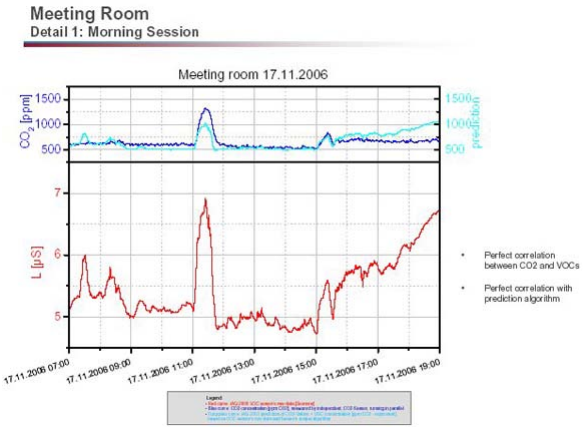
[ppm]	Air Quality
2100	BAD Heavily contaminated indoor air Ventilation required
2000	
1900	
1800	
1700	
1600	
1500	MEDIOCRE Contaminated indoor air Ventilation recommended
1400	
1300	
1200	
1100	
1000	FAIR
900	
800	GOOD
700	
600	EXCELLENT
500	
400	



BIO - IAQ Sensor for Indoor Air Quality

Metal Oxide Indoor Air Quality (VOC) Sensor

User Manual

October, 2014

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IAQ Indoor Air Quality (VOC) Sensor

1 Intended Use

The BIO IAQ air quality sensor with digital processing of the measuring values and temperature compensation is used for measuring and controlling the air quality in indoor areas within environmental conditions specified in the Technical Data.

The intended sites are all areas being directly connected to the public low voltage supply, e.g. residential, commercial and industrial ranges as well as small enterprises (according to EN50 082).

The BIO IAQ sensor must not be used in potentially explosive atmospheres. The sensor must only be employed in areas within the environmental conditions as specified in the Technical Data.

Electronics can be destroyed by static electricity. Therefore, do not touch the equipment without a wrist strap connected to ground or without standing on a conductive floor (acc. to EN 61340-5-1).

2 Functional Description

2.1 VOC Sensor

The semi-conducting metal oxide sensor measures the electrical conductivity of the nanocrystalline metal oxide coated on a heatable substrate. The typical operating temperature is between 300 and 400 °C. The doping of the metal oxide with noble metals results in a positive sensibility to combustible gases like VOCs, carbon monoxide and natural gas. The doping permits the adaptation to the demands of the measuring task. VOCs are partially or totally burnt at the sensor surface by the oxygen of the metal oxide. The electrons released in the semi-conductor by this process lead to an increase of the electrical conductivity. At the end of the combustion process, the metal oxide returns to its initial state by incorporating oxygen from the air, with the conductivity also adopting the initial value. The change of the conductivity is evaluated via the internal micro-controller and output as a standard signal.

2.2 VOC Measurements

The VOC content in indoor areas is mainly determined by the persons present and their activities. See table 1. When for example working with cleaning agents or when cooking, VOCs (Volatile Organic Compounds) are set free, but also human respiration is a constant source of volatile metabolism products (VOCs). The air quality sensor detects the increasing VOC level and calculates the proportional CO_2 value. The VOC/CO_2 correlation was determined by taking measurements under real conditions. See diagram 1.

To this day, there aren't any standard signals for the VOCs; therefore the IAQ air quality sensor reduces the measured VOC values to CO_2 equivalents with the unit ppm. This grants the compatibility to existing CO_2 ventilation standards.

Each time the IAQ air quality sensor is switched on, it runs through a warm-up period of 20 minutes. During this warm-up period there aren't any measurements; the sensor outputs the signal of 80% of the measuring range.

After the warm-up period, the sensor interprets the currently read VOC value as zero-point, independently from the actual concentration. An internal algorithm continuously updates the zero-point by taking the lowest measured VOC value. Therefore the ambient air should be of low VOC content after the warm-up period. This can be obtained by shortly venting when starting the measurements with the 80% signal.

If the sensor isn't started at low VOC concentrations, it can take a couple of days until the internal algorithm has updated the zero-point so far that effective measuring results are available.

The natural sensor drift and ageing is corrected by the implemented control algorithms.

Indoor Air		Typical Substances		Ventilation
Contamination Source	Emission Source	VOCs	Others	
Human Being	*Breath	Acetone, Ethanol, Isoprene		demand controlled
		CO2		
		Humidity		
	*Skin respiration & transpiration	Nonanal, Decanal, α-Pinene		
		Humidity		
	*Flatus	Methane, Hydrogen		
	*Cosmetics	Limonene, Eucalyptol		
	*Household Supplies	Alcohols, Esters, Limonene		
	*Combustion (Engines, Appliances, Tobacco Smoke)	Unburnt Hydrocarbons		
		CO		
		CO2		
		Humidity		
*Building Material *Furniture *Office Equipment +Consumer Products	*Paints *Adhesives *Solvents *Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes		permanent (5-10%)
	*PVC	Toluene, Xylene, Decane		
	*Printers/Copiers, Computers	Benzene, Styrene, Phenole		

Table 1 – Typical indoor air contaminants (VOC and others)

