

NEW TECH Holding

JBS-420 Gas Detector User manual



ID: JBS-420 User Manual P/N: 0101-0523 Review 2 19 May 2023

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1 Introduction

To ensure safety and proper operation of the JBS-420 Gas Detector device, read this manual carefully and follow the instructions contained therein. It contains important information on system installation, operation and service.

1.1 Symbols used

The following symbols are used in this manual:



Warning

This symbol indicates a potential hazard associated with improper use of the equipment. It draws attention to a procedure, condition, etc., which, if not properly performed or fulfilled, could cause injury or death.



Warning

This symbol indicates the potential danger of electric shock. It draws attention to a procedure, condition, etc., which, if not properly performed or fulfilled, could cause injury or death.



Тір

The use of this symbol draws attention to a procedure, condition, etc., which, if not properly performed or fulfilled, may cause the device to malfunction, damage the device and void the warranty.

1.2 Precautions



Warning

Connecting and operating the device is allowed only after reading and understanding this document.



Warning

The manufacturer is not responsible for errors, damage, failures caused by improper operation, faulty installation and misunderstanding of the contents of this document.



Warning

It is unacceptable to use non-original spare parts.



Warning

It is unacceptable to make any repairs or modifications to the device yourself. The manufacturer is not responsible for their consequences.



Warning

It is unacceptable to use damaged or incomplete devices.



Warning

This instrument <u>not</u> is a safety device. Some gases detected by this instrument may be flammable/explosive. A properly configured instrument is designed to alarm at concentrations below the lower explosive limit of the gas. As such, it is the buyer's responsibility to immediately plan a response to any gas leaks as soon as they are detected. This instrument <u>never</u> should be used to measure or sample gases at or above their lower explosive limits.



Tip

This device is designed to operate at 12-24VDC. The power consumption of the system is typically 1.5W. It is recommended that the system be connected directly to a DC power source, preferably to its own circuit with a UPS or surge protection.



Warning

Use extreme caution when accessing the inside of the device. Only qualified personnel with appropriate authorizations should make connections and adjustments. Always disconnect the power supply before opening the device casing.



Warning

Stop using the device if there are any symptoms of malfunction or failure. In this case, disconnect the power supply and then contact the manufacturer's service department.



Warning

Installation and connection of the device should be performed by a certified technician and must comply with all applicable NEC/CEC standards and local safety regulations.



Warning

Use prepared cable entries to connect the device. Drilling the device casing is a serious violation of safety standards and will void the warranty.



Тір

Use a dry cloth to clean the outside of the case. Do not use soap and/or water.



Warning

Before installation, it is essential to check the device for any visible damage.

1.3 Product information

JBS-420 Gas Detector is a device designed to monitor concentrations and detect gas leaks. It is equipped with 2 gas sensors. It can operate as an independent device or as part of a larger detection system. Due to its design, it is suitable for use in harsh industrial environments.

1.3.1 Functionality

Main device features

- A wide range of sensors.
- · Interfaces: RS485, BLE, 2 relay outputs, physical buttons
- Readable, multi-color indication of device status.
- Set of self-diagnostic functions.
- Internal electronic compensation for ambient temperature.

- IP66 protection.
- Build-in buzzer.

1.4 Operating parameters

Table 1 shows the specifications of the device. Do not exceed the permissible operating parameters listed therein.

