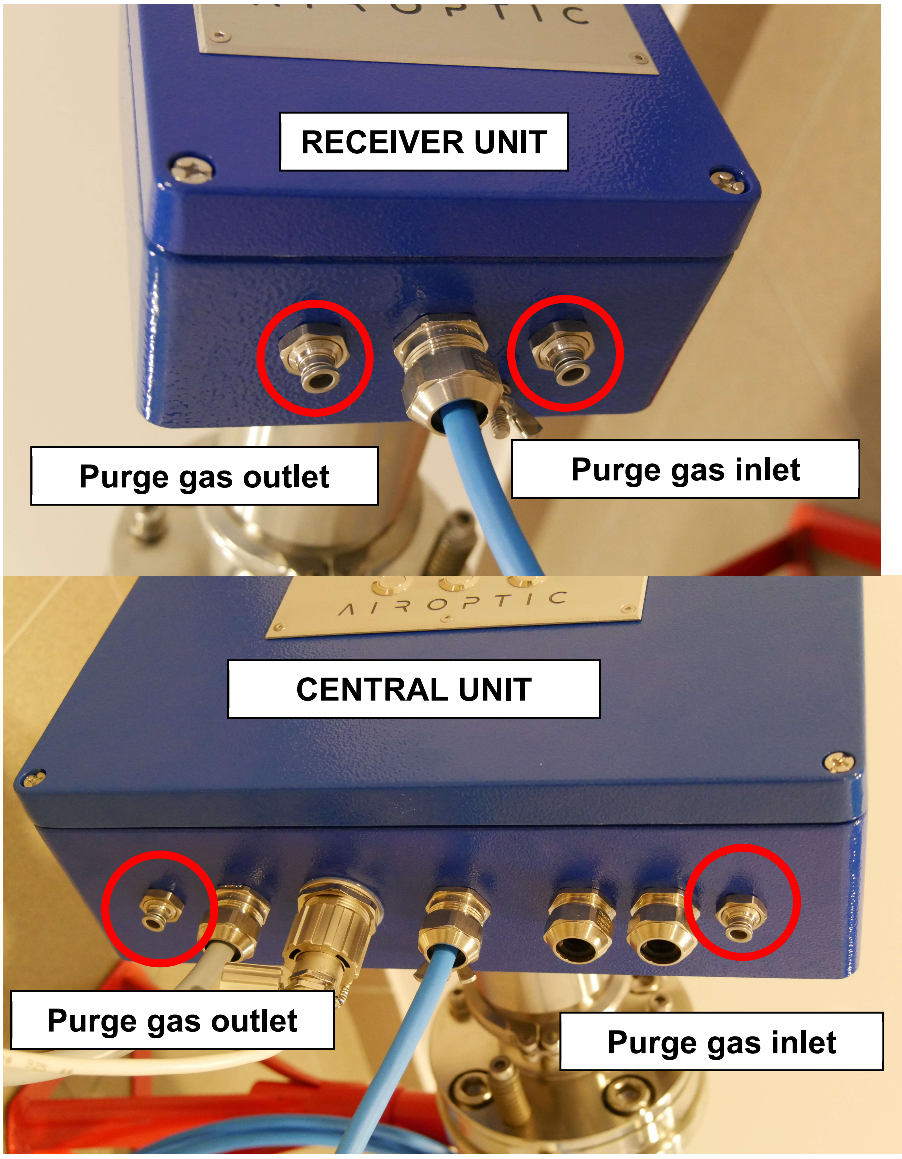


Figure 188. Purge gas inlet/outlet – Receiver and central unit.

9.1.2. Multi Gas

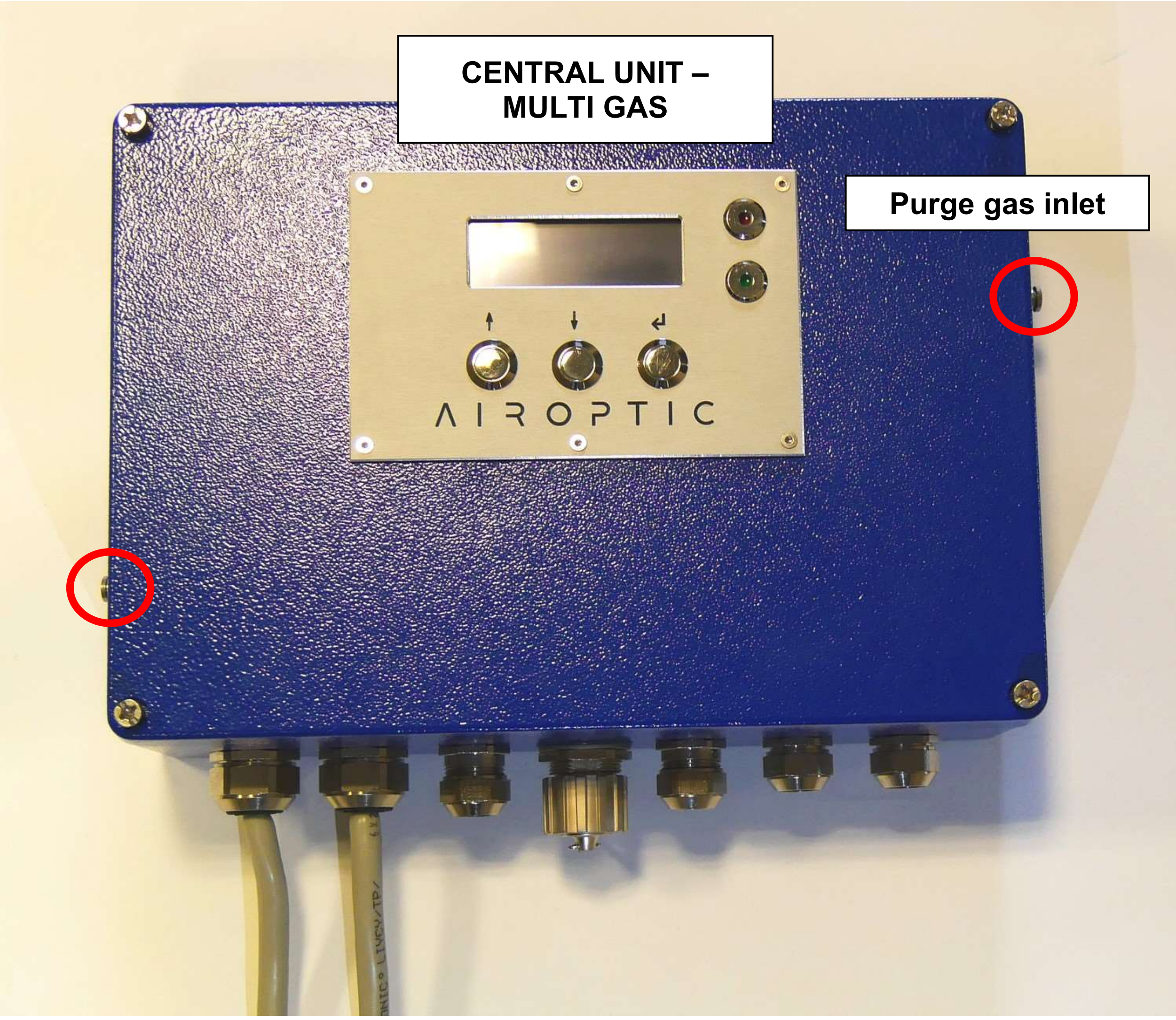


Figure 189. Purge gas inlet/outlet – Central unit (MG)

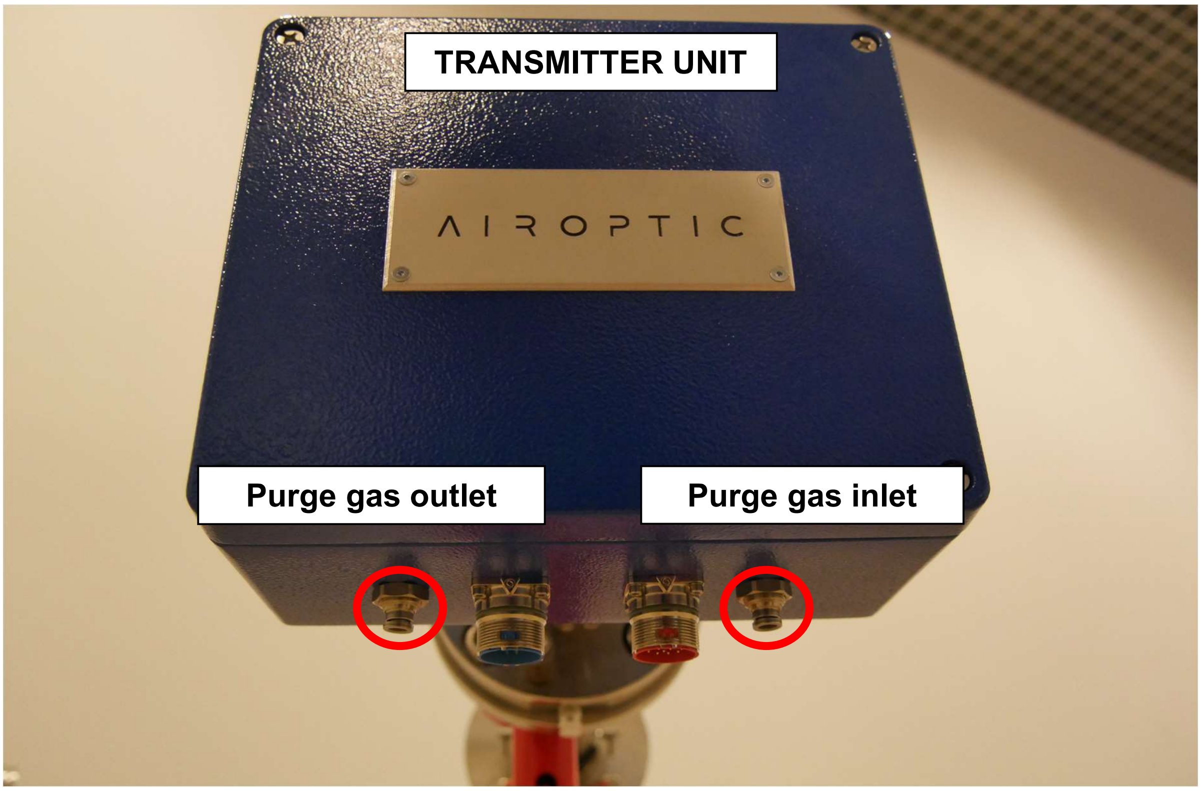


Figure 190. Purge gas inlet/outlet – Transmitter unit (MG)

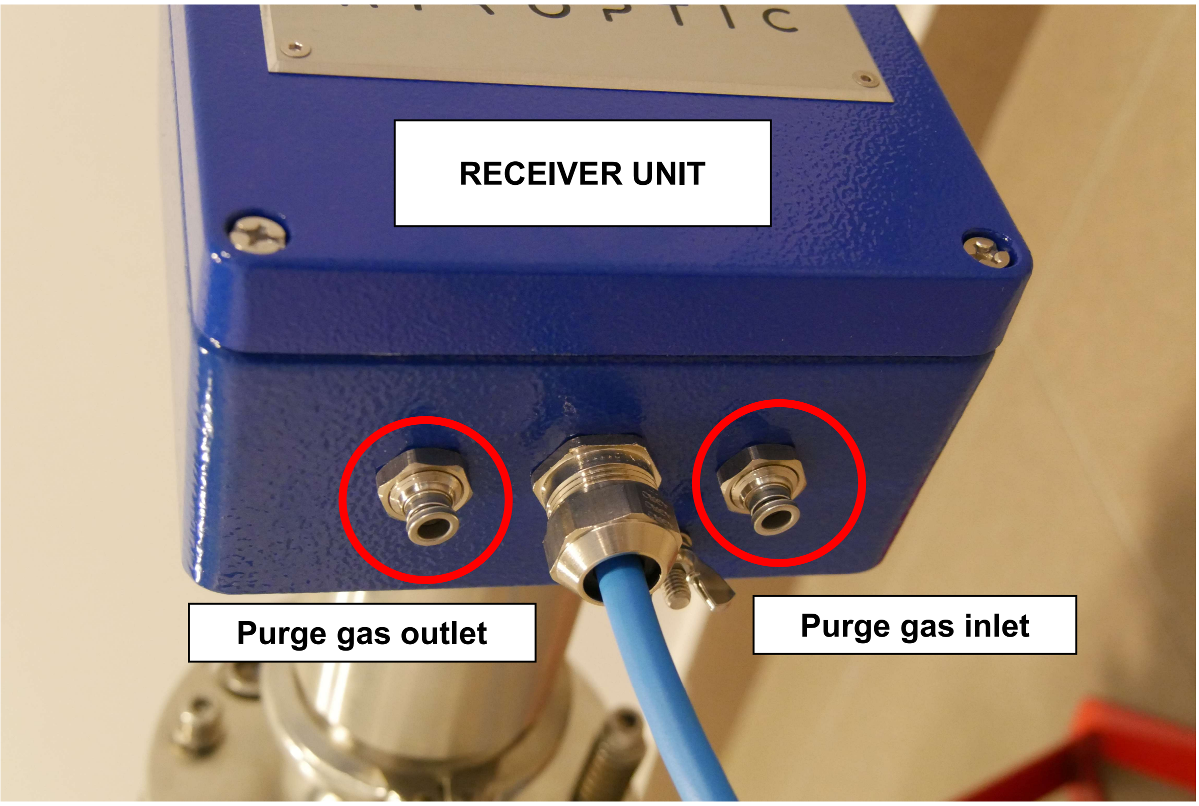


Figure 191. Purge gas inlet/outlet – Receiver unit (MG)

1. Prior to the insertion of the tubings into the fittings please ensure that the openings (red circles) are cleared and no object will interrupt the purge gas flow.

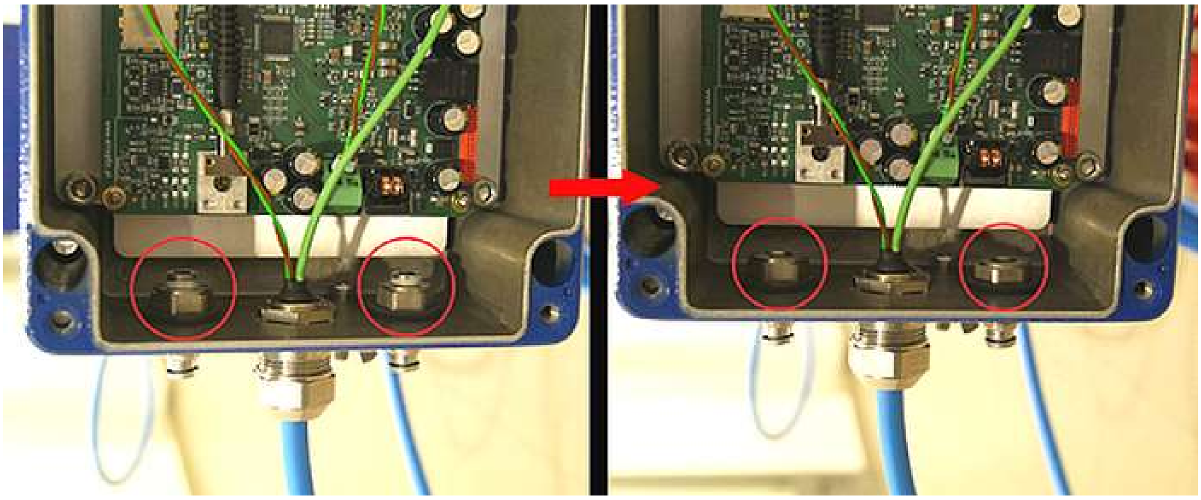


Figure 192. Receiver unit – purging fittings.

2. Slide tubing into the receiver housing purge inlet and outlet. Yellow arrows indicate purge gas flow direction.

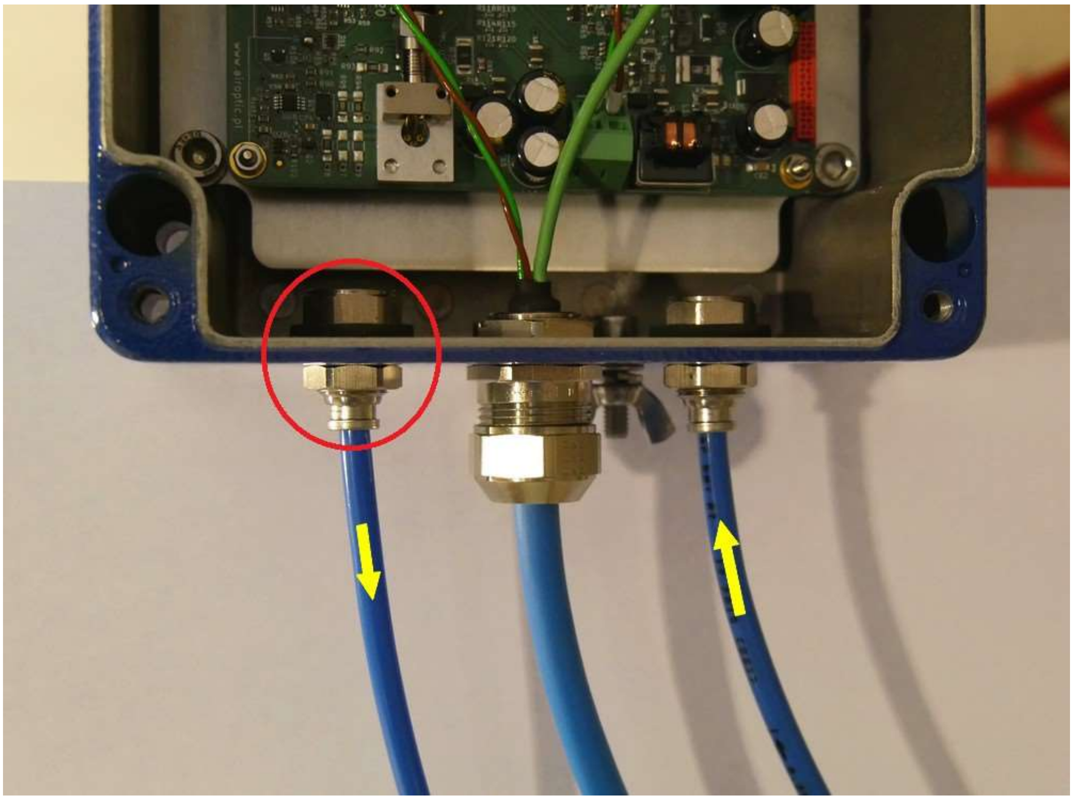


Figure 193. Tubing connection – purge inlet and outlet.

Outside thread/fitting type	Material	Picture
“Insert fitting” for ¼” tube	Nickel plated brass or SS316	
“Insert fitting” for 6mm tube	Nickel plated brass or SS316	
¼” double compression fitting	SS316	
6mm double compression fitting	SS316	

Table 55. Possible purge fittings versions for GasEye Cross Duct housings.

9.2. Tube and process purging

If it is necessary to purge the tubes and process side of the instrument the user should adapt the purging interfaces.

