ATEST GAZ

User Manual

Gas Detector

RapidGas E

Product code: PW-076-X

POD-056-ENG R03

ATEST GAZ

Reliable and Innovative Gas Safety Systems

We design, manufacture, implement and support:
Systems for Monitoring, Detection and Reduction of gas hazards

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Atest Gaz A. M. Pachole sp. j.
ul. Spokojna 3, 44-109 Gliwice
Poland

tel.: +48 32 238 87 94
fax: +48 32 234 92 71
e-mail: contact@atestgaz.pl

www.atestgaz.pl

Remarks and reservations

- Read and understand this manual prior to connection and operation of the device. Keep the User Manual with the device for future reference.
- The manufacturer shall not be held responsible for any errors, damage or defects caused by improper selection of suitable devices or cables, errors in installation of equipment or any misuse due to failure to understand the document content.
- Unauthorised repairs and modifications of the device are not allowed. The manufacturer shall discard any responsibility for consequences of such actions.
- Exposure of the device to the impact of excessive mechanical, electric or environmental factors may lead to damage of the device.
- Operation of damaged or incomplete devices in not allowed.
- Engineering of a gas safety system for any specific facilities to be safeguarded may need consideration of other requirements during the entire lifetime of the product.
- Use of unauthorized spare parts different from the ones listed in Table 8 is strictly forbidden.

How to use this manual?

- Important fragments of the text are highlighted in the following way:

Pay extreme attention to information provided in such framed boxes.

- This User Manual consists of a main text and attached appendices. The appendices are independent documents and can be used separately from this Manual. Page numbering of appendices starts anew with no relationship to pare numbering of the main document and appendices may have their own tables of contents. In the right bottom corner of each page you can find the name (symbol) of any document included into the User Manual package with its revision (issue) number.

Table of contents

List of Tables

List of Figures

1 Preliminary information

RapidGas E is a multi-channel (1 to 10 communication channels) gas detector designed to measure concentrations of toxic or explosive gases in ambient atmospheres. The measurements are carried out by means of aspiration sampling of gaseous atmospheres at several locations. Owing to its flameproof enclosure the device can be operated in areas with potentially explosive atmospheres.

An embedded pump enforces transferring small volumes of gaseous atmospheres via gas paths from field deployed sampling devices to gas sensors embedded into the gas detector and thus concentration of hazardous agents can be measured. After measurements the gas samples are discharged back to the atmosphere.