	Rated supply parameters				
1	1 Voltage 19,2-30VDC				
2	Power	<2,5W			
	Environm	ental conditions			
3	Ambient temperature	$-40^{o} extbf{C} \leq extbf{T}_{a} \leq 60^{o} extbf{C}$			
		NOTE: Operating temperature limited by sensor type			
		- contact manufacturer			
4	Relative humidity	max. 20 - 80% RH			
		NOTE: Relative humidity limited by sensor type - con-			
		tact manufacturer			
5	Height limit	1000m			
6	Pressure	1013hPa +/-10%			
	Digital c	ommunication			
9	Communication protocol	Modbus RTU			
10	Interface	RS485			
11	11 Default parameters 9600baud 8N1				
Built-in signaling					
12	Optical	Four-color			
13	Acoustic	Electromagnetic siren			
		85dB@10cm			
	Other	parameters			
14	Head material	Polyamide			
15	Case material	ABS + PC			
16	Weight	<1,0kg			
17	Frequency of service maintenance	See section 6.2			
18	Electrical protection class	111			
19	IP protection class	IP66			
20	Cable inlets	2/3 pieces: M20x1,5			
21	Installation method	4 holes ϕ 5mm, span 166,55mm x 64,00mm			
22	Wire cross-section for terminal connector	0,03 - 2,5mm ²			

Table 1: Operating parameters

1.5 Available sensors

JBS-420 Gas Detector It is available in various designs with a wide range of sensors. Table 2 shows the most popular.

Lp.	Gas detected	Code	Sensor Type	Range	Operating tempera-	
					ture	
1	Hydrocarbons	HC	Catalytic	0-100%LEL	$-40^{\circ}\mathrm{C} \leq \mathrm{T}_a \leq 60^{\circ}\mathrm{C}$	
2	Ammonia	NH3	Catalytic	0-100%LEL	$ $ -40 o C \leq T $_a \leq$ 60 o C	
3	Hydrogen	H2	Catalytic	0-100%LEL	$-40^{o}C \leq T_{a} \leq 60^{o}C$	
4	Mathana	014		0-100%LEL	4000 < T < 6000	
4	Wethane	014	חוטא	(4,4%Vol)	$ -40 \text{ C} \leq 1_a \leq 60 \text{ C}$	
5	Styrene	C8H8	NDIR	0-100%LEL	$-40^{o}C \leq T_{a} \leq 60^{o}C$	
<u> </u>	Dronono	00110		0-100%LEL	4000 < T < 0000	
6	Propane	0388		(1,7%Vol)	$ -40^{\circ} \text{C} \leq 1_a \leq 60^{\circ} \text{C}$	
7	Carbon dioxide	CO2	NDIR	0-5000ppm	$-40^{o}C \leq T_{a} \leq 60^{o}C$	
8	Carbon dioxide	CO2	NDIR	0-5%Vol	$-40^{o}C \leq T_a \leq 60^{o}C$	
9	Sulfur hexafluoride	SF6	NDIR	0-1000/2000ppm	$-40^{o}C \leq T_a \leq 60^{o}C$	
10	R134a and deriva-	B134a	NDIR	0-1000/2000ppm	$-40^{\circ}C < T_{\star} < 60^{\circ}C$	
10	tives	mona		0 1000/2000ppm		
10	R134a and deriva-	B134a	Semiconductor	0-1000ppm	$-40^{\circ}\text{C} < \text{T}_{-} < 60^{\circ}\text{C}$	
	tives	a		0 1000ppm	$\downarrow 0 0 \leq 1_a \leq 00 0$	
11	Carbon monoxide	CO	Electrochemical	0-300ppm	$-30^{o} extbf{C} \leq extbf{T}_{a} \leq 50^{o} extbf{C}$	
12	Hydrogen sulfide	H2S	Electrochemical	0-100ppm	$-30^{o} ext{C} \leq ext{T}_{a} \leq 50^{o} ext{C}$	
13	Hydrogen sulfide	H2S	Electrochemical	0-2000ppm	$-30^{o}C \leq T_{a} \leq 50^{o}C$	
14	Ammonia	NH3	Electrochemical	0-100/300ppm	$-30^{o}C \leq T_{a} \leq 50^{o}C$	
15	Ammonia	NH3	Electrochemical	0-1000/5000ppm	$-30^{o}C \leq T_{a} \leq 50^{o}C$	
16	Nitrogen dioxide	NO2	Electrochemical	0-30ppm	$-30^{o}C \leq T_{a} \leq 50^{o}C$	
17	Nitric oxide	NO	Electrochemical	0-300ppm	$-30^{o}C \leq T_{a} \leq 50^{o}C$	
18	Chlorine	CL2	Electrochemical	0-10ppm	$-30^{o}C \leq T_{a} \leq 50^{o}C$	
19	Sulfur dioxide	SO2	Electrochemical	0-20ppm	-30^{o} C \leq T $_{a}$ \leq 50 o C	
20	Oxygen	O2	Electrochemical	0-25%Vol	$-30^{o}{ m C} \leq { m T}_a \leq 50^{o}{ m C}$	

