ATEST GAZ

User Manual

Control Unit

Sigma Control L

Product code: PW-072-A

POD-026-ENG R20

ATEST GAZ

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Remarks and reservations

- Connection and operation of the device is allowed only after reading and understanding the contents of this document. Keep User's Manual with the device for future use.
- The manufacturer bears no responsibility for errors, damages and failures caused by improper selection of devices and cables, improper installation or failure to understand the contents of this document.
- Unauthorised repairs and modifications of the device are not allowed. The manufacturer bears no responsibility for the results of such interventions.
- Excessive mechanical, electrical or environmental exposure may result in damage to the device.
- Use of damaged or incomplete devices is not allowed.
- The design of the gas detection system for a protected facility may involve other requirements throughout all stages of the product life.
- It is unacceptable to use parts other than those specified in table 15.

How to use this manual?

- Important parts of the text are marked as follows:

Pay special attention to information given in these fields.

- User's Manual consists of main text and appendices. Appendices are independent documents and can exist without User's Manual. Appendices have their own page numbering independent of User's Manual page numbering. These documents can also have their own tables of contents. All documents included in the User's Manual are marked in the bottom right corner with their name (symbol) and revision (issue number).

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1 Preliminary information

1.1 Safety

This device may contain voltage dangerous to human health and life. Disconnect the device from its power supply to carry out any tasks to be done after its cover removal.

1.2 Purpose

Sigma Control L is an advanced Control Unit for use with small size gas detection systems. It controls all the devices connected and integrates them to create a single Sigma Gas system. Its advantage is to provide two unique, clear and consistent data presentations:

- general view:

  Sigma Control L (like other Sigma Gas system Control Units) is provided with a unique Visual System Indicator allowing users to precisely and immediately assess the whole system “at a glance”, even remotely.

- detailed view:

  the user staying in the vicinity of the Control Unit can monitor its indications (e.g. detectors) and manage them (alarm confirmation, changing parameters, etc.).

The Sigma Control L Unit cooperates with other Sigma type devices and makes an optimum and economical solution to provide access to all basic Sigma Gas system features.

Sigma Control L Unit reads:

- signals from Gas Detectors connected to it (measurement values, diagnostic information, etc.),
- digital input (DI),
- operator’s inputs (keyboard).

By using this information Sigma Control L:

- activates signal connected (both acoustic and visual),
- generates visual, acoustic indications for users,
- activates system outputs (e.g. to DCS or a ventilation system).

1.3 Device characteristics

Basic functionalists

- Supports from 1 to 20 detectors.
- Two 24 V DC outputs dedicated to control a visual and acoustic indicator.
- Three configurable dual outputs to provide the following functionalists:
  - output is triggered if detector warning and alarm thresholds are exceeded (warning 1, warning 2 and alarm),
  - system status indication by using a visual system indicator,
  - pulse valve control (see table 3),

- makes it possible to deny or delay output execution,
- binary input capable of operating in two different modes: as an external alarm or external fault (it allows for easy integration with other systems, e.g. a fire protection system).

- Modern, easy-to-use, intuitive and legible user's interface.
- Gas detection system control by the following commands:
  - unlocking detectors (functionality available e.g. for catalytic sensor detectors – disables the lock protecting catalytic sensor against overload),
  - switching detectors into "inhibit" mode (it allows for a temporary deactivation of selected Gas Detectors); the detector in "inhibit" mode will be ignored by the System (see NOTES in table 12),
  - detector parameter changes, e.g. alarm thresholds, noise gateway level, zeroing the detector,
  - testing device outputs, user's interface.
- Events history – logging of events related to the system operation.
- Safety – two access levels for persons who change parameters, password-protected.
- It has an extension slot for adding modules to extend existing functionalists, e.g.:
  - RS-485 output module for communication with DCS or SCADA,
  - system operation visualization module based on a website – Ethernet accessible.

Sigma Control L Unit is designed for indoor use. It cannot be installed in explosion (Ex) zones.

2 Operation description

Sigma Control L Unit reads the status of detectors connected to the system. This information is presented on the display and the built-in Visual System Indicator. Based on gas concentration measured and other special statuses (e.g. failures), it controls outputs for visual and acoustic indicators as well as for dual outputs. Control Unit reads the status of dual input and depending on its status, controls system operation (enables or disables outputs). During operation, the unit runs cyclic self-diagnostic procedures used to detect any damage to Sigma Control L Unit and detectors.

Optionally, the system status image can be accessed externally via a digital connection (by using optional Extension Module). It makes it possible to connect external systems, or visualization panels. In addition, the user's interface allows the operator to give system commands and change its operation parameters.

The whole system uses modern electronic solutions, while the manufacturer has made every effort to provide a high quality and reliable product.

3 Design description

The device design is presented in Figure 1 and 2.

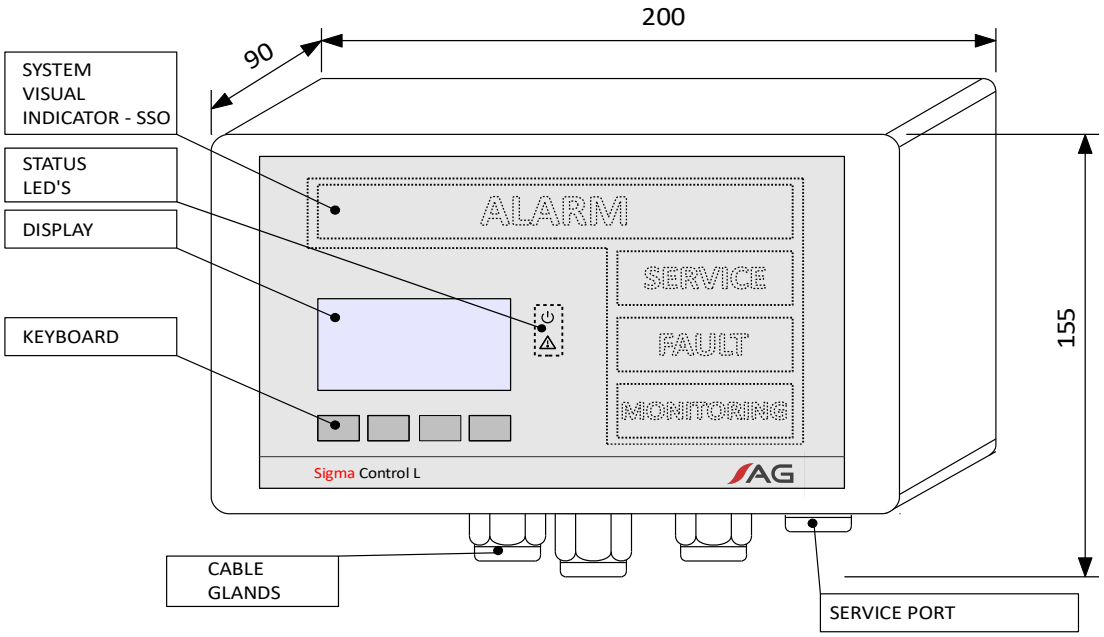


Figure 1: The construction of the device and its dimensions

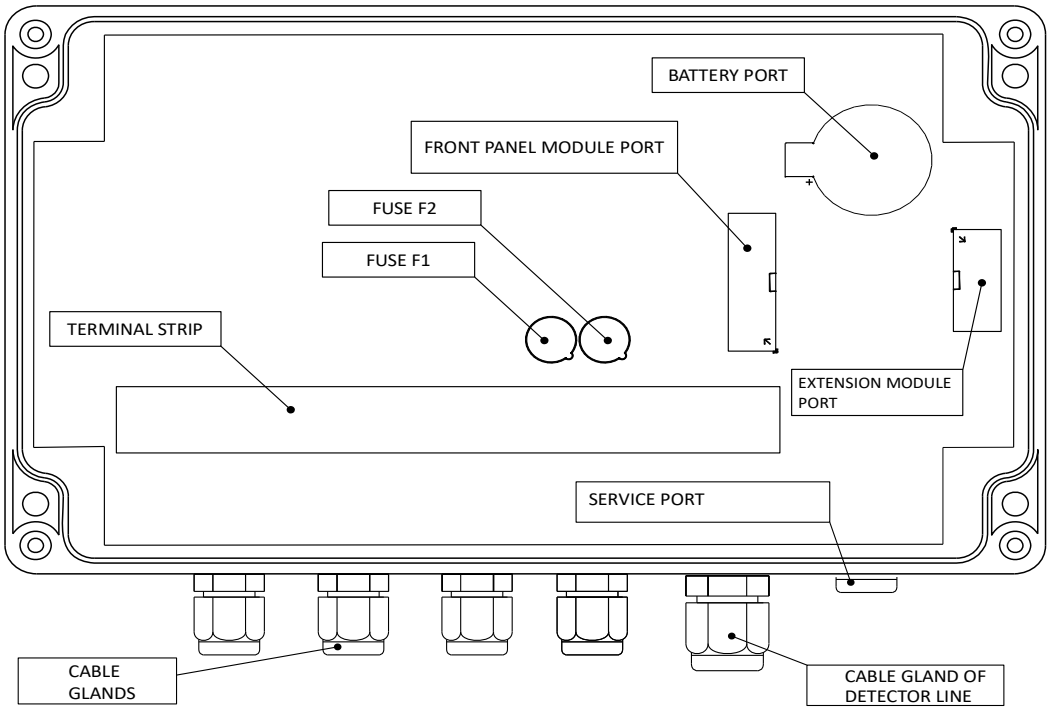


Figure 2: The construction of the device – view with front panel removed

Before you remove the front panel, disconnect the device from its power source.

4 Input-output interfaces

The interfaces are available on a terminal strip accessible afar front panel removal and on its bottom wall. The description of terminal strip is presented in figure 3 and table 1. For Extension Module interface description – see section 4.7, or service interface – see section 4.6.

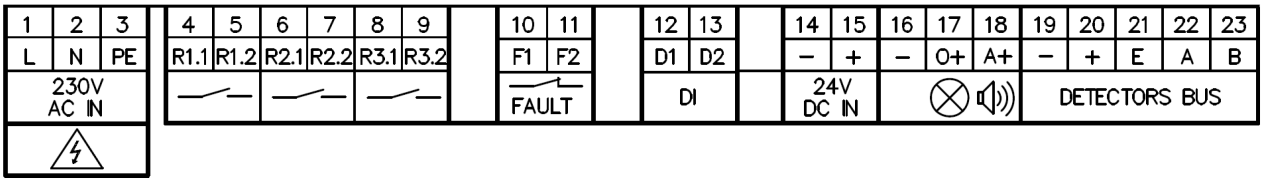


Figure 3: Terminal block

Port symbol	Terminal no.	Terminal name	Description
230V AC IN			Device 230 V AC power supply port. Parameters – see section 10
	1	L	Phase wire
	2	N	Neutral wire
	3	PE	Protective earth wire
3 ×			All-purpose relay port. For further information – see section 4.2
	4	R1.1	Relay 1 terminals
	5	R1.2	
	6	R2.1	Relay 2 terminals
	7	R2.2	
	8	R3.1	Relay 3 terminals
	9	R3.2	
FAULT			Fault relay. For further information – see section 4.1
	10, 11	F1, F2	Fault relay NC terminals
DI			External signal dual input. For further information – see section 4.3
	12,13	D1, D2	Digital input terminals – bidirectional polarity
24V DC IN			24 V DC power supply port. Parameters – see section 10
	14	-	Negative power supply pole
	15	+	Positive power supply pole
			24 VDC indicator port. For further information – see section 4.4
	16	-	Negative indicator power supply terminal
	17	⊗	Visual indicator power supply output
	18	🔊	Acoustic indicator power supply output

Port symbol	Terminal no.	Terminal name	Description
DETECTORS BUS			Bus detector port
	19	-	Negative indicator power supply terminal
	20	+	Positive indicator power supply terminal
	21	E	Cable shielding
	22	A	Signal line A
	23	B	Signal line B

Table 1: Terminal strip description

Default configuration for Sigma Control L Unit is presented below (see table 2).

I/O configuration / Parameters		Function / Parameter
No. of detectors		1
Relay outputs 3 ×	R1	Warning 1 (no delay on/off, normally open NO)
	R2	Warning 2 (no delay on/off, normally open NO)
	R3	Alarm (no delay on/off, normally open NO)
⊗ 🔊	⊗	Optical beacon active (sustained)
	🔊	Acoustic indicator – deactivation time 30 s
DI		External alarm
Internal buzzer	ON	Deactivation time for alarm – 10 min
		Deactivation time for fault – 8 h
GTW settings[1]	Address:	1
	Protocol:	Modbus RTU
	Baud rate:	19200
	Parity:	No parity bit (N)
	No. of bits:	8
Password	Level 1	1000
	Level 2	2000

Table 2: Sigma Control L Unit default configuration

4.1 Relay output fault

The Control Unit is provided with one relay fault output. This output can operate in one of the two statuses: closed – when there is no fault in gas detection system, or open – when at least one fault has been detected on one of the system devices or, when power supply is missing. Contact status is presented in figure 4:

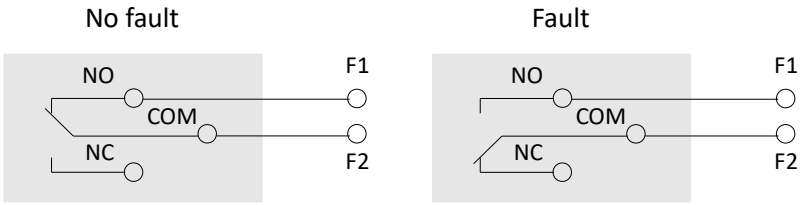


Figure 4: Fault relay contact status

1 After installing the Additional Extension Module

Input status can be observed on the user's interface (see section 5.7). Specifications – see section 10.

4.2 All-purpose relay outputs (R1 – R3)

Control Unit is fitted with three all-purpose relay outputs. The outputs can operate in one of the two statuses: as enabled or disabled (states are shown below).