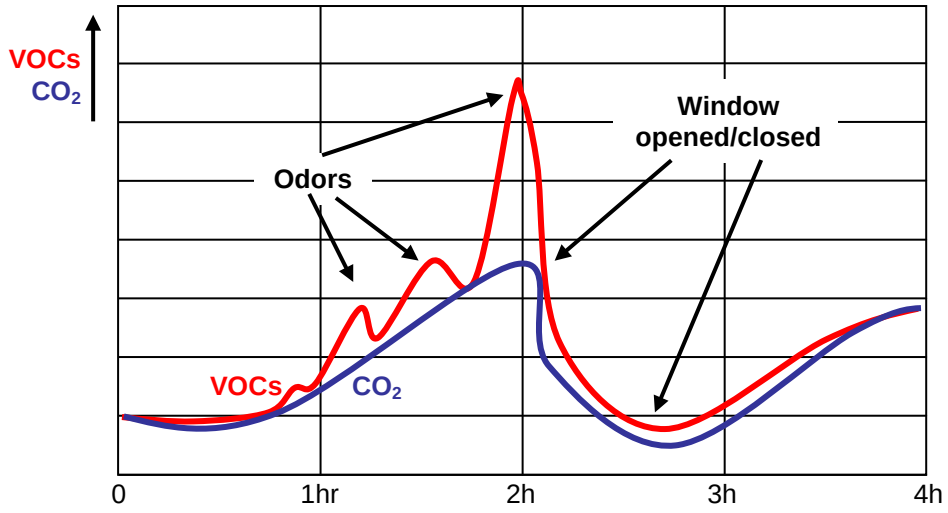


Diagram 1: Correlation CO_2- VOC (records from a business meeting session)

2.3 Temperature Measurement (option)

The temperature measurement is done via an internal sensor. The signal is output as a linear 0 – 10 V signal.

A customer's application with passive signal is possible as an option.

Additional heat sources in the flash-mounted box have an influence on the temperature measurements and have therefore to be avoided.

2.4 Functions

2.4.1 Sensor Function

The IAQ sensor shows the VOC value (0 – 4000 ppm or 0 – 2000 ppm) in form of a 0- 10 V signal at the analog output AO1. The temperature (0 – 50 °C) is also available as a 0 – 10 V signal at the analog output AO2.

In ModBus operation, the VOC value is displayed at the read register 01 and the temperature value at the read register 02.

The IAQ sensor offers a great number of options. The function can be defined according to the application via the ModBus interface by means of the ModBus function diagram (fig. 5). The definition of the function can be provided in the factory as well as on site by using the ModBus tool.

Option Setpoint Potentiometer

The temperature output can be adjusted by ± 3 °K.

Option Digital Output DO1

The digital output is activated in dependence of the programming via the following functions.

- Depending on the VOC value via the internal switch threshold (threshold = write register 03)
- Depending on the temperature value via the internal switch threshold (threshold = write register 03)
- Switch threshold can be selected via internal potentiometer.
- Via digital input 1 or 2.
- Via the operation mode switch.

Option Digital Output DO2

Function is the same as for digital output DO1.
The digital output DO2 takes the place of the analog output AO2, meaning that with two digital outputs, there is only one analog output available.

Option Status LED 1

The Status LED is activated in dependence of the programming via the following functions.

- Via digital input 1 or 2.
- Via the operation mode switch.
- Via digital output 1 or 2.
- ModBus command.

Option Status LED 2

- Function the same as for Status LED 1

Option Operation Mode Switch

The switch activates the digital outputs (DO1/DO2) and/or the status LEDs (LED1/LED2) in dependence of the programming.

Option IAQ Power

The IAQ Power Module offers a 230 VAC supply voltage for the IAQ sensor. A wet switch contact (230 V) is available in addition. The switch contact is activated via the digital output DO1.

The IAQ Power Module is mounted in the in-wall box. See fig. 10 and 11.

2.4.2 Controller Function

The standard control function described here can be changed via the ModBus interface by means of the ModBus function diagram (paragraph 5.7).

Air quality control function

The controller outputs the control signal (AO1 / 0- 10V) within the defined control range of 700 to 1200 ppm in dependence of the VOC concentration. The output signal is suppressed for all values below 700 ppm in order to grant a dead band.

The green LED is on for “good air quality”, that means the measured VOC value is < 700 ppm.

The orange LED is on for „bad air quality“, meaning that the measured VOC value is > 700 ppm.

The control parameters are factory-set, but can be adjusted to the application via ModBus.

Temperature control function

The pre-set temperature of 21°C can be changed via the potentiometer by +/- 3°K.

When the function “heating” is selected and the temperature falls below the set value, the PID controller delivers a signal at the analog output (AO2/ 0-10V) until the desired temperature is obtained and keeps this temperature up. The function of the air quality control (AO1) is blocked when the temperature falls below the set minimum temperature of 18°C.

When the measured temperature exceeds the set maximum temperature of 26°C (+ summer DIN increase), the air quality control is forced to 100% (10 V at the output).

The control parameters are factory-set, but can be adjusted to the respective configuration via ModBus (see point 5.6 and 5.7).