Table 2: Examples of available sensors

1.6 Device designation

JBS-420-[1]-[2]-[3]-[4]

- [1] Sensor type 1:
 - SC semiconductor sensor
 - IR infrared sensor
 - PEL catalytic sensor
 - EC electrochemical sensor
- [2] Type of measured gas for sensor 1 e.g.:
 - R134a refrigerant R134a
 - H2S hydrogen sulfide
 - NO nitric oxide
- [3] Sensor type 2:

- SC semiconductor sensor
- IR infrared sensor
- PEL catalytic sensor
- EC electrochemical sensor
- [4] Type of gas measured for sensor 2 e.g.:
 - R134a refrigerant R134a
 - H2S hydrogen sulfide
 - NO nitric oxide

Тір



The absence of parameter [3] and [4] indicates a version of the detector with only one sensor

1.7 Device dimensions

Picture 1 rearranges the dimensions of the main enclosure containing the control electronics, while the figure 2 shows the dimensions of a single sensor.



Figure 1: Dimensions of the main electronic distribution case



Figure 2: Sensor head dimensions

2 Instalation



Warning

Risk of explosion! Before installation, make sure that the atmosphere does not contain flammable liquids, vapors or aerosols. Do not, under any circumstances, unscrew the casing of the device during operation.



Тір

Always disconnect the power supply before opening the device casing.



Warning

Drilling the case of the device may lead to irreparable damage and will void the warranty. Use only the provided cable entries for electrical connections.



Warning

The system has sensitive electronic components that can be easily damaged. Do not touch any of these components.



Tip

The device has been tested before shipment, however, it is recommended to check again before installation for any damage.

2.1 Installation notes

Installation of the device should proceed exactly according to the order:

- 1. Inspect the device for visible damage.
- 2. Selection of a suitable site and installation of the device.
- 3. Connection of cables: power supply, RS485 interface, relay outputs.
- 4. Closing the case of the device, sealing the drains, checking the tightness of the case.
- 5. Turning on the power and checking the working device.

2.2 System components

The device consists of the following components:

- Main distribution case containing control board
- Sensor head 1
- Sensor head 2

It is recommended to inspect all components listed above for visible damage before installing the device.

2.3 Instalation

Dirt, grease and oil can adversely affect system performance. It is recommended to choose a mounting location that is easily accessible for visual monitoring and servicing. The unit should be mounted using the supplied mounting hardware. Drilling into the case is strictly prohibited. The mounting height of the sensor should be selected due to the specific gravity of the gas to be measured. The general rules are as follows:

- Heavier-than-air gases will fall the device should be mounted close to the ground.
- Lighter-than-air gases will rise it is recommended to install the device close to the ceiling.

In addition, factors such as:

- Gas accumulation sites
- Airflows locate gas sensors along the airflow route from the potential leak source to the air exhaust.
- Places of human occupancy
- · And others

2.4 Connection

The device has the following components highlighted in the picture 3:

- 1. 2-pin plug to plug in power supply respectively: +24VDC, 0V
- 2. 3-pin plugs for connecting the output of relays respectively: NO, COM, NC
- 3. 3-pin connector for connecting the master device via Modbus RTU protocol respectively: A,B
- 4. 4-pin plugs for connecting sensor heads
- 5. Buttons responsible for sensor calibration

2.5 Buzzer configuration

The device allows you to disconnect the buzzer. In this case, exceeding the alarm threshold will be signaled only by lighting the red LED and switching the relay.