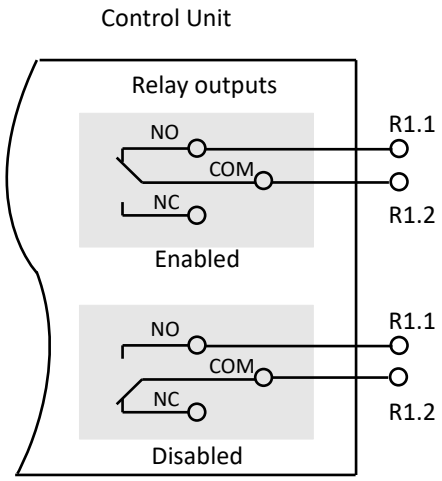


Figure 5: R1 – R3 relays in enabled and disabled status

Program	Description	Additional parameters
Bi-colour green indicator	Correct system operation – continuous light. After exceeding warning 1 and 2 threshold – modulated light. After exceeding alarm threshold and in case of fault – light off. Principle of operation see figure 6.	-
Bi-colour indicator red	Correct system operation – light off. After exceeding warning 1 and 2 threshold – modulated light. After exceeding alarm threshold – continuous light. In case of fault – light off. Principle of operation see figure 6.	-
Inactive	Always disabled.	-
WARNING 1	The output enables when warning 1 threshold exceeding is detected at any detector. It is disabled when gas concentration measured by all detectors is lower than warning 1 threshold.	Enable delay[2]. Disable delay. Normally open (NO) operation logic/ normally closed (NC)[3].
WARNING 2	The output enables when warning 2 threshold exceeding is detected at any detector. It is disabled when gas concentration measured by all detectors is lower than warning 2 threshold.	Enable delay. Disable delay. Normally open (NO) operation logic/ normally closed (NC).
Alarm	The output enables when alarm threshold exceeding is detected at any detector. It is disabled when gas concentration measured by all detectors is lower than the alarm threshold.	Enable delay. Disable delay. Normally open (NO) operation logic/ normally closed (NC).
SO copy	The output copies the status of visual indicator output.	-

2 Parameter enable delay and disable delay can range from 0 s ÷ 5400 s (90 min)
3 Selecting the "normally closed" option causes status change between activation and deactivation (see figure 5)

Program	Description	Additional parameters
SA copy	The output copies the status of acoustic indicator output.	-
Impulse valve control	When at any detector, alarm threshold is detected, the output generates 3 pulses 1 s of activation / 1 s deactivation ⊓_⊓_⊓_____ see figure 8.	Enable delay. Disable delay. Normally open (NO) operation logic / normally closed (NC).
NC valve control	When an alarm threshold is detected on any detector, the relay contact deactivates. It is possible to manually deactivate/activate the output – for details, see section 4.6.	-
Monitoring	The output copies the status of SSO Monitoring indicator	-
Service	The output copies the status of SSO Service	-

Table 3: Relay output operation programs

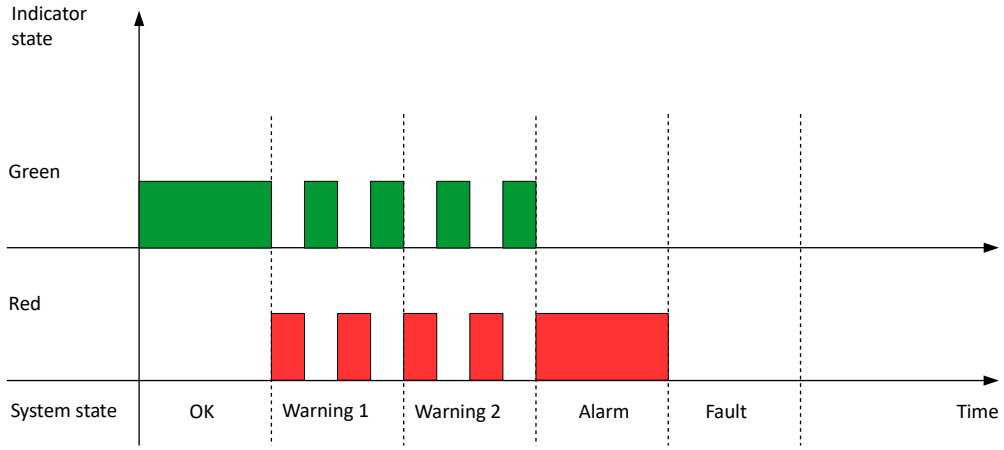


Figure 6: Principle of operation the indicator's relay outputs

4.3 Digital Inputs DI

This input is designed to activate the status of EXTERNAL ALARM or EXTERNAL FAULT by using an external signal coming from the automation system, alarm system or from a push button.

The dual input is galvanically isolated from the rest of unit circuits. To use it connect voltage with any polarity to terminals (parameters – see section 10).

The current input status can be observed via the user's interface (see section 5.7).

4.4 Visual and acoustic indicator outputs

The Control Unit is equipped with dedicated outputs for acoustic and visual indicator control.

The visual indicator output can operate in two modes: with backup and without backup. For the operation principle of visual indicator output with backup see Figure 7. The input enables when warning 1 threshold exceeding is detected at any detector. In the case of backup operation mode it disables when the concentration drops below the warning 1 threshold and after pushing the button (see also section 5.5). In the case of no backup operation, the input behaves as a relay operating in Warning 1 program (see section 4.2). The output status can be observed via the user's interface (see section 5.5). Input specifications – see section 10.

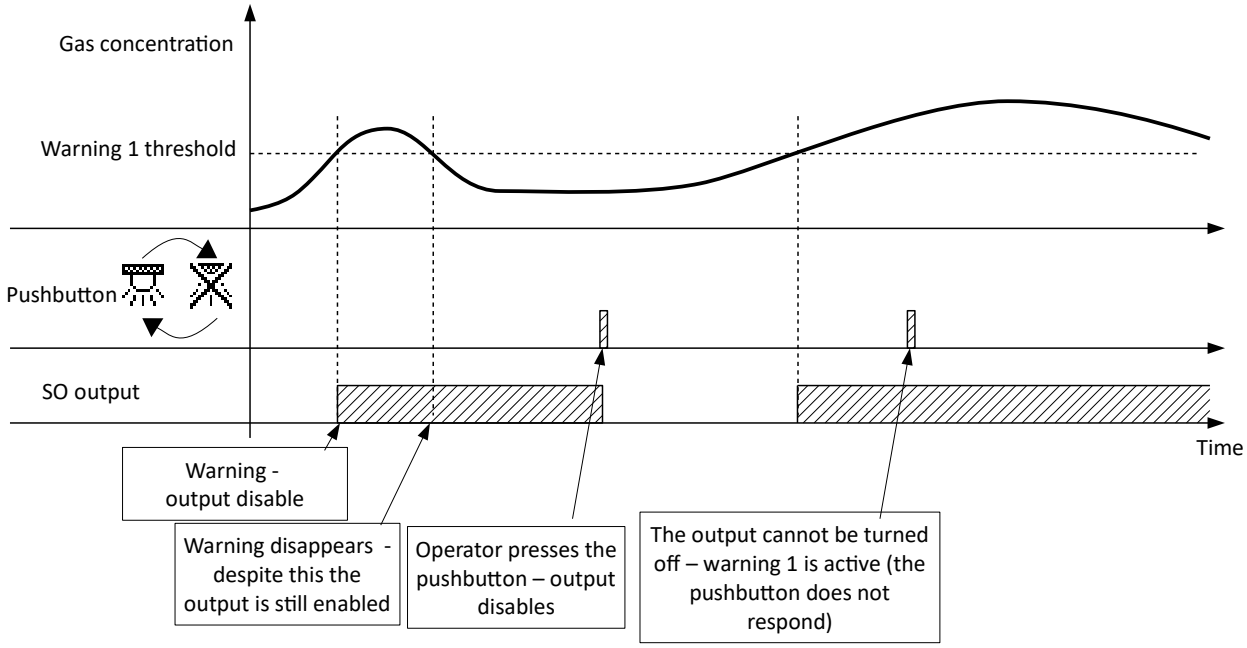


Figure 7: Operation principle for visual indicator output with sustained

The operation principle for an acoustic indicator output is presented in Figure 8. The output is activated when alarm threshold exceeding is detected at any detector. This output has to be temporarily disabled when alarm is on, by pressing the push button (see also section 5.5). The output status can be observed via the user's interface (see section 5.5). For output specifications – see section 10.

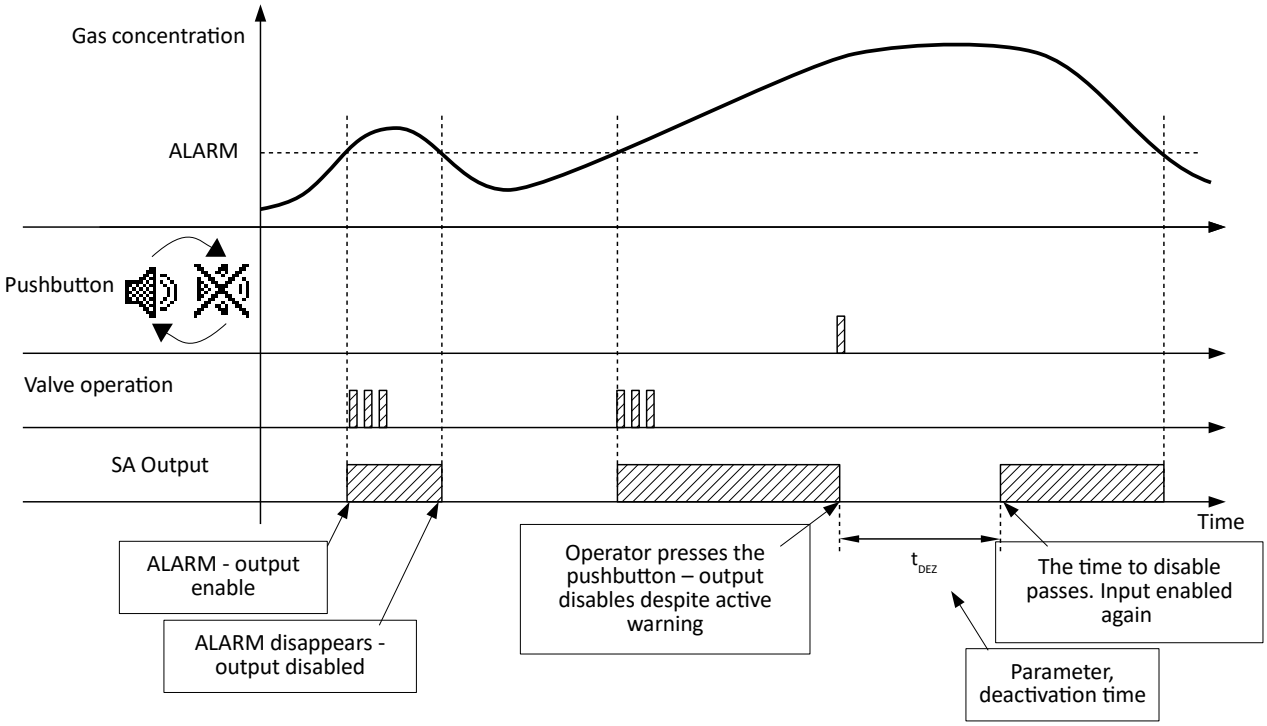


Figure 8: Impulse valve control and the operation principle for an acoustic indicator output

4.5 NC valve output

The Sigma Control L Control Unit is adapted to work with an NC (normally closed) valve. The valve is connected to universal relay outputs (see section 4.2).

The way of controlling the NC valve is shown on Figure 9.

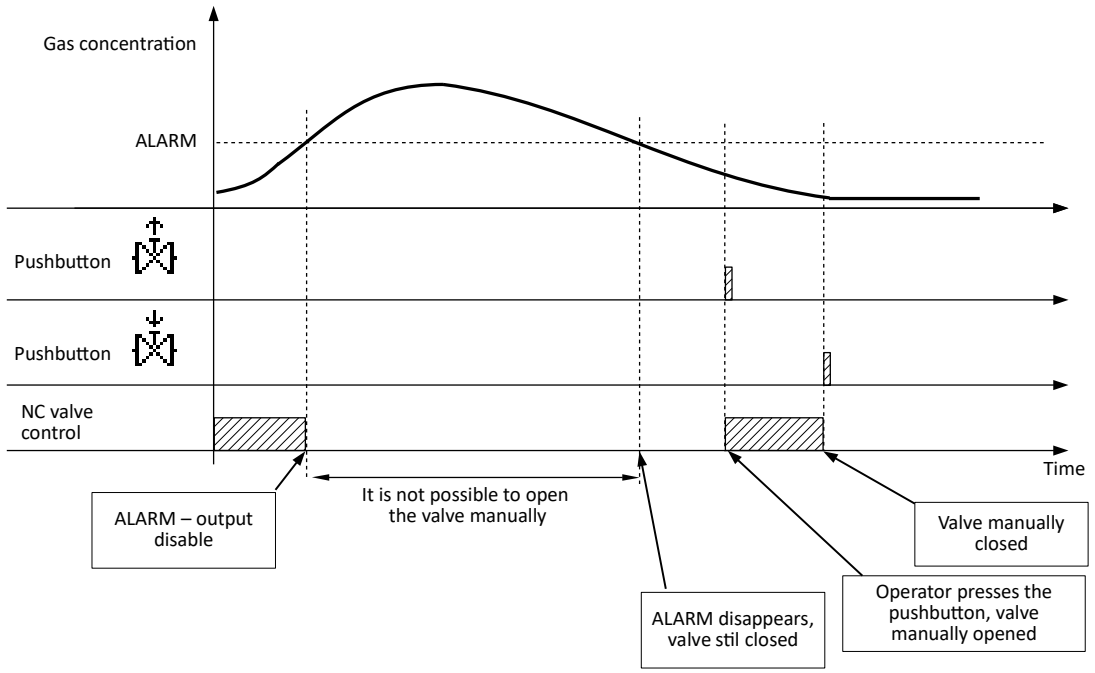


Figure 9: NC valve control

The manual change of valve state occurs after holding the appropriate button for 5 seconds ( or ).

Loss of control unit power supply will close the valve. After the voltage is restored, the valve will return to its previous position.

4.6 Service interface

At the bottom housing wall (see Figures 1 and 2) there is a service connector. It is designed to connect a service tool to Sigma Control L Unit (e.g. a PC with proper software installed). Interface parameters – see section 10.

4.7 Extension Module Interface

Extension Module Interface allows users to expand the functionality of Sigma Control L Unit. The interface port makes it possible to install the Extension Module Interface.

To install the Extension Module, take the following steps (see also figure 10).

1. Disconnect power supply from the control unit.
2. Remove the unit cover.
3. Disconnect the front panel by removing its cable from the port (see figure 2).
4. Install the module in the Extension Module slot (see figure 2) – step I and II (figure 10).
5. Connect cables to the Extension Module.
6. Re-connect and replace the unit cover.