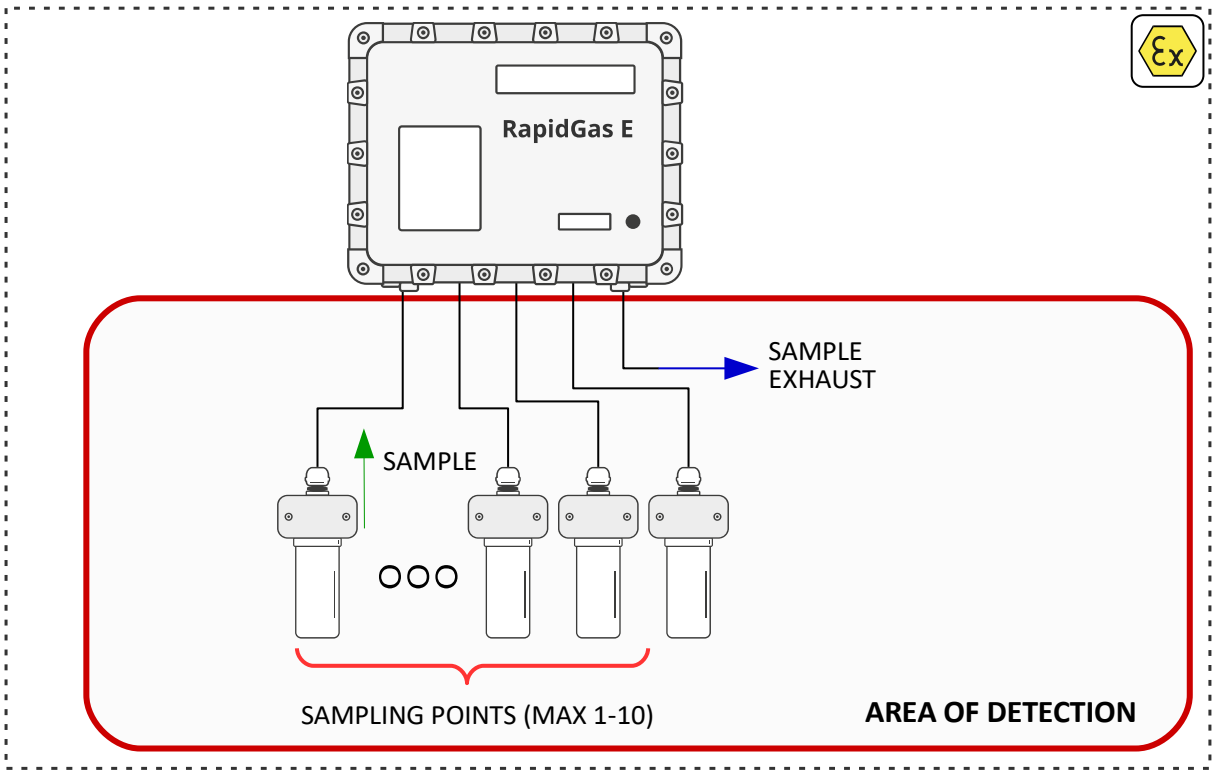


Figure 1: Example of the gas detector structure

1.1 Marking of explosion protection

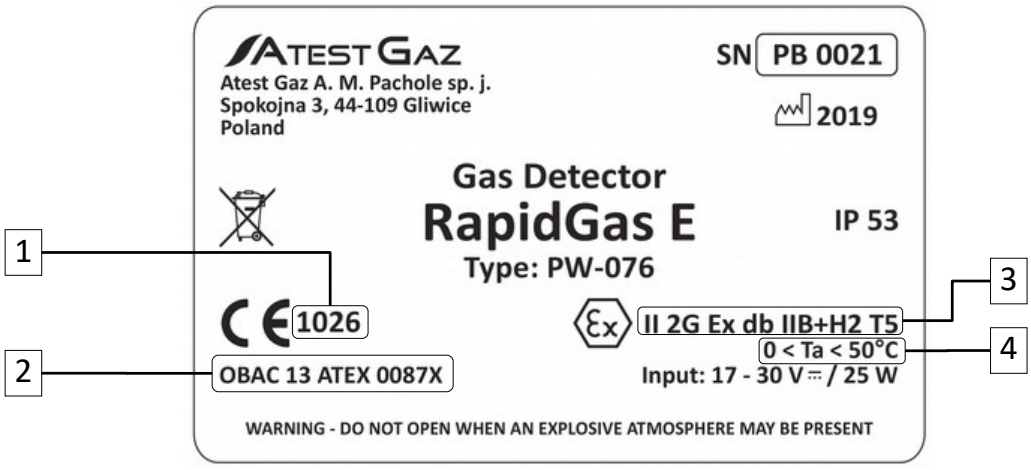


Figure 2: Information on the rating plate of the device

No.	Description
1	Number of the notified body responsible for supervision of the device
2	Number of ATEX certificate issued for the device
3	Ex code for the device
4	Information about ambient temperature

Table 1: Meaning of information provided on the rating plate

1.2 Additional information related to the explosion-proof protection of the device

- The recommended position for the detector operation is shown in the Figure 3.
- Equipment should not be covered by dust.
- While mounting the detector lid pay attention the correct tightening of all screws. Incorrect tightening may compromise the explosion protection of the device.
- Do not repair the device's flameproof joints.

1.3 Cable glands and blanking plugs

The cable gland and blanking plug are replaceable elements. To select spare ones please obey the following rules:

- ATEX certificate,
- degree of explosion protection (Ex code) – no worse than the detector (see Table 7),
- operating temperature range (see Table 7),
- appropriate mounting thread (see Table 7),
- flat gasket that allows to ensure proper IP and protect the enclosure surface.

1.3.1 Replacement of cable glands and blanking plugs

To replace/screw the cable gland or blanking plug:

- remove the gland/blanking plug from device (if it is screwed in),
- apply small amount of technical vaseline on the thread of the gland/blanking plug,
- screw in a new gland/blanking plug (remember to use the appropriate torque specified by the manufacturer).

1.4 Cables

When selecting cables, make sure that:

- the diameter of the cable is matched to the size of cable gland (ensuring an appropriate explosion-proof protection and IP degree),
- thermal resistance of cables must comply requirements set forth in Table 7.

1.5 Hazardous gases to be detected by the device

Depending on the device application and type of the gas to be monitored the manufacturer selects a suitable sensor.

Details about applicable sensors can be found in the User Manual – “Sensors suitable for gas detectors manufactured by Atest Gaz” (POD-062-ENG).

1.6 Gas detector status

Mode	Description
Correct operation	The detector operates properly and makes measurements. The concentration value of the gas being measured does not exceed threshold values and no irregularities in the device operation were detected.
Warning 1	Signalled after exceeding the gas concentration above the specific value.
Warning 2	Signalled after exceeding the gas concentration above the specific value.
Alarm	Signalled after exceeding the gas concentration above the alarm threshold.
Gas overload	Gas concentration has exceeded the overload threshold value. If such is the case, the sensor may be damaged or its sensitivity and shelf-life may be reduced.
Lock[1]	Gas concentration is above the overload value (the default value is 100% LEL). The detector is locked (see Appendix [2]) – the last value of the concentration is shut. The detector does not make measurements. It is possible to unlock the condition by means of sending the applicable command from the control unit or from the superior system. ⚠ Removing the lock on a detector which is in the conditions of concentration above the measuring range can damage the sensor.
Warm up	After turning on the detector's power supply, the sensors working parameters stabilize for some time. In this state, the detector does not take measurements.
Calibration	In this state the detector allows to change your settings. In the calibration mode it is also possible to examine the detector without raising an alarm (in fact, the behaviour of the system will be determined by the interpretation of the data by the central system). The detector can be switched to this state using the appropriate software tools.
Non-critical failure	Detector malfunction threatening its accuracy of measurement (e.g. time out for periodic calibration).
Critical failure	Detector failure or detector not present.

Table 2: Gas detector status

1.7 External filter

It is possible to take a sample directly from the environment (without using the Gas Sampling Point). In this case, an external filter must be used (details see Section 9).

2 Safety

⚠ All activities related to connecting detectors, signallers and other system components must be carried out while Control Unit's power supply is off.

⚠ The device must be reliably secured during any repair, installation or maintenance works.

1 The condition is present only for the detectors with a catalytic sensor. Active lock mechanism.

Before painting the facility walls make sure that the device is properly secured.

Before painting the facility floors make sure that the device is properly secured.