Figure 3: Description of the key electronic components of the control board

3 Operation description

This chapter describes the operation of the JBS-420 Gas Detector .

3.1 Optical signaling

The device is equipped with LED signaling to clearly identify the status of the device. Table 3 describes the state of the device depending on the optical signaling.

Color	State	Description
*	Warming	The device heats up the sensor head. No concentration mea-
		surement.
✓	Working	The device works normally.
*	Alarm 1	The first alarm threshold has been crossed.
1	Alarm 2/3	The second or third alarm threshold has been exceeded.
-	Pluataath	Double flash - indicates connection/disconnection of the mo-
×	Dideloolii	bile device with the detector.
1	Error	An error occurred - the concentration reading is uncertain
*	Critical error	A critical error has occurred - further work is not possible
*		

Table 3: Optical signaling: ✓- indicator light on, ★ - blinking light

3.2 Heating up the device

JBS-420 Gas Detector requires heating of the sensor heads from 2 to 15 minutes after power on (depending on the type of sensors used). For the first 3 minutes, the device does not measure gas concentration. In addition, the optical signaling flashes green according to the above table (picture 3). This is a normal state that occurs every time the device is turned on.

3.3 Available interfaces

The device has the following interfaces.

- RS485 with Modbus RTU protocol
- · Wireless communication
- Relay outputs
- Physical buttons

3.3.1 Modbus RTU

Digital communication of the device JBS-420 Gas Detector is based on an industrial RS485 interface and Modbus RTU protocol that allows real-time reading of sensor values with full diagnostics.

For a detailed list of data with description, see the chapter 5.

3.3.2 Wireless communication

JBS-420 Gas Detector as standard provides wireless communication with mobile devices. For details, see the section 4.

3.3.3 Relay output

A relay has been installed in the device, which is switched on when the alarm threshold I is exceeded.

3.3.4 Physical buttons

There are 2 physical buttons for configuring the sensors. For details, please refer to the section 6.2.

3.4 Temperature compensation

The basic design of JBS-420 Gas Detector provides temperature compensation as standard based on the electronic temperature sensor built into the device. This solution significantly reduces the gas concentration reading error.

4 Wireless communication

JBS-420 Gas Detector has been equipped with the BLE wireless communication protocol. This makes it convenient to check the status of the sensor, or to configure it from the position of a phone or tablet equipped with android.

The application is available for download on our website at: http://newtechholding.pl/downloads/ NTH_Sensors.apk, and also under the following code QR (Figure 4):



Figure 4: QR code - link to download the application

4.1 Requirements

- Minimum Android version: 5.0
- BLE protocol support

4.2 Application description

After launching the application, the start screen will appear (Figure 5). After clicking the "info" icon in the upper left corner, you will be taken to the information screen (Figure 6) from where we can contact the administrator and check the application version.

EN PL	About Us
New Tech Holding	NEW TECH HOLDING
CONNECT	Contact us
	New Tech Holding Ltd

Figure 5: Application startup screen

Figure 6: Information screen

In the upper right corner there is a button to select the application language (Polish or English). You switch to the screen where the sensors are scanned (Figure 8) by pressing the "CONNECT" button.



Тір

The first time you launch the app, you will be prompted for the app's permission to access (Figure 7). Due to the nature of the Android system, "exact location" and "Devices nearby" are required for the app to function properly. Continuing without permissions is not possible.



Тір

The next time you launch the app, make sure that location on your smartphone is enabled.



Figure 7: Permission to access

Figure 8: Device search

After pressing the "Scan" button, the search for devices will begin. After several seconds, the available nearby devices will be displayed (Figure 9) along with the serial number and the current gas concentration reading.

When you press on the device you are looking for, a dialog box will be displayed (Figure 10). To connect to the device, enter the four-digit access code (default access code is: 0000), and then press the "Connect" button.