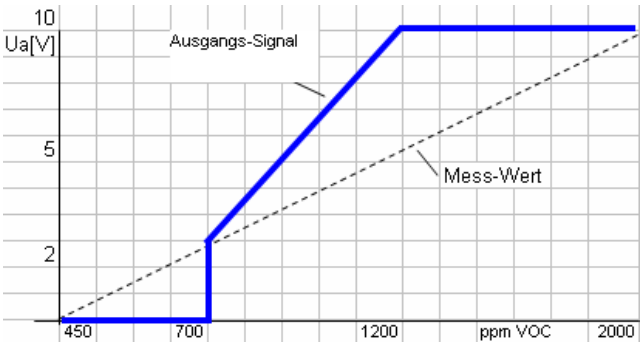


Fig. 1: Output signal VOC control

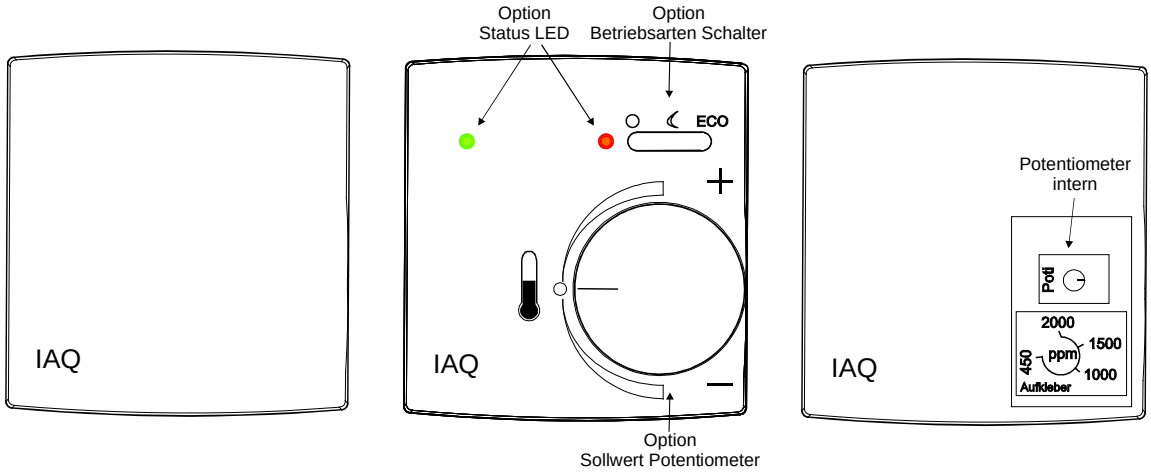


Fig. 2: Views: Sensor Complete version Internal potentiometer

3 Installation

3.1 Mounting Instructions

When choosing the mounting site please pay attention to the following:

- Recommended mounting height is 1.0 m (3 feet) to 1.5 m (5 feet) above floor.
- Do not mount the sensor next to doors, windows, air inlets and outlets.
- Free air supply must be granted.
- Vertical mounting (air inlet at the sensor down/up)
- Avoid direct sunlight.
- No heat sources around in case of temperature measurement.

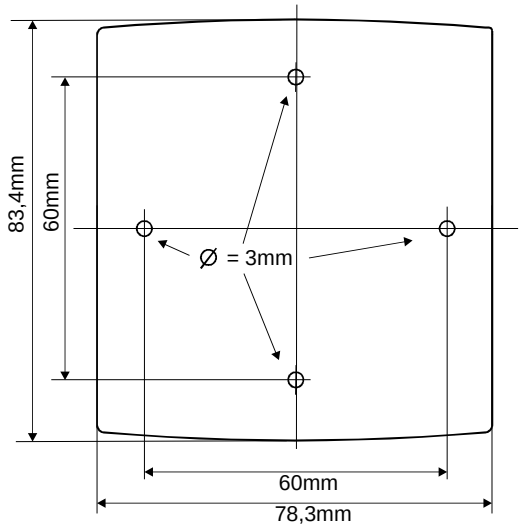


Fig. 3: Mounting IAQ Sensor

For IAQ-Power Module see also fig. 10 and 11

4 Electrical Connection

- Installation of the electrical wiring should only be executed by a trained specialist according to the connection diagram, without any power applied to conductors and according to the corresponding regulations!
- The connection is done via screw-type terminals with a section of 0.25 to 1.5 mm^2.
- The connection of the different applications is shown in the figures 7 to 11.
- Avoid any influence of external interference by using shielded cables for the signal line, but do not connect the shield.
- For ModBus wiring we recommend using the cable Y(St)Y 2x2x0.8 LG, in line topology and without any branch lines. Please consider in addition all regulations concerning the wiring of RS-485 field bus wiring.

5 ModBus

5.1 General

The ModBus protocol was developed for the data exchange between information processing units, programmable logic controllers and other intelligent systems. A master computer communicates with maximum 247 connected devices via a serial data link of RS-485 standard. There is only one device (host, master) per bus line determining the telegramming. The other devices (clients, slaves) only react on the request of the master and are never allowed to send data on the bus line without request of the master device.

The data are transmitted in form of data telegrams. There are two possible formats within the ModBus protocol, the ASCII and the RTU format. Only the RTU format is used and described in here.

The RTU telegram settings don't include any tag delimiters.
The beginning and the end of data telegrams are realized by short stops.

The syntax is as follows:

Address	Command	Data	CRC16

The data are transmitted with binary code. The address and the command are 1 byte each. When requested from the master, the data may contain for example address, order and the initial address and the number of data to be retrieved.
The answer from the slave is structured in the same way. The data may contain, besides the address and the order, for example the number of sent data bytes and the data.

CRC16 is a 2-bytes Cyclical Redundancy Check.

The end of the data telegram is recognized if there is an idle period of minimum 2 characters.

The slaves react to valid requests after a certain timeout after receipt of the last character by giving the corresponding answer. The master then expects the start of the answer. If it doesn't come, the master can occupy the bus anew and give new commands. The slave answers after a silence of 3.5 characters at the earliest. In case of transmission errors or not executable commands, the slave doesn't answer or respond with an error message (see troubleshooting).