7. Turn the control unit power on.
8. Set up Extension Module parameters as required (see section 5.9).

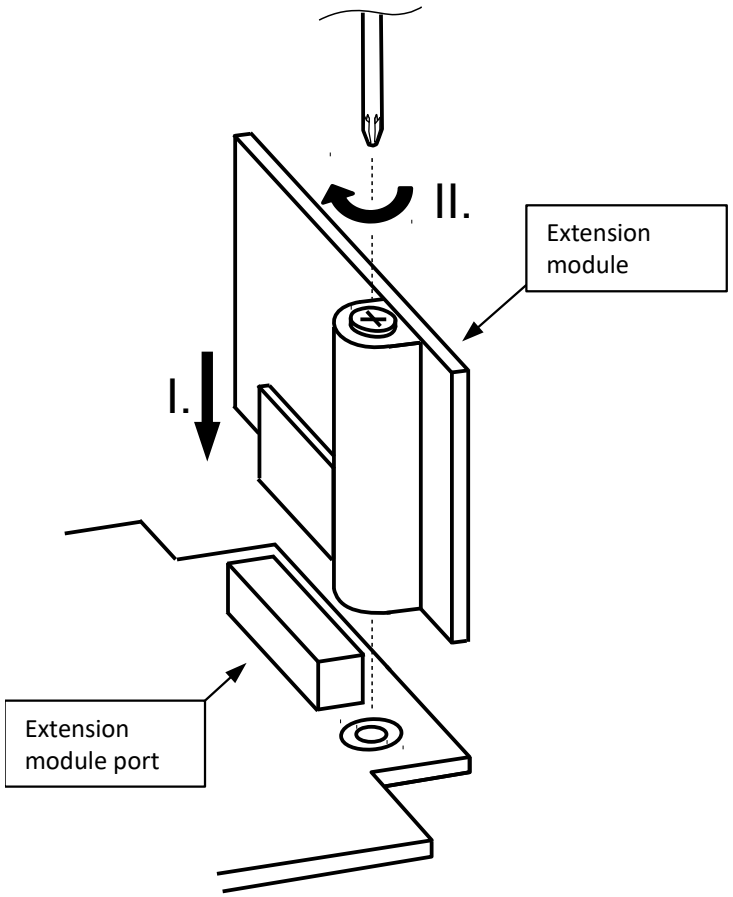


Figure 10: Installing the Extension Module

For a detailed Extension Module drawing, connection description and functionality settings, see the Extension Module instructions – see appendix: [2] and [3].

5 User's interface

User's interface includes:

- LCD display that provides measurement data, diagnostic information, all detector statuses,
- navigation keyboard allowing the user to browse the unit menu in an easy and intuitive way,
- built-in buzzer triggered when any malfunction requiring operator intervention is detected,
- System Visual Indicator that allows the user to access the system "at a glance", even from a distance.

Operation principle

- During standard operation (no risks or special statuses) it is System Visual Indicator that remains enabled – only the green LED "MONITORING" is on.
- If any gas alarms and/or special statuses appear, the built-in buzzer warns the operator who can easily assess the new system event by verifying four – colour System Visual Indicator.

- If more detailed information on system status is required and/or it is necessary to perform additional operations or settings, the operator can use the dynamic keyboard available under the unit display.

5.1 Front panel

Sigma Control L Unit front panel includes:

- system status LED field (see section 5.1.2),
- visual indicator System field (see section 5.1.1),
- LCD display field (see section 5.1.3),
- navigation push button field (see section 5.1.3).

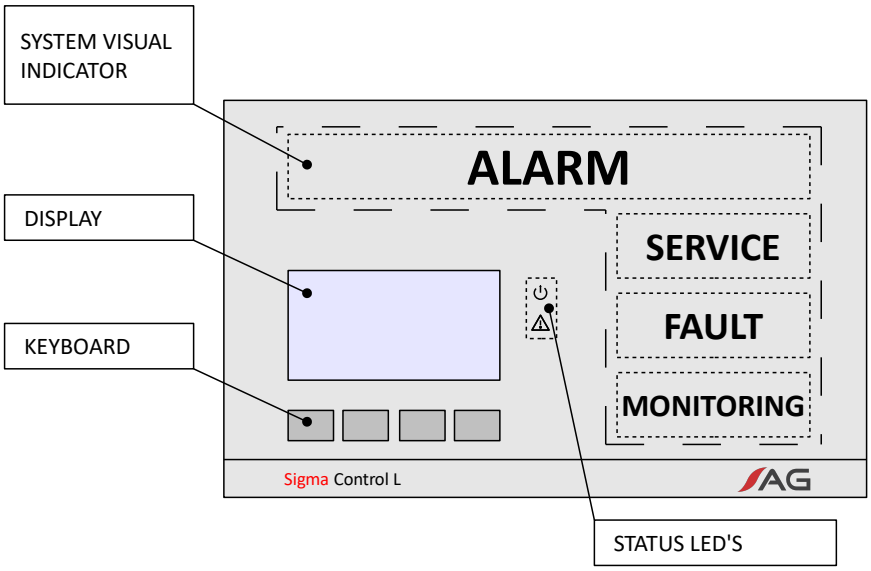


Figure 11: Sigma Control L Unit front panel with fields description

5.1.1 System Visual Indicator Field

System Visual Indicator allows the operator, who is normally focused on other activities, to quickly assess site gas safety status – by taking a quick glance at the indicator and confirming that only the green LED is on. System Visual Indicator is responsible for displaying four independent information:

LED	Color	Description
MONITORING	Green	Active, if at least one of the detectors connected measures gas concentration.
FAULT	Yellow	Active, if at least one system component is faulty.
SERVICE	White	Active, if at least one system component is in service status (e.g. warming up, calibration, “inhibit”, test or system configuration).
ALARM	Red	The most important and largest indicator, active if at least one Gas Detector detects a dangerous concentration.

Table 4: Description of System Visual Indicator LED's

5.1.2 System status LED field

LED		Status description
Green	⏻	LED is constantly on, when the Unit is energized.
		Blinks at equal intervals _⎍_⎍_⎍_⎍_ – incomplete unit configuration (default settings operation). Contact the manufacturer.
		Simple blink_⎍_____ – unit operates in configuration mode.
Yellow	⚠	Active, when special statuses occur in detectors of the control unit.

Table 5: Description of system status LED's

5.1.3 LCD display and navigation buttons

The navigation buttons combined with display allow users to browse the menu in an easy and intuitive way. The push button operation is not fixed, their current function is presented at the bottom area of the display (see figure 12).

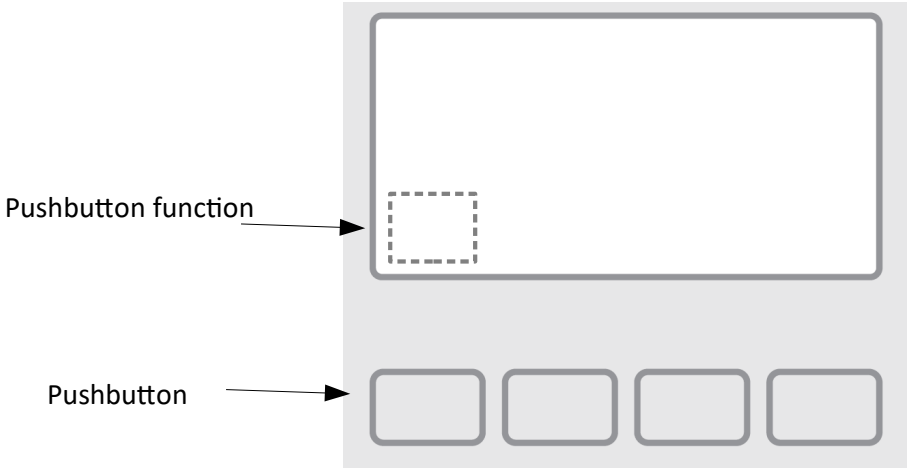


Figure 12: Push button and its function

5.2 Interface structure

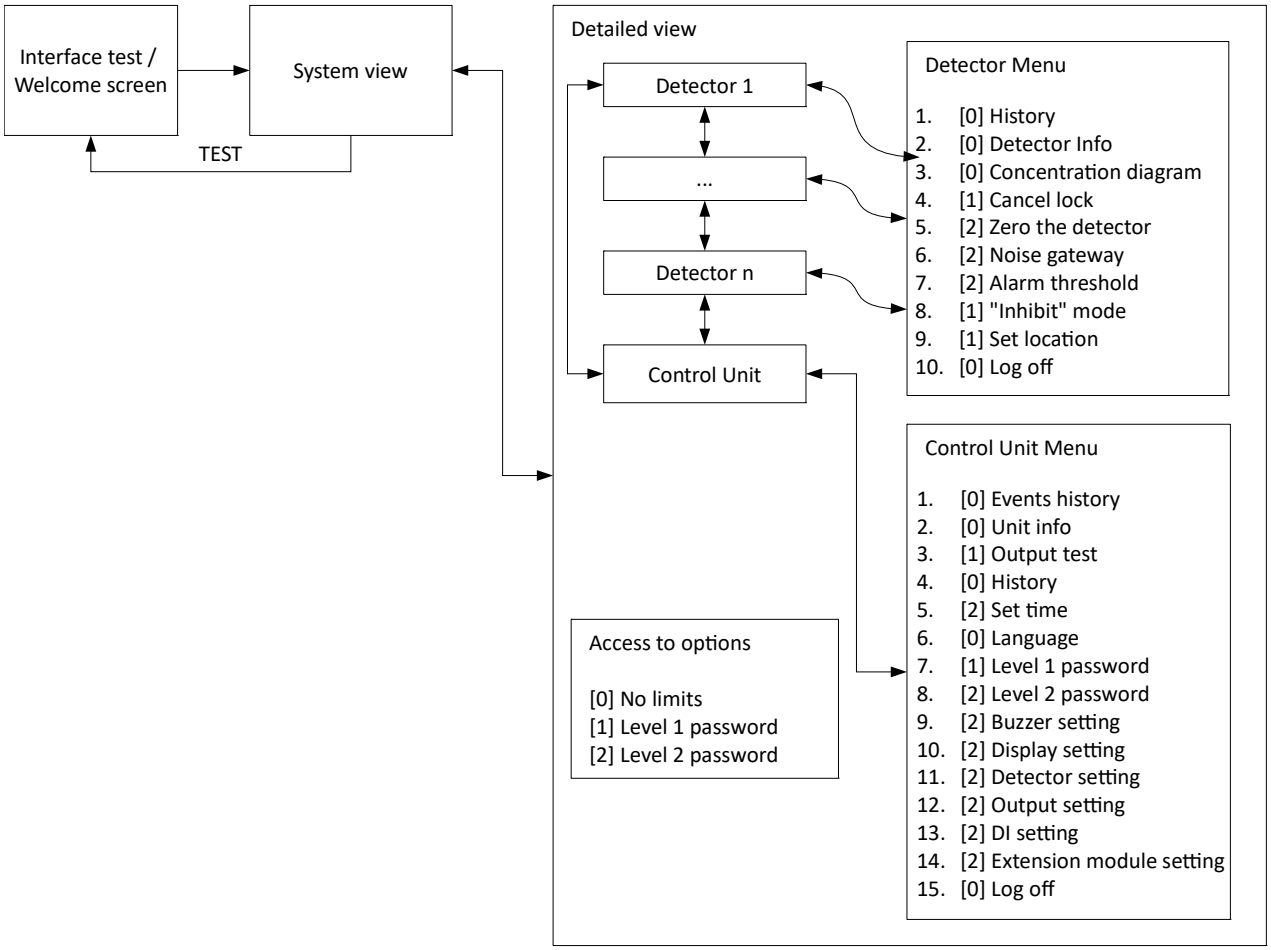


Figure 13: Interface structure

5.3 Access to options – log on mechanism

Because the unit has options that may have a significant impact on Sigma Gas detection system operation parameters, and consequently, on safety level, the access control has been introduced. There are 3 system access levels. They include:

- level 0 – basic – it allows for viewing indications and additional system information,
- level 1 – operational, password-protected – it allows for performing normal operations, including: detector lock cancellation,
- level 2 – allows for parametrization, password-protected – it allows for changing system operation parameters.

The default access level is level 0. Each user possessing access to the Control Unit Interface, operates at this level. If the user tries to choose an option for which a higher access level is required, the unit requests to enter an access password.

If the user enters a correct password, he will be logged on to proper access level, thus gaining access to the chosen option. The user returns to the basic access level (level 0) when:

- the user chooses the option “Log off” from the Menu (see section 5.8 and 5.9),
- keyboard is not used for a certain period.

If the user enters an incorrect password three times in a row, log on feature will be locked for 5 minutes and each effort to access the option requiring higher access level will generate the following message “Log off lock, wait for X min”, where X is the number of minutes remained to unlock.

For information on the access level required for each unit option, see section 5.2.

Default passwords include:

- level 1 password is: 1000
- level 2 password is: 2000

Before commissioning the detection system, it is necessary to change the default access password (see section 5.9).

5.4 Starting the unit, testing the user’s interface

To check the Sigma Control L Unit for proper operation, perform the user’s interface test. While testing, the unit starts all front panel LEDs (status and System Visual Indicator LEDs) as well as internal buzzer, all display pixels become darkened. After approx. 1 second, the LEDs and buzzer go off, while the display presents a welcome screen (see Figure 14). Product revision number is shown at the bottom area of the screen. After 2 seconds, the unit passes to system view.

Figure 14: Welcome screen

5.5 System view

The system view is the basic view of operating the Control Unit. It contains condensed system status information. Combined with the System Visual indicator being its addition, it provides complete information on gas detection key status components.

The screen is divided into a few sections (see figure 15).