Figure 9: Example of found device

Figure 10: Window to enter access code

4.3 Sensor screen

After successful connection, the sensor screen with three tabs will be displayed. On the first main tab (fig. 11), several seconds after connecting to the sensor, the gas concentration will be shown in the center of the circle. The lower right corner, meanwhile, displays the detector's internal temperature.

The status of the detector is indicated by the color of the circle according to the detector's signaling table (fig. 3), as well as by the writing at the bottom of the screen. A change in staus is also signaled by a slight vibration of the phone.



Тір

There is a mute button in the upper left corner that mutes all sound signaling for a period of 5min. This is a useful feature when setting up the sensor.

For full diagnostic data of the detector and sensor, go to the third tab (Figure 13). It contains such information as:

- Manufacturer producent
- Model oznaczenie modelu
- · Serial numer seryjny
- Firmware wersja oprogramowania
- · Hardware wersja sprzętowa
- · Detector error register rejestr błędów detektora w hex
- · Modbus node ID numer ID urządzenia Modbus
- Modbus baudrate prędkość transmisji danych Modbus
- · Modbus parity ustawienie bitu parzystości
- Alarm 1 Point ustawienie I progu alarmowego
- Alarm 2 Point ustawienie II progu alarmowego
- · Alarm 3 Point ustawienie III progu alarmowego
- · Calibration gas concentration stężenie gazu testowego
- · Gas range zakres pomiarowy
- Raw sensor reading odczyt sensora w punktuach ADC
- · Raw zero value wartość kalibracji zera
- · Raw span value wartość kalibracji wzmocnienia
- · Sensor type typ sensora np. SC półprzewodnikowy
- · Gas type typ mierzonego gazu np. R134a
- · Alarm direction kierunek alarmu
- · Sensor status register rejestr statusu sensora w hex
- · Sensor error register rejestr błędów sensora w hex



Warning

Note that the data from this screen is not updated on a regular basis. To refresh the data, press the "Update Data" button. It is recommended to perform this step the first time you connect to the detector.

The second tab was created for configuring the device (fig. 12). It contains configuration items such as:

- · Modbus protocol settings: setting the device ID, baud rate and parity bit,
- · Sensor settings: alarm settings, as well as the concentration of calibration gas,
- Security settings: change the detector access code.



Figure 11: Main sensor tab

Figure 12: Diagnostic tab

At the bottom of the configuration tab(fig. 12) there are 2 buttons "Set zero" and "Set span". They are responsible for zero calibration and gain calibration, respectively.



Warning

Do not, under any circumstances, press them without first familiarizing yourself with the calibration procedure from the chapter 6.2.

16:36 🖪	o 🗟 🖘 🖓 al al 12% 🗖				
Device					
Manufacturer	New Tech Holding				
Model	JBS-410				
Serial	S00002				
Firmware	1.01				
Hardware	1.00				
Detector error register	· 0x0				
Modbus					
Modbus node ID	1				
Modbus baudrate	9600				
Modbus parity	None				
Sensor					
Alarm 1 setpoint	500.00				
Alarm 2 setpoint	700.00				
Alarm 3 setpoint	1000.00				
Calibration gas conce	ntration 1000.00				
Gas range	1000.00				
Raw sensor reading	584				
Raw zero value	58				
Raw span value	165				
Sensor type	SC				
Gas type	R134a				
Update data					
\$ŷ €	} •••				

Figure 13: Configuration tab

4.4 Troubleshooting the application

In case of problems with the operation of the application, check whether:

- the device on which the application is installed has Android version at least 5.0 or higher,
- the device on which the application is installed supports the BLE protocol,
- The device has location enabled.
- The device has bluetooth transmission enabled and is not used by any other device.

If you have problems connecting to the device, please:

- retry the connection,
- restart the application,
- restart bluetooth transmission.

5 Modbus RTU Protocol

JBS-420 Gas Detector is equipped with a digital communication protocol Modbus RTU. With it, it is possible to connect the detector to a central SCADA/BMS system or to create, using other sensors and a control panel, a comprehensive gas detection system.