1. Screw in 1/8 inch fittings into points indicated by red arrows.

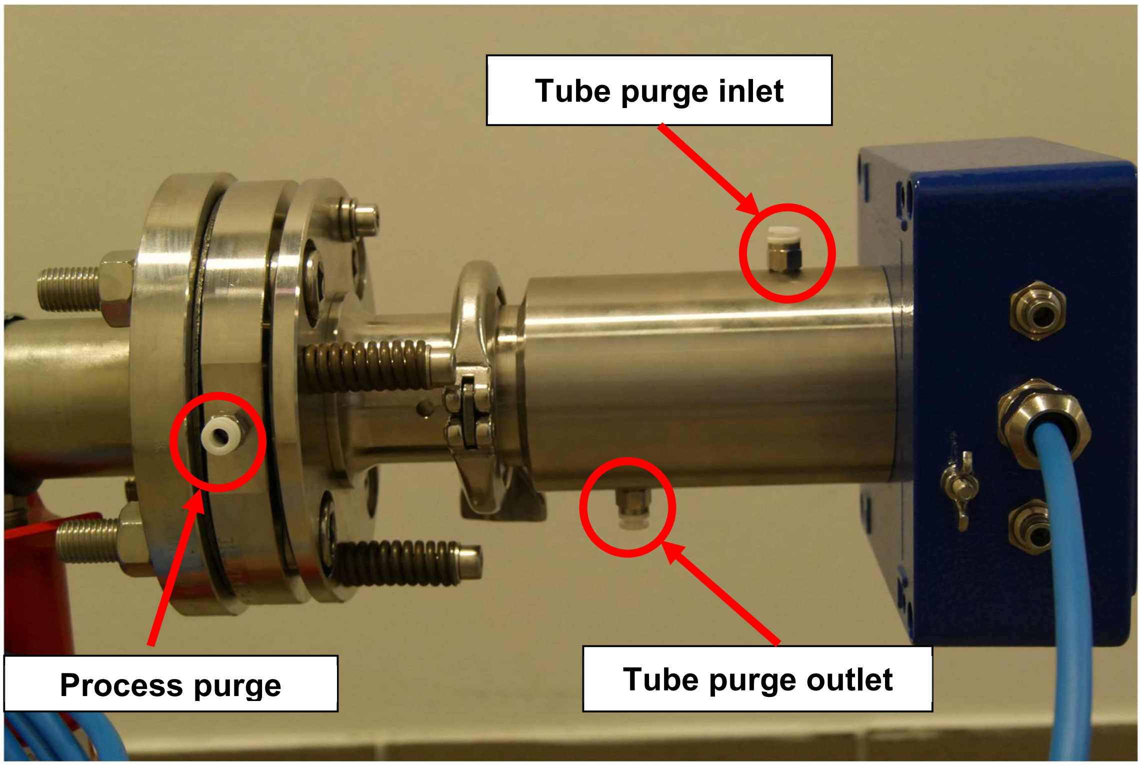


Figure 194. Tube and process purging.

The following versions of purge fittings exist:

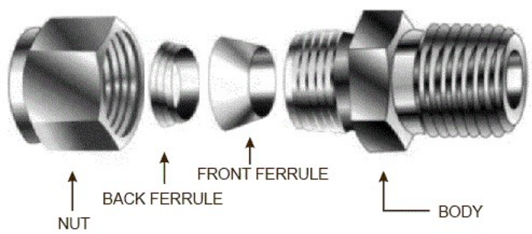
<table>
<tr><th>Fitting type</th><th>Thread</th><th>Material</th><th>Picture</th></tr>
<tr><td>“Insert fitting” for ¼” tube</td><td rowspan="4">1/8” BSPT thread</td><td>SS/PTFE</td><td rowspan="2"></td></tr>
<tr><td>“Insert fitting” for 6mm tube</td><td>SS/PTFE</td></tr>
<tr><td>¼” compression fitting</td><td>SS316</td><td rowspan="2"></td></tr>
<tr><td>6mm double compression fitting</td><td>SS316</td></tr>
</table>

Table 56. Possible purge fittings versions for GasEye Cross Duct tube or alignment flange.

2. Slide the other end of the tubing from the receiver's housing outlet into the tube purge inlet. Another tubing is needed to connect the tube purge outlet with the another housing or tube. Process purging should be supplied by another gas source or connected in series with tube and housing purging but only via check valve to prevent any process gas access into GasEye tubes or housings thus it may damage the analyzer. Yellow arrows indicate purge gas flow direction.

WARNING
If there is overpressure in the process please make sure the check valve is properly installed in the flange

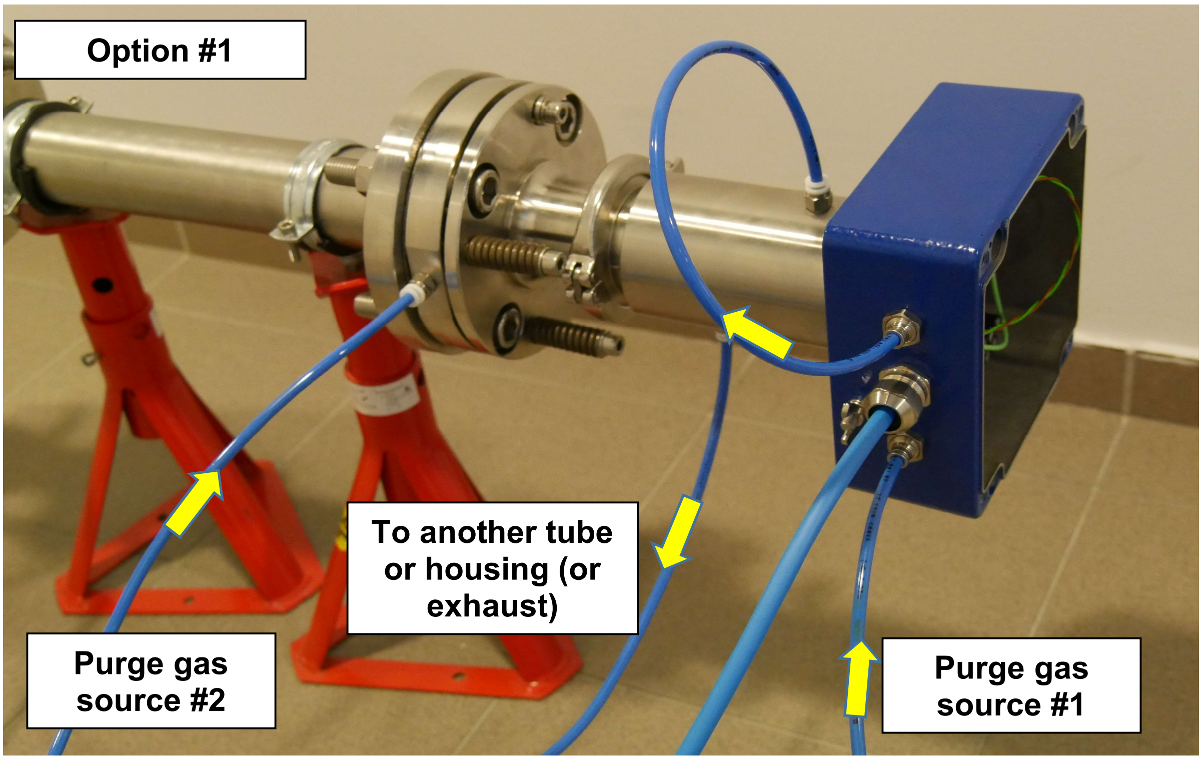


Figure 195. Purging setup - receiver side (Option #1).

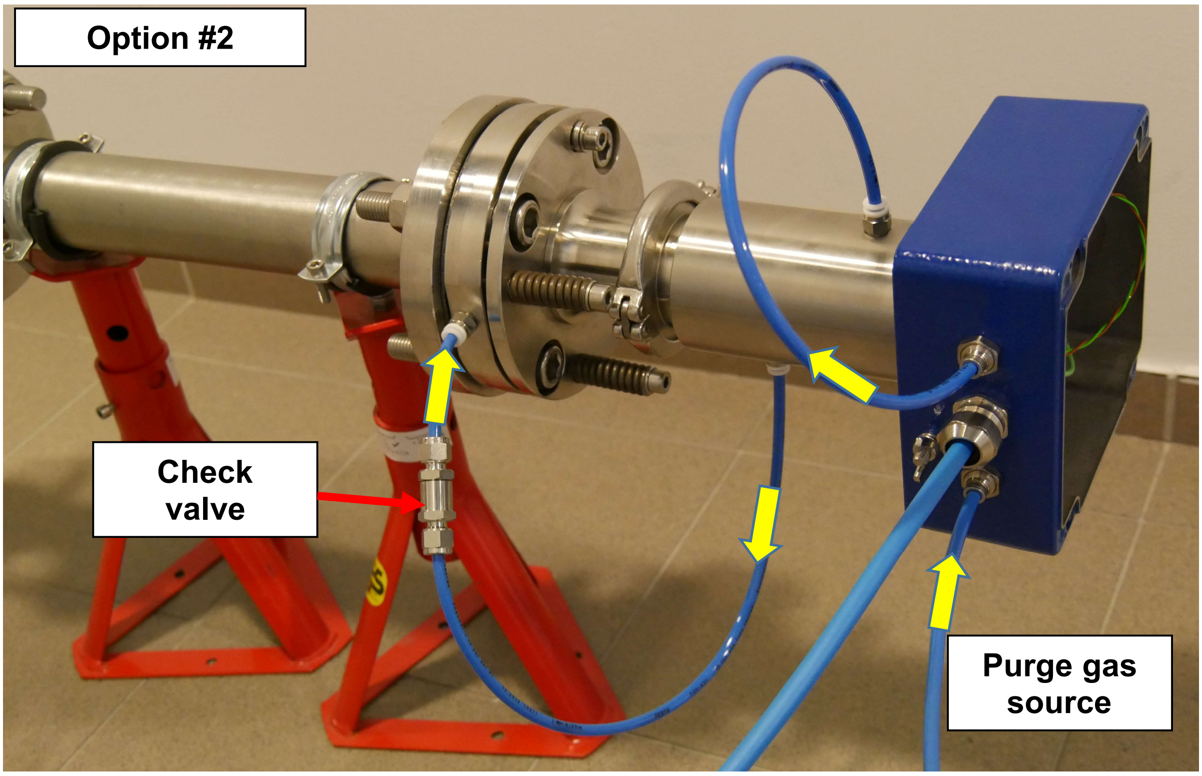


Figure 196. Purging setup - receiver side (Option #2).

At this point the purging setup for the receiver side of the instrument is completed.

For the transmitter/central unit side of the instrument the purging setup is prepared in similar way.

10. ATEX (Zone 1 and 21 purging system installation)

The GasEye Cross Duct (Ex1 version only) can be operated in Zone 1 and 21 and provide the optical radiation to Zone 0 and 20 per mark II (1)/2G [Ex pxb op is T6 Ga] IIC Gb and II (1)/2D [Ex pxb op is T6 Da] IIIC Db.

Any other ways of using the GasEye Cross Duct are forbidden.

10.1. Basic requirements and safe use

The manufacturer will not be liable for damage resulting from incorrect installation, failure to maintain the device in a suitably functional condition, or use of the device other than for its intended purpose.

Installation should be carried out by qualified personnel having the necessary authorization to install electrical and pressure measuring devices. The installer is responsible for performing the installation in accordance with these instructions and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation.

The device should be configured appropriately for the purpose for which it is to be used. Incorrect configuration may cause erroneous functioning, leading to damage to the device or an accident.

Installation of device should be performed with particular care, in accordance with the regulations and standards applicable to that type of installation.

The general rules for connecting and using pressurized enclosure should conform to the rules and standards for equipment with Ex p as specified in:

- IEC 60079-14: Explosive atmospheres. Electrical installations design, selection and erection.
- IEC 60079-17: Explosive atmospheres. Electrical installations inspection and maintenance.

The GasEye is designed and manufactured in accordance with following standards:

- EN IEC 60079-0:2018;
- EN 60079-2:2014;
- EN 60079-26:2015
- EN 60079-28:2015

WARNING
Never install GasEye Cross Duct system in the ATEX zone without permission of the plant manager (hot work permit). Death, personal injury and/or damage to property may result if this is not complied.

WARNING
Observe the specifications of the examination certificate valid in your country. Observe the laws and regulations valid in your country for the electric installation in hazardous areas with risk of explosion. Regulations for installation of electric equipment in hazardous areas: DIN EN 60079-14.

WARNING
Never switch on or operate an analyzer with lid open. Before opening the device wait at least two minutes after de-energizing. Make sure that externally powered signals are also be de-energized. For secure disconnection of all signals the device should be operated in hazardous areas only via a switch-off unit placed outside the hazardous area.

WARNING
Never repair the device on site! Any components not mentioned in the spare parts list must be replaced or repaired by certified field service technicians. Failure to do so will also result in loss of Ex approval.

WARNING
The use of the alignment kit for aligning the sensors is not covered by the ATEX certificate. Never use the kit in the ATEX zone without permission of the plant manager (hot work permit).

Information about possible ATEX use you will find on a label located on enclosure of the device.

10.2. ATEX Marking

II (1)/2G Ex pxb [op is Ga] IIC T6 Gb
II (1)/2D Ex pxb [op is Da] IIIC T85°C Db

Certificate No. KDB 20ATEX0003X

10.3. Special conditions for safe use

- External parts made of plastic should be cleaned with a damp cloth, with the addition of antistatic fluids.
- Enclosure should be installed in a way that prevents electrostatic charging, in accordance with the instructions.
- Maximum inlet pressure to the containment system should not exceed 2bar
- System power must not be restored after the enclosure has been opened until combustible gas/dust accumulations within the enclosure have been removed

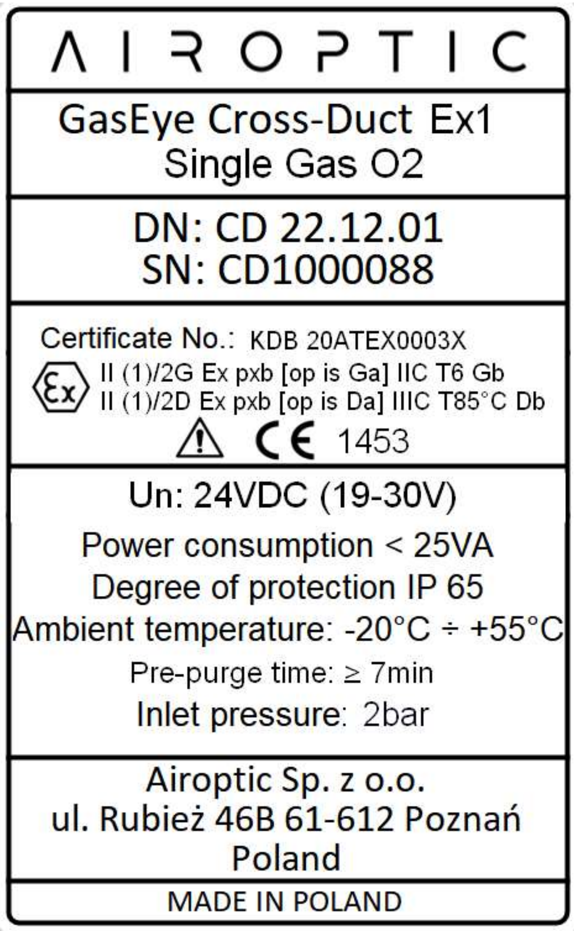


Figure 197. Gas analyzer identification plate – ATEX 1/21.

10.4. Overview of zone 1 and 21 purging system for GasEye Cross Duct Single Gas

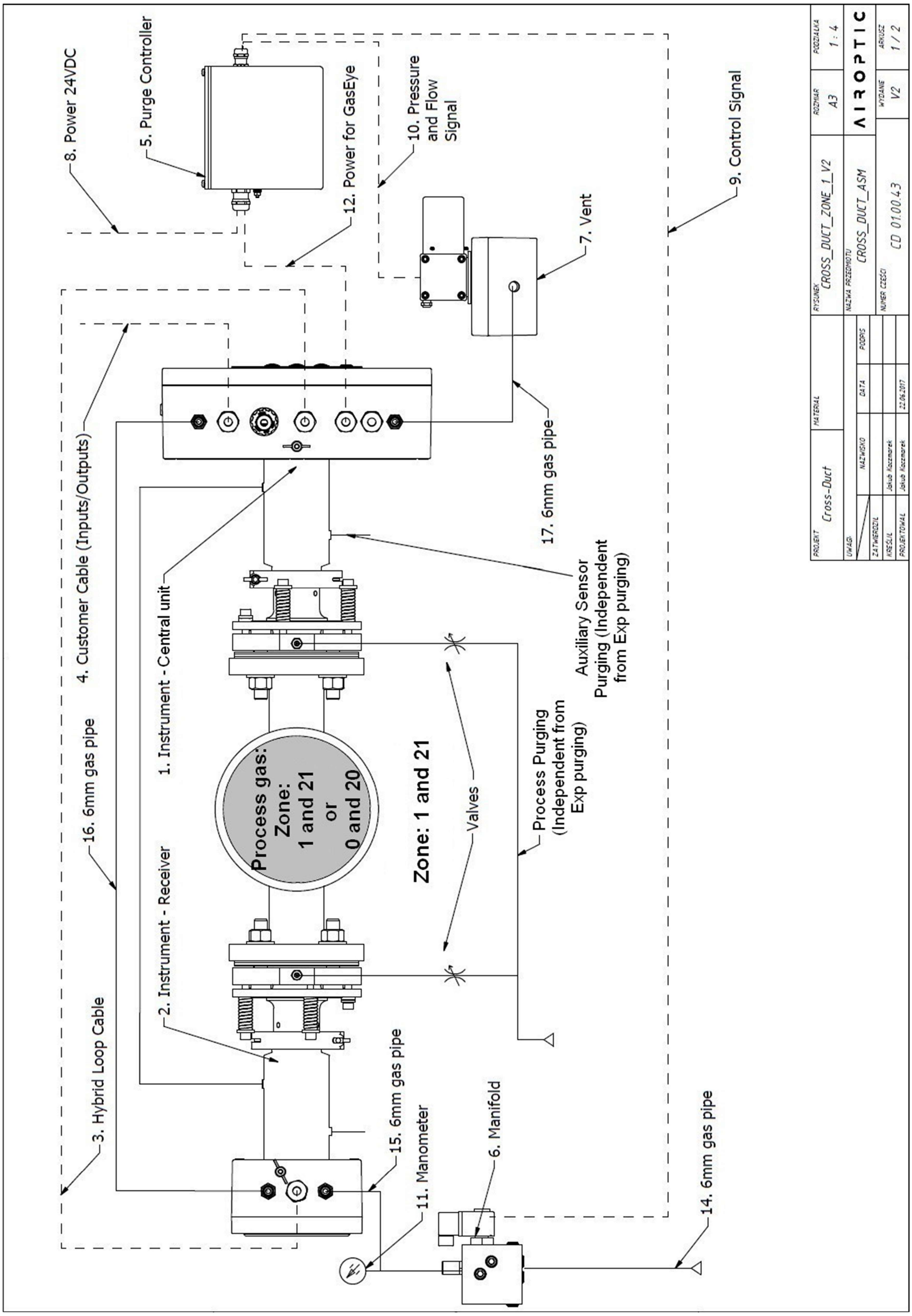


Figure 198 Overview of purging system installation with GasEye Cross Duct Single Gas.

Number	Description	Additional information
1	GasEye Cross-Duct central unit (tube and enclosure)	-
2	GasEye Cross-Duct receiver (tube and enclosure)	-
3	Hybrid loop cable	-
4	Customer cable (analog/digital input/outputs)	-
5	6500-01-EXT1-PNO-LNO purging controller	-
6	6500-MAN-DV-01 manifold	-
7	EPV-6500-AIR-07 vent with enclosure	-
8	3x1mm^2 cable (external power supply for complete system)	Required power supply: 24V/1.5A. Length is customer-dependent (customer must ensure nominal supply voltage on system power supply input)
9	Manifold control signal. Shielded 3x1mm^2 cable (power for manifold switched by 6500 controller)	Standard 2m, up to 50m
10	Vent pressure and flow signal cable.	Standard 5m, up to 60m
11	Pressure indicator (ATEX manometer)	Indication up to 10bar
12	3x1mm^2 cable (power for GasEye switched by 6500 controller)	Standard 2m, up to 20m
14	6mm gas pipe (purging gas input into manifold)	Length is customer-dependent (customer must ensure pressure of at least 1.5barg at the manifold input)
15	6mm gas pipe (from manifold output to GasEye receiver enclosure gas input)	Length should be minimum 0.3 m to maximum 5 m
16	6mm gas pipe (between receiver enclosure and central unit enclosure)	Length should be minimum 10 m to maximum 50 m
17	6mm gas pipe (from GasEye central unit enclosure gas output to vent enclosure gas input)	Length should be minimum 0.3 m to maximum 5 m

Table 57. Description of ATEX Zone 1/21 purging system for GasEye Cross Duct Single Gas.