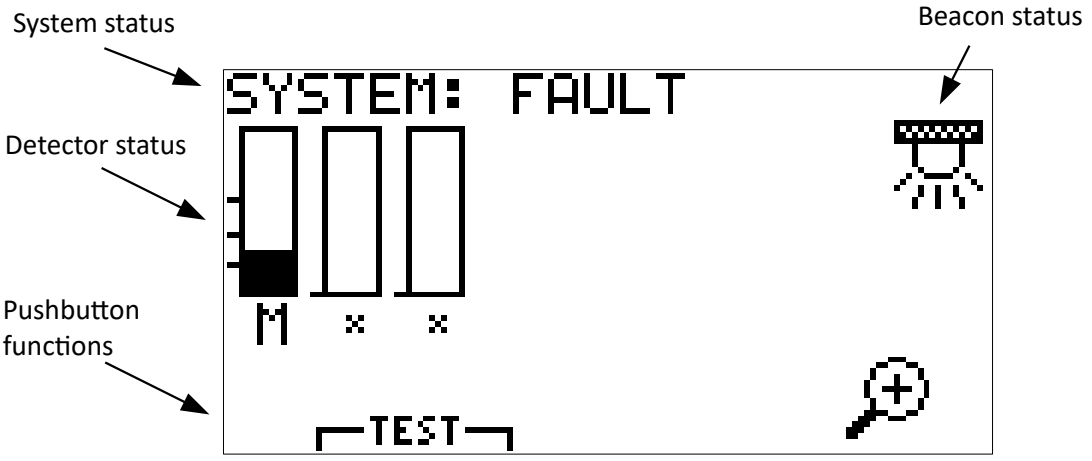


Figure 15: System view screen – system with up to 10 detectors

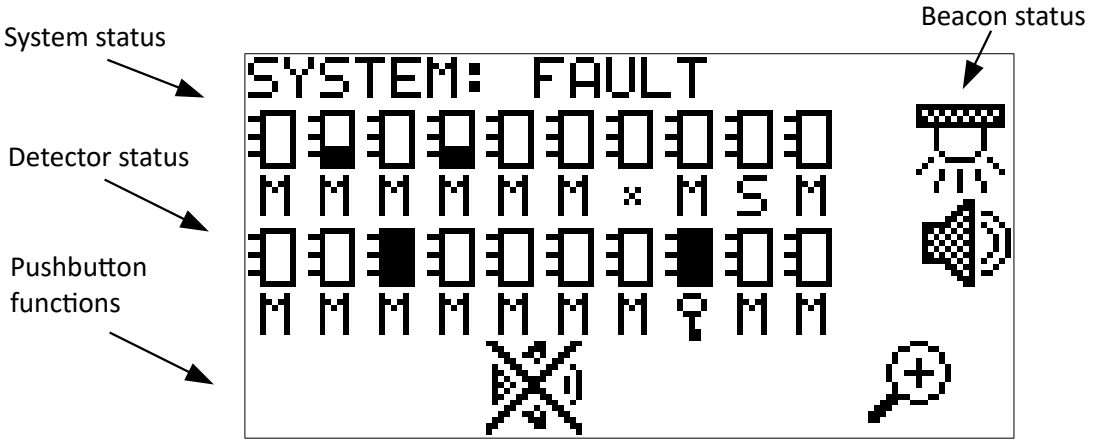


Figure 16: System view screen – system with 10 to 20 detectors

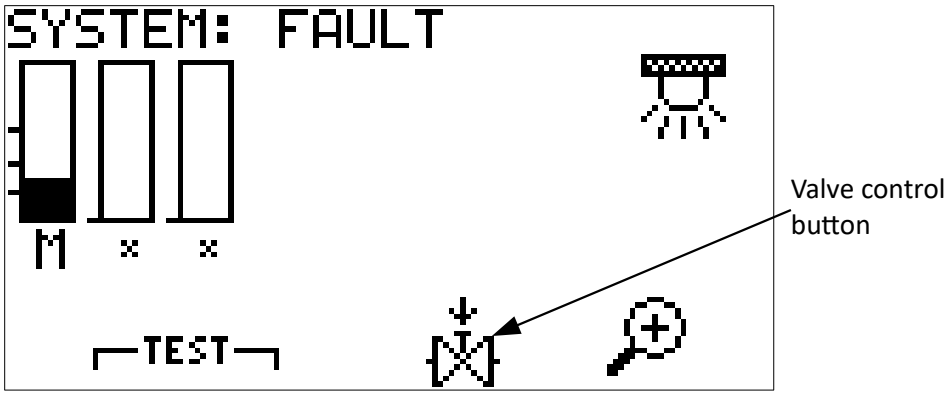


Figure 17: System view screen – NC valve control

- System status:

  Information about system status is displayed interchangeably with information about date and time (or clock not being set) – this allows to verify the setting of this parameters in control unit.

  This section shows a text collective description of the system. Possible messages include:

Message	Description
OPERATIONAL	This message is displayed, when all system components covered by self-diagnostics operate correctly.
FAULT	At least one component covered by self-diagnostics is faulty (Control Unit or a detector).
EXTER.ALARM	Dual Input (DI) has been set up as EXTER. ALARM and has been triggered.
EXTER.FAULT	Dual Input (DI) has been set up as EXTER. FAULT and has been triggered.

Table 6: Collective text system description

- Beacon status:
  This section presents indicator activations:

Icon	Description
	Active visual indicator. When the indicator is disabled, this field is empty.
	Active acoustic indicator. When the indicator is disabled, this field is empty.

Table 7: Indicator activation status

- Detector status:

  This section presents the status of individual detectors. Each detector is represented through the panel as shown in figure 19:

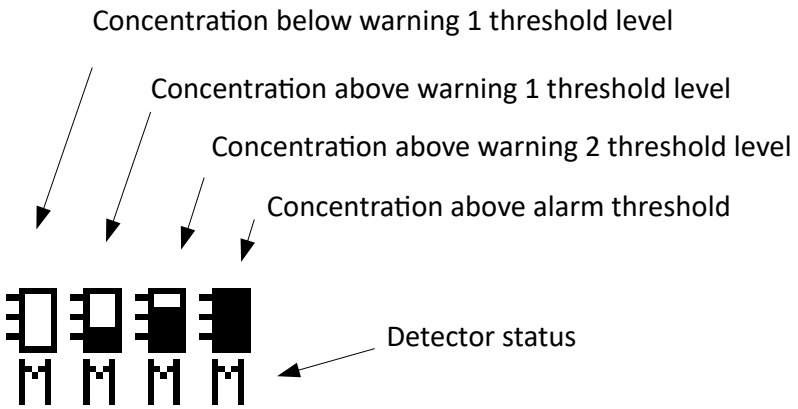


Figure 18: Detector panel with 10 to 20 detectors

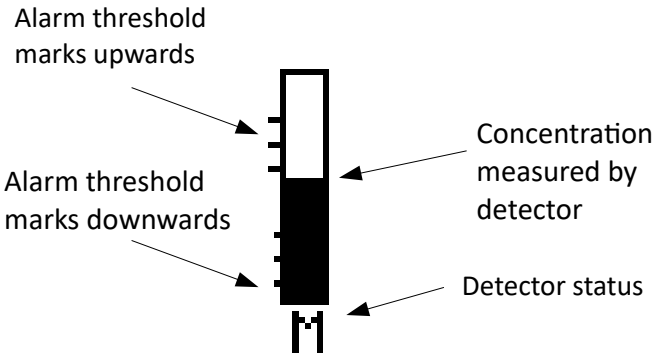


Figure 19: Detector panel with up to 10 detectors

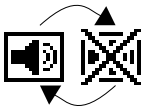
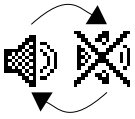
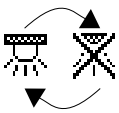
Detector statuses can be as follows:

Icon	Description
	The detector operates in monitoring mode – it takes measurement and its indications are reliable.
	The detector operates in special mode. Its indications are taken into account in the Control Unit output control.
	Detector fault or no communication with the detector. Its indications are not taken into account in the Control Unit output control (except for relay in fault status).
	The detector operates in lock mode – its indication before the lock is latched.
	Non-critical fault – detector malfunction measurement accuracy loss (eg exceeded time to periodic calibration).

Table 8: Detector statuses

- Push-button functions:

  In the system view push buttons can adopt the following functions:

Icon	Description
	Temporary internal buzzer deactivation.
	Temporary acoustic indicator deactivation.
	Visual indicator backup disabled
	System passes to detailed view (see section 5.6 and 5.7).

Icon	Description
TEST	Pressing two neighboring push buttons enables user's interface test (see section 5.4).
	If at least one of the relay outputs is configured for operation with an NC valve, the display will show information about the possibility of opening the valve (see chapter 4.5).
	If at least one of the relay outputs is configured for operation with an NC valve, the display will show information about the possibility of closing the valve (see chapter 4.5).

Table 9: Push button functions

5.6 Detailed detector view

The screen is divided into a few sections (see figure 20).

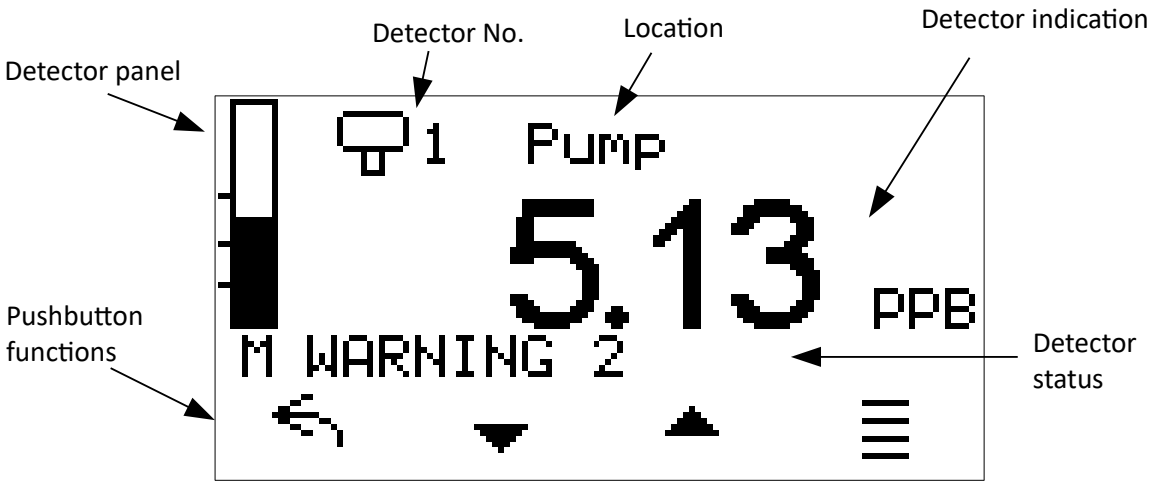


Figure 20: Screen showing detailed detector view

- Detector panel – see section 5.5.
- Detector No. – detector system number.
- Detector location – information on physical detector location.
- Detector indication – current value measured by the detector.
- Detector status

  This section presents a text description of the detector status. Possible messages include:

Message	Description
<no message>	The detector operates correctly, measures gas concentration, no exceeding or special situations.
WARNING 1 WARNING 2 ALARM	Detector indication above warning 1, warning 2, or alarm threshold.
FAULT :<fault code>	The detector fault, it does not measure. Fault code – see gas detector manual. Text message explaining fault code – see detector's menu – see section 5.8.
NC.FAULT: <fault code>	Detector malfunction measurement accuracy loss. Fault code – see gas detector manual. Text message explaining fault code – see detector's menu – see section 5.8.
OVERLOAD	Gas concentration is above the overload value.

Message	Description
SENSOR LOCKED	The detector is in locked mode – last measured value has been latched. It does not measure.
CALIBRATION	The detector is in calibration mode – its indications are ignored.
TEST	The detector is in test mode – its indications are simulated, but all outputs are treated as real. Possible gas alarms or faults.
WARMING UP...	Preparing detector for operation. Its indications are ignored.
INHIBIT MODE	The detector has been temporarily excluded from the system. In this status detector related flags are ignored (see NOTES Table 12).
NO RESPONSE	The detector does not respond for a longer period. It is a special detector fault.
STOP	System operation stopped by the operator.
CAL.REQUIRED	Non-critical fault: exceeded time to periodic calibration.

Table 10: Text description of the detector status

5.7 Control Unit detailed view

The screen is divided into a few sections (see figure 21):

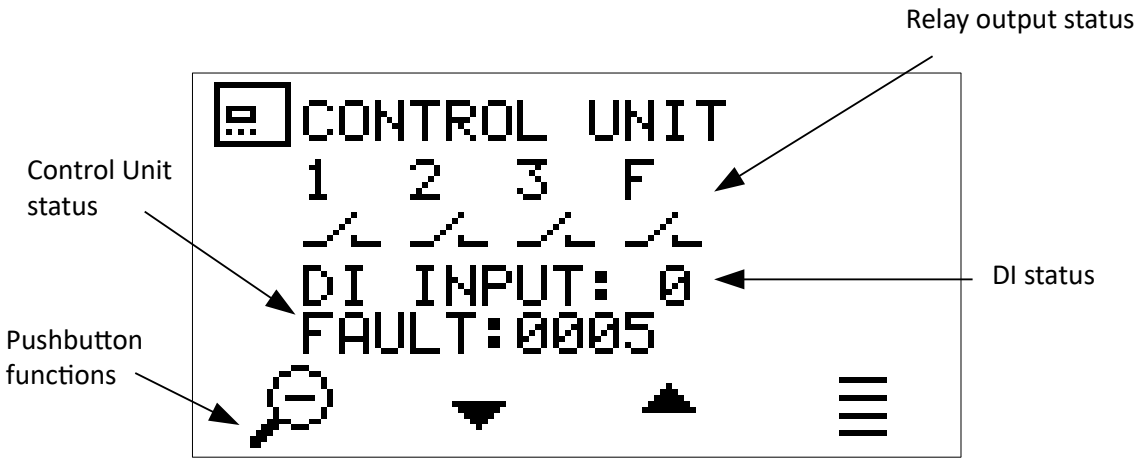


Figure 21: Screen with Control Unit detailed view

- DI (Digital Input) – when the input is enabled, “1” is displayed.
- Relay output status – this section shows the status of relay contact outputs R1 – R3 and fault relay.
- Control Unit status

  This section shows a text description for the status Control Unit. Possible messages include:

Message	Description
OPERATIONAL	The unit is operational.
AW <fault code >	Sigma Control L Unit is faulty. Fault code is a hexadecimal number. Text message explaining fault code find in unit's menu – see section 5.9.

Table 11: Control Unit status text description

5.8 Detector menu

Information on access to options – section 5.2 and 5.3.

For detailed description of the following options see detector User's Manual.