5.1 List of records

Lp.	Adres	Тур	Długość	Nazwa	Opis
1	0x1000 - 0x1002	String	6	Serial number	Serial number of the device - 6 ASCII characters
2	0x1003	uint16_t	2	Detector error log	Bit 0 - EEPROM error Bit 1 - ADC error Bit 2 - temperature measurement er- ror. Bit 3 - BLE error Bit 4 - Modbus error Bit 4 - Modbus confiuguration error Bit 4 - Modbus Confiuguration error Bit 9 - WDT critical error Bit 9 - WDT critical error Bit 10 - Freertos critical error Bit 11 - Modbus critical error Bit 12 - EEPROM critical error Bit 13 - I2C critical error Bit 14 - BLE critical error Bit 15 - other error
3	0x1004	uint16_t	2	Firmware version	The two lowest digits in the decimal format indicate the sub-version, the others the basic version. Example: 2305 means version 23.05
4	0x1005	uint16_t	2	Hardware version	The two lowest digits in the decimal format indicate the sub-version, the others the basic version. Example: 2305 means version 23.05
5	0x1006 - 0x1007	float	4	Temperature	Internal temperature of the detector
6	0x1010 - 0x1011	float	4	Gas concentration Sensor 1	Gas concentration in the form of a floating point number
7	0x1012 - 0x1013	float	4	Sensor range Sensor 1	Sensor range in the form of a float- ing point number
8	0x1014	uint16_t	2	Sensor type Sensor 1	 PEL - Pelistor SC - Semiconductor EC - Electrochemical NDIR - Infrared

Table 4: Lista rejestrów Modbus RTU - Input registers

9	0x1015	uint16_t	2	Measured gas Sensor 1	1 - R134a 2 - NH3 3 - H2 4 - CH4 5 - C3H8 6 - CO2 7 - CO 8 - H2S 9 - NO2 10 - O2 11 - HC
10	0x1016	uint16_t	2	Unit Sensor 1	1 - ppm 2 - LEL 3 - VOL 4 - ppb
11	0x1017	uint16_t	2	Sensor status log Sensor 1	Bit 0 - błąd Bit 1 - heating Bit 2 - 1st level alert Bit 3 - 2nd level alert Bit 4 - 3rd level alert Bit 5 - alarm direction
12	0x1018	uint16_t	2	Sensor error log	Bit 0 - zero calibration error Bit 1 - gain calibration error Bit 2 - alarm setting error Bit 3 - indication below range Bit 4 - indication above range Bit 5 - no sensor reading Bit 6 - sensor should be replaced
13	0x1019	uint16_t	2	Zero point value Sensor 1	Value of zero point in ADC points
14	0x101A	uint16_t	2	Gain point value Sensor 1	Gain point value in ADC points
15	0x101B	uint16_t	2	ADC concentration reading Sensor 1	ADC point concentration reading
16	0x101C	uint16_t	2	Alarm direction Sensor 1	1 - alerts up (al.1 < al.2 < al.3) 0 - alerts down (al.1 > al.2 > al.3)
17	0x1020 - 0x1021	float	4	Gas concentration Sensor 2	Gas concentration in the form of a floating point number
18	0x1022 - 0x1023	float	4	Sensor Range Sensor 2	Sensor range in the form of a float- ing point number
19	0x1024	uint16_t	2	Sensor type Sensor 2	 PEL - Pelistor SC - Semiconductor EC - Electrochemical NDIR - Infrared