Purging gas flow direction:

Purging gas source -> 6mm gas input pipe (**14 on schematic**) -> Manifold **(6)** -> 6mm gas pipe **(15)** -> GasEye receiver enclosure **(2)** -> 6mm gas pipe **(16)** -> GasEye transmitter enclosure **(1)** -> 6mm gas pipe **(17)** -> Vent with enclosure **(7)** -> Exhaust/ambient air

10.5. Overview of zone 1 and 21 purging system for GasEye Cross Duct Multi Gas

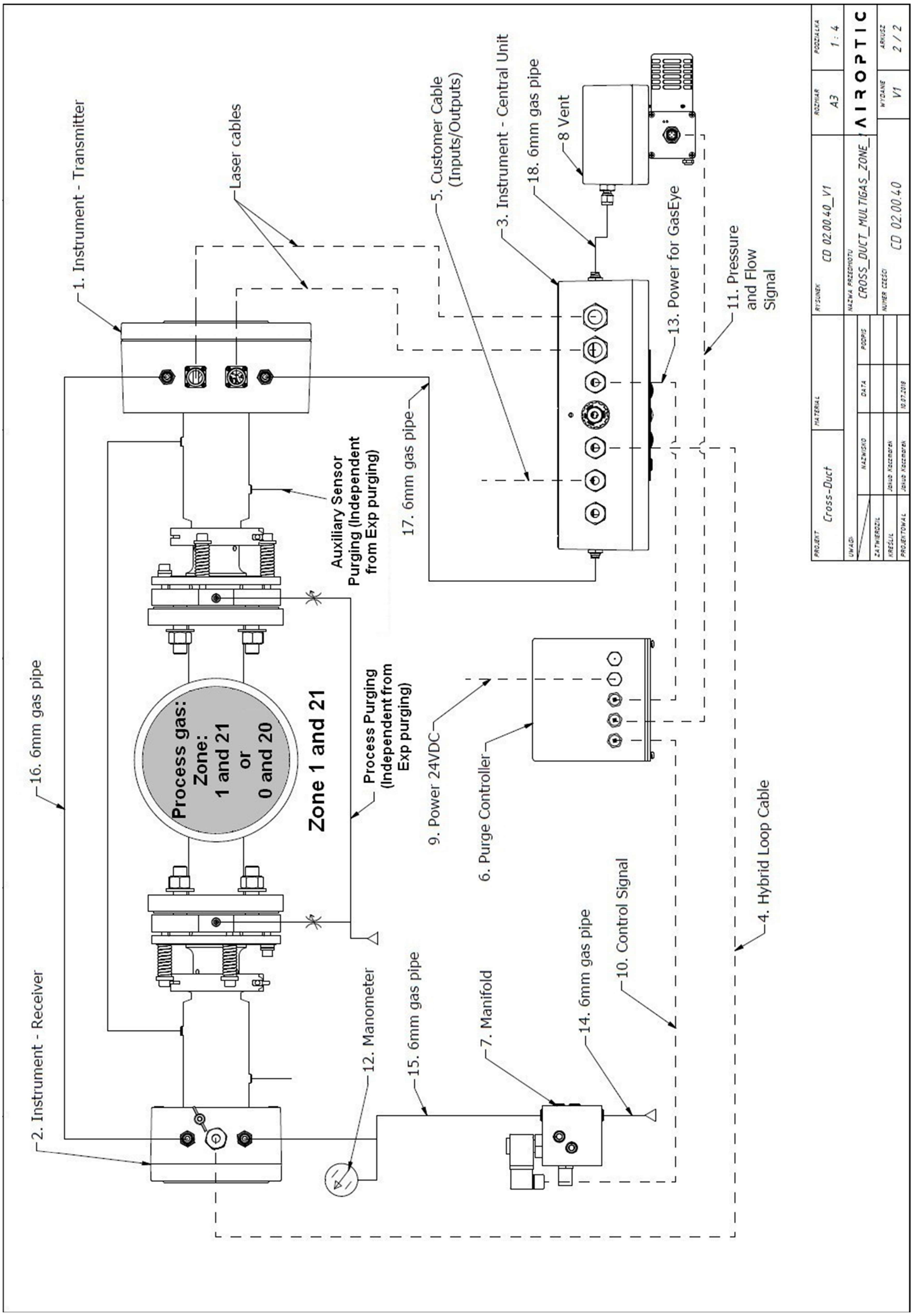


Figure 199. Overview of purging system installation with GasEye Cross Duct Multi Gas

Number	Description	Additional information
1	GasEye Cross-Duct transmitter (tube and enclosure)	-
2	GasEye Cross-Duct receiver (tube and enclosure)	-
3	GasEye Cross-Duct central-unit	-
4	Hybrid loop cable	-
5	Customer cable (analog/digital input/outpus)	-
6	6500-01-EXT1-PNO-LNO purging controller	-
7	6500-MAN-DV-01 manifold	-
8	EPV-6500-AIR-07 vent with enclosure	-
9	3x1mm^2 cable (external power supply for complete system)	Required power supply: 24V/1.5A. Length is customer-dependent (customer must ensure nominal supply voltage on system power supply input)
10	Manifold control signal. Shielded 3x1mm^2 cable (power for manifold switched by 6500 controller)	Standard 2m, up to 50m
11	Vent pressure and flow signal cable.	Standard 5m, up to 60m
12	Pressure indicator (ATEX manometer)	Indication up to 10bar
13	3x1mm^2 cable (power for GasEye switched by 6500 controller)	Standard 2m, up to 20m
14	6mm gas pipe (purging gas input into manifold)	Length is customer-dependent (customer must ensure pressure of at least 1.5barg at the manifold input)
15	6mm gas pipe (from manifold output to GasEye receiver enclosure gas input)	Length should be minimum 0.3 m to maximum 3 m
16	6mm gas pipe (between receiver enclosure and transmitter enclosure)	Length should be minimum 10 m to maximum 50 m
17	6mm gas pipe (from GasEye transmitter enclosure gas output to GasEye central-unit gas input)	Length should be minimum 0.3 m to maximum 3 m
18	6mm gas pipe (from GasEye central-unit enclosure gas output to vent enclosure gas input)	Length should be minimum 0.3 m to maximum 3 m

Table 58. Description of ATEX Zone 1/21 purging system for GasEye Cross Duct Multi Gas.

Purging gas flow direction:

Purging gas source -> 6mm gas input pipe (**14 on schematic**) -> Manifold **(7)** -> 6mm gas pipe **(15)** -> GasEye receiver enclosure **(2)** -> 6mm gas pipe **(16)** -> GasEye transmitter enclosure **(1)** -> 6mm gas pipe **(17)** -> GasEye central unit enclosure **(3)** -> 6mm gas pipe **(18)** -> Vent with enclosure **(8)** -> Exhaust/ambient air

10.6. Technical parameters

- Power input: Un = 24VDC
- Power consumption: < 35VA (including purge system)
- Degree of protection: IP 65
- Ambient temperature: -20°C ÷ +55°C
- Estimated max purge time: 7-18 min (depends on piping overall length)
- Inlet pressure: 2 bar
- Minimal pressure: not less than 2.3 mbar during continuous system work after initial purging.

DECLARATION
Minimum cross-sectional area of PE conductors is the same as phase conductors or more.

DECLARATION
Bonding conductor connection allows to the effective connection of at least one conductor with a cross-sectional area of at least 4mm2

10.7. Zone 1/21 purging system

Purging system consist of three parts: purging controller, manifold and a vent. The main parts of the purging system are shown in figure and table below.

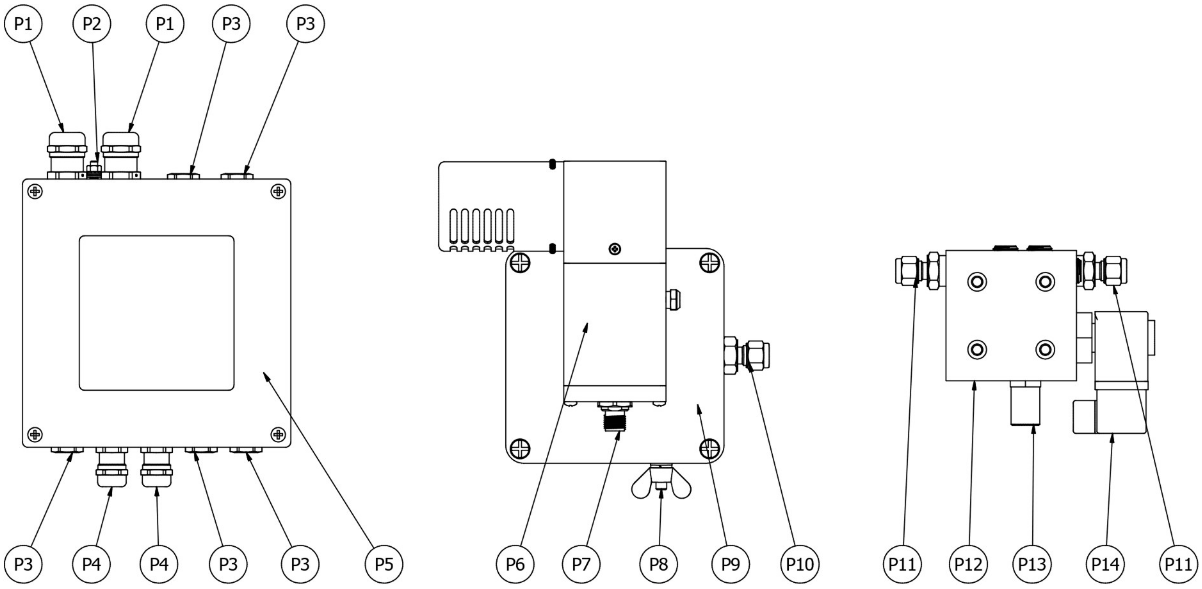


Figure 200. Purging system drawings.

ID	Name
P1	Cable gland M16
P2	PE connector
P3	Plug M12
P4	Cable gland M12
P5	Purging controller
P6	Vent
P7	Vent electrical connector
P8	PE connector
P9	Vent enclosure
P10	Purging gas connector
P11	Purging gas connector
P12	Manifold
P13	Manifold needle valve
P14	Manifold electrical connector

Figure 201. Descriptions of purging system parts.

10.8. Zone 1 and 21 purging system installation with GasEye Cross Duct Single Gas

1. Connect 6mm gas pipe (14) into manifold (6) input. Make sure that there will be no purging gas flow into system, until installation is complete and purging controller is energized.
2. Connect short 6mm gas pipe (15) into manifold (6) output and GasEye receiver enclosure (2) gas input with ATEX certified manometer (11) in between (using 6mm tee connector). Make sure that GasEye receiver gas inlets are not sealed with plugs.
3. Install manifold control signal cable (9) into 6500 controller internal terminals through one of the M12 glands.

   Manifold (6) should be placed on the GasEye receiver side and connected through 3x1mm^2 power cable (9) with purging controller (5) placed on the GasEye central unit side. Length of the cable (9) should be less than 50m.

Wire number	6500 controller terminal designation
1	Connect to grounding screw
2	“DV -“
3	“DV +”

Table 59. Manifold control signal cable installation (system 6500).

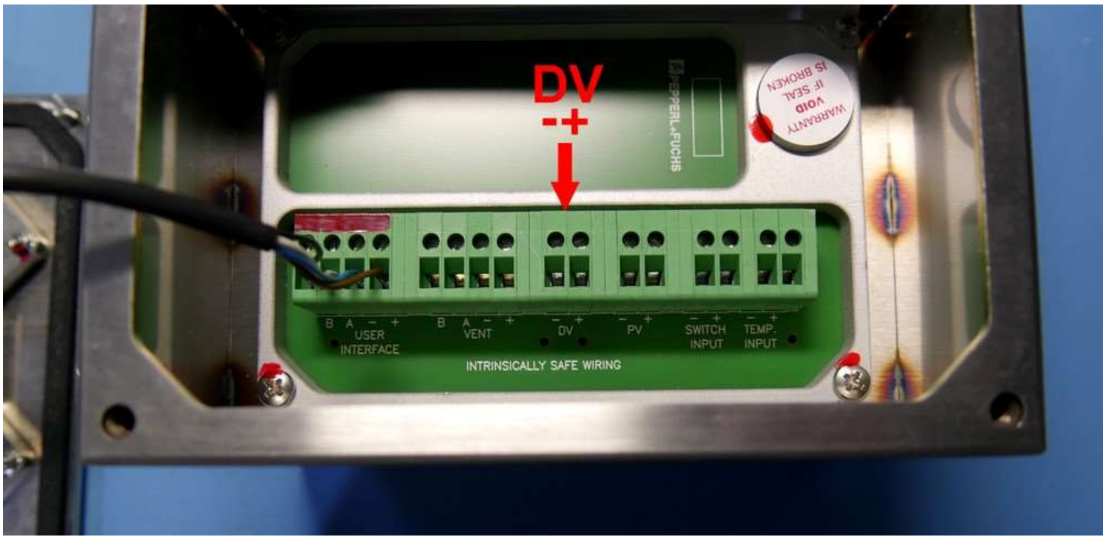


Figure 202. Manifold connectors – controller side.

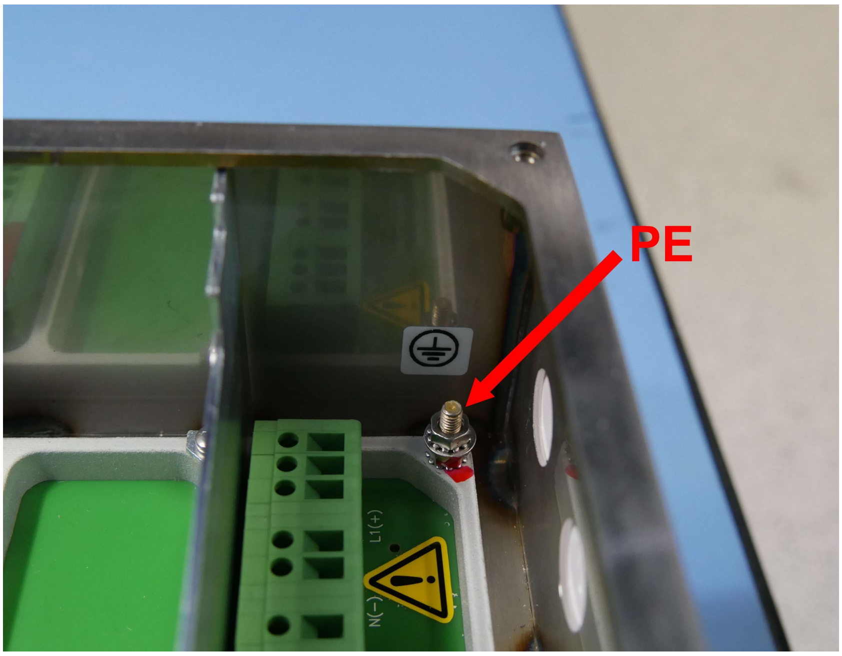


Figure 203. Internal grounding terminal in purge controller.

4. Connect vent pressure and flow signal cable (10) into purging controller (5) through one of the M12 glands. Other end of the cable connects into threaded gland on vent (7).

Wire number	Vent cable wire color	6500 controller terminal designation
1	Brown	"Vent +"
2	Blue	"Vent -"
3	White	"Vent A"
4	Black	"Vent B"
5	Black with ring terminal	Connect to grounding screw

Table 60. Vent pressure and flow signal cable connection (system 6500).

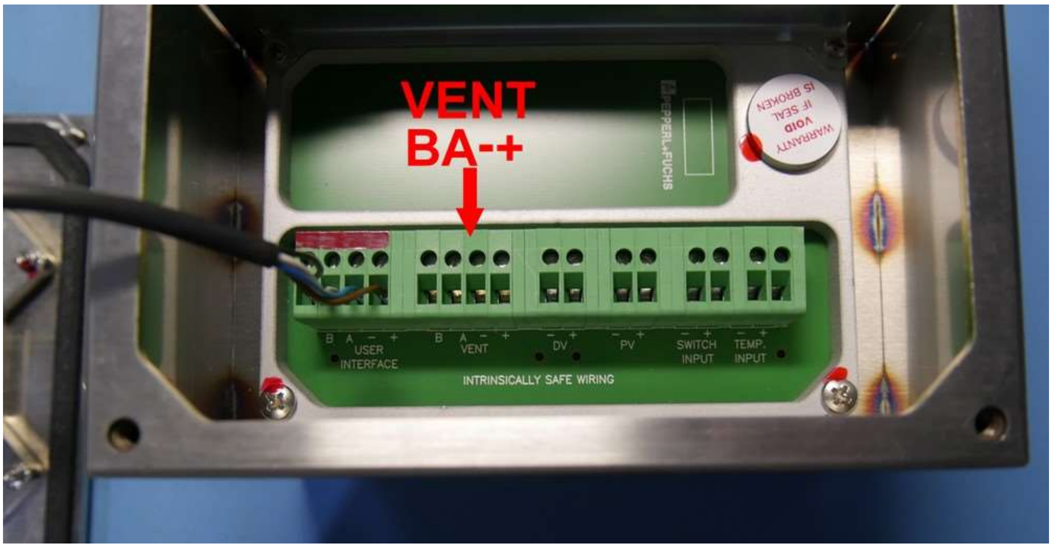


Figure 204. Vent connectors – controller side.

5. Connect 6mm gas pipe (17) into vent enclosure (7) gas input and GasEye central unit enclosure (1) gas output. Make sure that GasEye central unit gas inlets are not sealed with plugs.
6. Connect 3x1mm^2 power cable (12) between 6500-type purging controller (5) (through M16 gland) and GasEye central unit (1). Length of the cable should be <20m.

Wire color	GasEye central unit terminal designation	6500 controller terminal designation
Brown	24 VDC+ (socket number 25 on host board)	"Enclosure power relay" terminal (L+ side)
Blue	24 VDC- (socket number 26 on host board)	"Enclosure power relay" terminal (N- side)
Green/Yellow	PE Connect to internal grounding screw	Connect to internal grounding screw

Table 61. 3x1mm^2 power cable (12) connection (system 6500).

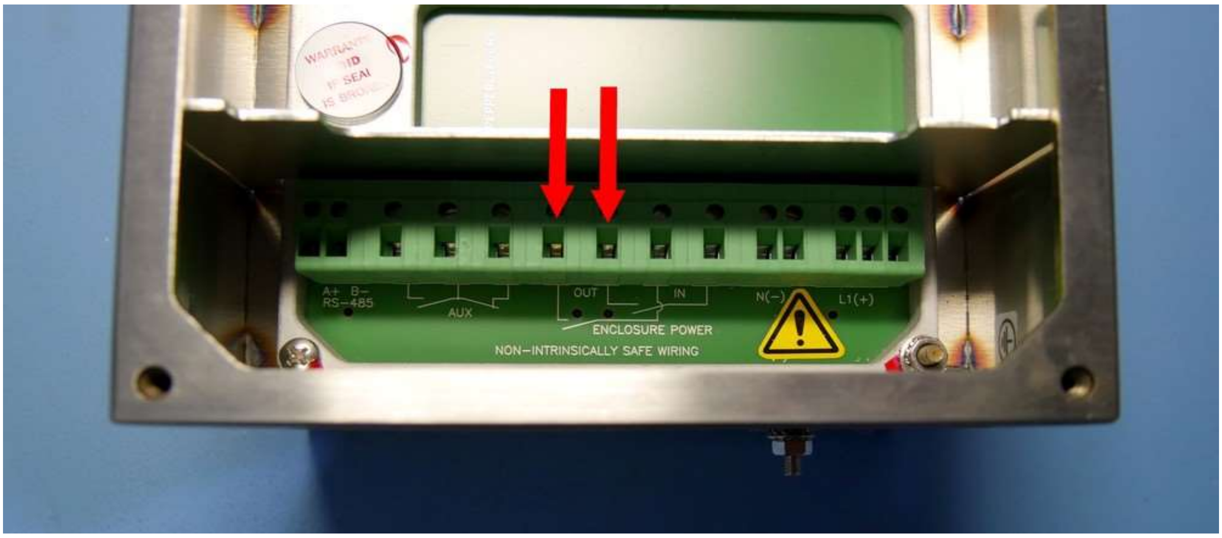


Figure 205. Supply connectors for powering the analyzer.

7. Connect short 2x1mm^2 wire from purging controller internal terminals designated as "L+" and "N-" into another ones of "Enclosure power relay" terminals.

Figure 206. Jumpers placement for powering the main supply switch in purge controller.

8. Connect 3x1mm^2 power cable (8) into purging controller (5) through M16 gland:

Wire number	Cable wire color	6500 controller terminal designation
1	Brown	“L+”
2	Blue	“N-“
3	Yellow/Green	Connect to internal grounding screw

Table 62. 3x1mm2 power cable (8) connection (system 6500).