5.2 Physical Port

The communication between master and slaves uses a serial data link of RS-485 standard.

The port settings are as follows:

9600 Baud, 1 Start Bit, 8 Data Bits, Parity none, 1 Stop Bit

5.3 Time Response

Transmission telegram:

The master can start a data exchange. The master sends a data telegram to a slave containing:

- Address of the slave
- Function requested from the slave (order)
- Data field (variable depending on the order)
- Control characters

The slave starts uploading a telegram after each idle period of 3.5 characters. If the first character is the slave's own address or the address 0 (all), it processes with the telegram. If there is a silence of 2 characters at least, it considers the telegram finished and checks the CRC.

If the telegram is without errors, it executes the function and composes an answer.

Answer telegram:

- Address of the slaves
- Executed function (order)
- Data field (e.g. data length and data)
- Control characters

The answer is sent at the earliest after a silence of 3.5 characters after the end of the master's telegram.

In case of an error, the slave waits for the end of the telegram and the period of 3.5 characters, and then returns an error message.

The master awaits the answer of the slave or a timeout (see table) before starting a new exchange in order to avoid complications resulting from mutual transmissions.

Data organization

The devices offer properties and states generally described here as objects. These objects can be asked specifically as bit or byte ranges by the master and changed by it.

An input object can only be read.

An output object can be read or written.

ModBus functions

The following functions are available with the communication protocol ModBus:

- The main functions granting the data exchange.
- The additional functions for the control and the diagnosis of the data exchange.

The table below indicates the functions managed here.

The functions "Read" and "Write" refer respectively to the action of the master.

Function	Description	Implemented
03	Reading of N output registers	Yes (max 32 reg.)
16	Writing of N output registers	Yes (max 22 reg.)

5.4 ModBus Functional Description

Function 03: Reading of N output registers

This function enables to read the output registers; these are the registers the master can read or write in the slave.

This function enables to read the input registers; these are the registers the master only can read.

Example:

Reading of N registers; function 3

Request:

Slave address 1 - 254	Function 03	Start address	Number of words	CRC16
1 Byte	1 Byte	2 Bytes	2 Bytes	2 Bytes

Answer:

Slave address 1 – 254	Function 03 or 04	Number of sent bytes	Data	CRC16
1 Byte	1 Byte	1 Byte	n Bytes	2 Bytes

5.5 Troubleshooting

If there is any parity, framing, overrun or CRC error during receipt of a telegram, the slave doesn't accept and answer it.

If the slave cannot execute the requested order, it sends an error message.

Format of an error message:

Slave address 1 - 254	Answer code	Error code	CRC16
1 Byte	1 Byte	1 Byte	2 Bytes

Answer code: Order function code + 0x80 (the most significant bit is set to 1).

5.6 ModBus Register Description

Read register Request with command 0x03					
Register	**Description**	**Range**	**Default**		
0	Sensor type	(defined by product type)	19505		
1	Measured value VOC	0- max (defined in register 11)			
2	Measured value Temperature	0- max (defined in register 12)			
3	PID output value VOC	0-10000			
4	PID output value Temp	-10000 to +10000			
5	PID sign Temp	+1 = heat; -1 = cool			
6	res				
7	res				
8	res				
9	Potentiometer position	0-10000			
10	Own MODBus address	1-255	254		
11	Measuring range VOC	0-32767	2000		
12	Measuring range Temp.	0-32767 (50 with 1 decimal place)	500		
13	Alarm threshold 1	0- max (defined in register 11 o 12)			
14	Alarm threshold 2	0- max (defined in register 11 o 12)			
15	Hysteresis 1	0- max (defined in register 11 o 12)	100		
16	Hysteresis 2	0- max (defined in register 11 o 12)			
17	Max-temp_limit	0- max (defined in register 12)			
18	Min-temp_limit	0- max (defined in register 12)			
19	Ao1 switch	0-6	Dep. on version		
20	Ao1_Do2 switch	0-21	Dep. on version		
21	Do1 switch	0-21	Dep. on version		
22	PID kp parameter		10		
23	PID ki parameter		40		
24	PID kd parameter		10		
25	PID setpoint VOC		Dep. on version		
26	PID- setpoint Temp.		Dep. on version		
27	res				
28	LED1 switch	0-24	Dep. on version		
29	LED2 switch	0-24	Dep. on version		
30	Day/ night setback value	0- max (defined in register 12)			
31	Relay status of Bus	0-3			

Write register Command with command 0x10 (16d)					
Register	**Function**	**Possible Range**		**Default**	**Note**
0	Sensor MODBus address	1-255		254	
1	Measuring range VOC	0-32767		2000	
2	Measuring range Temp.	0-32767 (50 with 1 decimal place)		500	
3	Alarm threshold 1	0- max (defined in register 11 o 12)		1000	
4	Alarm threshold 2	0- max (defined in register 11 o 12)			
5	Hysteresis 1	0- max (defined in register 11 o 12)		500	
6	Hysteresis 2	0- max (defined in register 11 o 12)			
7	Max-temp_limit	0- max (defined in register 12)			
8	Min-temp_limit	0- max (defined in register 12)			
9	A01 switch	0= OFF		1	VOC
		1= ACTUAL VOC			
		2= ACTUAL Temp			
		3= PID Heating			
		4= PID Cooling			
		5= PID Heating + Cooling			
		6= PID VOC			
		7= PID VOC (acc. to DIN)			