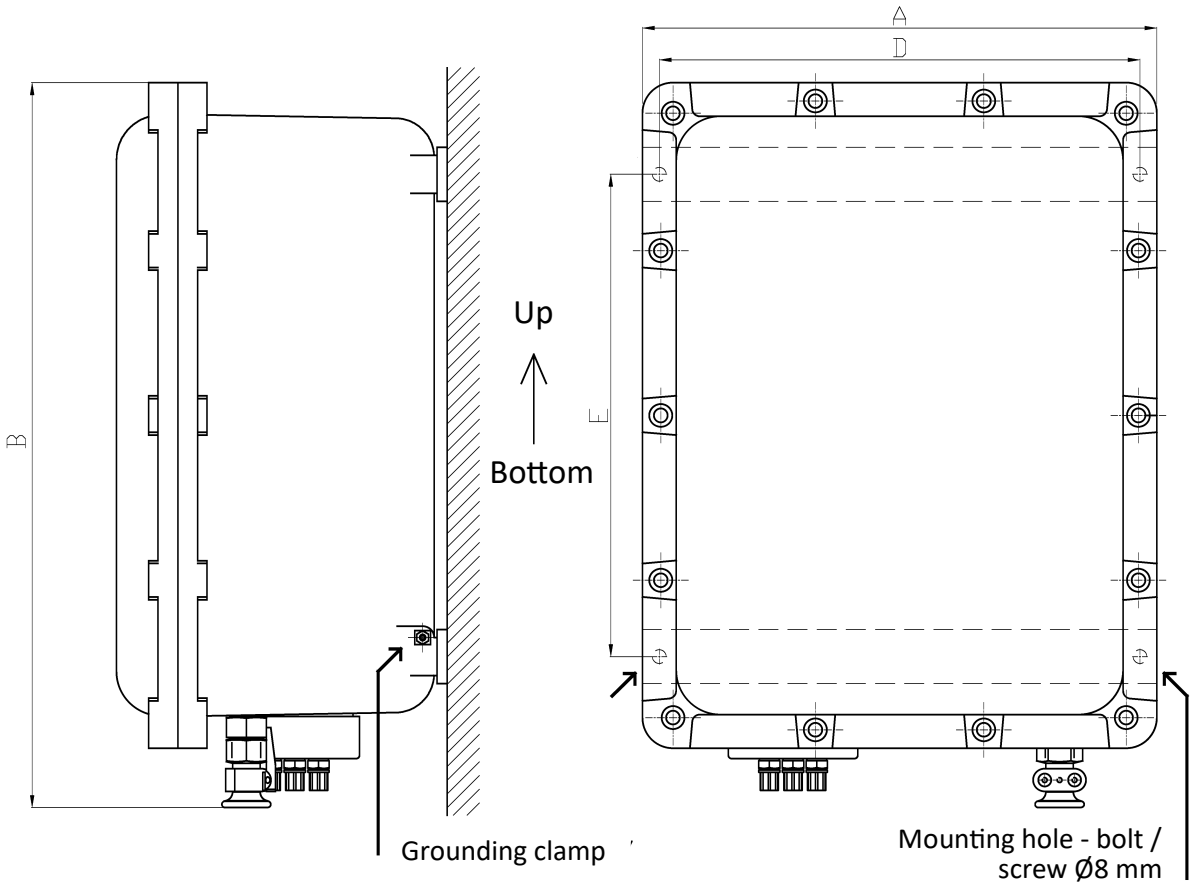
Before use of silicon or silicon-based materials (paints, adhesives, sealant, etc.), make sure that the device is properly secured.

Do not allow the gas path to be blocked. Long-term blockage of the gas path during operation of the detector may cause damage.

The use of external filters at the entrance of gas paths is mandatory.

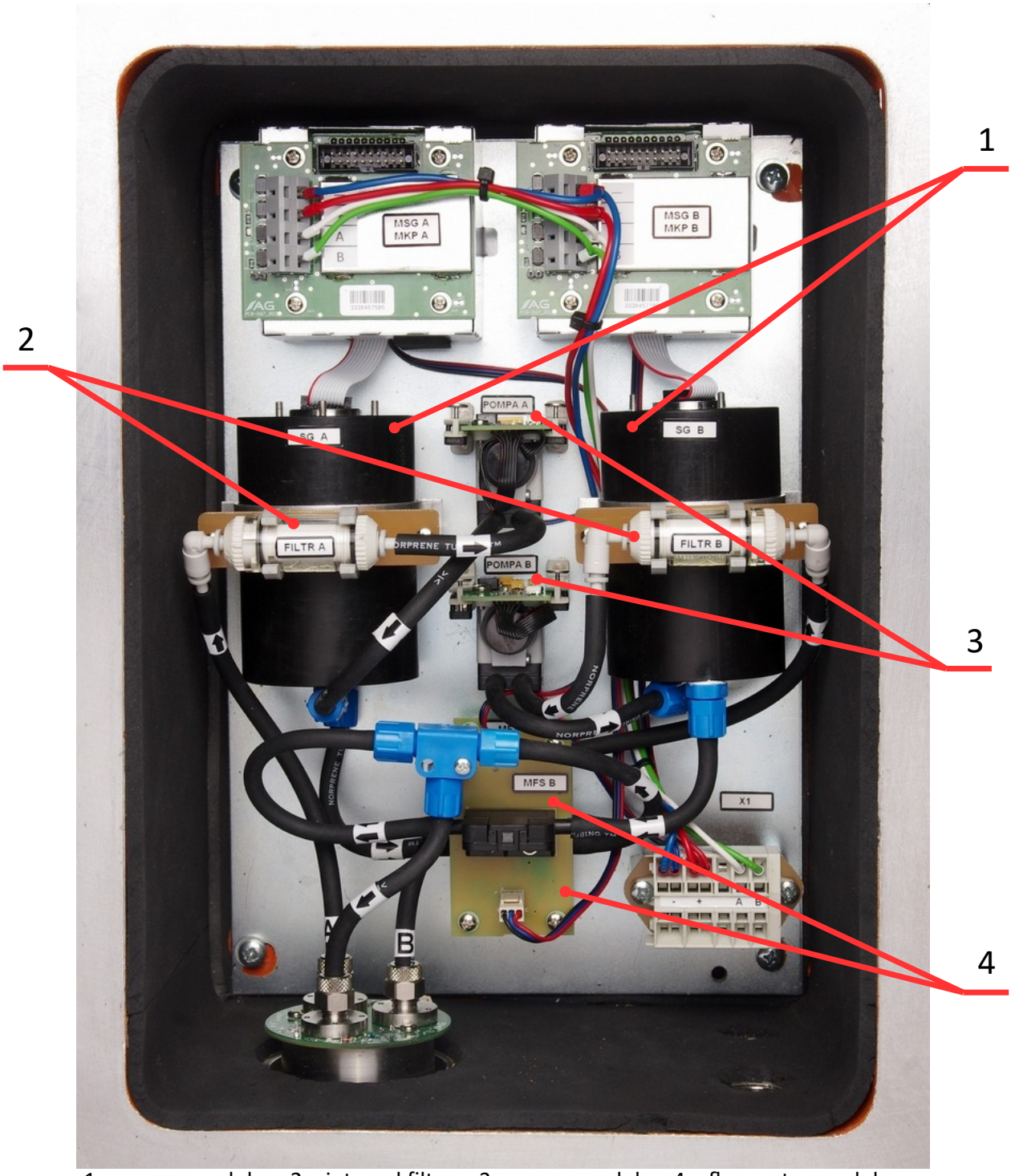
In the device that isn't connected, plug the stub-pipe – e.g. with plugs.