Option	Description
1. History	This option allows the user to browse recorded statuses (threshold exceeding, faults) that occurred at individual detectors. Status memory can be cleared.
2. Detector info	It displays detailed detector information, including: • Range, alarm threshold values. • Detector type and type name. • Measured substance CAS No. and name. • Detector's time of operation in days, date of last calibration. • Detector network address, its serial number. • Information on detector diagnostic status (critical and non-critical fault records). When fault codes are different than zero the icon appears. Push bottom under the icon allows to read information about fault type.
3.Concentration graph	Presents the gas concentration graph recorded by individual detectors over the last 90 minutes of system operation.
4. Cancel lock	It allows users to cancel detector lock. This operation is possible when the detector is in lock mode. Prior to using this option, find out the requirements to be met and the procedure for lock cancellation.
5. Zero detector	It makes it possible to zero the detector. After choosing this option, the Control Unit sends a zero command to the detector. Prior to using this option, find out the requirements to be met and the procedure for detector zeroing.
6. Noise gateway	It makes it possible to set a detector noise gateway threshold parameter. Possible settings range from 0 to 5%.
7. Alarm thresholds	It makes it possible to set detector threshold levels. The user is requested to enter 6 values – 3 alarm thresholds "upwards" and 3 "downwards". These possible settings include: • not less than 10% of the range[4] • not more than 95% of the range • for detectors operating with % LEL unit not more than 60% LEL • it is possible to disable lower limits.
8.„Inhibit" mode	It is possible to exclude the detector. After activating this function, the detector is disconnected from the system. The "Inhibit" mode does not mean that the detector is without power supply. It is not allowed to open it without prior power supply disconnection

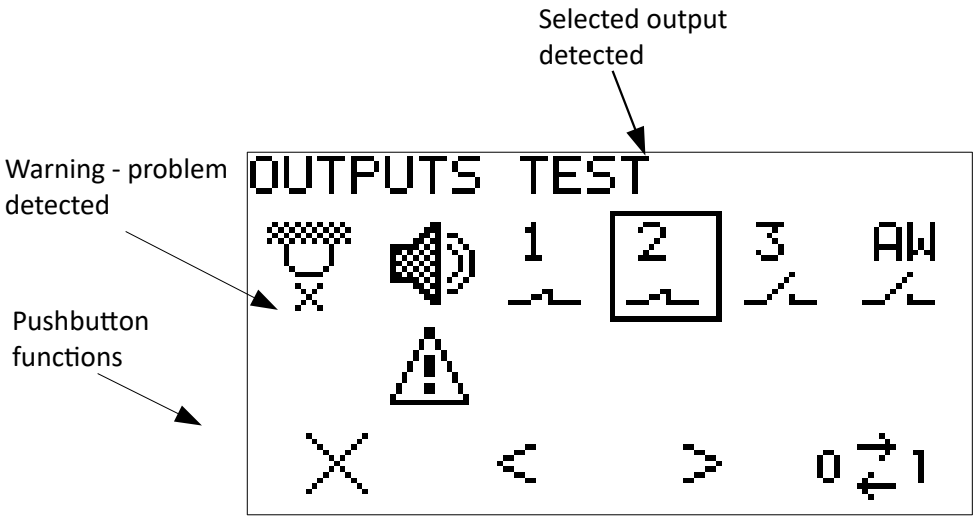
4 Threshold settings are introduced in a physical unit, while limits are values entered in % of the range. Numeral values can vary.

Option	Description
9. Set location	This option allows users to set a detector location. It is possible to enter a text of 8 characters from the range a-z, A-Z, 0-9, hyphen and space.
10. Log off	The system returns to basic access level (level 0) – see section 5.3.

Table 12: Detector menu

5.9 Control Unit menu

Information on access to options – sections 5.2 and 5.3.

Option	Description
1. Events history	This function allows to view logged system states.
2. Unit info	Presents detailed information on Control Unit, including: • software revision number • information on Control Unit diagnostic status.
3. Output test	This function allows for manual testing the dual inputs of Control Unit. After choosing this function, the user can select any output and switch its status. If improper operation is detected, the following messages are displayed: • in the form of a warning triangle (see figure 22), when the output port signal is incorrect, • "OVERLOAD!", when the device is overloaded (it refers to Control Units supplied from an external power supply).  **Figure 22: Screen during output test** ⚠ When this output option is not controlled based on current system status. It is indicated through the "SERVICE" LED lit on the visual system indicator (see section 5.1.1). Gas risk or system fault occurrence will not result in triggering individual outputs, therefore it is necessary to pay special attention while performing this test. Only SSO and buzzer will respond to detector indications.
4. History	This option allows the user to browse recorded statuses (faults). Status memory can be cleared.

Option	Description
5. Set time	This option allows to set the date and time.
6. Language	It allows users to choose user's interface language. Available languages include: • Polish, • English.
7. Level 1 password	It makes it possible to change access password for access level 1. ⚠ Pay special attention while changing access password for access level 1. Entering a new password after losing the old one will be possible after logging on to access level 2 or by the manufacturer's service
8. Level 2 password	It makes it possible to change the access password for access level 2. ⚠ Pay special attention while changing access password for access Level 2. Only manufacturer's service will be capable of entering a new password after losing the old one.
9. Buzzer settings	It allows users to change internal buzzer settings. The following parameters can be changed: (see section 5.11): • buzzer recovery time for an alarm, • buzzer recovery time for a fault, • buzzer disabled permanently.
10. Display settings	It allows users to set a display contrast level.
11. Detector settings	It allows users to configure the number of detectors in the gas detection system. The user is requested to enter this number ranging from 1 to 20. Subsequent network addresses starting from 1 are assigned to subsequent Control Unit detector channels. Make sure that detectors connected to the Control Unit have subsequent addresses from the pre-set range.
12. Output settings	It is possible to configure Control Unit outputs. After choosing this option, the user is requested to select an output to be configured, and then to enter operation parameters for this output. Parameter information – see section 4.2 and 4.4.
13. DIs settings	It allows users to configure the input as ALARM or FAULT.
14. Extension Module settings	It allows users to configure Extension Module installed in the Control Unit (see also section 4.7). This option is available only, when the Extension Module is installed. The type and range of parameters depends on the type of Extension Module – see Extension Module manual for their descriptions (see section 13).
15. Log off	It returns to the basic setting level (level 0) – see also section 5.3.

Table 13: Control Unit menu

5.10 Events history

The device registers events related to the system operation (alarms, failures or information events, e. g. inhibit mode). A specific event is connected with its time of occurrence.

Event history allows to store 4 000 records (in case of space used the oldest events are overwritten by new) and can not be deleted.

It is possible to save event history directly to a file (using the Sigma Toolbox software).

5.11 Buzzer – internal acoustic indicator

Sigma Control L Unit module has a built-in internal acoustic indicator, called a buzzer. It is designed to generate an acoustic signal when operator intervention can be necessary, including a gas risk or system component fault.

The buzzer is triggered when:

- gas alarms, i.e. when warning level 1 or 2 and alarm are reported by any of the detectors connected,
- fault, i.e. a critical fault of any detectors connected appears, loss of communication and in the case of Control Unit Module critical fault.

The triggered buzzer generates an acoustic signal, modulated, 0.5 s sound, 0.5 s silence.

The buzzer can be muted for a certain period (temporarily deactivated). Then, even when the triggering signal remains, the buzzer does not generate any sound. However, if the deactivation time expires, and the triggering signal is still active, the buzzer resumes its operation (reactivates). If during the time of buzzer deactivation a new gas alarm[5] occurs or a fault, the buzzer resumes its operation. When the source of triggering stops, the buzzer turns off.

The buzzer can be disabled by the keyboard (see section 5.9) and External DIs (see appendix [2] and [3]). The mechanism of temporary deactivation is treated separately for gas alarms and faults. Possible deactivation times include:

- for gas alarms: 1 – 90 minutes,
- for faults: 1 – 168 hours (1 week) and infinite time (the buzzer will not reactivate).

The values of the above listed parameters can be pre-set by the user from the unit menu level (see section 5.9).

Below is a time diagram for maintaining internal acoustic signal (it was assumed that the trigger signal is a gas alarm and deactivation is perfumed by a push button):

5 New gas alarm means exceeding the upper alarm threshold at any detector or a threshold at any other detector.

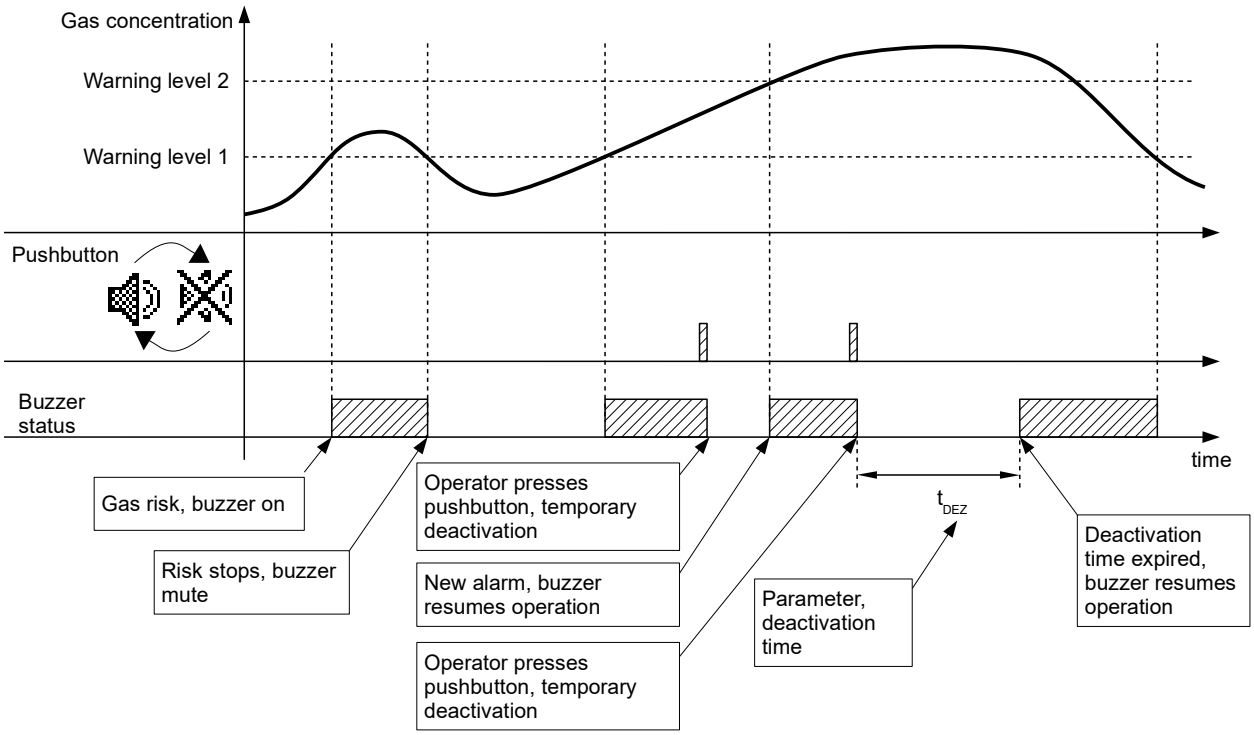


Figure 23: Internal buzzer operation – time diagram

The buzzer can be configured so as not to be triggered at all.

6 Options for SCL connection in a gas detection system

Below we present some examples for connecting Sigma Control L Unit connections with other gas detection system components.