10	A02_D02 switch	**as analog out 2**	**as digital out 2 (optional)**	4	Temp-Cooling
		0= OFF	11= ACTUAL VOC		
		1= ACTUAL VOC	12= ACTUAL Temp.		
		2= ACTUAL Temp.	13= PID Heating		
		3= PID Heating	14= PID Cooling		
		4= PID Cooling	15= PID Heating + Cooling		
		5= PID Heating + Cooling	16= PID VOC		
		6= PID VOC	17= DI1		
		7= PID VOC (acc. to DIN)	18= DI2		
			19= Switch pos. 1		
			20= Switch pos. 2		
			21= Switch pos. middle		
11	D01 switch	0= OFF		0	free
	(Function depending on version)	11= ACTUAL VOC			
		12= ACTUAL Temp			
		13= PID Heating			
		14= PID Cooling			
		15= PID Heating + Cooling			
		16= PID VOC			
		17= DI1			
		18= DI2			
		19= Switch position 1			
		20= Switch position 2			
		21= Switch position middle			
12	PID kp parameter	0-100		10	
13	PID ki parameter	0-100		40	
14	PID kd parameter	0-100		10	
15	PID setpoint VOC	0- max (defined in register 11)		1200	
16	PID setpoint Temp	0- max (defined in register 12)		210	
17	res				
18	LED1 switch	0= OFF		0	
		17= DI1			
		18= DI2			
		19= Switch 1			
		20= Switch 2			
		21= Switch middle			
		22= Bus_Di			
		23= Dig Out 1			
		24= Dig Out 2			
		25= Invert. LED2			
19	LED2 switch	0= OFF		0	
		17= DI1			
		18= DI2			
		19= Switch 1			
		20= Switch 2			
		21= Switch middle			
		22= Bus_DI			
		23= Dig Out 1			
		24= Dig Out 2			
		25= Invert. LED1			
20	Day/night setback value	0- max (defined in register 12)		5	
21	Relay status of Bus	0-3 (1= LED1, 2= LED2, 3= both)			

5.7 Overview ModBus Functions

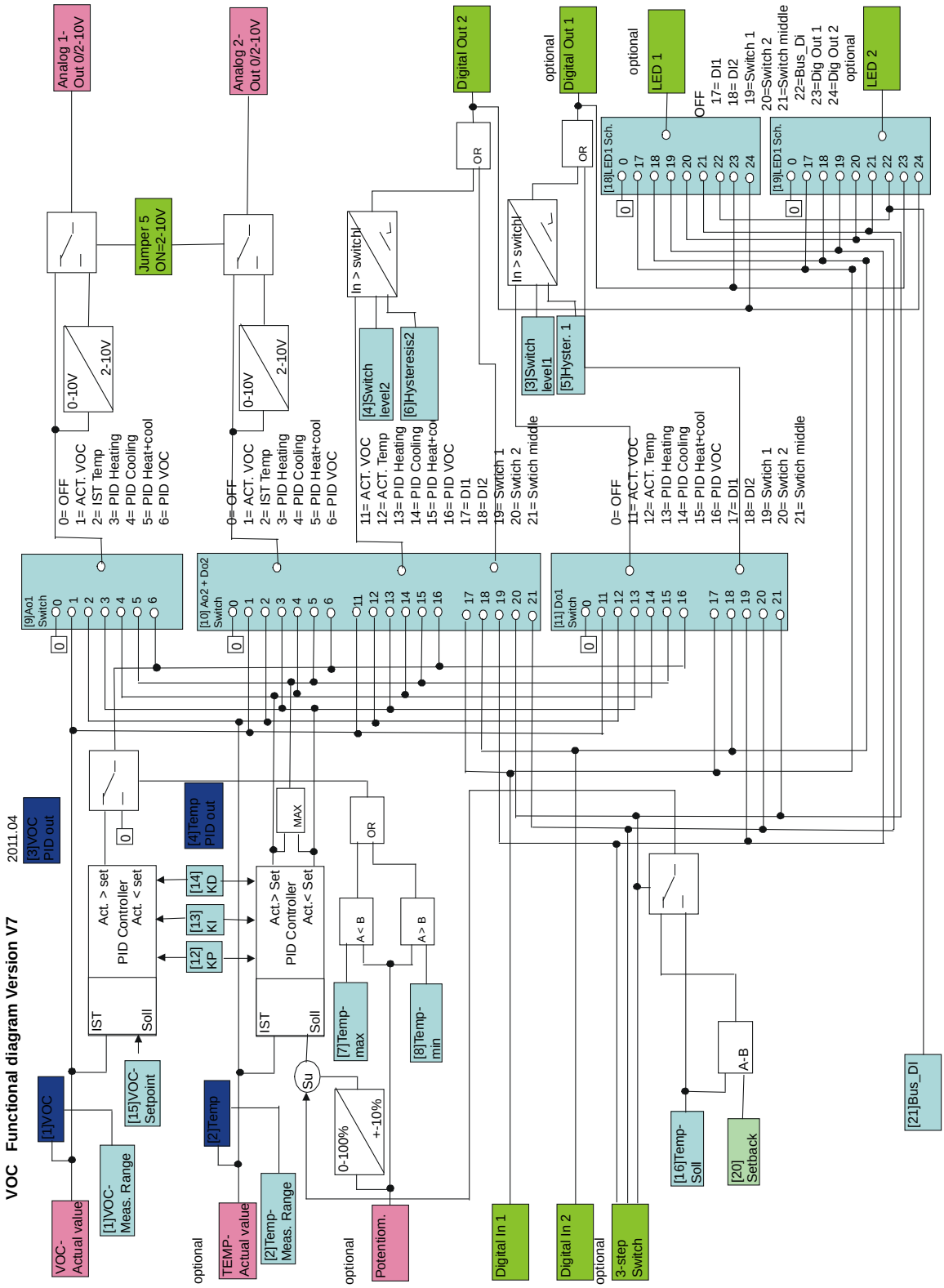


Fig. 5: Functional diagram

6 Commissioning

General

- Check mounting location.
- Check power voltage at the terminals 1 (+) and 2 (GND) at X2.