3 Description of the construction



Channels	Dimension A	Dimension B	Dimension C	Dimension D	Dimension E
1 – 2	300	445	205	275	275
3 – 10	400	545	205	370	350

Figure 3: The construction of the device and its dimensions



1 – sensor modules 2 – internal filters 3 – pump modules 4 – flowmeter modules

Figure 4: Internal components of the device (two channels)

4 Input-output interfaces

4.1 Electric interface 24 V

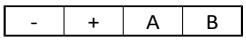


Figure 5: Diagram connections description

Name	Pin	Description
Power supply		Power supply port. Parameters – see Section 7
	-	Negative
	+	Positive
Communication protocol		
	A	Signal line A
	B	Signal line B

Table 3: Diagram connections description 24 V

4.2 Electric interface 230 V

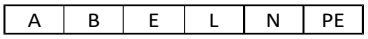


Figure 6: Diagram connections description

Name	Pin	Description
Communication protocol		
	A	Signal line A
	B	Signal line B
-	E	Shield
Power supply		Power supply port. Parameters – see Section 7
	L	Phase wire
	N	Neutral wire
	PE	Protective wire

Table 4: Diagram connections description 230 V

The cable preparation method is described in the Appendix [3].

4.3 Pneumatic interface

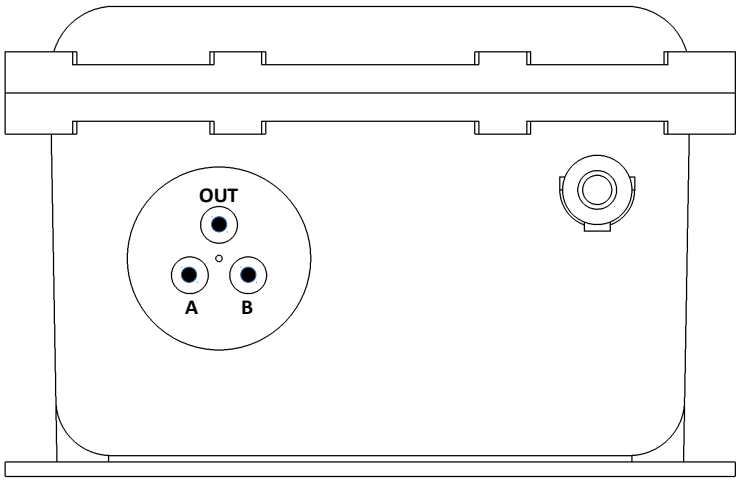


Figure 7: Pneumatic interface for 2-channels detector

No.	Name	Description
1	A	Gas inlet of channel A
2	B	Gas inlet of channel B
3	OUT	Gas outlet from channels A i B

Table 5: Description of pneumatic interface for 2-channels detector

5 System architecture

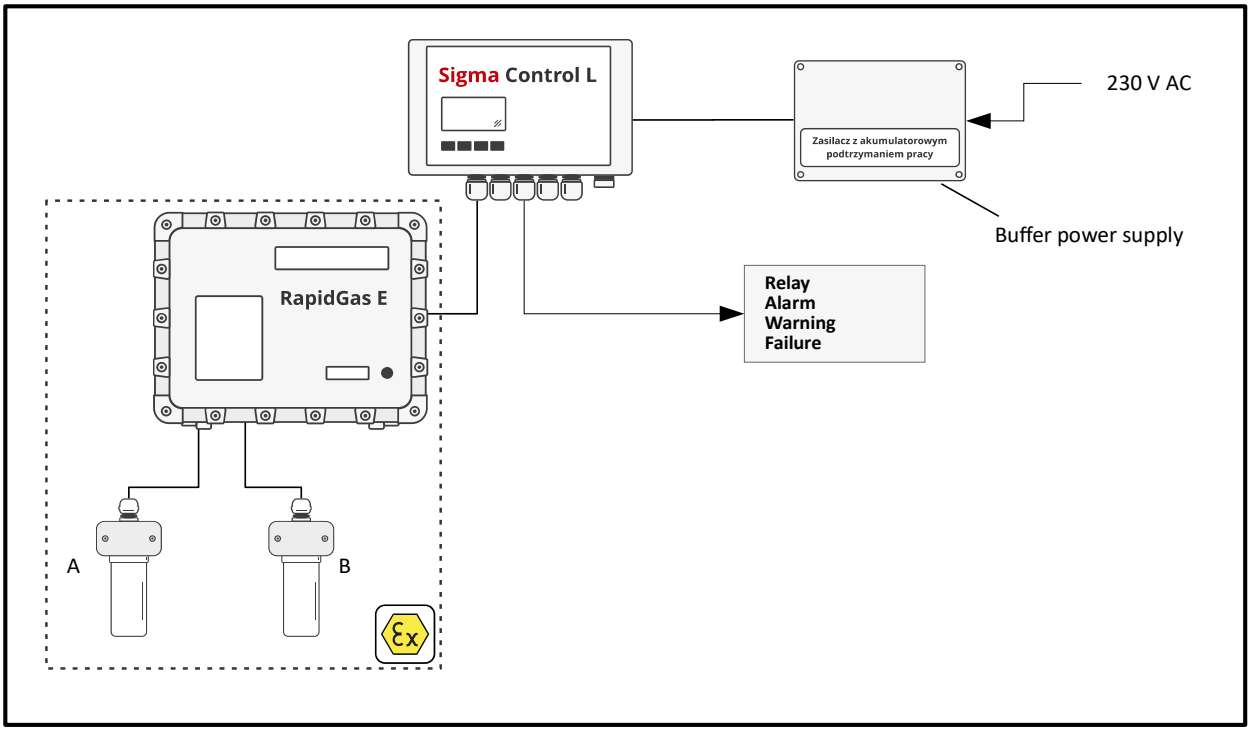


Figure 8: An exemplary system architecture with a two-channel detector

6 Life cycle

6.1 Transportation

The device should be conveyed in the same way as a new device of the same type. If the original package, i.e. box, fitting drawpiece or other protective cushioning (cork pellets) is not available, the device should be protected by the customer itself by means of other equivalent methods against shocks, vibrations and moisture or other contaminants that may clog the gas line.

The device can be conveyed under environmental conditions as described in Table 7.

6.2 Storage

Gas detectors should be stored with blinded inlet and outlet opening (gas inlets and also cable bushings when cables are not connected).

6.3 Installation

The device should be mounted on a flat a vertical wall, where the mounting position is shown in Figure 3. The location of the detector should be easily accessible to operating personnel but access of unauthorized persons should be restricted as much as possible.

It is recommended to install the device at the height that enable easy access to the unit.

If electric connections are made by means of multi-core wires (stranded cables) the cable ends should be secured with clamping ferrules.