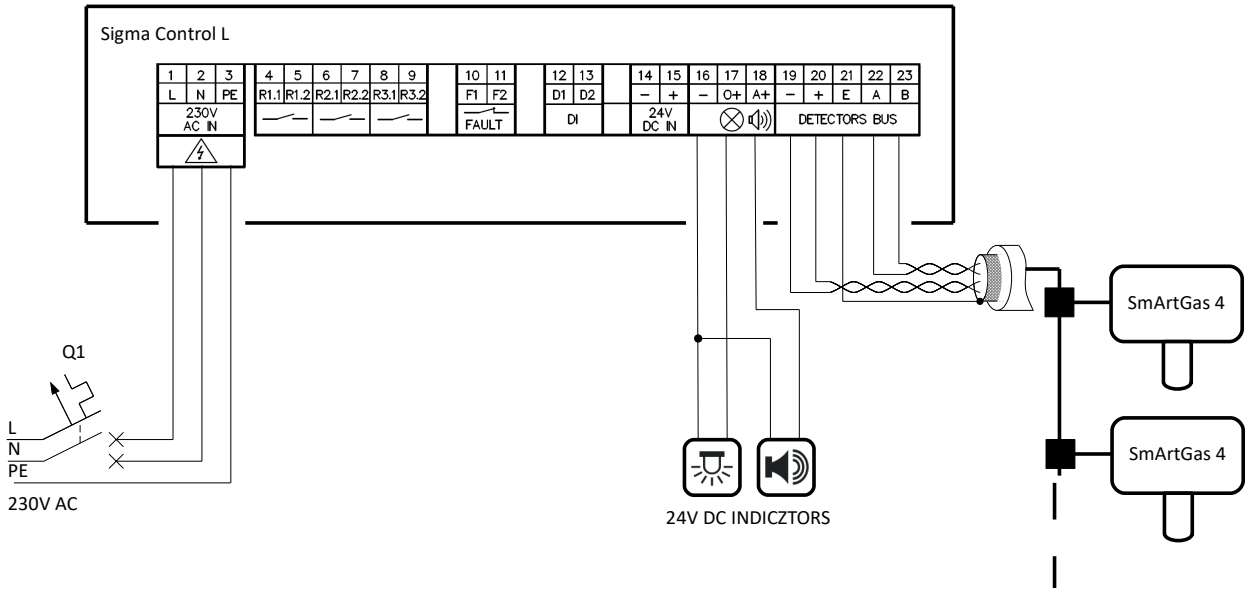


Figure 24: A connection example: power supply 230 V AC and 24 V DC indicators

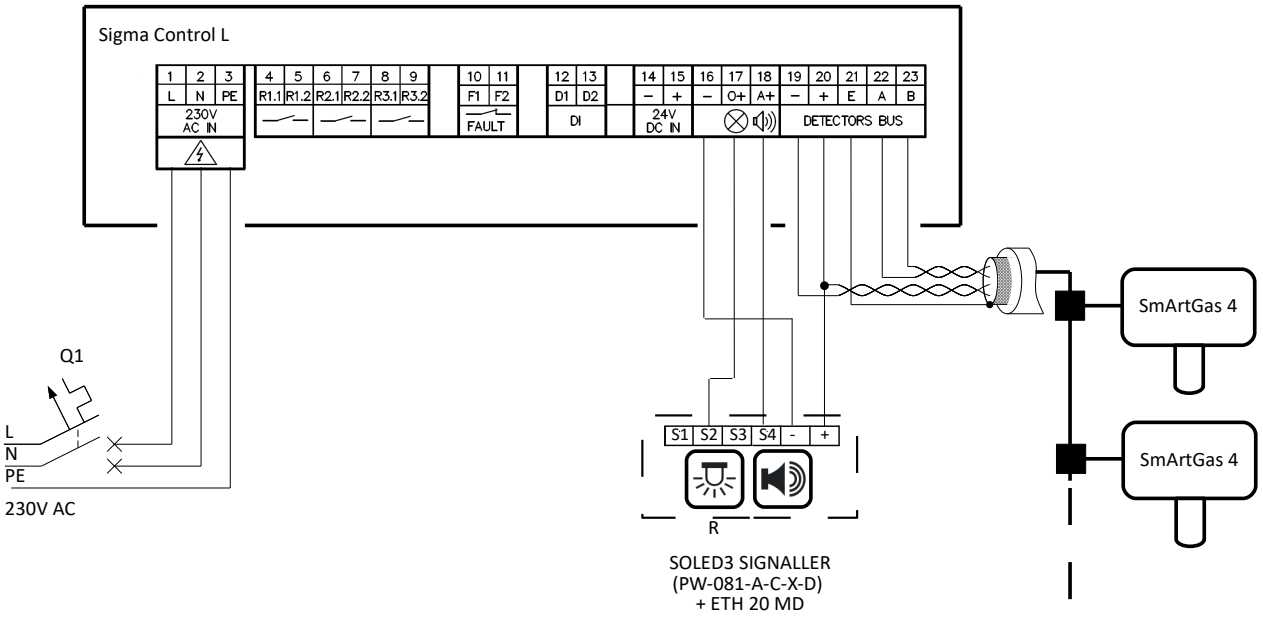


Figure 25: A connection example: one-colour SOLED3 signaller

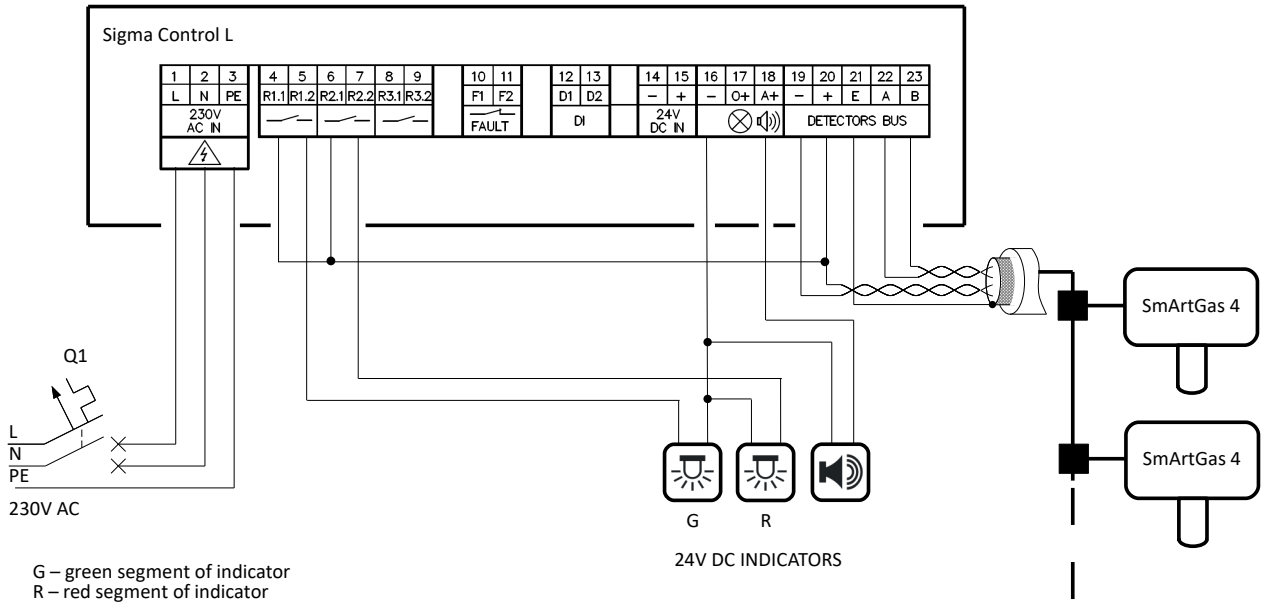


Figure 26: A connection example: bi-colour 24 V DC indicator to relay's outputs

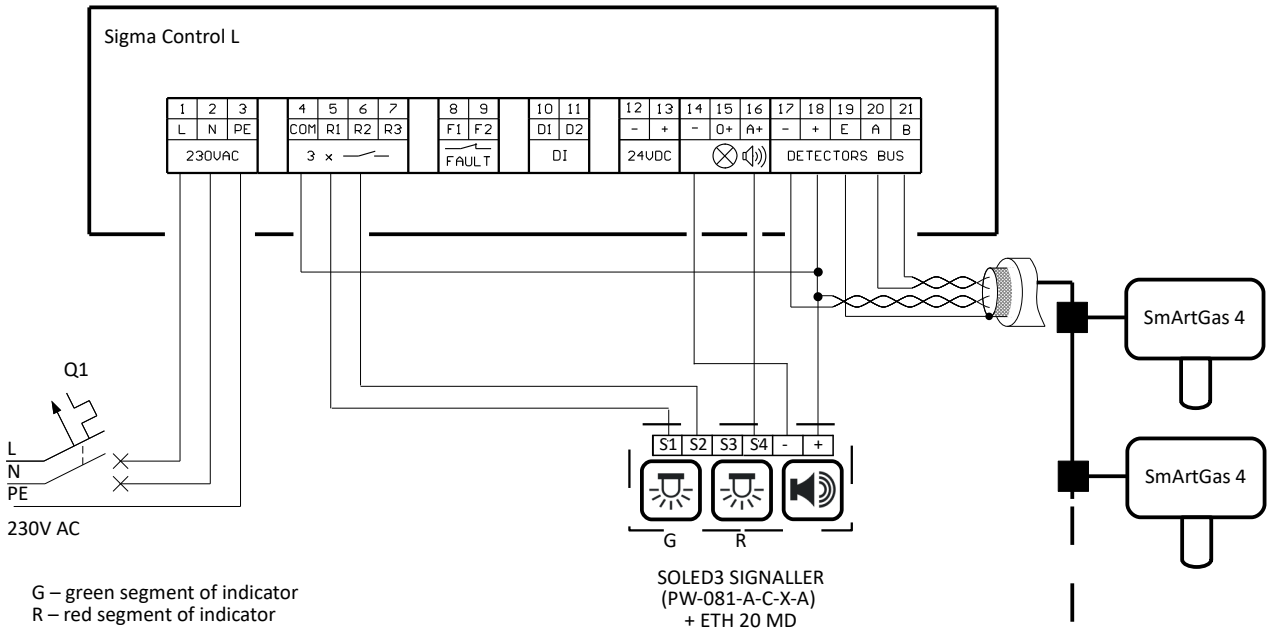


Figure 27: A connection example: bi-colour SOLED3 signaller to relay's outputs

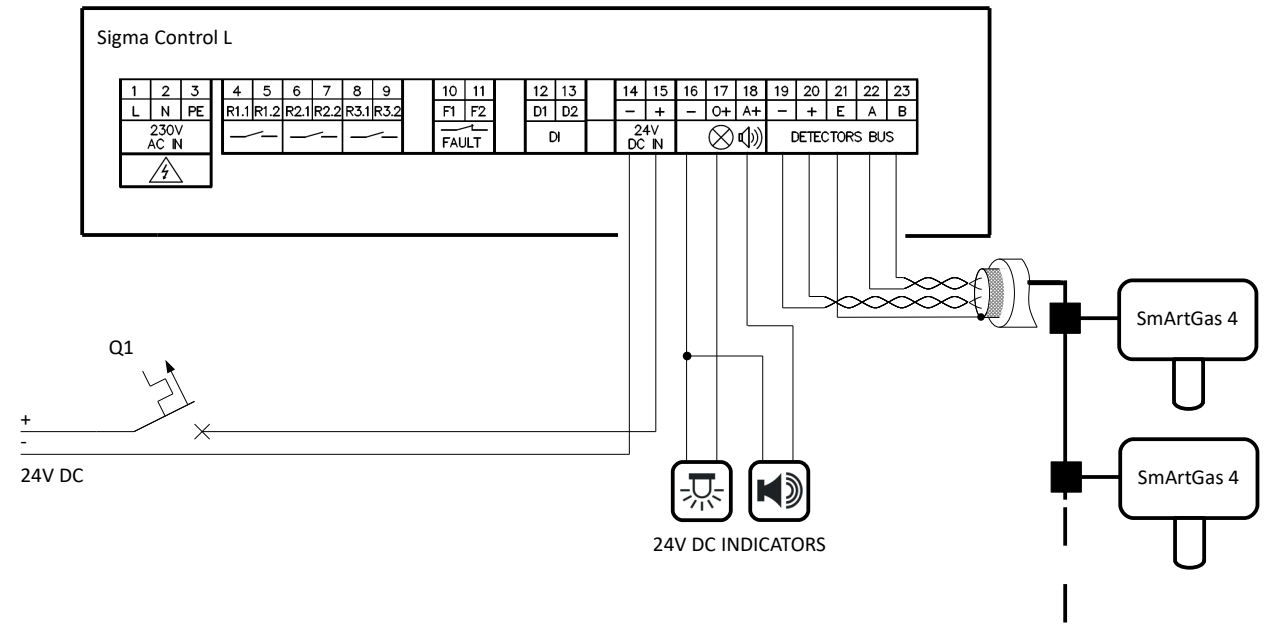


Figure 28: A connection example: power supply 24 V DC and 24 V DC indicators

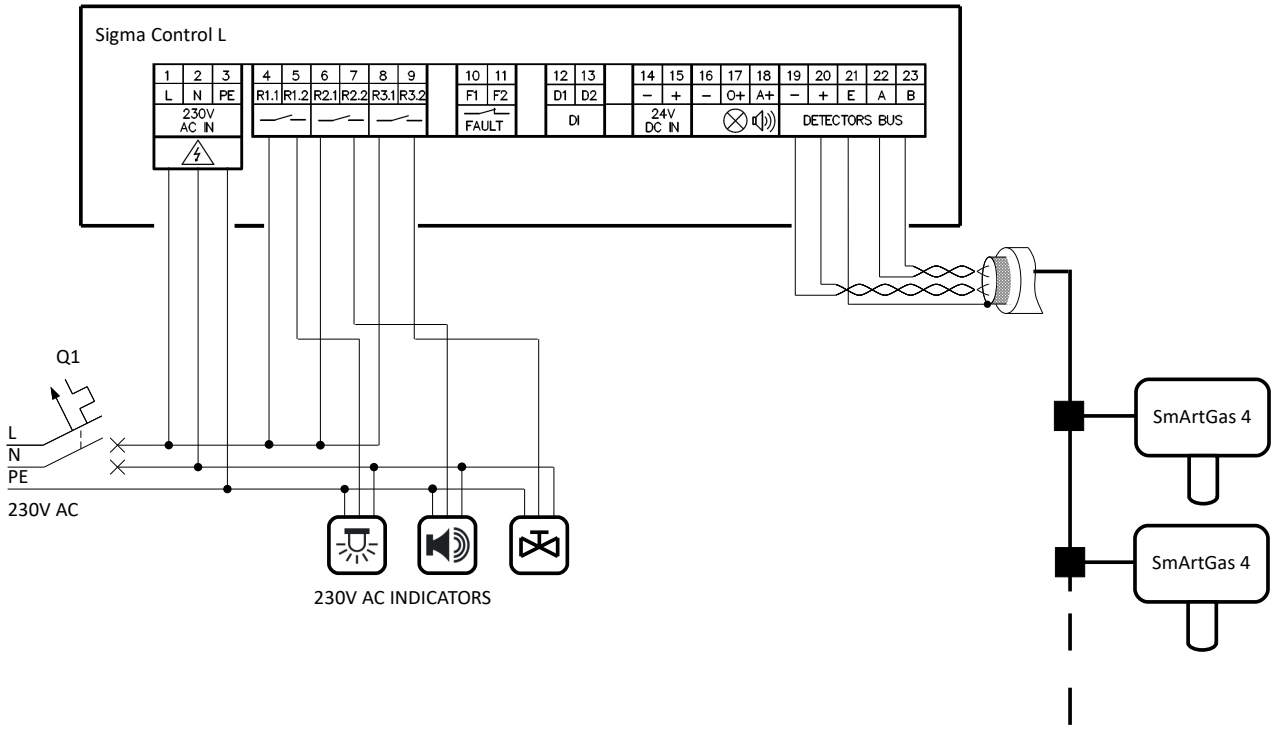
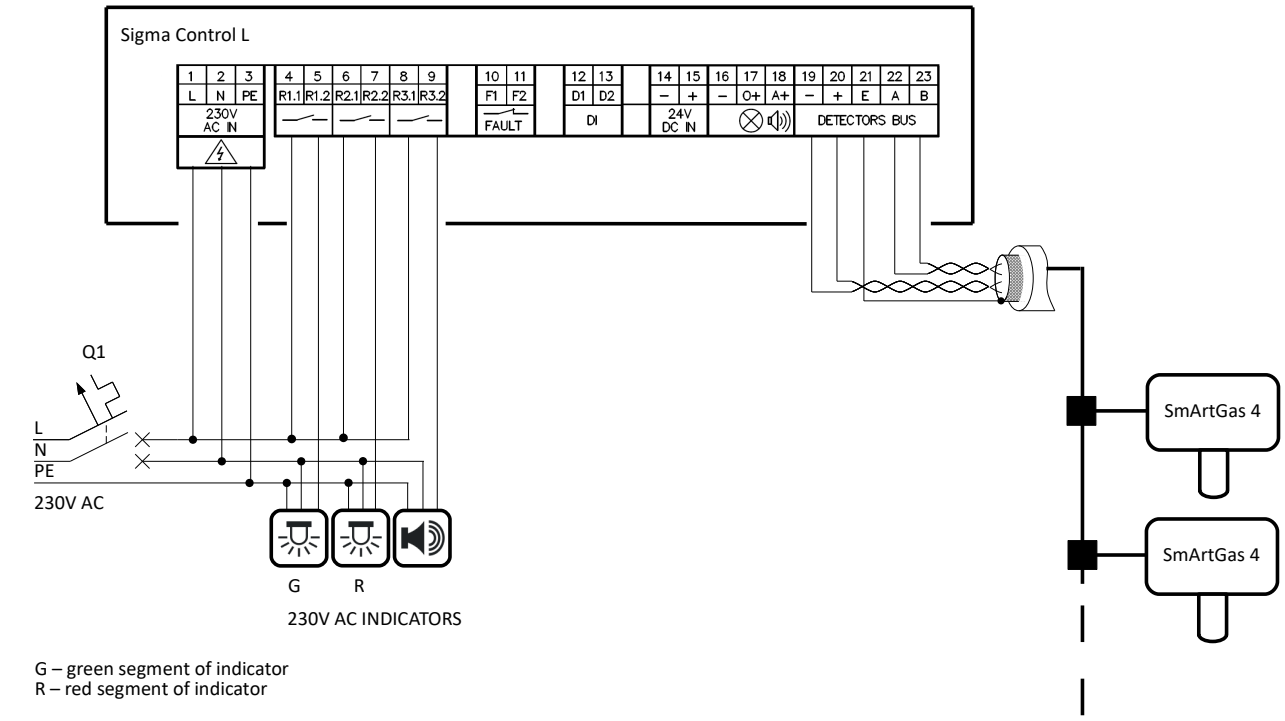


Figure 29: A connection example: power supply 230 V AC, 230 V AC indicators and valve



G – green segment of indicator
R – red segment of indicator

Figure 30: A connection example: bi-colour 230 V AC indicator to relays outputs

7 Selecting cooperation devices

When Sigma Control L is supplied by 230 V AC, the total current consumed by devices connected to the Control Unit (through detector bus and indicator terminals) cannot exceed 1.5 A, while the current consumed at indicator terminals cannot exceed 1.15 A.