20	0x1025	uint16_t	2	Measured gas	1 - R134a 2 - NH3 3 - H2 4 - CH4 5 - C3H8 6 - CO2 7 - CO 8 - H2S 9 - NO2 10 - O2 11 - HC
				Sensor 2	
21	0x1026	uint16_t	2	Unit	1 - ppm 2 - LEL 3 - VOL 4 - ppb
				Sensor 2	
22	0x1027	uint16_t	2	Sensor status log	Bit 0 - błąd Bit 1 - heating Bit 2 - 1st degree alert Bit 3 - 2nd degree alert Bit 4 - 3rd degree alert Bit 5 - alarm direction
23	0x1028	uint16_t	2	Sensor error log Sensor 2	Bit 0 - zero calibration error Bit 1 - gain calibration error Bit 2 - alarm setting error Bit 3 - indication below range Bit 4 - indication above range Bit 5 - no sensor reading Bit 6 - sensor should be replacement
24	0x1029	uint16_t	2	Zero point value Sensor 2	Value of zero point in ADC points
25	0x102A	uint16_t	2	Gain point value Sensor 2	Gain point value in ADC points
26	0x102B	uint16_t	2	ADC concentration reading Sensor 2	ADC point concentration reading
27	0x102C	uint16_t	2	Alarms direction Sensor 2	1 - alarm up (al.1 < al.2 < al.3) 0 - alarm down (al.1 > al.2 > al.3)

Lp.	Adres	Тур	Długość	Nazwa	Opis
1	0x2000	uint16_t	2	Modbus ID	ID in Modbus network 1-127
2	0x2001	uint16_t	2	Modbus Baudrate	1 - 1200bps 2 - 2400bps 3 - 4800bps 4 - 9600bps 5 - 19200bps 6 - 38400bps
3	0x2002	uint16_t	2	Modbus bit parity	0 - None 2 - Even 3 - Odd
4	0x2010 -	float	4	Level I alert	Level I alert threshold expressed in
	0X2011			Sensor 1	measurement unit
5	0x2012 - 0x2013	float	4	Level II alert	Level II alert threshold expressed in measurement unit
				Sensor 1	
6	0x2014 - 0x2015	float	4	Level III alert	Level III alert threshold expressed in measurement unit
				Sensor 1	
7	0x2016 - 0x2017	float	4	Calibration gas concentration Sensor 1	Concentration of calibration gas expressed in measurement unit
8	0x2020 - 0x2021	float	4	Level I alert	Level I alert threshold expressed in measurement unit
				Sensor 2	
9	0x2022 - 0x2023	float	4	Level II alert	Level II alert threshold expressed in measurement unit
				Sensor 2	
10	0x2024 - 0x2025	float	4	Level III alert	Level III alert threshold expressed in measurement unit
				Sensor 2	
11	0x2026 - 0x2027	float	4	Calibration gas concentration Sensor 2	Concentration of calibration gas ex- pressed in measurement unit

Table 5 [.] Lista re	iestrów Modbus	BTU - Holding	a registers
	jestiow woubus		y registers

Lp.	Code	Туре	Lenght	Name	Description
1	0x0000	bool	1	Set zero	Perform zero calibration
				Sensor 1	
2	0x0008	bool	1	Set the gain	Perform gain calibration
				Sensor 1	
3	0x0010	bool	1	Set zero	Perform zero calibration
				Sensor 2	
4	0x0018	bool	1	Set zero	Perform gain calibration
				Sensor 2	

Table 6: Modbus RTU Registers - Coils



Тір

If the detector is equipped with only one Sensor, registers with the designation "Sensor 2" are not available.

6 Maintenance



Warning

Risk of explosion or fire! Always disconnect power before opening the device's case.



Warning

It is not allowed to use spare parts other than those indicated by the manufacturer.



Tip

The system has sensitive electronic components that can be easily damaged. Do not touch any of these components.

6.1 General inspection

For trouble-free operation of the sensor, a general inspection of the device should be carried out every 3 months or more often including:

- Checking the tightness of the case and cable penetrations
- · Checking the patency of the gas supply to the sensor
- · Determinate the usage of device

6.2 Sensor calibration

Sensors, depending on the type, should be calibrated:

- · At least once a year for sensors with Electrochemical or NDIR sensors,
- At least twice a year (every three months is recommended) for sensors with a catalytic or solid-state sensor.

Calibration may be performed more frequently if it is due to the user's internal regulations.

In addition, calibration should be performed each time the gas concentration is recorded at 100% of the device's range or higher.