When more than one cores needs to be connected to a single terminal all these cores must be mandatory secured together in a single ferrule (see details in Table 7).

Combining two or more wires at a single terminal is not allowed if such wires are not clamped in a common cable ferrule.

Leaving spare lengths of cables inside the device is not allowed. Bare wires or wires surplus may lead to a hazard of electric shock or equipment damage.

All cable cores must be terminated inside the device. Leaving unterminated cores is not allowed.

Incorrect routing of cables may result in impairment of the equipment immunity to electromagnetic interferences.

All installation jobs must be carried out in areas with no presence of potentially explosive atmosphere.

Prior to operation of the device make sure that the detector cover is closed and all bolts are firmly tightened.

6.3.1 Connection of electric and pneumatic lines to the detector

After having the detector mounted in the position as in Figure 3 proceed in the following way:

- unscrew bolts and remove the cover of the housing,
- prepare ends of the power supply cable (see Appendix [3]), thread the cable through the cable gland and connect to the terminal box),
- reinstall the housing cover (make sure that all bolts are firmly tightened),
- earth the detector by connecting the earthing wire (4 – 6 mm^2) to the earthing terminal (see Figure 3),
- connect hoses for gas sampling (see Table 7 for types and variations of inlet ports).

6.4 Start up

Upon connection of the detector to the central control unit check indications of that unit – it should confirm undisturbed operation of the detector and correct flow rate (500 ± 50 ml/min).

6.5 Monitoring of gas flow

The device is furnished with implements for monitoring of gas flow. Information about correct flow rates is indicated by the control unit (for channels A – J).

If any message about flow obstacles is provided by the control unit check the following components of the flow line (for a specific channel).

6.5.1 Filters

To check operability of filters proceed as follows:

- inspect the filter visually – in case of any damage, clogging or presence of dirt replace the filter with a new one,
- if clogging of the filter is suspected check flow rates of gas by connecting a rotameter directly to the gas line and compare flow rates with and without the filter. When significant drop of flow rate is observed replace the filter with a new one.

6.5.2 Leaks from a gas line

To check any gas line for possible leaks proceed as follows:

- blind the gas inlet until the central control unit responses – no longer than for 20 seconds,
- make sure that the control unit responses accordingly – it should report lack of flow in the gas line.

Should the control unit fails to indicate failure of gas flow, carry out the following checks:

- inspect visually whether all components of the gas line are correctly connected,
- when connections seems correct contact the system manufacturer.

6.5.3 Pumps

To check operability of pumps proceed as follows:

- check whether the pump is running (hearable sound),
- check indication of the pump status (status green lamp on the pump is on),
- check connections of the pump (no visible breaks of cables or hoses),
- flow rate is displayed on the control unit.

6.6 Scheduled maintenance

Operation	Frequency
Calibration	Not less than once per year[2]
Replacements of the cartridge for the internal filter	Not less than once per three years
Replacements of the cartridge for the external filter	Not less than once per year
Replacement of the pump module	Not less than once per 18 months

Table 6: Frequency of scheduled maintenance

6.6.1 Calibration

Calibration can be carried out only by authorized servicemen of the manufacturer.

Opening of the device housing is not required for calibration.

Calibration is to be carried out within a regular schedule as specified in the Calibration Certificate or when the detector is overloaded.

To carry out calibration the following equipment must be available:

- gas cylinders with zero gas (air),
- gas cylinders with reference gas,
- auxiliaries (tee-piece, flow control device 0.6 dm^3/min, hose),
- software dedicated for the specific device,
- dedicated service cable.

2 The exact time between subsequent calibrations is set forth in the Calibration Certificate

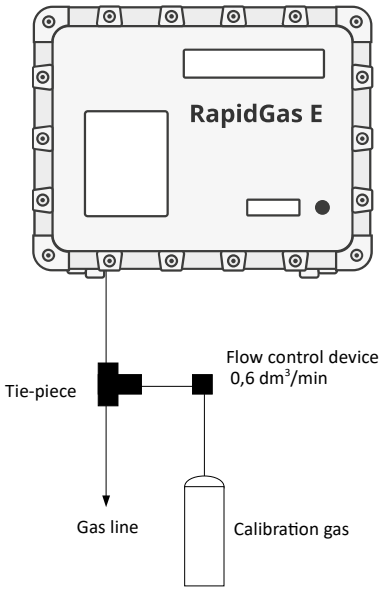
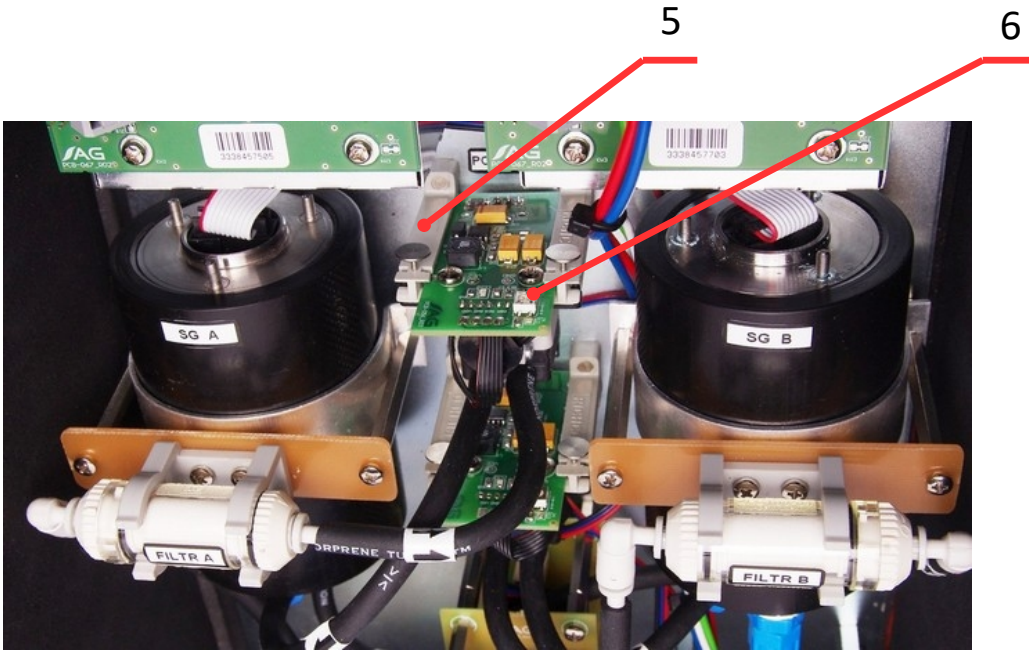