When Sigma Control L is supplied by 24 V DC, the total current consumed by devices connected to the Control Unit (through detector bus and indicator terminals) cannot exceed 2.3 A, while the current consumed at indicator terminals cannot exceed 1.15 A.

The list of current values consumed by detectors connected to the unit is presented in its documentation. Current demand for other devices, e.g. visual-acoustic indicators should be defined by referring to their technical documentation.

Information about cable types can be found in the Guide – "Sigma Gas Safety System" (POD-070-ENG) available for download at doc.atestgaz.pl/AG/POD/POD-070-ENGPrint.pdf.

Once the system is installed perform a load test – see section 8.4.

Examples of correct and incorrect device selection are presented below:

Example 1:

Power supply 230 V AC		
10 x detector PW-017-PG4-EC-LCD-AL-0-485-0-0-0-0,	current input 10 x 35 mA = 350 mA	
6 x detector PW-044-SG4-EC-0-ALB-T-485-0-0-0-0,	current input 6 x 70 mA = 420 mA	
1 x visual-acoustic indicator,	current input 1 x 250 mA = 250 mA	
Current input for indicators:	250 mA < 1150 mA	Correctly
Total current input:	1020 mA < 1500 mA	Correctly
	system configured **correctly**	

Example 2:

Power supply 230 V AC		
10 x detector PW-044-SG4-PEL-0-ALB-0-485-0-0-0-0,	current input 10 x 70 mA = 700 mA	
2 x visual-acoustic indicator,	current input 2 x 480 mA = 960 mA	
Current input for indicators:	960 mA < 1150 mA	Correctly
Total current input:	1660 mA > 1500 mA	Incorrectly
	system configured **incorrectly**	

Example 3:

Power supply 24 V DC		
5 x detector PW-044-SG4-PEL-0-ALB-0-485-0-0-0-0,	current input 5 x 70 mA = 350 mA	
2 x visual-acoustic indicator,	current input 2 x 600 mA = 1200 mA	
Current input for indicators:	1200 mA > 1150 mA	Incorrectly
Total current input:	1550 mA < 2300 mA	Correctly
	system configured **incorrectly**	

8 Life cycle

8.1 Transport

The unit should be transported the same way as a new one. If its original packaging, protective extrusion or other protective components are unavailable, protect the unit against mechanical shocks, vibrations and moisture with other equally effective methods.

8.2 Installation

Install the unit on a flat, vertical wall as shown in Figure 1. The unit must be accessible to system operators but, if possible, prevented from access of unauthorized persons. Elevation of the installation place must be convenient for operation and maintenance.

Use the drill template provided in the package for drilling holes. If stranded cables are used to connect the unit, use bushing terminals to the ends of these cables.

It is unacceptable to combine in one connector two wires which are not pinched in one cable lug.

Do not place the cable reserve in the device. Bare wires or wires surplus may create a danger of electric shock or equipment damage.

Do not leave disconnected cables inside the device.

Incorrect cable routing can lead to reducing the device's immunity from electromagnetic interference.

Unused screw terminals must be tightened.

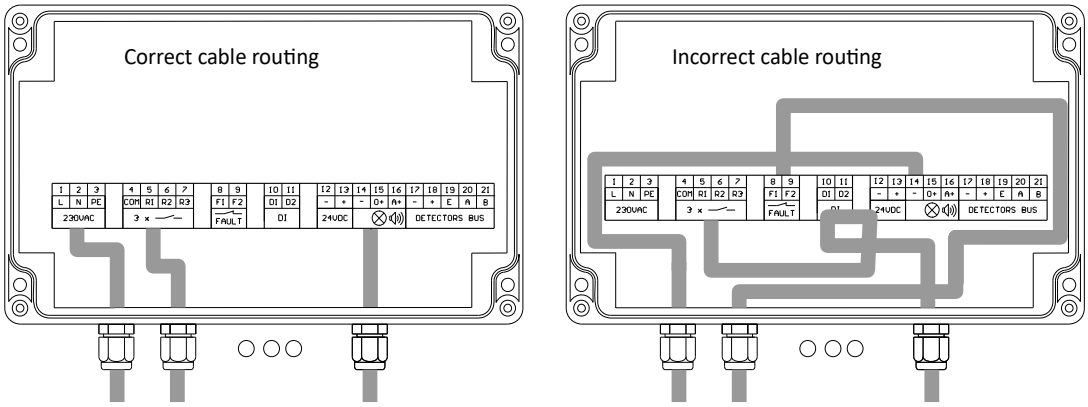


Figure 31: Example connection of cables to the device

8.3 Start up

Once the unit is installed change access passwords (see section 5.9).

Perform a load test before operating your gas detection system for the first time and after each system component replacement – see section 8.4.

8.4 Load test

To perform a load test:

1. operate all outputs using the output test (see section 5.9),
2. observe the unit behaviour for a certain period (at least one minute),
3. check for any fault status on the display.

Test result can be assumed positive if:

- devices connected to SO and SA outputs operate correctly,
- no unit overload occurred during the test (see section 5.9).

If the test result is negative, remove the cause for system malfunction and repeat the test. See also section 7.

If an overload occurs during unit operation (also during the load test), remove the cause of load as soon as possible. Using the system with overload may result in its shut down / damage in a critical situation (when there is a risk caused by a dangerous substance).

8.5 Periodical operations

It is recommended to perform interface test (see section 5.4) once a week.

It is recommended to perform output test (see section 5.9) once a month.

8.5.1 Replacement of consumables

The life cycle of consumables/ wearing components is presented in table 15.

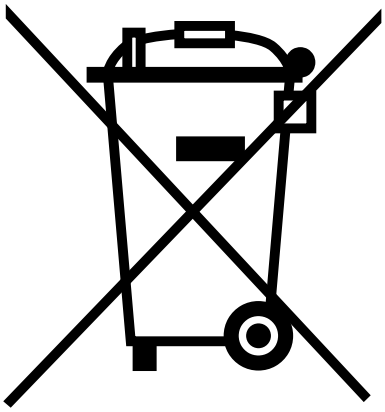
To replace a discharged battery or a burned fuse, take the following steps:

1. disconnect power supply from the control unit,
2. remove unit cover,
3. disconnect the front panel by unplugging the connector (see figure 2),
4. remove the discharged battery from the battery port or a burned fuse from the fuse seat (see figure 2),
5. install a new battery or a fuse (for component types – see table 15),
6. connect and replace the unit cover,
7. connect power supply to the control unit.

8.5.2 Maintenance

Except for cleaning the external surface of unit housing, no special unit maintenance is required. Clean the external unit housing with a non-abrasive cloth moistened with water and some soft detergent.

8.6 Utilization



This symbol on the product or its packaging indicates that this product must not be disposed of with other household waste. Instead, it is user's responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your consumer waste equipment for recycling, please contact your local city recycling office, waste collection company or the dealer from whom you originally purchased the product. The product can be also returned to its manufacturer.

9 Troubleshooting

9.1 Clock not set

In case the control unit signals "Clock not set" replace the battery and update the date and time settings (see section 8.5.1).

10 Technical specifications

Rated power supply parameters • V_{CC}; Power consumption	 230 V ~ ± 10%; 60 W[6] 21 – 29 V ⎓; 60 W
Environment (operation and storage) • Ambient temperature range	 • For power supply 230 V ~: -10 – +40°C • For power supply 24 V ⎓: -10 – +50°C ⚠ When an extension module is used, the temperature range may be limited – details see appendices [2] and [3].
• Relative humidity range	10 – 90% long term, 0 – 99% short term, without condensation
IP	IP 65
Output capacity	• For power supply 230 V ~: 1.5 A • For power 24 V ⎓: 2.3 A For signaller output, independent of the power, max 1.15 A More information in section 7
Digital input parameters • R_{in} • Inactive • Active • Time parameters	 10 kΩ 0 – 1 V ⎓ any polarization 10 – 30 V ⎓ any polarization The shortest pulse duration noticeable by the system is 0.2 s
Digital output parameters • Relays	 3 pieces, current carrying capacity: DC1[7]: 230 V ⎓ / 0.25 A DC1: 24 V ⎓ / 3 A AC1: 230 V ~ / 3 A Total current for all contacts not to exceed 3 A
• Indicator outputs	Active[8], 24 V / 1.15 A, fused

Digital communication parameters
• Port “DETECTORS BUS”
  • Electric standard
  • Communication protocol
• Service port
  • Electric standard
  • Connector type
	
	RS-485 non-isolated
	Sigma BUS
	
	USB non-isolate, class V2.0
	Mini-B

Integrated signalling equipment (visual)	LCD display, monochromatic, approx. 2.4” LED indicator
Integrated signalling equipment (audible)	60 dB from 1 m
Protection class	I – for 230 V ~ power supply, III – for 24 V ⎓ power supply Unit design according to class II

6 Provided power value is a power available for the whole system – i.e. for Control Unit, Detectors, Indicators and other components. The Sigma Control L alone consumes 10 W.

7 EN 60947 – Low-voltage switchgear and control gear.

8 If to “24 VDC” input a voltage of approx. 21 – 29 V ⎓ is connected, then the output voltage is the same as the Sigma Control L Unit power supply voltage.

Required protection • 230 V ~ power supply • 24 V ⎓ power supply	 Over-current breaker type C2 on L and N wires Over-current breaker type B6 on one of the poles
Dimensions	See figure 1
Cable glands (cable diameter range)	4 x 5 – 10 mm 1 x 8 – 14 mm (cable gland of detector line)
Acceptable cables	0.2 – 2.5 mm^2 (cable lugs 2 x 1 mm^2 or 2 x 0.75 mm^2 should be used for double wires)
Enclosure material	Polycarbonate
Weight	1.5 kg
Consumables	See table 15
Mounting	4 holes for 4 mm dia. screws, spacing 189.3 x 90 mm, see drawing POD-QS-026

Table 14: Technical specification

11 List of consumables

No.	Consumables	Lifetime	Manufacturer	Product code
{1}	Battery	5-6 month[9]	-	CR2032
{2}	Fuse F1 external power supply circuit 24 V	-	-	Miniatured, TR5, T3,15 A (time -lag)
{3}	Fuse F2 supply indicator circuit SO and SA 24 V	-	-	Miniatured, TR5, T1,25 A (time -lag)

Table 15: List of consumables

12 Product marking

Product code	Device
PW-072-A	Sigma Control L Unit

Table 16: Method of product's marking

13 Appendices

[1] DEZG086-ENG – EU Declaration of Conformity – Sigma Control L

[2] PU-Z-062-ENG – Extension Module PCA-062A-E2 GTW Port (RS -485, isolated)

[3] PU-Z-116-ENG – Extension Module PWS-050 – Visualization Panel / Modbus TCP Gateway

9 When power supply is disconnected.

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)
Control Unit	**Sigma Control L**	**PW-072**

complies with the following Directives and Standards:

- 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 2014/35/EU – on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits:
  - EN 60335-1:2012
  - EN 62368-1:2014
- 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, 16.03.2023

(Name and Signature)
Managing Director
Aleksander Pachole

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Extension Module PCA-062A-E2 GTW Port (RS-485, isolated)

Table of contents

1 General information

Extension Module PCA-062A-E2 extends the functionalities of units where it is installed, by an additional, digital port RS-485. It provides communication with different systems, including:

- DCS
- SCADA
- PLCs
- Fire protection

This port is galvanically isolated, which allows for connecting systems supplied from different power sources with no need to use additional RS-485 line separators.

PCA-062A-E2 module is not a stand-alone device and is designed for use as a built-in component inside other equipment.

2 Design description

3 Input/output interfaces

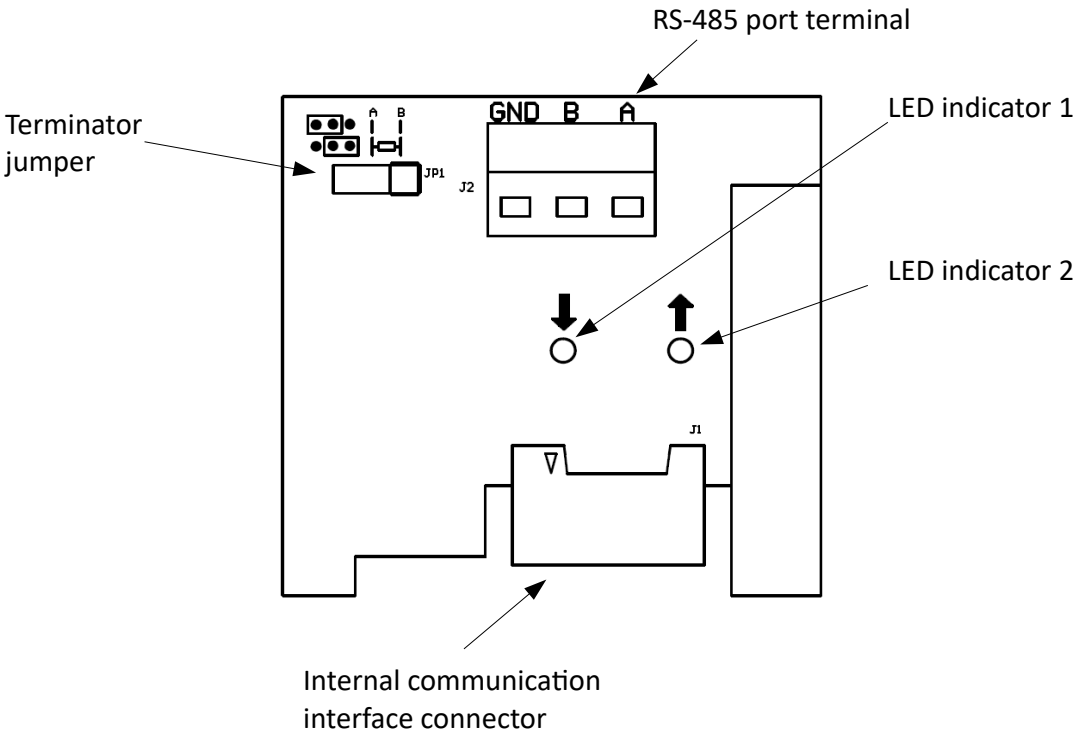


Figure 1: Module design

Interfaces are available via the connectors. For connectors description see Table 1.