Operation mode sensor

- Check output tensions 0 – 10 V.
- Check digital output
- Option internal potentiometer: Check/ adjust switch threshold at the internal potentiometer.
- Option IAQ Power Module: Check fan activation by lowering the switch threshold to 450 ppm.

Operation mode ModBus

- Addressing in the operation mode ModBus (see point 5, ModBus)
- Check/ adjust the parameters. See read-write register.
- Check VOC value at the read register 01, temperature value at the read register 02.

Operation mode control

- Check/ adjust the parameters. See read-write register.
- Check output control signal(s).

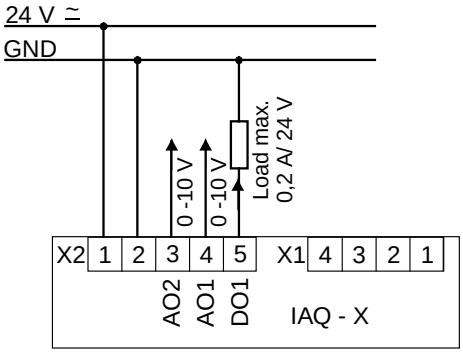
7 Specifications

Electrical	
Supply voltage	24 VAC/DC ±20%, 50 Hz
Power consumption	Approx. 30 mA + power digital outputs
VOC sensor data	
Gas type	VOC (see table 1)
Sensor element	Metal oxide semi-conductor
Measuring range	0 – 4000 ppm or 0 – 2000 ppm
Accuracy	± 150 ppm
Repeatability	± 5 % of reading
Response time	t_{90} = 60s
Warm-up time	20 min.
Expected life time	> 10 years/ normal ambient conditions
Temperature sensor data	
Sensor element	NTC
Measuring range	0 – 50 °C (32 to 122°F)
Accuracy	± 1% of reading
Output signal	
AO1 = analog, VOC 0 – 4000 ppm	0- 10 V proportional, max. 2mA
AO2 = analog, temperature 0 -50 °C	0- 10 V proportional, max. 2mA
DO1 = digital	24 VDC, max. 200 mA
Ambient conditions	
Humidity	15 – 90 % RH non condensing
Temperature operation	0 °C to + 50 °C (32 to 122 °F)
Temperature storage	5 °C to + 50 °C (41 to 122 °F)
Pressure range	Atmosphere ± 10 %
Serial interface	
Transceiver	RS 485 / 9600 Baud
Protocol	ModBus
Physical	
Housing	Plastic ABS
Colour	Pure white similar to RAL 9010
Dimensions (W x H x D)	78 x 84 x 25 mm (3.07 x 3.31 x 0.98 in.)
Weight	Approx. 95g (0.21 lb.)
Wire connection	Screw-type terminal 0.25 to 1.5 mm^2 24 to 16 AWG
Directives	EMC Directives 2004 / 108 / EEC EN 61000-6-2. EN 61000-6-3 72/23/EEC: EN 60730

Specifications IAQ Power Module

Electrical	
Supply voltage	230 VAC ± 10%, 50/60 Hz
Output voltage	24 VDC, max. 80 mA (unregulated)
Power consumption	1,5 VA
Switch output for fan/ valve	Normally open contact, wet 230 VAC max. 2A (inductive load)
Physical	
Dimensions (W x H x D)	35 x 41 x 32 mm (1.38 x 1.61 x 1.26 in.)
Weight	Approx. 250 g (0.55 lb.)

8 Figures



Function sensor:
AO1 = VOC: 0 – 4000 ppm or 0 – 2000 ppm (0 – 10 V)
AO2 = Temperature: 0 – 30 °C (0 – 10 V)

Function control
AO1 = Control signal ventilation (0 – 10V)
AO2 = Control signal heating/ cooling (0 – 10V)

DO1 = Digital output: (24 V 0,2 A)