Figure 9: Calibration example for a two-channel gas detector

The calibration procedure includes:

- establishing a connection between the gas detector and the control unit by means of a dedicated service cable,
- switching the detector into the calibration mode (the calibration mode is recognized by the control unit, which eliminates undesired alarms due to the detector response to test gas),
- supplying some zero gas to channel A of the detector (see Figure 9) and comparison of the indicated concentration against the reference concentration stored in the detector memory. If necessary, the detector settings should be adjusted,
- supplying some reference gas to channel A and comparison of the indicated concentration against the reference concentration stored in the detector memory. If necessary, the detector settings should be adjusted,
- switching the calibration mode off,
- repeating the foregoing operations for all channels of the gas detector.

6.6.2 Adjustment of gas flow



5 – guiding rails for the pump control board
6 – potentiometer for adjustment of the pump control board

Figure 10: Electronic control board for the pump

- Gas flow is adjusted by means of a potentiometer (See Figure 10) mounted on the pump control board (if access to the potentiometer is hindered the board can be slid out from guiding rails).
- Adjusted flow rate is shown on the control unit display (for all channels from A to J).
- The correct flow rate should be set to 500 ± 50 ml/min.

Detectors are designed for operation in areas with potentially explosive atmospheres. Therefore uninterrupted protection from hazardous gases must be assured during maintenance of gas detectors and other equipment must be used to guarantee continuous gas safety.

6.6.3 Replacement of consumables and wearable parts

Lifetimes of consumables and wearable parts are listed in Table 8.

6.6.3.1 Replacement of cartridges in the internal filter

To replace a cartridge in the internal filter proceed as follows:

- take the filter out of the clamping ring (see Figure 4),
- unscrew the filter lids,
- replace the filter cartridge,
- screw the filter lids back in position,
- insert the filter into clamping rings.

6.6.3.2 Replacement of cartridges in the external filters in gas lines

To replace a cartridge in the external filter proceed as follows:

- unscrew a locking screw for the external filter,
- replace the filter cartridge,
- retighten the locking screw.

6.6.3.3 Replacement of a sensor module

The sensor module can be replaced exclusively by authorized servicemen of the manufacturer.

6.6.3.4 Replacement of a pump control board

To replace the pump control boards proceed as follows:

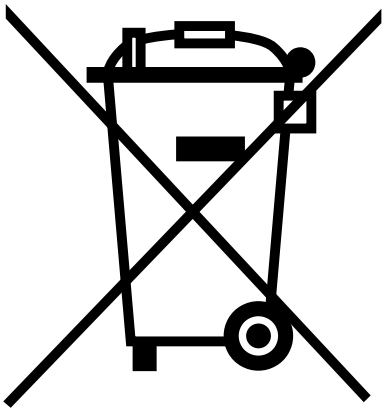
- slide the board out of the guiding rails (see Figure 10),
- disengage the board from the connector,
- disconnect hoses,
- replacement the board with a new one,
- reconnect hoses,
- engage the power supply connector,
- insert the board back into the guiding rails,
- check the flow rate,
- adjust the flow rate, if necessary (see Section 6.6.2).

6.6.4 Maintenance

The device needs no particular maintenance except for cleaning external surfaces of its housing. These surfaces shall be cleaned with a soft cloth damped with water and tiny amount of mild detergent.

Other components of the detector, connectors and the gas line must be kept clean, no dust or other contaminants should be deposited thereon.

6.7 Utilization



This symbol on a product or on its packaging indicates that the product must not be disposed of with other household waste. Instead, it is the user's responsibility to ensure disposal of waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The proper recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. Information about relevant designated collection points can be obtained from the Local Authority, waste disposal companies and in the place of purchase. The equipment can also be returned to the manufacturer.

7 Technical specification

Power supply • Voltage V_{cc} • Power	15 – 30 V ⎓ / 230 V ~ 25 / 100 / 150 W[3]	
Environment	In operation	Storage
• Ambient temperatures Ta • Humitidy • Pressure • pH	0 – 50°C / -28 – 40°C – see Point 10 10 – 90% long term 0 – 99% short term 1013 ± 10% hPa 5.5 – 7	0 – 40°C 30 – 90% long term
ATEX	 II 2G Ex db IIB+H2 T5	
Sampling method	Aspiration	
Number of measuring channels	1 – 10	
Time parameters	T90 – depending on the type of sensor and the length and diameter of the gas path – see Calibration Certificate	
IP	IP 53	
Protection class	III	
Parameters of the pneumatic interface • Type of compatible connector	BSP 60° 1/4”	

Digital communication parameters
• Port
  • Electrical standard
  • Communication protocol
	
	RS-485
	Sigma BUS	

Dimension	See Figure 3	
Cable glands • Cable diameter range • External thread	 See details in POD-066-ENG „ Cable glands used in offered devices” M20x1.5	
Acceptable cables	0.5 – 2.5 mm² (solid wire) 0.5 – 1.5 mm² (multi-wire cable)	
Enclosure material	Aluminium spray epoxy	
Weight	20 kg	
Mandatory periodic inspection	Every 12 months (Calibration Certificate validity)	
Lifetime of consumables	See Table 8	
Mounting	See Figure 3	

Table 7: Technical specification

3 The value depends on the version of the device.

8 List of consumables

No.	Consumables	Lifetime	Manufacturer	Product code
(1)	Sensor module	Depends on the type of sensor	Atest Gaz	-
(2)	Internal filter cartridge	3 years	SMC	I-62S-A
(3)	External filter cartridge	1 year	DK LOK	FE73B-15
(4)	Pump module (POMP A, POMP B)	1.5 year	Atest Gaz	PWS-031-D-HR

Table 8: List of consumables

9 List of accessories

Product code	Description
PW-094-A	Gas Sampling Point
V76A	External filter
AF-HDSB-06AS	Hose HYPERLINE SB ¼", internal diameter 6.7 mm, antistatic

Table 9: List of accessories

10 Product marking

RapidGas E Gas Detector

PW-076-[CH]-[P]-[H]-[G]