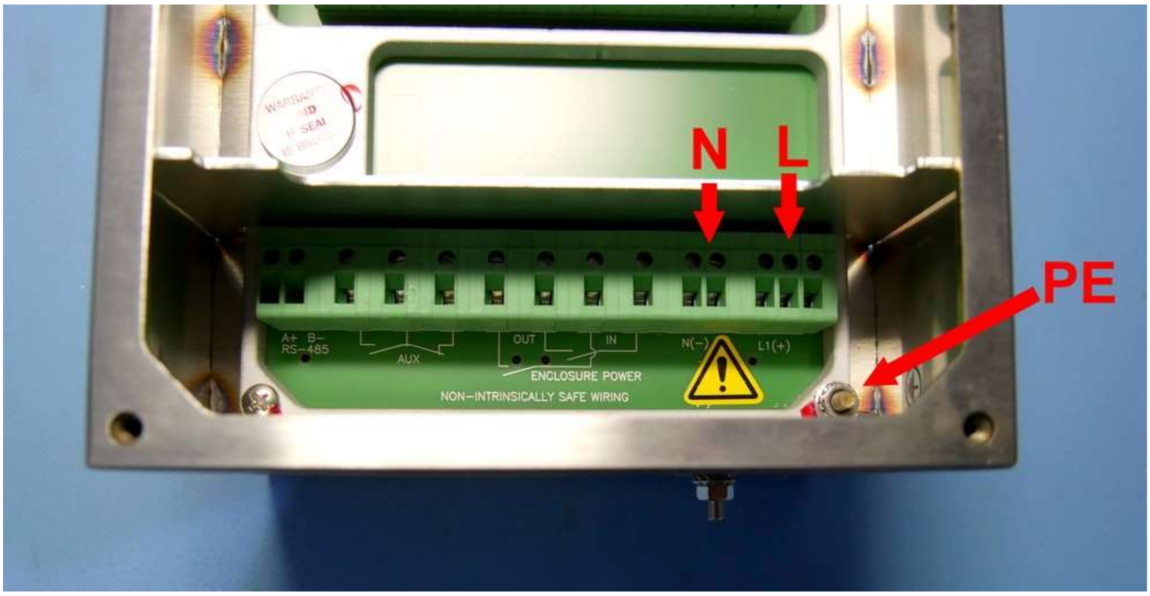


Figure 207. Powering the purge controller.

9. Connect 6mm pipe (16) between GasEye receiver enclosure (2) and GasEye central unit enclosure (1). This pipe should be at least 10m long (and not longer than 50m) to satisfy proper pressure/flow conditions.

10. Connect grounding cable with ring terminal into internal grounding screw inside GasEye central unit enclosure (if using GasEye ‘customer cable’ (4)) or into external grounding screw on GasEye enclosure. Make sure the wing nut is well screwed on.

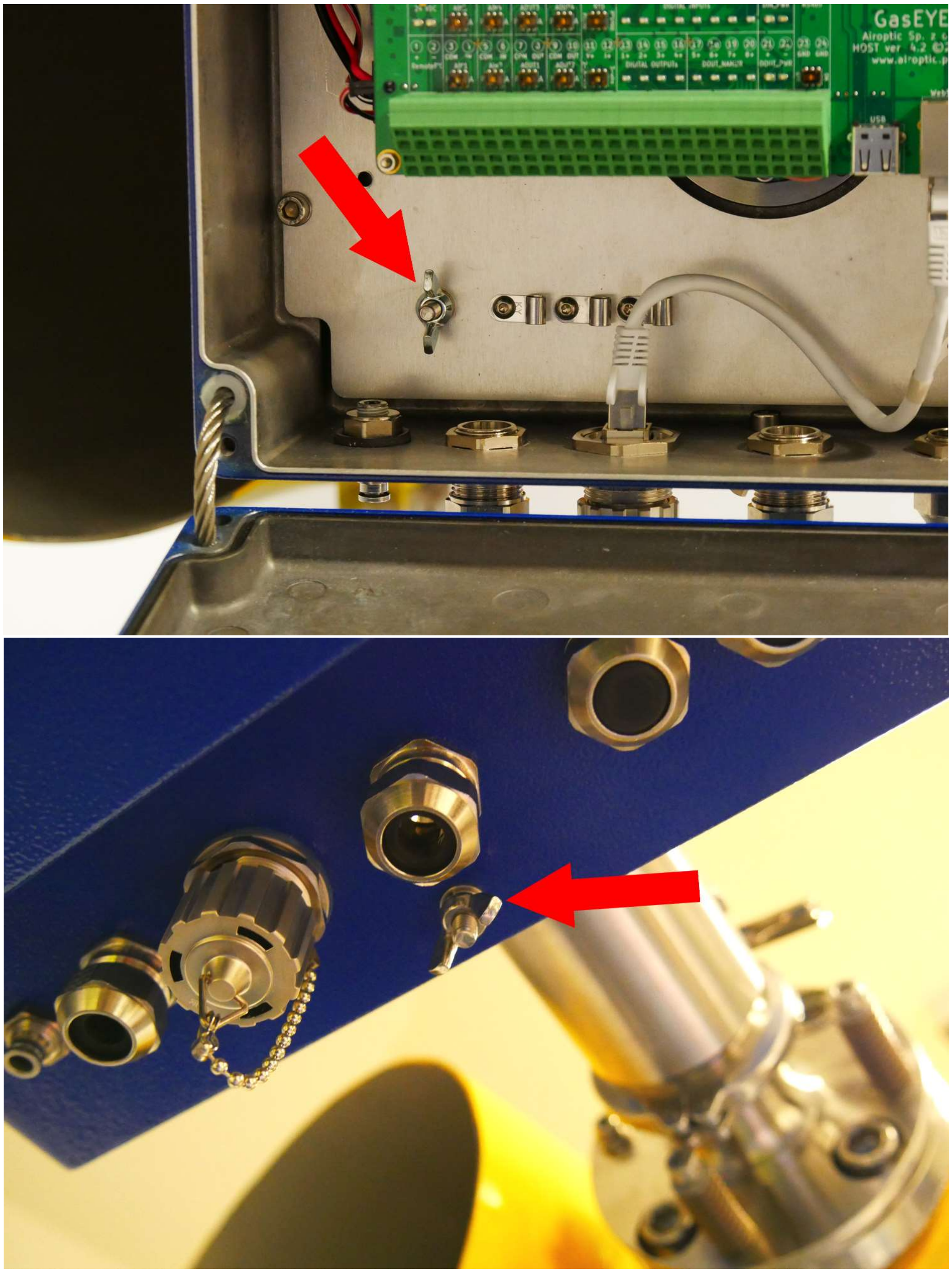


Figure 208. Grounding terminals central unit Single Gas.

11. Close both GasEye and purging system enclosures. Make sure that all of the system glands are well sealed.
12. Make sure the system 24VDC power cable (8) wires are isolated and not directly exposed in the hazardous zone. Energize purging controller (5).
13. Wait for controller to initialize, until there will be visible “Waiting for safe conditions” text on the display. Parameters such as vent pressure, vent flow and purging gas exchange percentage (during purging procedure) can be shown on display by clicking “up” and “down” arrows on controller panel.

WARNING

All purging controller settings are pre-defined by Airoptic and user is not allowed to change them.

14. Start the purging gas flow into 6mm gas input pipe (14) and slowly rise the input pressure to ~1.5bar (observed on inlet pressure manometer (11)) – this pressure should be regulated in range 1.5-2bar to obtain vent pressure reading on the controller display in range of 3-24mbar during purging to ensure proper system work.
    Do not exceed system maximum input pressure of 2 bar.
15. Wait until ‘rapid exchange’ LED on 6500 controller is lit blue (purging process has started).
16. After purging, the GasEye will be powered up and ‘enclosure power’ LED on 6500 controller will be lit green.
17. Power for GasEye system will be interrupted if enclosure overpressure drops below 1.3mbar.

10.9. Zone 1 and 21 purging system installation with GasEye Cross Duct Multi Gas

1. Connect 6mm gas pipe (14) into manifold (7) input. Make sure that there will be no purging gas flow into system, until installation is complete and purging controller is energized.
2. Connect 6mm gas pipe (15) into manifold (7) output and GasEye receiver enclosure (2) gas input (length <3m) with ATEX certified manometer (12) in between (using 6mm tee connector). Make sure that GasEye receiver gas inlets are not sealed with plugs.
3. Install manifold control signal cable (10) into 6500 controller internal terminals through one of the M12 glands.

Wire number	6500 controller terminal designation
1	Connect to grounding screw
2	“DV -“
3	“DV +”

Manifold (7) should be placed on the GasEye receiver side and connected through 3x1mm^2 cable (10) with purging controller (6) placed on the GasEye central unit side. Length of the cable (10) should be less than 50m.

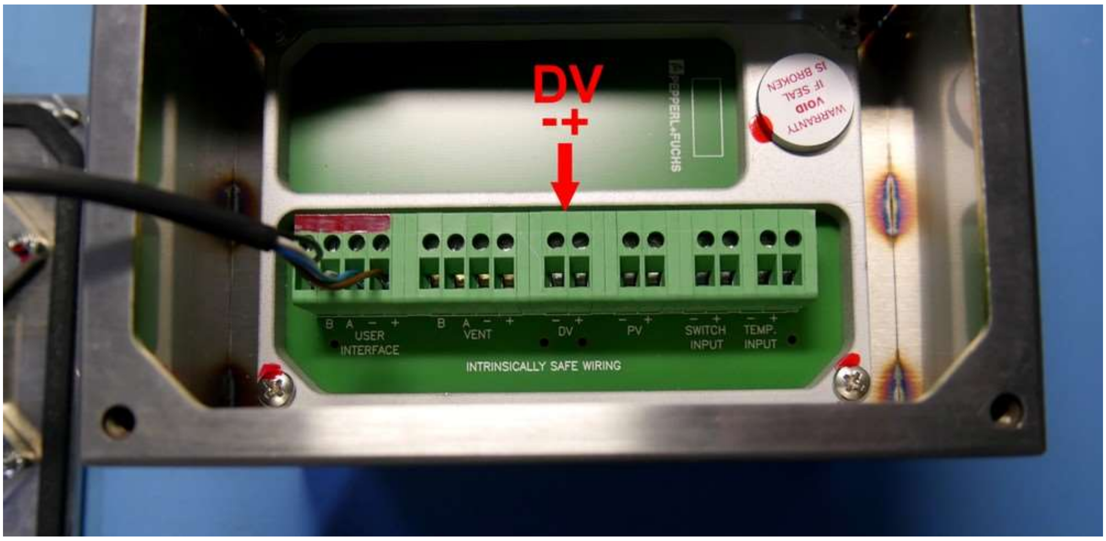


Figure 209. Manifold connectors – controller side.

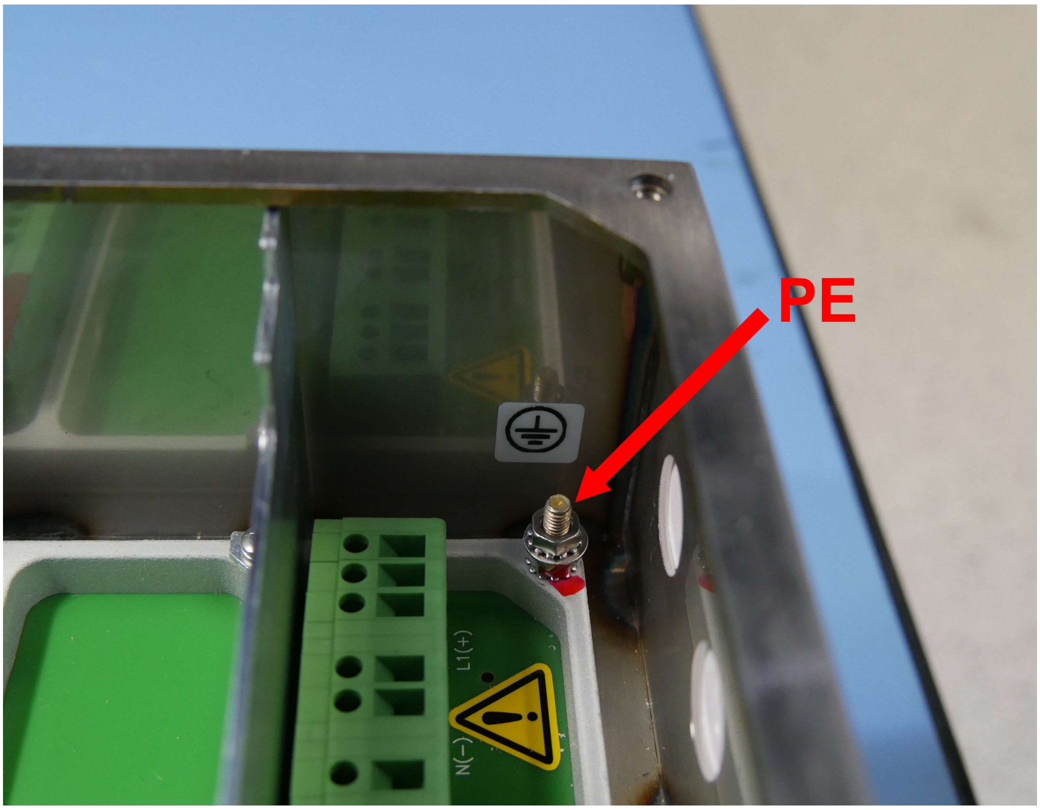


Figure 210. Internal grounding terminal in purge controller.

4. Connect vent pressure and flow signal cable (11) into purging controller (6) through one of the M12 glands. Other end of the cable connects into threaded gland on vent (8).

Wire number	Vent cable wire color	6500 controller terminal designation
1	Brown	“Vent +”
2	Blue	“Vent -“
3	White	“Vent A”
4	Black	“Vent B”
5	Black with ring terminal	Connect to grounding screw

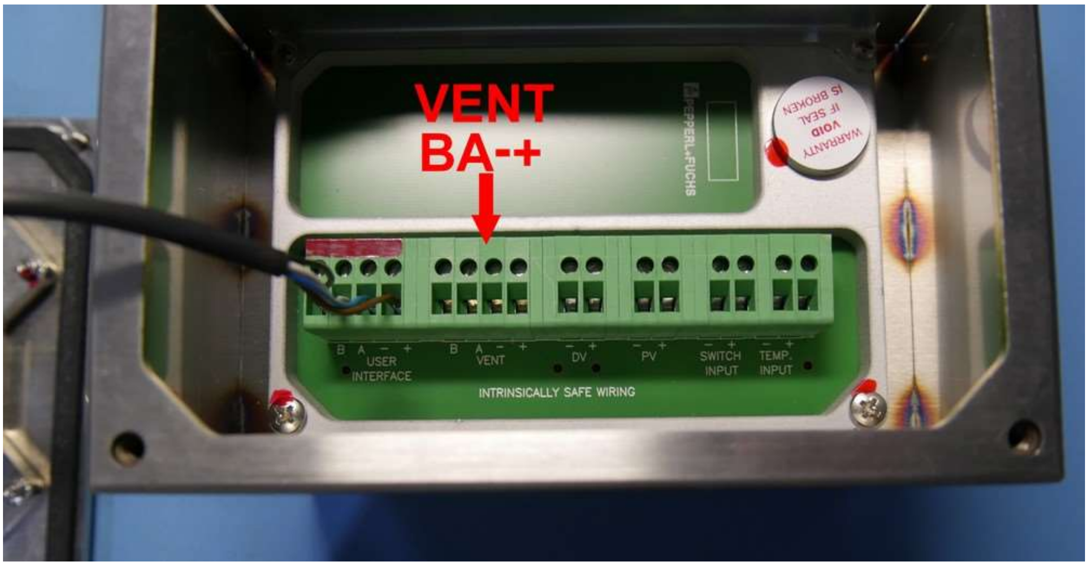


Figure 211. Vent connectors – controller side.

5. Connect 6mm gas pipe (18) into vent enclosure (8) gas input and GasEye central unit enclosure (3) gas output (length <3m). Make sure that GasEye central unit gas inlets are not sealed with plugs.
6. Connect 3x1mm^2 power cable (13) between 6500-type purging controller (6) (through M16 gland) and GasEye central unit (3). Length of the cable should be <20m.

Wire color	GasEye central unit terminal designation	6500 controller terminal designation
Brown	24 VDC+ (socket number 25 on host board)	"Enclosure power relay" terminal (L+ side)
Blue	24 VDC- (socket number 26 on host board)	"Enclosure power relay" terminal (N- side)
Green/Yellow	Connect to internal grounding screw	Connect to internal grounding screw

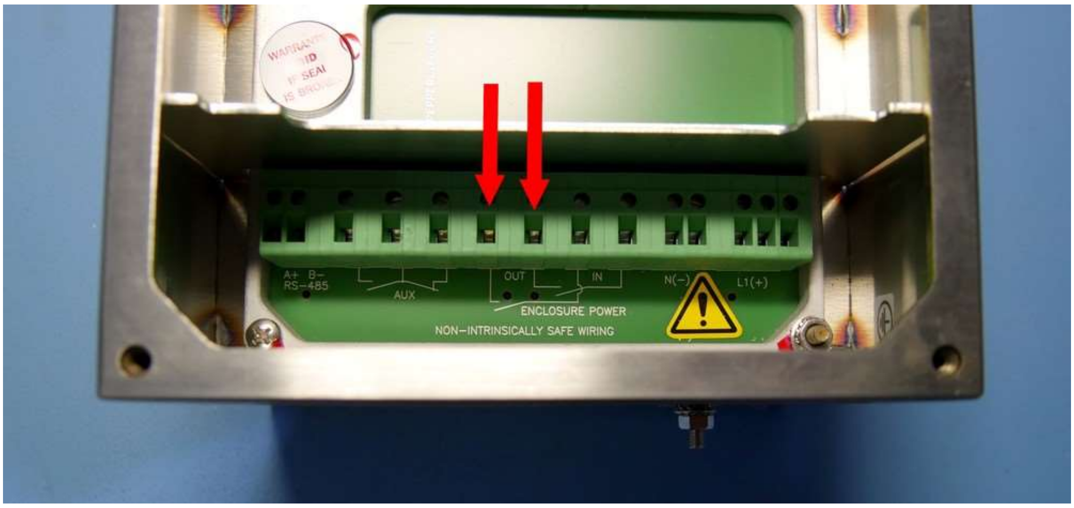


Figure 212. Supply connectors for powering the analyzer.

1. Connect short 2x1mm^2 wire from purging controller internal terminals designated as "L+" and "N-" into another ones of "Enclosure power relay" terminals.

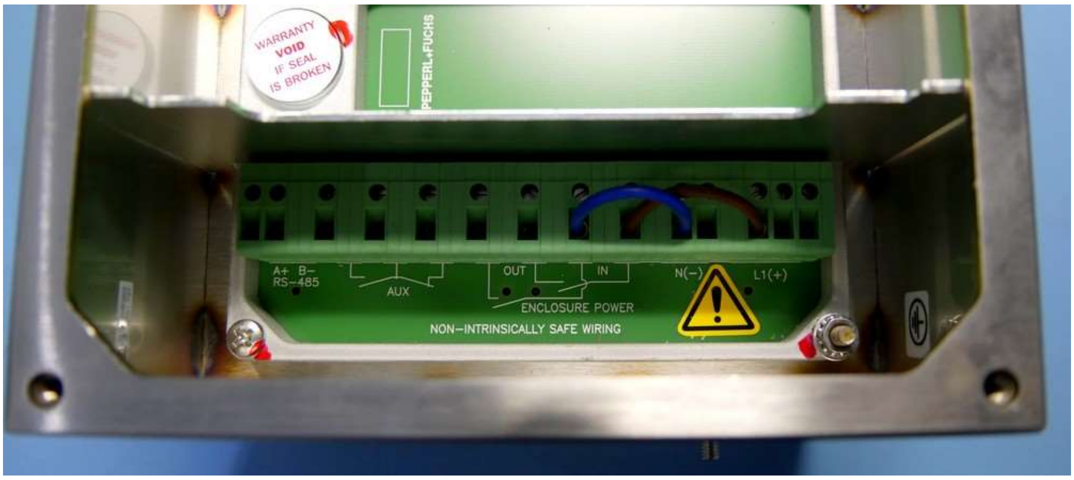


Figure 213. Jumpers placement for powering the main supply switch in purge controller.