6.3 Calibration perform

The calibration process is carried out in two stages: first calibrate the zero point, and then calibrate the sensor gain.

6.3.1 Zero point calibration

Using the app

- 1. Place the sensor head in an inert atmosphere that does not contain the gas to be measured.
- 2. Press the "Set Zero" button for the corresponding sensor which will calibrate the zero.

Using Modbus RTU protocol

- 1. Place the sensor head in an inert atmosphere that does not contain the gas to be measured.
- 2. (a) For sensor 1, write to register 0x0000 of logical coil type "1" which will cause zero calibration.
 - (b) For sensor 2, write to register 0x0010 of logical coil type "1" which will cause zero calibration.

With physical buttons

- Enter calibration mode by pressing and holding both buttons at the same time ("zero" and "span"). After about 10s, the led will start oscillating between purple and brown color. The purple color corresponds to sensor 1, while the brown color corresponds to sensor 2. Simultaneous release of the buttons while the color corresponding to the sensor is lit, indicates the selection of that sensor as well. This action will be confirmed by a short beep once, along with a single flash of the color corresponding to the selected sensor. After releasing the buttons you are in calibration mode, leaving this mode will be automatic after 30 seconds or after the zero or span calibration action.
- 2. Place the sensor head in an inert atmosphere that does not contain the gas to be measured.
- 3. Press the button labeled "Zero" and hold it. When the button is pressed, you will hear two short beeps and a led flashing twice. Hold the button until you hear a single beep along with a single led flash.

6.3.2 Sensor gain calibration

Using the app

- 1. Set the "Calibration gas concentration" field for the corresponding sensor to the calibration gas concentration.
- 2. Feed the test gas into the sensor head for at least 5 minutes.
- 3. Press the "Set Span" button for the corresponding sensor which will calibrate the gain.

Using Modbus RTU protocol

- 1. (a) For sensor 1, by writing to registers 0x2016-0x2017 Holding type the desired calibration gas concentration value.
 - (b) For sensor 2, by writing to registers 0x2026-0x2027 Holding type the desired calibration gas concentration value.
- 2. Feed the test gas into the sensor head for at least 5 minutes.
- 3. (a) For sensor 1, write to register 0x0008 of logical coil type "1" which will calibrate the gain.
 - (b) For sensor 1, write to register 0x0018 of logical coil type "1" which will calibrate the gain.

With physical buttons

- 1. For calibration with physical buttons, the test gas must be equal to 100% of the sensor range.
- 2. Feed the test gas into the sensor head for at least 5 minutes.
- 3. Enter calibration mode by pressing and holding both buttons at the same time ("zero" and "span"). After about 10s, the led will start oscillating between purple and brown color. The purple color corresponds to sensor 1, while the brown color corresponds to sensor 2. Simultaneous release of the buttons while the color corresponding to the sensor is lit, indicates the selection of that sensor as well. This action will be confirmed by a short beep once, along with a single flash of the color corresponding to the selected sensor. After releasing the buttons you are in calibration mode, leaving this mode will be automatic after 30 seconds or after the zero or span calibration action.
- 4. Press the button labeled "Span" and hold it. When the button is pressed, you will hear two short beeps and a led flashing twice. Hold the button until you hear a single beep along with a single led flash.



Warning

If the zero or gain calibration is unsuccessful or you enter data from outside the ranges into the registers you will hear and see an "error" of a few seconds



Тір

For a detector equipped with only 1 sensor, calibration from the position of physical buttons does not have a calibration mode. Skip the step of selecting the sensor of interest.

6.4 List of spare parts

Name	P/N	Description
M20 cable gland	0102-0523	M20x1.5 polyamide cable gland
Set of mounting screws	0103-0523	Set of M4 mounting screws
Control board	0104-0523	Internal control board
Sensor head	0105-0523	Sensor head
Calibration gas	0106-0523	Test gas for calibration
Flow regulator	0107-0523	Flow regulator for test gas

Table 7: List of spare parts and accessories