[CH] **Channels number**	**X**	Number of channels (maximum number of channels: 10)
[P] **Power supply**	**24**	15 – 30 V ⎓ power supply
	230	230 V ~ power supply
[H] **Heating system**	**0**	Without (temperature in operation 0 – 50°C)
	P	With heating system (temperature in operation -28 – 40°C)
[G] **Cable gland**	**X**	See details in POD-066-ENG „ Cable glands used in offered devices”

Figure 11: Method of product's marking

11 Appendices

[1] DEZG124-ENG – EC Declaration of Conformity – RapidGas E

[2] PU-Z-093-ENG – Instructions for removing the lock of a detector with a catalytic sensor

[3] PU-Z-015-ENG – Shielded cables applied for connecting detectors – preparation and installation

[4] PU-Z-115-ENG – Register map of RapidGas E, Rapid Gas S Gas Detectors

EU Declaration of Conformity

Atest Gaz A. M. Pachole sp. j. declares with full responsibility, that the product:

(Product description)	(Trade name)	(Type identifier or Product code)
Gas Detector	**RapidGas E**	**PW-076**

complies with the following Directives and Standards:

- in relation to Directive 2014/34/EU – on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres:

Marking	Certificate no.	Standards	Notified body
Ex II 2G Ex db IIB+H2 T5-T4	OBAC 13 ATEX 0087X	EN IEC 60079-0:2018 EN 60079-1:2014	1461 The "OBAC" Institute for Research and Certification Ltd., Toruńska 27, 44-122 Gliwice, Poland
CE 1026	FTZU 03 ATEX Q 004	EN ISO/IEC 80079-34:2020	1026 Physical-Technical Testing Institute, Pikartska 7, 716 07 Ostrawa-Radvanice, Czech Republic

- in relation to Directive 2014/30/EU – on the harmonisation of the laws of the Member States relating to electromagnetic compatibility:
  - EN 50270:2015
- In relation to directive 2011/65/EU – on the restriction of the use of certain hazardous substances in electrical and electronic equipment
  - EN IEC 63000:2018

This declaration of conformity is issued under the sole responsibility of the manufacturer.

This EU Declaration of Conformity becomes not valid in case of product change or rebuild without manufacturer's permission.

Gliwice, 30.06.2022

(Name and Signature)
Managing Director
Aleksander Pachole

Instructions for removing the lock of a detector with a catalytic sensor

Detectors using a catalytic sensor (more details concerning the sensor – see User Manual POD-062-ENG “Sensors used in gas detectors produced by Atest Gaz”) are equipped with a system protecting against its damage caused by a gas concentration exceeding the measuring range of the sensor and before entering non-monotonic part of the catalytic sensor characteristics. In the case of occurrence of such a situation, the detector is switched into the lock state. In this state, the detector saves the last value of gas concentration and switches it off to protect the sensor and prevent false indications.

The lock state is signalled on the detector's display and on all devices showing the detector status (e. g. control units). When the lock detector status occurs, the level of gas concentration in the place of the detector operation must be measured with the use of another measuring device. In a situation when the concentration level drops to the value within the measuring range of the sensor, the operator may proceed to removing the lock – see illustration 1. If the lock is turned off, when the gas concentration in the place of the detector operation is beyond the measuring range of the sensor, a permanent sensor damage or a false reading of the concentration can occur, as a result of the non-monotonic characteristics of the sensor.

When the detector is in the inhibit state and the gas overload condition occurs, the detector will also enter the lock mode and it will be visible after the inhibit mode is deactivated.

The method of executing the **"Remove the lock"** command can be found in the documentation of the control unit that controls the detector. Turning off the power of the detector automatically disables the lock.

Removing the lock on a detector which is in the conditions of concentration above the measuring range can damage the sensor.

Removing the lock on a detector which is in the conditions of concentration over the measuring range can cause its false indication (due to the non-monotonic characteristics of the sensor).

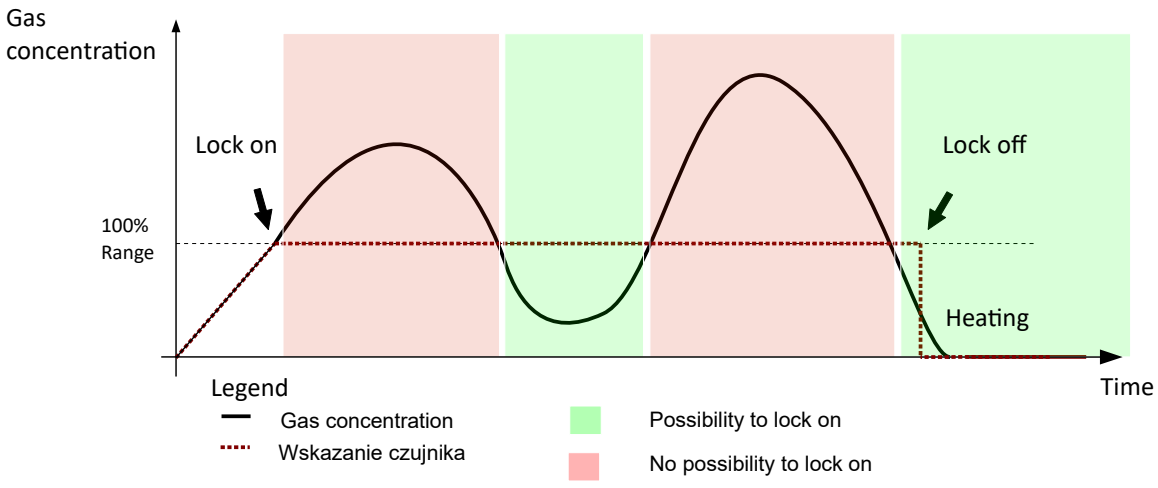


Figure 1: Operation of lock on /off detector

Shielded cables applied for connecting detectors – preparation and installation

The cable shall be prepared in accordance with the following guidelines (see also 1):

- the cable external sheath shall be removed at the applicable length (see 1),
- the cable shield shall be cut right by the end of the external sheath,
- the cable shield shall be protected with isolation,
- at the ends of the cables, isolated clamp sleeve shall be placed,
- he conductive part of the clamp sleeve shall have applicable length (see 1).