8. Connect 3x1mm^2 power cable (9) into purging controller (6) through M16 gland:

Wire number	Cable wire color	6500 controller terminal designation
1	Brown	"L+"
2	Blue	"N-"
3	Yellow/Green	Connect to internal grounding screw

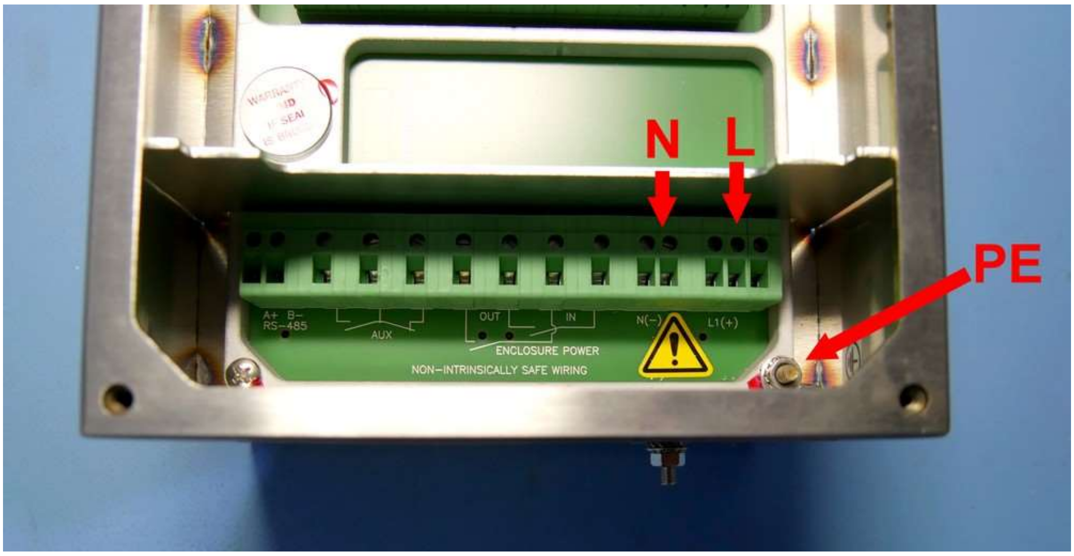


Figure 214. Powering the purge controller.

9. Connect 6mm pipe (16) between GasEye receiver enclosure (2) and GasEye transmitter enclosure (1). This pipe should be at least 10m long (and not longer than 50m) to satisfy proper pressure/flow conditions.
10. Connect 6mm gas pipe (17) between GasEye transmitter enclosure (1) and GasEye central unit (3). This pipe should be shorter than 3m.
11. Connect grounding cable with ring terminal into internal grounding screw inside GasEye central unit enclosure (PE wire from GasEye 'customer cable' (5)). Make sure the wing nut is well screwed on.

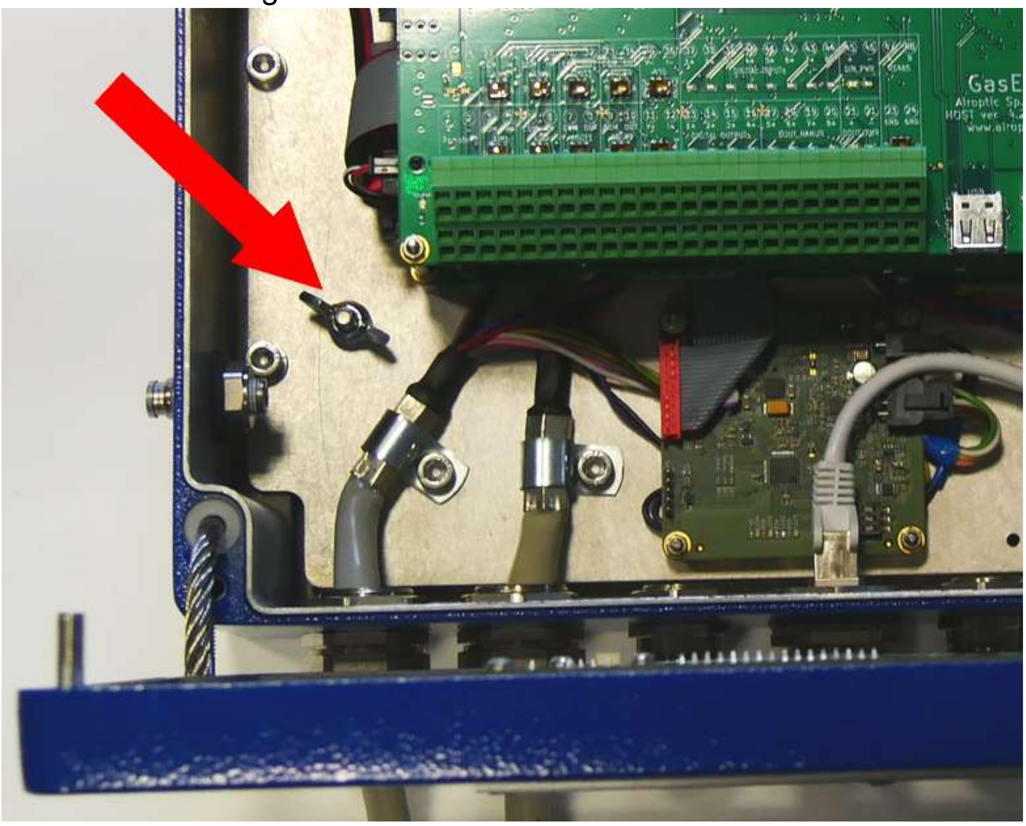


Figure 215 Grounding terminal central unit Multi Gas.

12. Close both GasEye and purging system enclosures. Make sure that all of the system glands are well sealed.
13. Make sure the system 24VDC power cable (9) wires are isolated and not directly exposed in the hazardous zone. Energize purging controller (6).
14. Wait for controller to initialize, until there will be visible “Waiting for safe conditions” text on the display. Parameters such as vent pressure, vent flow and purging gas exchange percentage (during purging procedure) can be shown on display by clicking “up” and “down” arrows on controller panel.

WARNING

All purging controller settings are pre-defined by Airoptic and user is not allowed to change them.

15. Start the purging gas flow into 6mm gas input pipe (14) and slowly rise the input pressure to ~1.5bar (observed on inlet pressure manometer) – this pressure should be regulated in range 1.5-2bar to obtain the vent pressure reading on the controller display in range of 3-24mbar during purging to ensure proper system work.
    Do not exceed system maximum input pressure of 2bar.
16. Wait until ‘rapid exchange’ LED on 6500 controller is lit blue (purging process has started).
17. After purging, the GasEye will be powered up and ‘enclosure power’ LED on 6500 controller will be lit green.
18. Power for GasEye system will be interrupted if enclosure overpressure drops below 1.3mbar.

10.10. Differences between Single Gas and Multi Gas systems

1. Single Gas system has only one laser placed in central unit tube. Multi Gas system has two lasers placed in transmitter enclosure.
2. Single Gas system consists of only receiver and central unit enclosures, main system electronics are placed in transmitter enclosure with laser in its tube. Multi Gas (with two system consists of receiver, transmitter lasers and no other electronics) and central unit enclosure which contains only main electronics and no lasers.
3. Multi Gas system has larger overall internal volume of enclosures to purge (0.016m^3 vs. 0.0131m^3 for Single Gas).
4. Multi Gas system is used to analyze two or more gases which absorption lines wavelengths lies too far to each other to use only one laser. Single Gas system is used to analyze one or more gases which absorption lines wavelengths lies in a spectrum range that can be covered by a single laser module.

10.11. Zone 1 and 21 purging system enclosures mounting

Enclosure of the 6500 controller should be mounted in proximity to GasEye Transmitter and vent enclosure using four M4 screws and spring washers. Holes for screws mounting are placed on the back of the 6500 controller enclosure, see Figure 216.

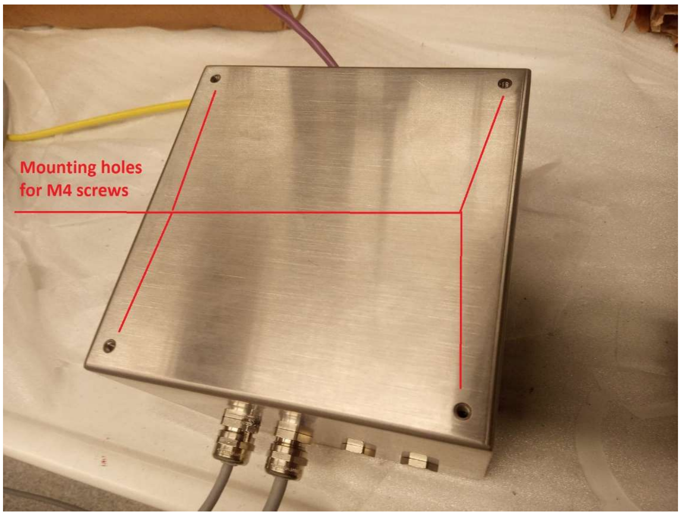


Figure 216. Mounting of the 6500 controller

This enclosure should be mounted in a way that does not block user access to the glands and display. Enclosure must not be exposed to UV light sources and direct sunlight.

Enclosure with vent should be mounted near 6500 controller using four screws. To do this, enclosure lid must be removed. Four M6 screws should be mounted through the enclosure holes, see Figure 217Figure 217. Vent enclosure should be mounted in a way that does not block flow of the gas through the vent's spark arrestor (metal cap with mesh). The enclosure lid must be mounted back afterwards.

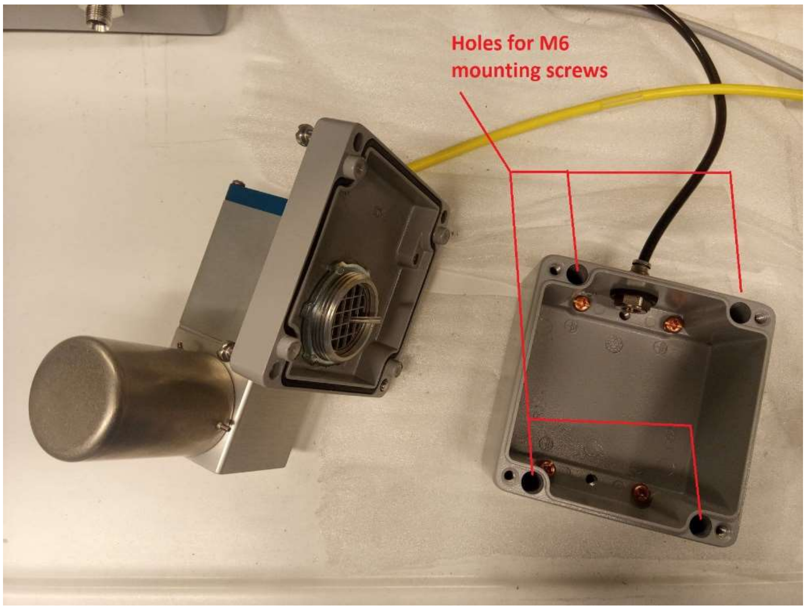


Figure 217. Mounting of the vent box.

Manifold should be mounted near GasEye receiver using four kit-included screws (1/4"-20, 316 stainless steel) in a way that does not block user access to gas inlet and outlet and also to the needle valve regulation screw, see Figure 218.

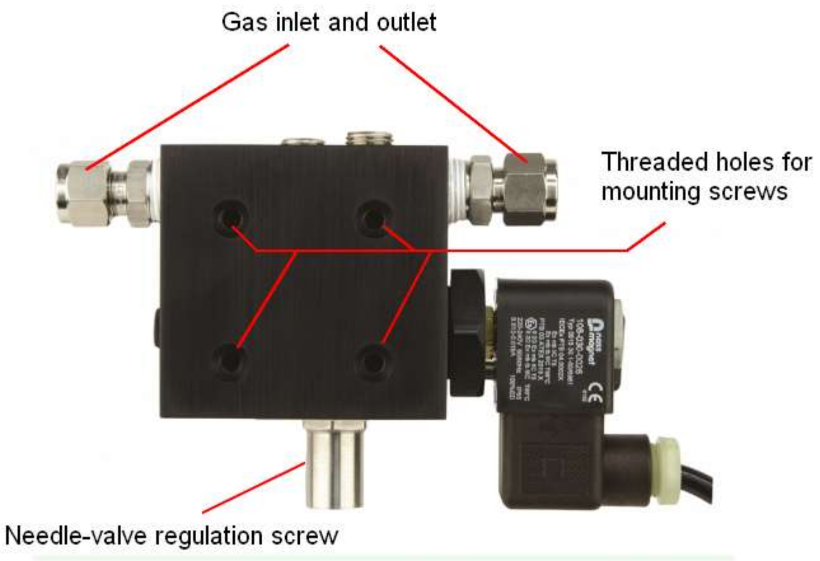


Figure 218. Manifold mounting holes.

10.12. Zone 1 and 21 purging system adjustment possibilities

6500-type purging systems are supplied by Airoptic with already configured software and hardware settings. However, some parameters can be adjusted by the user, those are:

- Inlet gas pressure

  User must supply regulated pressure gas source into manifold inlet. Pressure must not exceed 2bar. This pressure must be regulated to the value that gives the vent pressure reading on controller display of range 3-24mbar (during purging).

- Average gas flow rate after purging

  During purging procedure, 6500 controller opens solenoid valve in manifold completely, increasing gas flow through the system. After respective purging time there is no need to purge more so the solenoid valve is being closed and gas flows only through a needle valve which level of opening can be adjusted by the user after purging (special key is included in the kit).
  This adjustment regulates average value of the gas flow. If the needle valve is opened more, the flow is greater and compensation for system leakages is better, although the consumption of the gas will be greater too – even more than 10l/min. If the needle valve is rather closed, pressure at the vent may not raise above safe value (1.3mbar) and the power for GasEye system will be then interrupted.
  This needle valve is pre-adjusted by Airoptic - however, it is recommended to slowly adjust this needle valve to obtain vent pressure reading above ~2.5mbar (gives optimal gas consumption – around 7l/min).

WARNING
Customer is not allowed to change any other purging system settings nor replace any hardware element

10.13. System pressurization failure alarm

If pressurization failure of the enclosures occurs, power to the GasEye is cut-off by the 6500 purging controller. At the same time, auxiliary contacts of 6500 controller (AUX) are switched on when pressurization is too low. Those contacts can be used to generate additional alarms signals or switching. To use it properly, additional M12, stainless-steel gland must be installed near the AUX contacts:

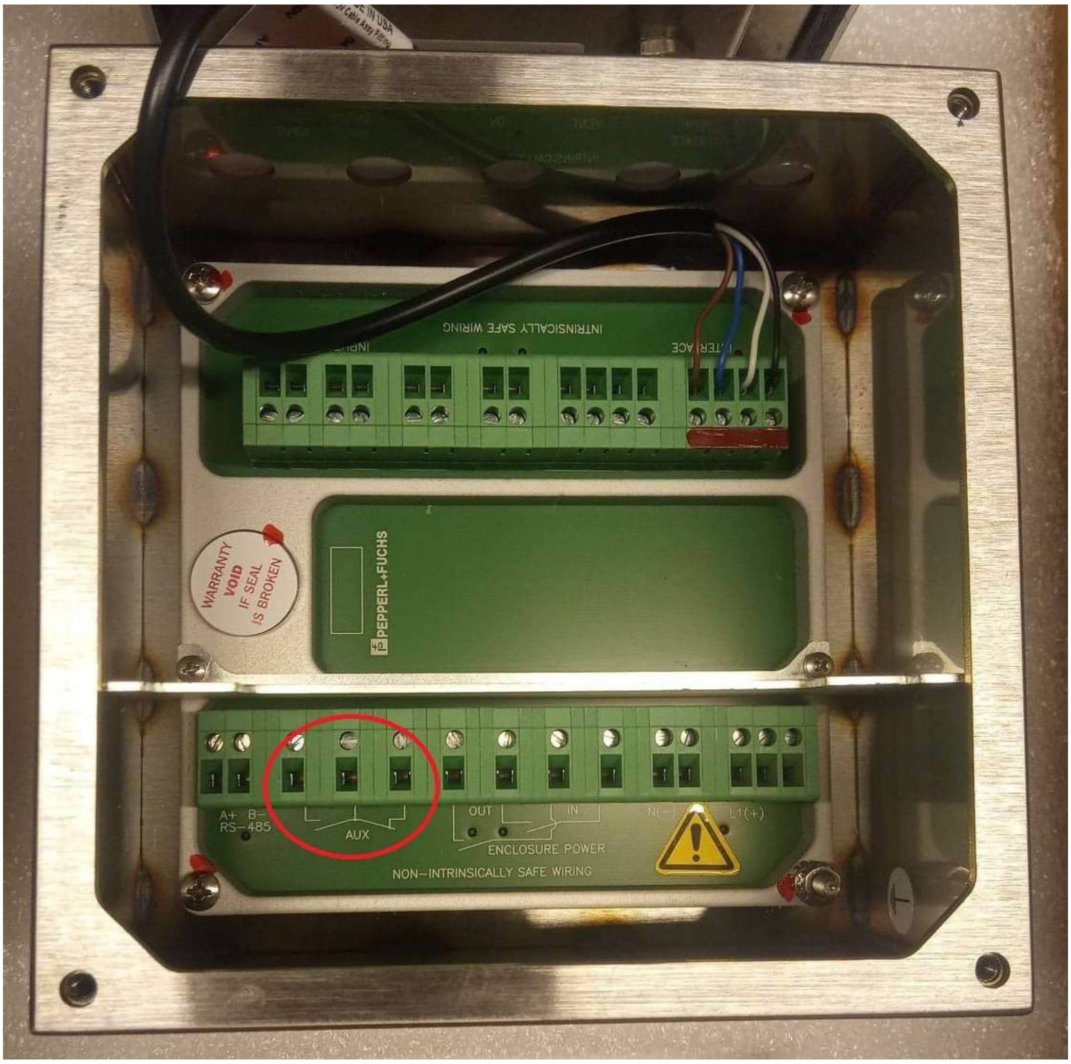


Figure 219. Alarm terminals for pressurization failure.

When alarm occurs, AUX contacts are energized and switched other way than visible on the picture above (white schematic lines on PCB).

Airoptic Sp. z o.o. supplies purging system controller without any connection to the auxiliary contacts nor dedicated gland installed.

10.14. System electrical connections - intrinsic safety warnings

Even though power to the GasEye analyser is cut-off by the purging controller (in case of pressurization loss), not all electrical connections that customer is supplying to the system are safe (intrinsically safe). Those are:

- Externally powered analog or digital connections to analyser (through Airoptic's 'customer cable')
- Externally powered ethernet communication cable
- Externally powered Modbus communication cable
- Externally powered ProfiNet communication cable
- Externally powered Profibus communication cable

Those and all other electrical non-intrinsically safe connections with GasEye analyser that are powered other way than through the 6500 purge controller, must be cut-off when pressurization failure occurs to ensure safety.

WARNING
All non-intrinsically safe connections with GasEye analyzer that are powered other way than through the 6500 purge controller, must be cut-off when pressurization failure occurs to ensure safety.

To do this, auxiliary (AUX) alarm contacts in purging controller could be used, e.g. to control a switch to cut-off all non-intrinsically safe, externally powered electrical connections to the GasEye analyser.

We recommend that in case neither a switch nor intrinsically safe connection can be used, customer should choose to use active analog input and output settings on the GasEye analyser as they will be switched off by the purge controller. Similarly, digital output should be powered from the same 24VDC provided to power the GasEye (i.e. from 6500 purge controller).

10.15. System conservation for zone 1 and 21

In order to insure safe and convenient operating conditions of 6500-type purging system, subsequent requirements must be satisfied:

- Inlet pressure of the gas must not exceed 2 bar
- Vent pressure reading on the controller display must not exceed 24mbar.
- An ATEX certified manometer should be installed right after solenoid valve for inlet pressure monitoring
- Temperature of the inlet gas must not exceed 40°C
- External parts made of plastic should be cleaned with a damp cloth, with the addition of antistatic fluids
- All metal parts of the system must be grounded
- System must not be exposed to UV light sources and direct sunlight
- When servicing, installing, and commissioning, the area must be free of all combustible material and/or hazardous explosive gas
- Only the terminal compartment of the control unit is accessible to users. Under no circumstances shall the control unit, manifold or vent be dismantled or removed from the supplied enclosure
- In case of any system failure, please contact Airoptic Sp. z o.o.

10.16. Contact information

Airoptic Sp. z o.o.
ul. Rubiez 46B
61-612 Poznan, Poland

info@airoptic.pl
www.airoptic.pl

tel. +48 61 6272128
fax.+48 61 6272129

11. IECEx (Zone 2 and 22 purging system installation)

The GasEye Cross Duct can be operated in Zone 2 and 22 and provide the optical radiation to Zone 2 and 22 per mark Ex op is pzc IIC T6 Gc and Ex op is pzc IIIB T85°C Dc.