Fig. 6: Electrical connection: Analog output AO1, AO2, digital output DO1

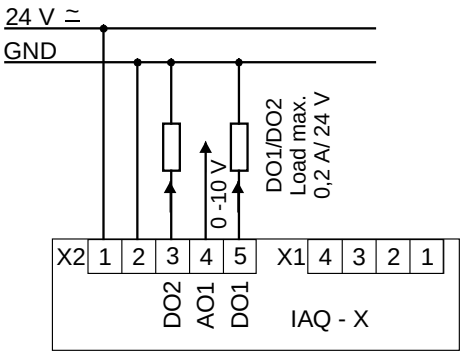


Fig. 7: E Electrical connection: Analog output AO1, digital output DO1, DO2

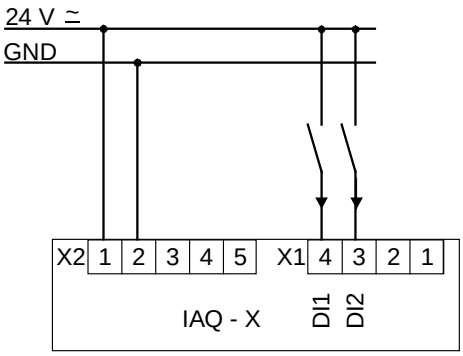


Fig 8: Electrical connection: Digital input DI1, DFI2

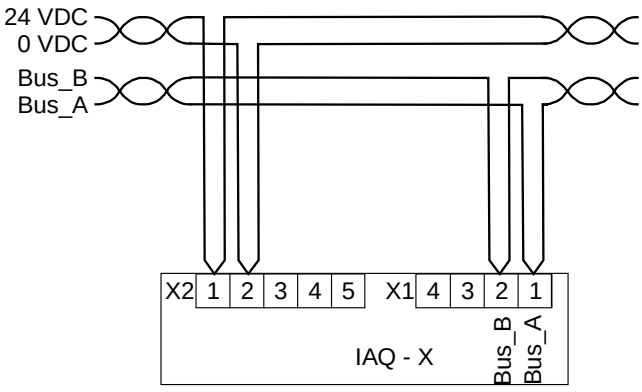


Fig. 9: Electrical connection: MODBus

Connect the IAQ Power Module on the primary side and put it into the flash-mounted socket
Connect the IAQ transmitter on the secondary side and put it onto the flash-mounted socket

L =black (feed line 230VAC 50/60Hz)
N =blue
L1 =brown (switch contact venitator 230VAC/5A)
+ = red (+24VDC)
GND =gray
VOC =green (switch signal VOC 24V/0,2A)

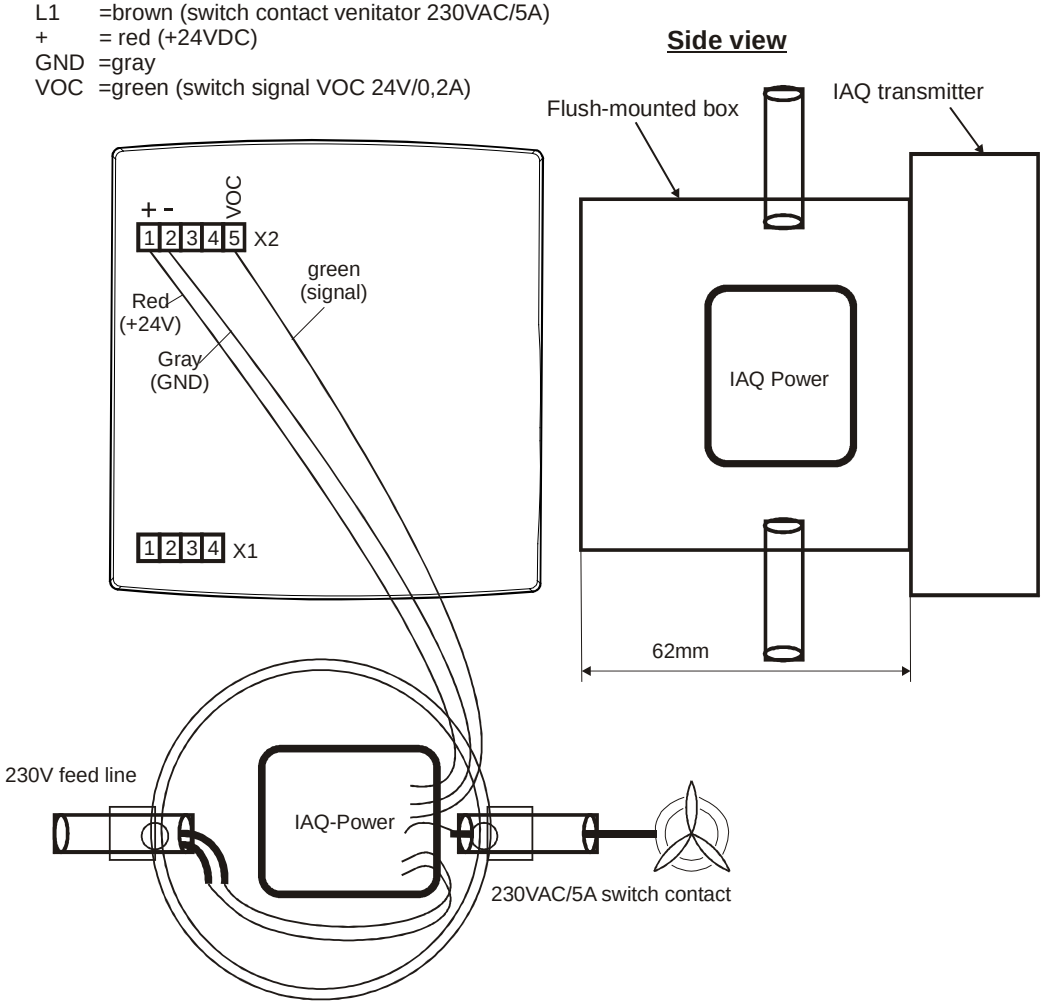
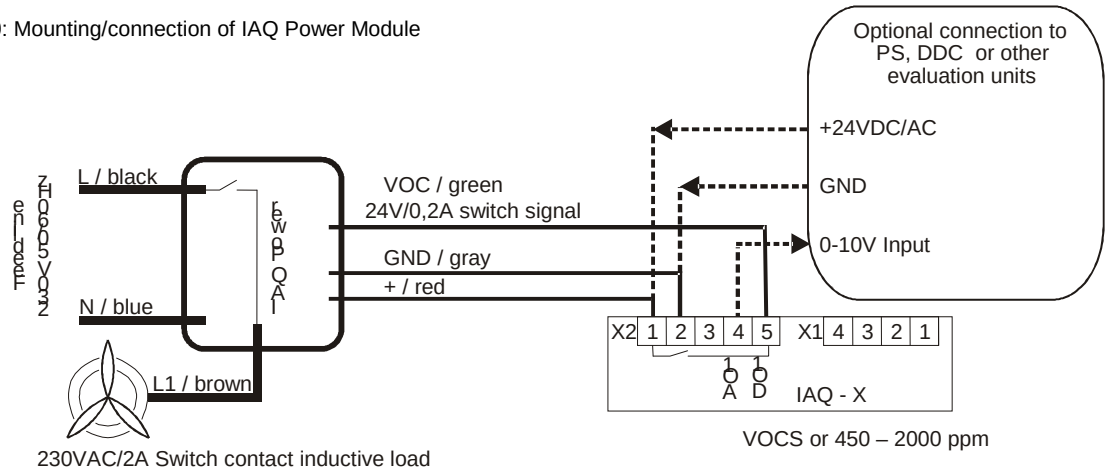