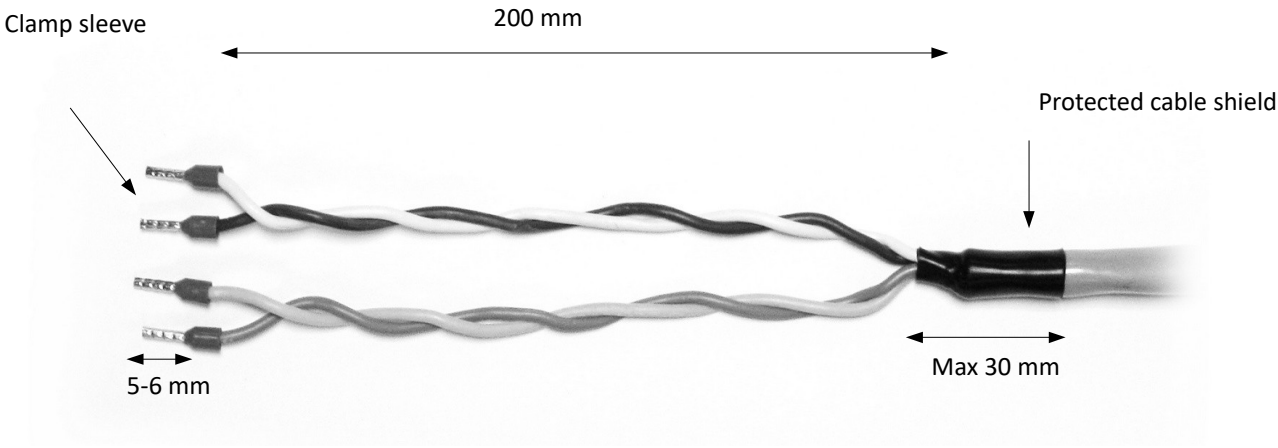


Figure 1: Cable preparation

For the systems with RS-485 interface, it is necessary to make sure that A and B transmission signals as well as + and – power supply were led with the use of the cables which belong to one pair.

The cable shall be placed in the detector as shown on figure 2. It is necessary to make sure that the shield protection is not located in the rubber element of the cable entry and that the smallest part of the cable external sheath was located inside the detector.

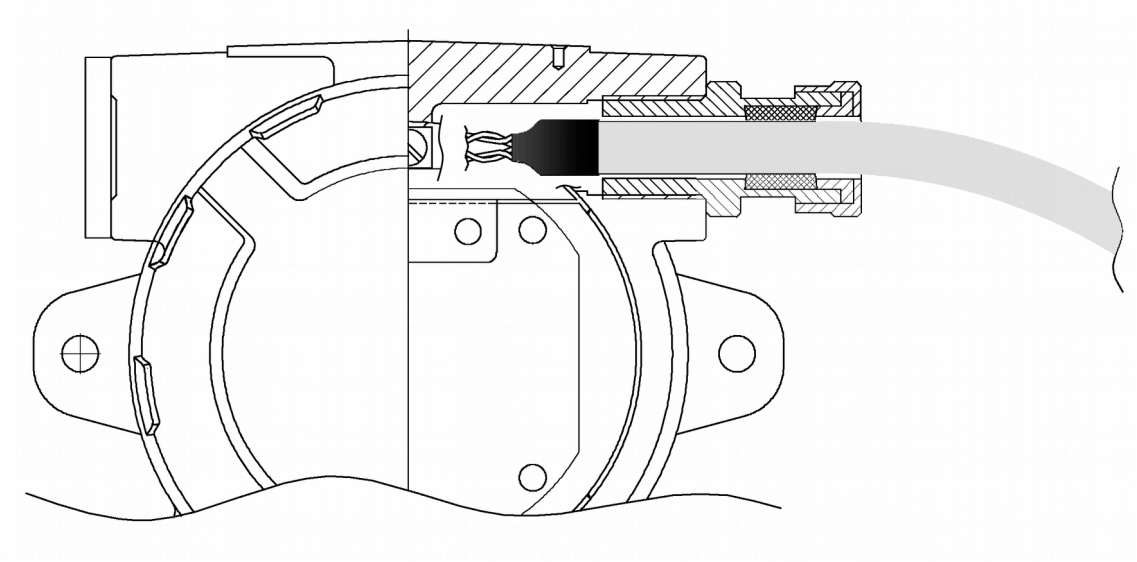


Figure 2: Placing cables in the detector

When laying the cable inside the detector enclosure, it must be remembered that:

- cables should be ordered,
- connecting cables should be kept as far away from the detector electronics as possible and routed as directly as possible to the crimp connection,
- it is necessary to minimize the amount of unnecessary conductor on the detector electronics. It is unacceptable to leave a reserve inside the detector.

Register map of RapidGas E, RapidGas S Gas Detectors

All the data are available in the 'holding registers' (function code 3).

Register	Name	Description	Type
40001	State_A	Detector status – the definition of bits below	flags
40002	-	Inessential data, can take any value	-
40003	N	Gas concentration A value of 0 corresponds to the 0 concentration, the value of 1000 corresponds to a concentration of the range of the detector	16 bit integer
40004	-	Inessential data, can take any value	-
40005	Sample_Cnt	Sample counter. The value is increased by 1 after each measurement. It takes values from 0 to 65 353	Total number 16 bit

State_A – detector status. The meaning of the bits is described in the table below.

Bit	Name	Description
0	Collective_W1	Gas concentration is above first warning threshold
1	Collective_W2	Crossing the second warning threshold
2	Collective_AL	Crossing the alarm threshold
3	Collective_CrFail	Collective information about a critical failure
4	Collective_NonCrFail	Collective information about a non-critical failure
5	Gas_Hi_Range	Operation on a coarse measuring channel (for type 2 and 3).
6	Gas_HiHi_Range	Gas overload
7	Sensor_Lock	Lock of the sensor (the last measurement was locked)
8	Calibration	Calibration mode
9	Test	Test mode
10	Warm_Up	Sensor warm-up
11..15	-	Inessential data, can take any value

Notes

ATEST GAZ

Reliable and Innovative Gas Detection & Safety Systems

Atest Gaz A. M. Pachole sp. j.
Spokojna 3, 44-109 Gliwice

tel.: +48 32 238 87 94
fax: +48 32 234 92 71
e-mail: contact@atestgaz.pl

For more details on our devices and other products and services offered by us, visit:

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