Any other ways of using the GasEye Cross Duct are forbidden.

11.1. Basic requirements and safe use

The manufacturer will not be liable for damage resulting from incorrect installation, failure to maintain the device in a suitably functional condition, or use of the device other than for its intended purpose.

Installation should be carried out by qualified personnel having the necessary authorization to install electrical and pressure measuring devices. The installer is responsible for performing the installation in accordance with these instructions and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation.

The device should be configured appropriately for the purpose for which it is to be used. Incorrect configuration may cause erroneous functioning, leading to damage to the device or an accident.

Installation of device should be performed with particular care, in accordance with the regulations and standards applicable to that type of installation.

The general rules for connecting and using pressurized enclosure should conform to the rules and standards for equipment with Ex p as specified in:

- IEC 60079-14: Explosive atmospheres. Electrical installations design, selection and erection.
- IEC 60079-17: Explosive atmospheres. Electrical installations inspection and maintenance.

The GasEye is designed and manufactured in accordance with following standards:

- IEC 60079-0(Ed.7.0);
- IEC 60079-2 (Ed.6.0);
- IEC 60079-28 (Ed.2).

WARNING
Never install GasEye Cross Duct system in the hazardous zone without permission of the plant manager (hot work permit). Death, personal injury and/or damage to property may result if this is not complied.

WARNING
Observe the specifications of the examination certificate valid in your country. Observe the laws and regulations valid in your country for the electric installation in hazardous areas with risk of explosion. Regulations for installation of electric equipment in hazardous areas: DIN EN 60079-14.

WARNING
Never switch on or operate an analyzer with lid open. Before opening the device wait at least two minutes after de-energizing. Make sure that externally powered signals are also be de-energized. For secure disconnection of all signals the device should be operated in hazardous areas only via a switch-off unit placed outside the hazardous area.

WARNING
Never repair the device on site! Any components not mentioned in the spare parts list must be replaced or repaired by certified field service technicians. Failure to do so will also result in loss of Ex approval.

WARNING
The use of the alignment kit for aligning the sensors is not covered by the ATEX certificate. Never use the kit in the Ex zone without permission of the plant manager (hot work permit).

Information about possible Ex use can be found on a label located on the device enclosure.

11.2. IECEx Marking

Ex op is pzc IIC T6 Gc
Ex op is pzc IIIB T85°C Dc
IECEx KDB 19.0004X

11.3. Special conditions for safe use

- External parts made of plastic should be cleaned with a damp cloth, with the addition of antistatic fluids.
- Enclosure should be installed in a way that prevents electrostatic charging, in accordance with the instructions.
- Maximum inlet pressure to the containment system should not exceed 2 bar.
- System power must not be restored after the enclosure has been opened until combustible gas/dust accumulations within the enclosure have been removed

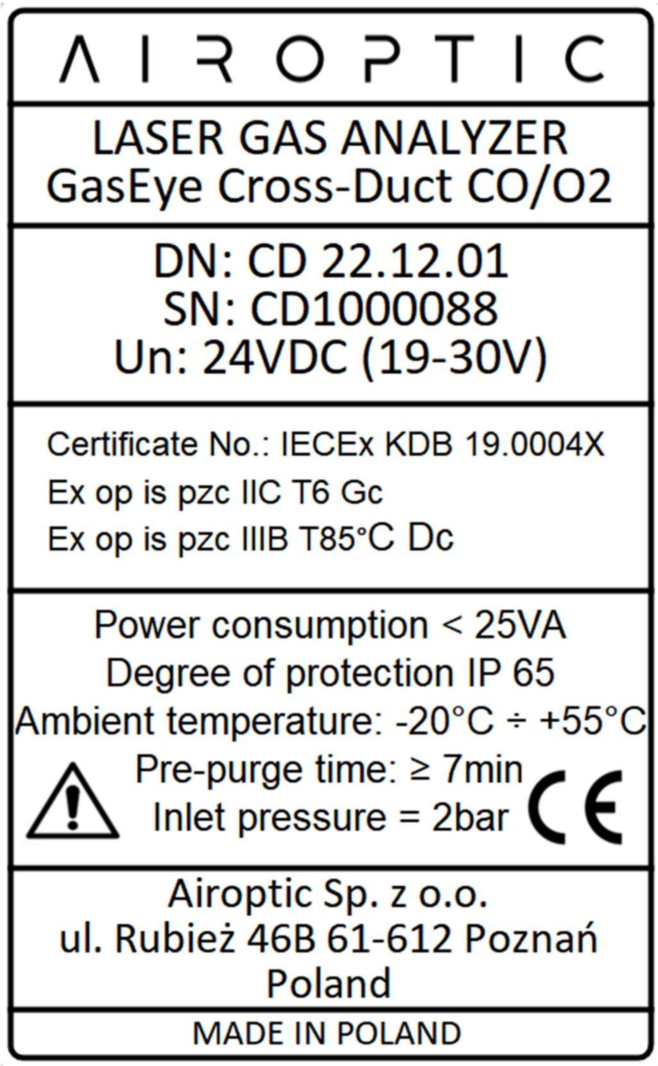


Figure 220. Gas analyzer identification plate – IECEx 2/22.

11.4. Overview of zone 2 and 22 purging system for GasEye Cross Duct Single Gas

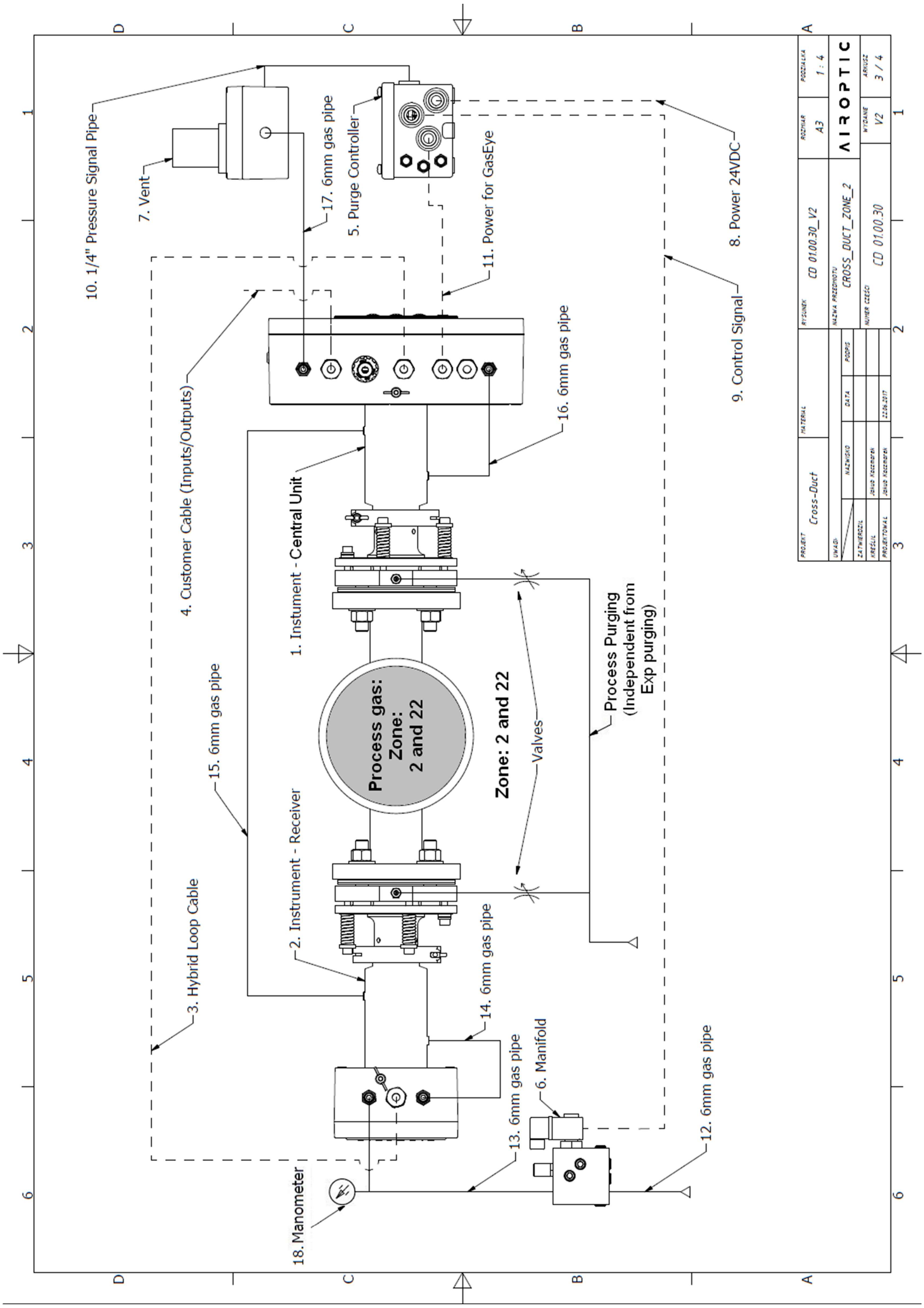


Figure 221. Overview of purging system installation with GasEye Cross Duct Single Gas in Zone 2.

Number	Description	Additional information
1	GasEye Cross-Duct Single Gas central unit enclosure and tube	-
2	GasEye Cross-Duct Single Gas receiver enclosure and tube	-
3	Hybrid loop cable	-
4	Customer cable (analog/digital inputs/outputs)	-
5	5500-SS-E-VDC-PBC-LBC purging controller	-
6	5500-MAN-EX01-24VDC manifold	-
7	EPV-5500-SS-03 vent with enclosure	-
8	3x1.5mm2 cable (external power supply for complete system)	Required power supply: 24V/1.5A. Length is customer-dependent (customer must ensure nominal supply voltage on system power supply input)
9	3x1mm2 manifold control signal cable (power for manifold switched by 5500 controller)	Standard 2m, up to 100m
10	1/4" pressure signal pipe (for vent pressure control)	Standard 2m
11	3x1.5mm2 cable (power for GasEye switched by 5500 controller)	Standard 2m, up to 30m
12	6mm gas pipe (purging gas input into manifold)	Length is customer-dependent (customer must ensure pressure of at least 1.5 barg at the manifold input)
13	6mm gas pipe (from manifold output to GasEye receiver enclosure gas input)	Length should be minimum 0.4 m to maximum 5 m
14	6mm gas pipe (between receiver enclosure and tube)	Length should be minimum 0.4 m to maximum 1 m
15	6mm gas pipe (between receiver tube and transmitter tube)	Length should be minimum 1 m to maximum 100 m
16	6mm gas pipe (between transmitter tube and enclosure)	Length should be minimum 0.4 m to maximum 1 m
17	6 mm gas pipe (from GasEye transmitter enclosure gas output to vent enclosure gas input)	Length should be minimum 0.4 m to maximum 5 m
18	Pressure indicator (atex manometer)	Input pressure indication

Table 63. Description of IECEx Zone 2/22 purging system for GasEye Cross Duct Single Gas.

Purging gas flow direction:

Purging gas source -> 6 mm gas input pipe **(12)** -> Manifold **(6)** ->6mm gas pipe **(13)** -> GasEye receiver enclosure **(2)** -> 6mm gas pipe **(14)** -> GasEye receiver tube **(2)** -> 6mm gas pipe **(15)** -> GasEye transmitter tube **(1)** -> 6mm gas pipe **(16)** -> GasEye transmitter enclosure **(1)** -> 6mm gas pipe **(17)** -> Vent with enclosure **(7)** -> Exhaust/ambient air

Additionally, purging gas pressure is measured through 1/4" gas pipe **(10)** connected to pressure control input on purging controller.

11.5. Overview of zone 2 and 22 purging system of GasEye Cross Duct Multi Gas

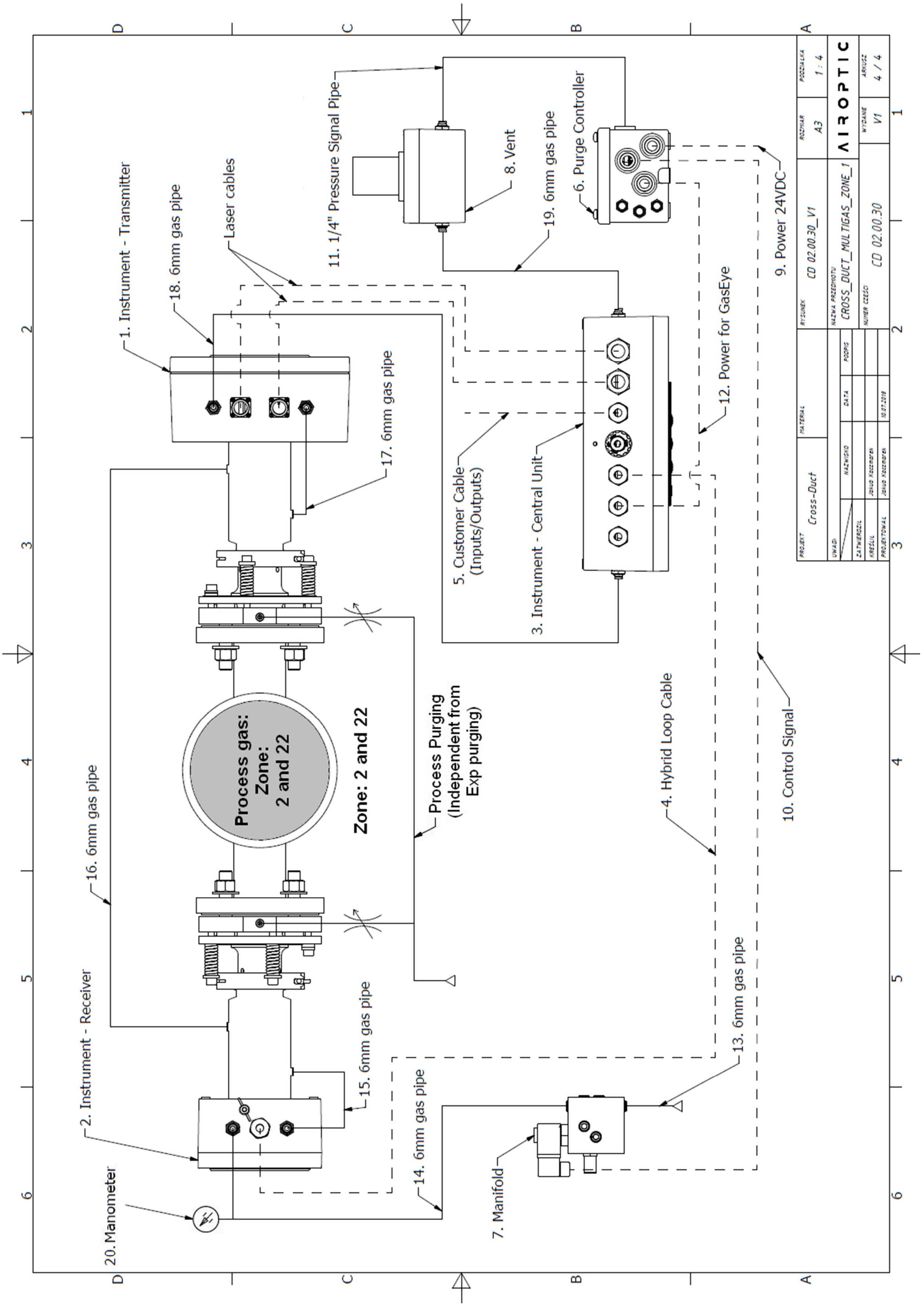


Figure 222. Overview of purging system installation with GasEye Cross Duct Multi Gas.

Number	Description	Additional information
1	GasEye Cross-Duct Multi Gas transmitter enclosure and tube	-
2	GasEye Cross-Duct Multi Gas receiver enclosure and tube	-
3	GasEye Cross-Duct Multi Gas central unit enclosure	-
4	Hybrid loop cable	-
5	Customer cable (analog/digital inputs/outputs)	-
6	5500-SS-E-VDC-PBC-LBC purging controller	-
7	5500-MAN-EX01-24VDC manifold	-
8	EPV-5500-SS-03 vent with enclosure	-
9	3x1.5mm2 cable (external power supply for complete system)	Required power supply: 24V/1.5A. Length is customer-dependent (customer must ensure nominal supply voltage on system power supply input)
10	3x1mm2 manifold control signal cable (power for manifold switched by 5500 controller)	Standard 2m, up to 100m
11	1/4" pressure signal pipe (for vent pressure control)	Standard 2m
12	3x1.5mm2 cable (power for GasEye switched by 5500 controller)	Standard 2m, up to 30m
13	6mm gas pipe (purging gas input into manifold)	Length is customer-dependent (customer must ensure pressure of at least 1.5barg at the manifold input)
14	6mm gas pipe (from manifold output to GasEye receiver enclosure gas input)	Length should be minimum 0.3 m to maximum 3 m
15	6mm gas pipe (between receiver enclosure and tube)	Length should be minimum 0.4 m to maximum 1 m
16	6mm gas pipe (between receiver tube and transmitter tube)	Length should be minimum 1 m to maximum 100 m
17	6mm gas pipe (between transmitter tube and enclosure)	Length should be minimum 0.4 m to maximum 1 m
18	6mm gas pipe (between transmitter enclosure and central unit enclosure)	Length should be minimum 0.3 m to maximum 3 m
19	6 mm gas pipe (from GasEye central unit enclosure gas output to vent enclosure gas input)	Length should be minimum 0.3 m to maximum 3 m
20	Pressure indicator (ATEX manometer)	Input pressure indication

Table 64. Description of IECEx Zone 2/22 purging system for GasEye Cross Duct Single Gas.

Purging gas flow direction:

Purging gas source -> 6 mm gas input pipe **(13)** -> Manifold **(7)** -> 6mm gas pipe **(14)** -> GasEye receiver enclosure **(2)** -> 6mm gas pipe **(15)** -> GasEye receiver tube **(2)** -> 6mm gas pipe **(16)** -> GasEye transmitter tube **(1)** -> 6mm gas pipe **(17)** -> GasEye transmitter enclosure **(1)** -> 6mm gas pipe **(18)** -> GasEye central unit enclosure **(3)** -> 6mm gas pipe **(19)** -> Vent with enclosure **(8)** -> Exhaust/ambient air

Additionally, purging gas pressure is measured through 1/4" gas pipe **(11)** connected to pressure control input on purging controller.

11.6. Technical parameters

- Power input:	Un = 24VDC
- Power consumption:	< 20VA
- Degree of protection:	IP 65
- Ambient temperature:	-20°C ÷ +55°C
- Pre-purge time (both systems):	7 min.
- Inlet pressure:	2 bar
- Minimal pressure:	not less than 1.3 mbar during continuous system work after initial purging.

DECLARATION
Minimum cross-sectional area of PE conductors is the same as phase conductors or more.

DECLARATION
Bonding conductor connection allows to the effective connection of at least one conductor with a cross-sectional area of at least 4mm2

11.7. Zone 2 and 22 purging system installation with GasEye Cross-Duct Single Gas

1. Connect 6 mm gas pipe (12) into manifold (6) input. Make sure that there will be no purging gas flow into system, until installation is complete and purging controller is energized.
2. Connect 6mm gas pipe (13) into manifold (6) output and GasEye receiver enclosure (2) gas input with ATEX certified manometer (18) in between (using 6mm tee connector). Make sure that GasEye receiver gas inlets are not sealed with plugs.
3. Install manifold control signal cable (9) into 5500 controller internal terminals through one of the M20 glands.

   Manifold (6) should be placed on the GasEye receiver side and connected through 3x1mm2 control signal cable (9) with purging controller (5) placed on the GasEye central unit side. Length of the cable (9) should be less than 100m

Wire number	Manifold control signal cable wire color	5500 controller terminal designation
1	Brown	“SV”
2	Blue	“-“
3	Green/Yellow	Connect to grounding screw

Table 65. Manifold control signal cable installation (system 5500).

4. Connect 1/4" pressure signal pipe (10) into “enclosure pressure control” input in purging controller (5). Other end of the pipe connects into threaded output on vent enclosure (7).
5. Connect 6mm gas pipe (17) into vent enclosure (7) input and GasEye central unit enclosure (1) gas output. Make sure that GasEye central unit gas inlets are not sealed with plugs.
6. Connect 3x1.5mm2 cable (11) between 5500-type purging controller (5) (through M20 gland) and GasEye central unit (1). Length of the cable should be <30m.