Fig. 10: Mounting/connection of IAQ Power Module



AO1 = VOC: 450-4000ppm (0-10V) optional: Connection to SPS, DDC...
DO1 = Relay output (relay switch threshold adjustable via internal potentiometer)

Fig. 11 Electrical connection of the IAQ sensor wit IAQ Power Module

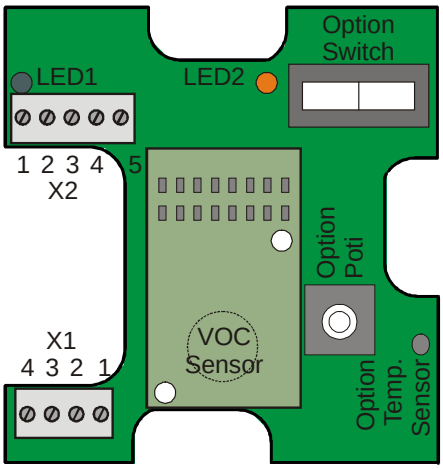


Fig. 12: PCB

Levels to set up for controlling the air quality by the ventilation system

[ppm]	Air Quality
2100	BAD Heavily contaminated indoor air Ventilation required
2000	
1900	
1800	
1700	
1600	
1500	MEDIOCRE Contaminated indoor air Ventilation recommended
1400	
1300	
1200	
1100	
1000	FAIR
900	
800	GOOD
700	
600	EXCELLENT
500	
400	

Measurement starts at 450 ppm. At 10 volt output signal it becomes approximately 11% at 4000 ppm and 22% at 0 to 2000 ppm.

9 Notes and General Information

It is important to read this user manual thoroughly and clearly in order to understand the information and instructions. The IAQ sensor must be used within product specification capabilities. The appropriate operating and maintenance instructions and recommendations must be followed.
Due to on-going product development, the manufacturer reserves the right to change specifications without notice. The information contained herein is based upon data considered to be accurate. However, no guarantee is expressed or implied regarding the accuracy of this data.

9.1 Installers' Responsibilities

It is the installer's responsibility to ensure that the IAQ sensor is installed in compliance with all national and local codes and OSHA requirements. Installation should be implemented only by technicians familiar with proper installation techniques and with codes, standards and proper safety procedures for control installations and the latest edition of the National Electrical Code (ANSI/NFPA70). It is also essential to follow strictly all instructions as provided in the user manual.

Attention:

- The electrical connections of the device have to be made according to the legal requirements.
- To avoid personal injuries and/or equipment or other property damages, please take care to always disconnect power supply before working on the electrical wiring.
- For avoiding property damages, the device must only be employed within the
- intended use.

Attention:

The circuits used in the device react to electrostatic discharge.
Please take appropriate precautions!

9.2 Maintenance

It is recommended to check the IAQ sensor regularly. Due to regular maintenance any performance deviations may easily be corrected. Re-calibration and part replacement in the field may be implemented by a qualified technician and with the appropriate tools. Alternatively, the IAQ sensor may be returned for service to the manufacturer.

9.3 Limited Warranty

The manufacturer warrants the IAQ sensor for a period of one (1) year from the date of shipment against defects in material or workmanship. Should any evidence of defects in material or workmanship occur during the warranty period, the manufacturer will repair or replace the product at their own discretion, without charge. This warranty does not apply to units that have been altered, had attempted repair, or been subject to abuse, accidental or otherwise. The warranty also does not apply to units in which the sensor element has been overexposed or gas poisoned. The above warranty is in lieu of all other express warranties, obligations or liabilities.

This warranty applies only to the IAQ sensor. The manufacturer shall not be liable for any incidental or consequential damages arising out of or related to the use of the IAQ sensors.

10 Part Disposal

Since August 2005 there are EC-wide regulations defined in the EC Directive 2002/96/EC and in national codes concerning the disposal of waste electrical and electronic equipment and also regarding this device.
For private households there are special collecting and recycling possibilities. For this device isn't registered for the use in private households, it mustn't be disposed this way. You can send it back to your national sales organisation for disposal. If there are any questions concerning disposal please contact your national sales organisation.

Outside the EC, you have to consider the corresponding directives.