Wire color	GasEye transmitter terminal designation	5500 controller terminal designation
Brown	24 VDC+ (socket number 25 on host board)	“K1 NO”
Blue	24 VDC- (socket number 26 on host board)	“-“
Green/Yellow	Connect to internal grounding screw	Connect to internal grounding screw

Table 66. 3x1.5mm2 cable connection (system 5500).

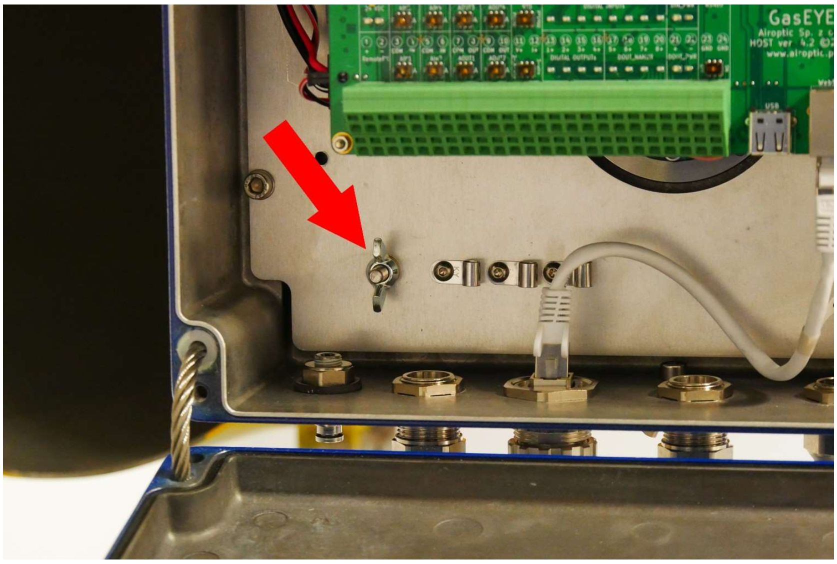
7. Connect short 1x1.5mm2 wire between purging controller internal terminals designated as “+” and “K1 NO”.

8. Connect 3x1.5mm2 cable (8) into purging controller (5) through M20 gland.

Wire number	Cable wire color	5500 controller terminal designation
1	Brown	"+"
2	Blue	"-"
3	Yellow/Green	Connect to internal grounding screw

Table 67. 2x1.5mm2 cable connection (system 5500).

9. Connect short 6mm pipe (14) between GasEye receiver enclosure and tube (2).
10. Connect short 6mm pipe (16) between GasEye central unit enclosure and tube (1).
11. Connect 6mm pipe (15) between GasEye receiver tube (2) and GasEye central unit tube (1).
12. Additional grounding wire may be connected into external grounding screw on GasEye enclosure. Make sure the wing nut is well screwed on



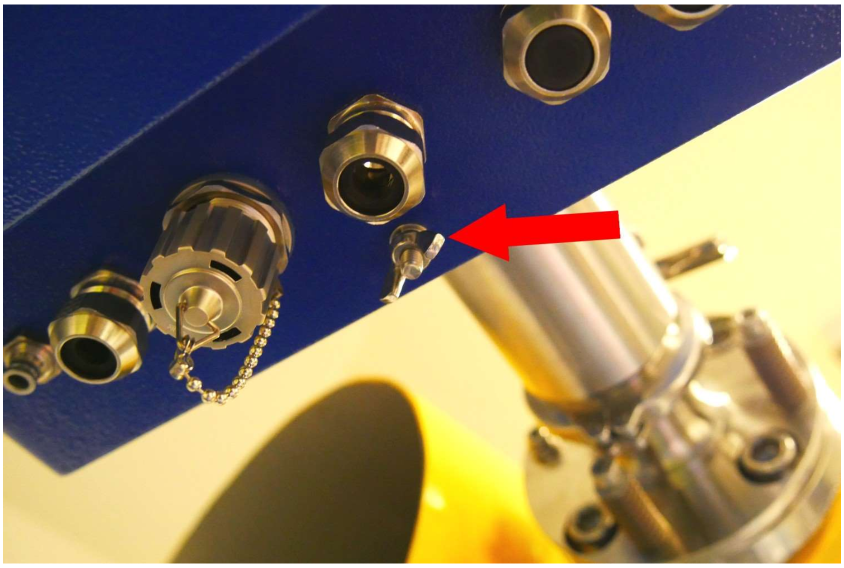


Figure 223. Grounding terminals central unit Single Gas.

13. Close both GasEye and purging system enclosures. Make sure that all of the system glands are well sealed.
14. Make sure that the gas source is NOT connected into 6 mm gas input, before next step.
15. Make sure the system 24VDC power cable (8) wires are isolated and not directly exposed in the hazardous zone.
16. Energize the purging controller (5) by connecting external power supply (24VDC / 1.5A) into supply cable (8).
17. Get into parameters menu on purging controller by holding "SET" button and enter the password "0000" by pushing "SET" button. Make sure that corresponding parameters on purging controller menu are set as follows before executing next step:

    - P1 pressure: 0.7 mbar / 0.3 in/H2O
    - P2 pressure: 1.3 mbar / 0.52 in/H2O
    - P3 pressure: 2.0 mbar / 0.8 in/H2O
    - P4 pressure: 10 mbar / 4.0 in/H2O
    - Leakage HYST: 0.5 mbar / 0.2 in/H2O
    - Purging Time: 7 min
    - Purge Program: Program 3
    - Other parameters: default

18. Set the "working" state on the purging controller menu by holding the "SET" button. "On work!" text will be visible on the display. After that, the display will show actual pressure difference between enclosure and ambience air.
19. Connect the purging gas source (with regulated pressure) into 6 mm gas input pipe (12) and slowly rise the input pressure to about 1.7 bar(g). Do not exceed system maximum input pressure (2 bar(g)).

20. Differential pressure on controller display should rise above P3 pressure and purge timer will start counting.
21. After purging, the GasEye will be powered up and differential pressure will be kept between P2 and P4 pressure. Slow oscillations of manifold may be noticed.
22. Power for GasEye system will be interrupted if differential pressure in enclosure drops below P1 pressure.

11.8. Zone 2 and 22 purging system installation with GasEye Cross-Duct Multi Gas

1. Connect 6 mm gas pipe (13) into manifold (7) input. Make sure that there will be no purging gas flow into system, until installation is complete and purging controller is energized.
2. Connect 6mm gas pipe (14) into manifold (7) output and GasEye receiver enclosure (2) gas input with ATEX certified manometer (20) in between (using 6mm tee connector). Make sure that GasEye receiver gas inlets are not sealed with plugs.
3. Install manifold control signal cable (10) into 5500 controller internal terminals through one of the M20 glands.

   Manifold (7) should be placed on the GasEye receiver side and connected through 3x1mm2 control signal cable (10) with purging controller (6) placed on the GasEye central unit side.

Wire number	Solenoid valve's cable wire color	5500 controller terminal designation
1	Brown	"SV"
2	Blue	"-"
3	Green/Yellow	Connect to grounding screw

4. Connect 1/4" pressure signal pipe (11) into "enclosure pressure control" input in purging controller (6). Other end of the pipe connects into threaded output on vent enclosure (8).
5. Connect 6mm gas pipe (19) into vent enclosure (8) input and GasEye central unit enclosure (3) gas output. Make sure that GasEye central unit gas inlets are not sealed with plugs.
6. Connect 3x1.5mm2 cable (12) between 5500-type purging controller (6) (through M20 gland) and GasEye central unit (3). Length of the cable should be <30m.

Wire color	GasEye central unit terminal designation	5500 controller terminal designation
Brown	24 VDC+ (socket number 25 on host board)	“K1 NO”
Blue	24 VDC- (socket number 26 on host board)	“-“
Green/Yellow	Connect to internal grounding screw	Connect to internal grounding screw

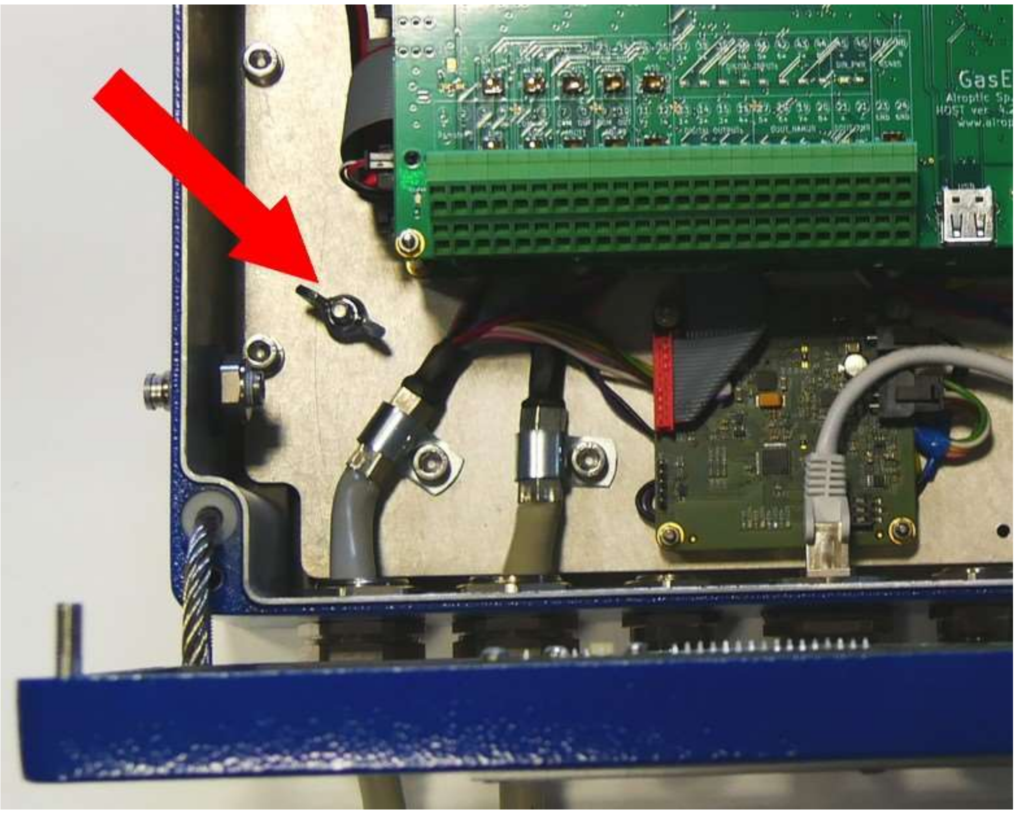


Figure 224. Grounding terminal Central Unit Multi Gas.

7. Connect short 1x1.5mm2 wire between purging controller’s internal terminals designated as “+” and “K1 NO”.
8. Connect 3x1.5mm2 cable (9) into purging controller (6) through M20 gland:

Wire number	Cable wire color	5500 controller terminal designation
1	Brown	“+”
2	Blue	“-“
3	Yellow/Green	Connect to internal grounding screw

9. Connect 6mm pipe (15) between GasEye receiver enclosure and tube (2).
10. Connect 6mm pipe (17) between GasEye transmitter enclosure and tube (1).
11. Connect 6mm pipe (16) between GasEye receiver tube (2) and GasEye transmitter tube (1).

12. Connect 6mm pipe (18) between GasEye transmitter enclosure (1) and GasEye central unit (3).
13. Close both GasEye and purging system enclosures. Make sure that all of the system glands are well sealed.
14. Make sure that the gas source is NOT connected into 6 mm gas input pipe, before next step.
15. Make sure the system 24VDC power cable (9) wires are isolated and not directly exposed in the hazardous zone.
16. Energize purging controller (6) by connecting external power supply (24VDC / 1.5A) into supply cable (9).
17. Get into parameters menu on purging controller by holding “SET” button and enter the password “0000” by pushing “SET” button. Make sure that corresponding parameters on purging controller menu are set as follows before executing next step:

    - P1 pressure: 0.7 mbar / 0.3 in/H2O
    - P2 pressure: 1.3 mbar / 0.52 in/H2O
    - P3 pressure: 2.0 mbar / 0.8 in/H2O
    - P4 pressure: 10 mbar / 4.0 in/H2O
    - Leakage HYST: 0.5 mbar / 0.2 in/H2O
    - Purging Time: 7 min
    - Purge Program: Program 3
    - Other parameters: default

18. Set the “working” state on the purging controller menu by holding the “SET” button. “On work!” text will be visible on the display. After that, the display will show actual pressure difference between enclosure and ambience air.
19. Connect the purging gas source (with regulated pressure) into 6 mm gas input pipe (13) and slowly rise the input pressure to about 1.7 bar(g). Do not exceed system maximum input pressure (2 bar(g)).
20. Differential pressure should rise above P3 pressure and purge timer will start counting.
21. After purging, the GasEye will be powered up and differential pressure will be kept between P2 and P4 pressure. Slow oscillations of manifold may be noticed.
22. Power for GasEye system will be interrupted if differential pressure in enclosure drops below P1 pressure.

11.9. Differences between Single Gas and Multi Gas systems

1. Single Gas system has only one laser placed in central unit tube. Multi Gas system has two lasers placed in transmitter enclosure.
2. Single Gas system consists of only receiver and central unit enclosures, main system electronics are placed in central unit enclosure with laser in its tube. Multi Gas system consists of receiver, transmitter (with two lasers and no other electronics) and central unit enclosure which contains only main electronics and no lasers.
3. Multi Gas system has larger overall internal volume of enclosures to purge (0.016m^3 vs. 0.0131m^3 for Single Gas).
4. Purging time should be theoretically longer for Multi Gas systems (due to volume difference). Practically, difference is not much, so purging time for both systems has been established (with margin of error) as 7min.
5. Multi Gas system is used to analyze two or more gases which absorption lines wavelengths lies too far to each other to use only one laser. Single Gas system is used to analyze one or more gases which absorption lines wavelengths lies in a spectrum range that can be covered by a single laser module.

11.10. Zone 2 and 22 purging system enclosures mounting

Enclosure of the 5500 controller should be mounted in proximity to GasEye Transmitter and vent enclosure using three, kit-included M6x16 screws and rubber-metal washers.

Figure 225. Mounting of the 5500 controller

This enclosure should be mounted in a way that does not block user access to the glands and display. Enclosure must not be exposed to UV light sources and direct sunlight. All unused glands to the 5500 control unit must be sealed with included plugs.

Enclosure with vent should be mounted near 5500 controller using four screws. To do this, enclosure lid must be removed. Four M6 screws should be mounted through the enclosure holes. Vent enclosure should be mounted in a way that does not block flow of the gas through the vent's spark arrestor (metal cap with mesh). The enclosure lid must be mounted back after.

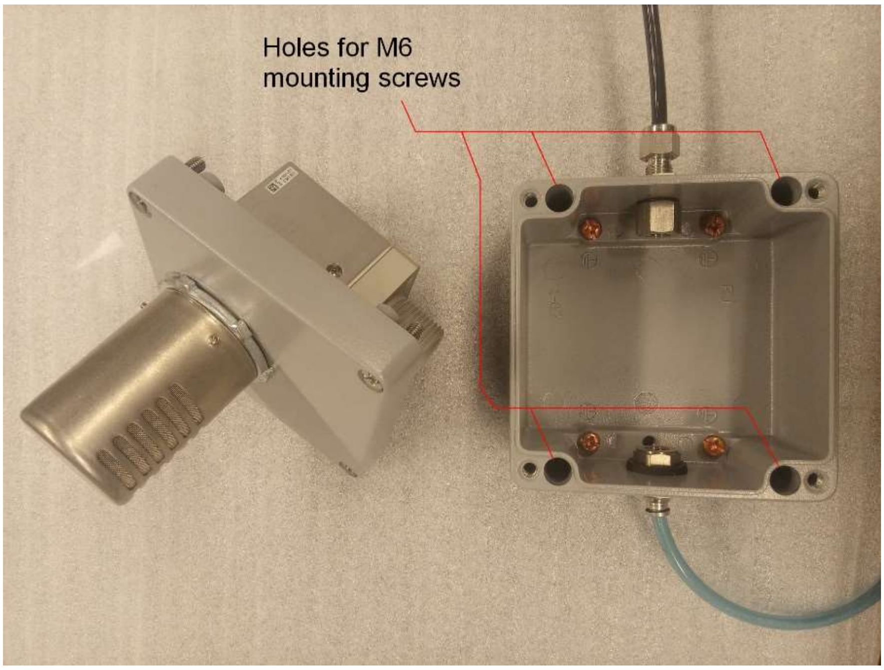


Figure 226. Mounting of the vent enclosure.

Manifold should be mounted near GasEye receiver using four kit-included screws (1/4"-20, 316 stainless steel) in a way that does not block user access to gas inlet and outlet and also to the needle valve regulation screw.

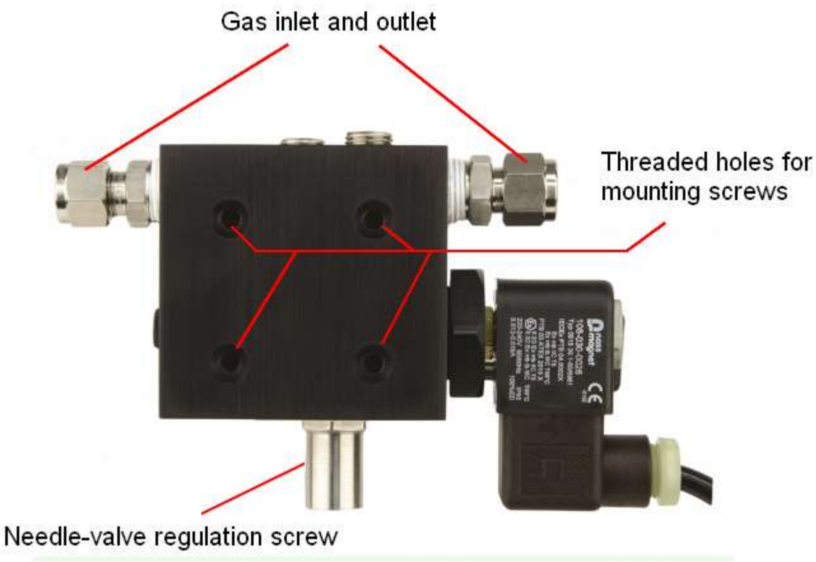


Figure 227. Mounting of the manifold.

11.11. Zone 2 and 22 purging system adjustment possibilities

5500-type purging systems are supplied by Airoptic with already configured software and hardware settings. However, some parameters can be adjusted by the user, those are:

- Inlet gas pressure

  User must supply regulated pressure gas source into manifold inlet. Pressure must not exceed 2 bar(g) and should not be less than 1.4 bar(g) at this point.

- Average gas flow rate after purging

  During purging procedure, 5500 controller opens solenoid valve in manifold completely, increasing gas flow through the system. After respective purging time there is no need to purge more so the solenoid valve is being closed and gas at the manifold flows only through a needle valve which level of opening can be adjusted by the user after purging (special key is included in the kit).
  This adjustment regulates average value of the gas flow. If the needle valve is opened more, the flow is greater and compensation for system leakages is better, although the consumption of the gas will be greater too – even more than 10l/min. If the needle valve is closed completely, purging controller will be opening the manifold more often to build up pressure at the vent above P2 value and the gas flow will be pulsed, making unnecessary gas turbulences in the system. It is good to set some constant flow through manifold and thus make the pump-up action less frequent.

- Password to the 5500-controller parameters menu

  Password to controller menu is ‘0000’ by default. It can be reset by choosing ‘change password’ in the menu. After that controller will immediately ask for a new password. Entrance to the controller menu is achievable only by holding ‘set’ button for 5 seconds.

WARNING
Customer is not allowed to change any other purging system settings nor replace any hardware element

11.12. System pressurization failure alarm

If pressurization failure of the enclosures occurs, power to the GasEye is cut-off by the 5500 purging controller. At the same time, “K2” relay contacts of 5500 controller are switched on when pressurization is too low. Those contacts can be used to generate additional alarms signals or switching. To use it properly, user must replace 24VDC 2-wire power cable with e.g. 5-wire cable and connect additional 3 wires to the “K2” contacts.

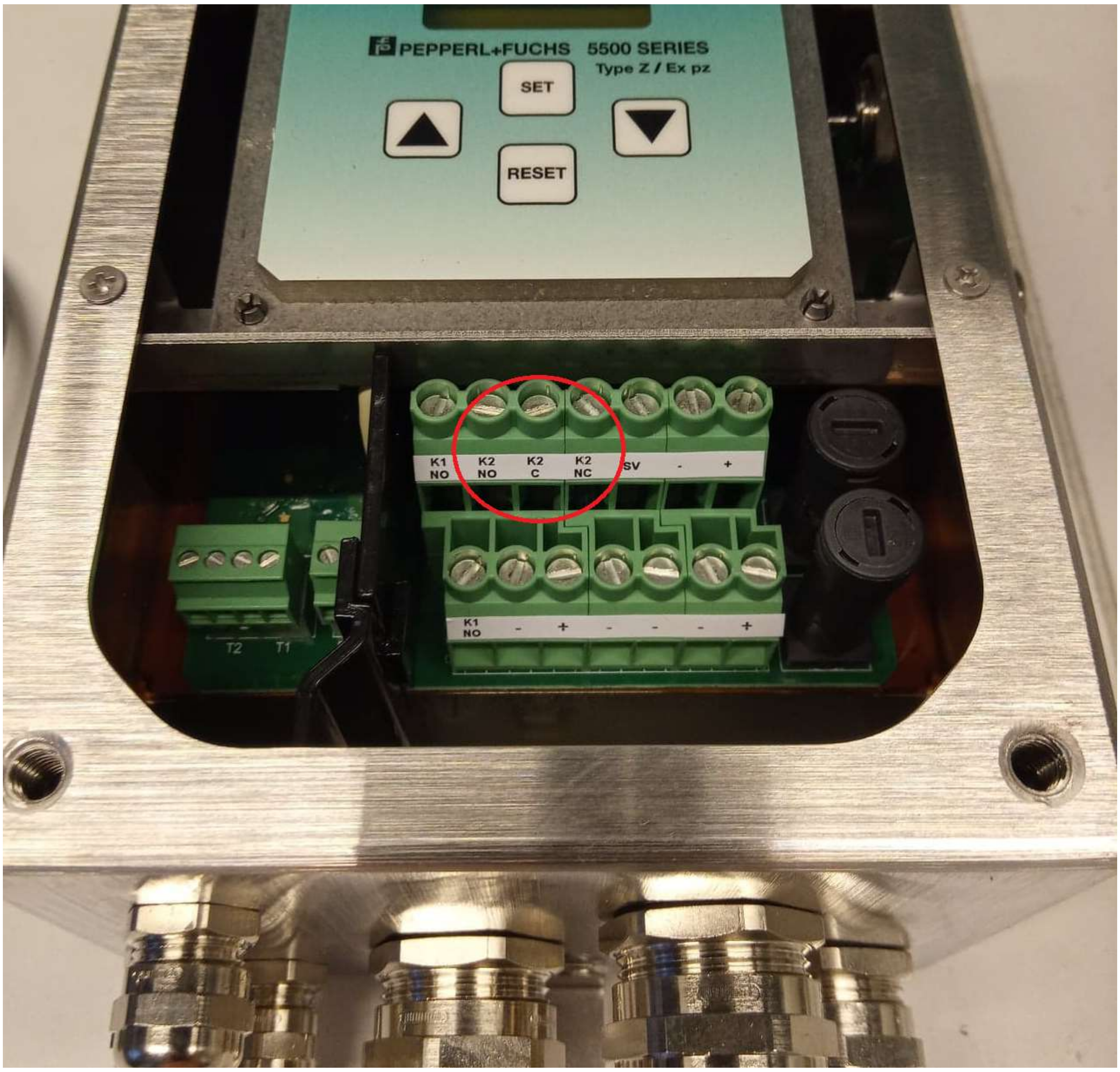


Figure 228. Alarm terminals for pressurization failure.

When alarm occurs, “K2” contacts are energized and switched into NC position (“K2 C” connected with “K2 NC”)

Airoptic Sp. z o.o. supplies purging system controller without any connection to the “K2” contacts.

11.13. System electrical connections - intrinsic safety warnings

Even though power to the GasEye analyser is cut-off by the purging controller (in case of pressurization loss), not all electrical connections that customer is supplying to the system are safe (intrinsically safe). Those are:

- Externally powered analog or digital connections to analyser (through Airoptic's 'customer cable')
- Externally powered ethernet communication cable
- Externally powered Modbus communication cable
- Externally powered ProfiNet communication cable
- Externally powered Profibus communication cable

Those and all other electrical non-intrinsically safe connections with GasEye analyser that are powered other way than through the 5500 purge controller, must be cut-off when pressurization failure occurs to ensure safety.

WARNING
All non-intrinsically safe connections with GasEye analyzer that are powered other way than through the 5500 purge controller, must be cut-off when pressurization failure occurs to ensure safety.

To do this, "K2" alarm contacts in purging controller could be used, e.g. to control a switch to cut-off all non-intrinsically safe, externally powered electrical connections to the GasEye analyser.

We recommend that in case neither a switch nor intrinsically safe connection can be used, customer should choose to use active analog input and output settings on the GasEye analyser as they will be switched off by the purge controller. Similarly, digital output should be powered from the same 24VDC provided to power the GasEye (i.e. from 5500 purge controller).

11.14. System conservation for zone 2 and 22

In order to insure safe and convenient operating conditions of 5500-type purging system, subsequent requirements must be satisfied:

- Inlet pressure of the gas must not exceed 2 bar(g)
- An Ex certified manometer should be installed right after solenoid valve for inlet pressure monitoring
- Temperature of the inlet gas must not exceed 40^{o}C
- External parts made of plastic should be cleaned with a damp cloth, with the addition of antistatic fluids
- All metal parts of the system must be grounded
- System must not be exposed to UV light sources and direct sunlight
- All unused glands to the 5500 control unit must be sealed with included plugs
- When servicing, installing, and commissioning, the area must be free of all combustible material and/or hazardous explosive gas
- Only the terminal compartment of the control unit is accessible to users. Under no circumstances shall the control unit, manifold or vent be dismantled or removed from the supplied enclosure
- In case of any system failure, please contact Airoptic Sp. z o.o.

12. Troubleshooting

As described in Chapter 3, the system status is indicated by two LEDs placed on the front panel of the transmitter unit, next to the display. In the table below the possible modes of operation are presented. Please note that during the start-up procedure the red LED will flash until the procedure is completed (approx. 5 minutes).

On Single Laser transmitter unit there is a white LED on the side that indicates the 24VDC power supply status.

Green - OFF **Red - OFF**	**System off**
Green - ON **Red - OFF**	**System operational**
Green - OFF **Red - ON**	**System operational** **Possible issue:** *low transmission* 1. Check the transmission value. 2. If transmission is below threshold value (depends on the application - typically 1% of transmission) please recheck the alignment 3. If realigning does not improve the transmission value, please remove the sensors and check visually the optical condition of windows. It may occur that dust or powder layer builds up on their surface and lowers the transmission. To remove the residuals, apply process side purging with sufficient pressure. 4. If purging is not sufficient to remove the contamination it is needed to clean the windows manually by dismounting them from the flange. For cleaning please use standard optics cleaning products. It is advised to contact Airoptic representative when window cleaning is needed. If the transmission value is above threshold value the red LED illumination indicates an internal analyzer error. Please restart the system and check whether the system restart resolves the issue. If not, contact Airoptic representative.
Green - OFF **Red - FLASHING**	**System not operational – startup procedure not completed** Red LED flashing (remaining for more than 10 minutes after power on) may indicate that an internal analyzer issue has occurred. Please restart the system and check whether the system restart resolves the issue. If not, contact Airoptic representative.

Appendix 1. Parameters list.

Below the full list of parameters available through the WebServer is presented. For each parameter there is a brief description of its functionality.

ID	Name	Description
8000	PROCESS.TEMP_IS	Process temperature input signal selection
8001	PROCESS.TEMP_MANUAL_VALUE	Process temperature manual value in [ºC]
8003	PROCESS.PRESS_IS	Process pressure input signal selection
8004	PROCESS.PRESS_SENSOR_TYPE	Pressure sensor type selection (absolute/ gauge)
8005	PROCESS.PRESS_MANUAL_VALUE	Process pressure manual value in [mbar]
8010	MEAS.PATH_LENGTH_CH_1	Measuring path length channel 1 in [m]
8011	MEAS.PATH_LENGTH_CH_2	Measuring path length channel 2 in [m]
8012	MEAS.RESPONSE_TIME_T90	Response time (T90) in [s]
8106	GAS101.SPAN_CALIBRATION	Span calibration factor
8107	GAS101.OFFSET	Span offset value
8126	GAS102.SPAN_CALIBRATION	Span calibration factor
8127	GAS102.OFFSET	Span offset value
8146	GAS103.SPAN_CALIBRATION	Span calibration factor
8147	GAS103.OFFSET	Span offset value
8166	GAS104.SPAN_CALIBRATION	Span calibration factor
8167	GAS104.OFFSET	Span offset value
8186	GAS105.SPAN_CALIBRATION	Span calibration factor
8187	GAS105.OFFSET	Span offset value
81A6	GAS106.SPAN_CALIBRATION	Span calibration factor
81A7	GAS106.OFFSET	Span offset value
81C6	GAS107.SPAN_CALIBRATION	Span calibration factor
81C7	GAS107.OFFSET	Span offset value
81E6	GAS108.SPAN_CALIBRATION	Span calibration factor
81E7	GAS108.OFFSET	Span offset value
8209	TEMP.SPAN_CALIBRATION	Span calibration factor
820A	TEMP.OFFSET	Span offset value
9300	DOUT.DO1	Signal selection for digital output
9301	DOUT.DO2	Signal selection for digital output
9302	DOUT.DO3	Signal selection for digital output
9303	DOUT.DO4	Signal selection for digital output
9500	AOUT.FORCE_MANUAL_MODE_ENABLE	Force manual mode for all analog outputs
9501	AOUT.SCALE_ENABLE	Enable scaling range for all analog outputs
9510	AOUT1.SELECT_SIGNAL	Measurement signal selection for the output
9511	AOUT1.MANUAL_VALUE	Manual mode value in scaling range
9512	AOUT1.SCALE_MIN	Scaling range value corresponds to 4 mA
9513	AOUT1.SCALE_MAX	Scaling range value corresponds to 20 mA
9520	AOUT2.SELECT_SIGNAL	Measurement signal selection for the output
9521	AOUT2.MANUAL_VALUE	Manual mode value in scaling range
9522	AOUT2.SCALE_MIN	Scaling range value corresponds to 4 mA
9523	AOUT2.SCALE_MAX	Scaling range value corresponds to 20 mA
9530	AOUT3.SELECT_SIGNAL	Measurement signal selection for the output
9531	AOUT3.MANUAL_VALUE	Manual mode value in scaling range
9532	AOUT3.SCALE_MIN	Scaling range value corresponds to 4 mA
9533	AOUT3.SCALE_MAX	Scaling range value corresponds to 20 mA
9540	AOUT4.SELECT_SIGNAL	Measurement signal selection for the output
9541	AOUT4.MANUAL_VALUE	Manual mode value in scaling range
9542	AOUT4.SCALE_MIN	Scaling range value corresponds to 4 mA
9543	AOUT4.SCALE_MAX	Scaling range value corresponds to 20 mA
9600	AIN.SCALE_ENABLE	Enable scaling range for all analog inputs
9610	AIN1.SCALE_MIN	Scaling range value corresponds to 4 mA
9611	AIN1.SCALE_MAX	Scaling range value corresponds to 20 mA
9620	AIN2.SCALE_MIN	Scaling range value corresponds to 4 mA
9621	AIN2.SCALE_MAX	Scaling range value corresponds to 20 mA
9630	AIN3.SCALE_MIN	Scaling range value corresponds to 4 mA
9631	AIN3.SCALE_MAX	Scaling range value corresponds to 20 mA
9640	AIN4.SCALE_MIN	Scaling range value corresponds to 4 mA

9641	AIN4.SCALE_MAX	Scaling range value corresponds to 20 mA
9901	NET.SYSTEM_IP_ADDRESS	System IP address (x.x.x.x, default: 192.168.16.13)
9902	NET.SYSTEM_IP_MASK	System IP mask (x.x.x.x, default: 255.255.255.0)
9903	NET.GATEWAY_IP_ADDR	Gateway IP address (x.x.x.x, default: 192.168.16.1)
9904	NET.DNS_IP_ADDR	DNS IP address (x.x.x.x, default: 8.8.8.8)
9905	NET.STREAM_ENABLE	Enable UDP streaming
9906	NET.STREAM_IP_ADDR	UDP IP address for streaming (for broadcast select x.x.x.255)
9907	NET.STREAM_UDP_PORT	UDP port number
9908	NET.STREAM_INTERVAL	Sampling time for the UDP streaming in [ms]
A100	ANB.IP_ADDRESS	Add-on module IP address (x.x.x.x)
A101	ANB.IP_MASK	Add-on module IP mask (x.x.x.x)
A102	ANB.GATEWAY_IP_ADDR	Add-on module gateway IP address (x.x.x.x)
A103	ANB.DHCP	Add-on module DHCP enable/disable
BTN	ANB.SHOW	Add-on module register map presentation
A200	RTC.SECOND	Second
A201	RTC.MINUTE	Minute
A202	RTC.HOUR	Hour
A203	RTC.DAY	Day
A204	RTC.MONTH	Month selection
A205	RTC.YEAR	Year
9A01	HMI.PASSWORD	Password for HMI
9C00	ALARM1.ENABLE	Alarm enable/disable
9C01	ALARM1.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C02	ALARM1.RESET	Alarm manual reset
9C03	ALARM1.NORMAL_STATE	Alarm normal state value
9C04	ALARM1.SIGNAL	Alarm signal selection
9C05	ALARM1.OPERATOR	Alarm mathematical operator
9C06	ALARM1.THRESHOLD	Alarm threshold value
9C07	ALARM1.HYSTERESIS	Alarm hysteresis value
9C10	ALARM2.ENABLE	Alarm enable/disable
9C11	ALARM2.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C12	ALARM2.RESET	Alarm manual reset
9C13	ALARM2.NORMAL_STATE	Alarm normal state value
9C14	ALARM2.SIGNAL	Alarm signal selection
9C15	ALARM2.OPERATOR	Alarm mathematical operator
9C16	ALARM2.THRESHOLD	Alarm threshold value
9C17	ALARM2.HYSTERESIS	Alarm hysteresis value
9C20	ALARM3.ENABLE	Alarm enable/disable
9C21	ALARM3.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C22	ALARM3.RESET	Alarm manual reset
9C23	ALARM3.NORMAL_STATE	Alarm normal state value
9C24	ALARM3.SIGNAL	Alarm signal selection
9C25	ALARM3.OPERATOR	Alarm mathematical operator
9C26	ALARM3.THRESHOLD	Alarm threshold value
9C27	ALARM3.HYSTERESIS	Alarm hysteresis value
9C30	ALARM4.ENABLE	Alarm enable/disable
9C31	ALARM4.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C32	ALARM4.RESET	Alarm manual reset
9C33	ALARM4.NORMAL_STATE	Alarm normal state value
9C34	ALARM4.SIGNAL	Alarm signal selection
9C35	ALARM4.OPERATOR	Alarm mathematical operator
9C36	ALARM4.THRESHOLD	Alarm threshold value
9C37	ALARM4.HYSTERESIS	Alarm hysteresis value
9C40	ALARM5.ENABLE	Alarm enable/disable
9C41	ALARM5.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C42	ALARM5.RESET	Alarm manual reset
9C43	ALARM5.NORMAL_STATE	Alarm normal state value
9C44	ALARM5.SIGNAL	Alarm signal selection
9C45	ALARM5.OPERATOR	Alarm mathematical operator
9C46	ALARM5.THRESHOLD	Alarm threshold value
9C47	ALARM5.HYSTERESIS	Alarm hysteresis value
9C50	ALARM6.ENABLE	Alarm enable/disable
9C51	ALARM6.AUTORESET_ENABLE	Alarm autoreset enable/disable

9C52	ALARM6.RESET	Alarm manual reset
9C53	ALARM6.NORMAL_STATE	Alarm normal state value
9C54	ALARM6.SIGNAL	Alarm signal selection
9C55	ALARM6.OPERATOR	Alarm mathematical operator
9C56	ALARM6.THRESHOLD	Alarm threshold value
9C57	ALARM6.HYSTERESIS	Alarm hysteresis value
9C60	ALARM7.ENABLE	Alarm enable/disable
9C61	ALARM7.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C62	ALARM7.RESET	Alarm manual reset
9C63	ALARM7.NORMAL_STATE	Alarm normal state value
9C64	ALARM7.SIGNAL	Alarm signal selection
9C65	ALARM7.OPERATOR	Alarm mathematical operator
9C66	ALARM7.THRESHOLD	Alarm threshold value
9C67	ALARM7.HYSTERESIS	Alarm hysteresis value
9C70	ALARM8.ENABLE	Alarm enable/disable
9C71	ALARM8.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C72	ALARM8.RESET	Alarm manual reset
9C73	ALARM8.NORMAL_STATE	Alarm normal state value
9C74	ALARM8.SIGNAL	Alarm signal selection
9C75	ALARM8.OPERATOR	Alarm mathematical operator
9C76	ALARM8.THRESHOLD	Alarm threshold value
9C77	ALARM8.HYSTERESIS	Alarm hysteresis value
9C80	ALARM9.ENABLE	Alarm enable/disable
9C81	ALARM9.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C82	ALARM9.RESET	Alarm manual reset
9C83	ALARM9.NORMAL_STATE	Alarm normal state value
9C84	ALARM9.SIGNAL	Alarm signal selection
9C85	ALARM9.OPERATOR	Alarm mathematical operator
9C86	ALARM9.THRESHOLD	Alarm threshold value
9C87	ALARM9.HYSTERESIS	Alarm hysteresis value
9C90	ALARM10.ENABLE	Alarm enable/disable
9C91	ALARM10.AUTORESET_ENABLE	Alarm autoreset enable/disable
9C92	ALARM10.RESET	Alarm manual reset
9C93	ALARM10.NORMAL_STATE	Alarm normal state value
9C94	ALARM10.SIGNAL	Alarm signal selection
9C95	ALARM10.OPERATOR	Alarm mathematical operator
9C96	ALARM10.THRESHOLD	Alarm threshold value
9C97	ALARM10.HYSTERESIS	Alarm hysteresis value

Appendix 2. Measurements list

The full list of measurements available through the WebServer is presented below.

ID	Name	Description
0001	PROCESS.TEMPERATURE	
0002	PROCESS.PRESSURE	
0100	TEMP.CALCULATED	
0010	GAS101.CONCENTRATION	
0020	GAS102.CONCENTRATION	
0030	GAS103.CONCENTRATION	
0040	GAS104.CONCENTRATION	
0050	GAS105.CONCENTRATION	
0060	GAS106.CONCENTRATION	
0070	GAS107.CONCENTRATION	
0080	GAS108.CONCENTRATION	
0200	LASER11.TRANSMISSION	
0201	LASER12.TRANSMISSION	
0202	LASER13.TRANSMISSION	
0203	LASER14.TRANSMISSION	
0300	FIBER1.TRANSMISSION	
0301	FIBER2.TRANSMISSION	
0302	REMOTERX1.GAIN	
0303	REMOTERX2.GAIN	
0602	TEC0.THL_REF_AMP	
0606	TEC0.AMB_TEMPERATURE	
0612	TEC1.THL_REF_AMP	
0616	TEC1.AMB_TEMPERATURE	
0622	TEC2.THL_REF_AMP	
0626	TEC2.AMB_TEMPERATURE	
0632	TEC3.THL_REF_AMP	
0636	TEC3.AMB_TEMPERATURE	
0800	SYSTEM.STATUS	
0801	SYSTEM.STARTUP_PROCEDURE	
0802	SYSTEM.TRANS_MP1_STATUS	
0810	SYSTEM.ALARM1	
0811	SYSTEM.ALARM2	
0812	SYSTEM.ALARM3	
0813	SYSTEM.ALARM4	
0814	SYSTEM.ALARM5	
0815	SYSTEM.ALARM6	
0816	SYSTEM.ALARM7	
0817	SYSTEM.ALARM8	
0818	SYSTEM.ALARM9	
0819	SYSTEM.ALARM10	
0900	AOUT1	
0901	AOUT2	
0902	AOUT3	
0903	AOUT4	
0A00	AIN1	
0A01	AIN1.VAL	
0A10	AIN2	
0A11	AIN2.VAL	
0A20	AIN3	
0A21	AIN3.VAL	
0A30	AIN4	
0A31	AIN4.VAL	
0B00	RTD	
0B01	AMB_PRESSURE	
0B02	DOUT	
0B03	DIN	