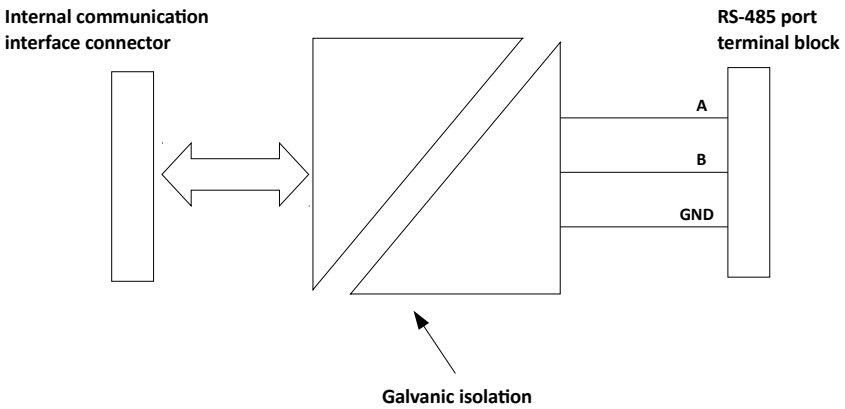


Figure 2: Device schematic diagram

Connector marking	Connector name	Description
RS-485		RS-485 port is designed to connect the module to RS-485 network
	A	Signal line A
	B	Signal line B
	GND	Signal ground

Table 1: Connectors description

4 User interface

User interface – is used to monitor device operation and consists of two LED indicators:

Visual indicator No.	Visual indicator marking	Operation description
1	⬆	Active at the moment of sending information to RS-485 bus
2	⬇	Active at the moment of receiving information from RS-485 bus

Table 2: User interface description

5 Life cycle

5.1 Transportation

The device should be transported the same way as a new one. If its original packaging, protective extrusion or other protective components (e.g. plugs) are unavailable, protect the unit against mechanical shocks, vibrations and moisture with other equally effective methods. If the Extension Module is installed inside a unit, then carry the whole unit according to the rules provided above (see also user manual of the device with which the module works).

5.2 Module assembly – installation

For information on Extension Module installation – see its user manual of the device with which the module works.

5.3 Module configuration

5.3.1 Line terminator configuration

To configure the built-in line terminator (turn it on or off) set the terminator jumper (see Figure 1) in JP1 slot as shown in the table below:

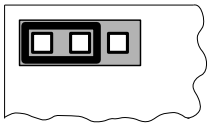
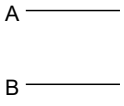
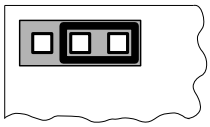
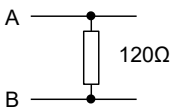
JP1 jumper setting	Operation	Schematic diagram
	Terminator off	
	Terminator on	

Table 3: Line terminator configuration

5.3.2 Transmission parameter configuration

To configure transmission parameters use an appropriate option in the control unit menu, where the module is installed (see user's manual). The module offers the following settings:

- protocol: Modbus ASCII / Modbus RTU
- network address: 1 – 255
- baud rate: 4800, 9600, 19200, 38400, 57600, 15200 bod
- parity control: parity (E), odd (O), no (N)
- number of character bits: 7 (only for Modbus ASCII) or 8

6 Memory maps

6.1 Memory map for Sigma Control L Unit

Register range	Description
40001 – 40040	Detector status at channels 1 – 20
40041 – 40064	Unused – always zero
40065 – 40066	Input and output status
40067 – 40067	Control Unit status
40068 – 40087	Temperature in detector's measuring head at channels 1 – 20
40088 – 40099	Unused – always zero
43501 – 43503	Interface for operator's command execution
44001 – 44002	External DI (Digital Inputs)

6.1.1 Detectors statuses

Channel No.	Register	Name	Description	Type
1	40001	State_A	Detector status	flags
	40002	N	Output (concentration)	U16[1]
2	40003	State_A	Detector status	flags
	40004	N	Output (concentration)	U16
...	...	...	...	...
20	40039	State_A	Detector status	flags
	40040	N	Output (concentration)	U16

State_A –detector status at specific channel. For bits description see table below

Bit	Flag	Description
0	Collective_W1	Warning 1 threshold exceeded
1	Collective_W2	Warning 2 threshold exceeded
2	Collective_AL	Alarm threshold exceeded
3	Collective_CrFail	Collective critical failure information
4	Collective_NonCrFail	Collective non-critical failure information
5	-	Unused – always zero

1 U16 – 16-bit unsigned.

Bit	Flag	Description
6	Gas_HiHi_Range	Gas overload
7	Sensor_Lock	Sensor lock (last measurement latched)
8	Calibration	Calibration mode
9	Test	Test mode
10	Warm_Up	Sensor warming up
11	Sensor_Inhibit	Inhibit mode
12	Comm_Error	Detector communication error
13	Calibration_Warning	Calibration time out (non-critical failure)
14	Measure	Detector takes measurements
15	System_Stop	System stopped

N – gas concentration. Value 0 correspond to 0 concentration, value 1000 corresponds to detector maximum range.

6.1.2 Output status and DI1 – DI2 input status (read only)

Register	Name	Description	Type / range
40065	DO_Status	Control Unit output status. Specific bit description bit 0 – state of R1 relay bit 1 – state of R2 relay bit 2 – state of R3 relay bit 3 – visual indicator output bit 3 – acoustic indicator output bit 4 – FAULT relay bit 5 – 15 – unused (can show any values) value 0 – inactive output value 1 – active output	flags
40066	DI_Status	Control Unit input status. Specific bit description bit 0 – DI status bit 1 – 15 – unused (can show any values) value 0 – inactive input value 1 – active input	flags

6.1.3 Control Unit status (read only)

Register	Name	Description	Type / range
40067	CU_Status	Control Unit module status	flags

CU_Status – Control Unit module status. For specific bits description see the table below.

Bit	Flag	Description
0	System_fail	Collective system failure
1	CU_fail	Control Unit module failure
2..15	-	Unused – always zero

6.1.4 Detector Measurement Head temperature (read only)

No.	Register	Name	Description	Type
1	40068	Temp.	Temperature in the detector's measurement head [°C]	S16[2]
2	40069	Temp.	Temperature in the detector's measurement head [°C]	S16
...	...	...	...	...
20	40087	Temp.	Temperature in the detector's measurement head [°C]	S16

6.1.5 External Digital Inputs (read / write)

Register	Name	Description	Type / range
44001	Static_External_DI	External DI – static Write 1 – sets input as active Write 0 – sets input as inactive Read – current input state Application: source for output activation	flags
44002	Pulse_External_DI	External DI – pulse Write 1 – Previous value 0: generates a single positive impulse at a selected output Write 1 – Previous value 1: no changes Write 0 – input with no changes (Previous input value remains) Read – always 0 Application: temporary deactivation, latch resetting	flags

Static_External_DI, Pulse_External_DI – for bits description see the table below.

Bit	Flag	Description	Default configuration
0	External_DI_0	Input no. 0	Temporary internal buzzer deactivation
1	External_DI_1	Input no. 1	Temporary external acoustic indicator deactivation
2	External_DI_2	Input no. 2	Temporary internal buzzer activation
3	External_DI_3	Input no. 3	Visual alarm indicator cancellation, backed up
4	External_DI_4	Input no. 4	Visual indicator activation
5	External_DI_5	Input no. 5	R1 relay activation
6	External_DI_6	Input no. 6	R2 relay activation
7	External_DI_7	Input no. 7	R3 relay activation
8	External_DI_8	Input no. 8	FAULT relay activation
9..15	External_DI_9..15	Input no. 9..15	Unassigned

2 S16 – 16-bit unsigned.

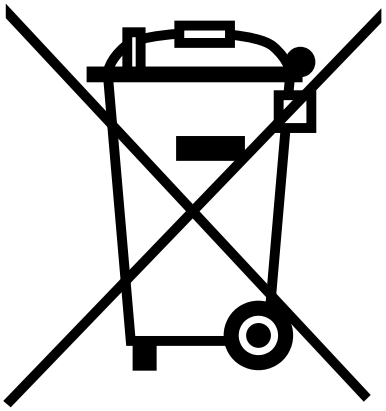
6.1.6 Interface for executing operator commands (read / write)

Register	Name	Description	Type / range
43501	Command_Status	Current command execution status Write – data ignored Read – status, possible values include: • 0 – inactive • 1 – command in progress • 2 – task completed successfully; this value is latched up for 5 s from execution • 3 – command execution not succeeded, incorrect command or its parameters; this value is latched for 5 s from execution	U16
43502	Command_Code	Command code to be executed Write – command code to be executed; Writing to this log initiates command execution Read – current command code value For possible values – see description below	U16
43503	Command_Param	Command parameter Read, Write – Command parameter For possible values – see description below	U16

List of commands:

Command code	Description
1	Disable detector lock Execution parameters – detector channel number to be cancelled, possible values: 1 – 20

7 Utilization



This symbol on the product or its packaging indicates that this product must not be disposed of with other household waste. Instead, it is user's responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your consumer waste equipment for recycling, please contact your local city recycling office, waste collection company or the dealer from whom you originally purchased the product. The product can be also returned to its manufacturer.

8 Technical specification

Rated power supply parameters: • Power	 0.5 W
Environmental conditions (operation and storage) • Ambient temperature range • Relative humidity range	 -10 – +50^{O}C 10 – 90% long term, 0 – 99% short term
Digital communication parameters: • Electric standard • Galvanic isolation strength • Communication protocol, link parameters	 RS-485, galvanically isolated 500 V See section 5.3.2
Terminal cable cross-section	• 0,15 – 1,5 mm^2 – solid wire • 0,15 – 1 mm^2 – multi-wire

Table 4: Technical specification

Extension Module PWS-050 - Visualization Panel / Modbus TCP Gateway

Table of contents

1 General information

The PWS-050 Extension Module expands functionalities of equipment where the module is embedded with an additional Ethernet communication port. The module enhances capacities of a master device with a fully operative HMI panel that displays information acquired from gas detectors and enables data transmission to various high-level systems, such as:

- DCS
- SCADA
- PLCs
- Fire protection systems

The PWS-050 module is not a stand-alone device, it is designed to be used as a built-in component of other equipment.

2 Visualization Panel

The module provides functionalities of a Visualization Panel capable of displaying the system status and data received from gas detectors connected to the control unit of a gas monitoring system. The screen can be easily accessed via any web browser upon the module IP address is entered into the URL line.

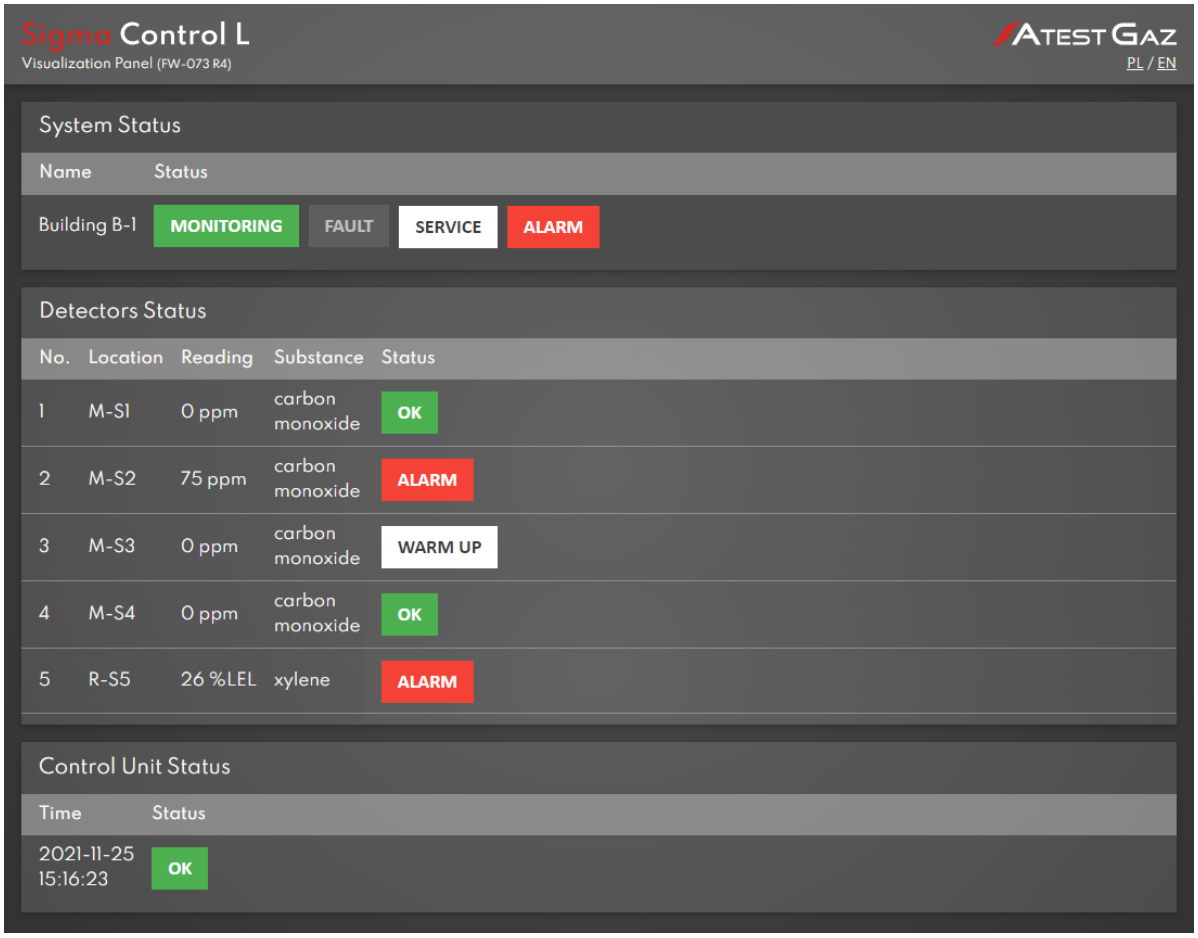


Figure 1: Example of Visualization Panel view

The Visualization Panel is available in two languages: English and Polish. The language can be toggled by means of hyperlinks provided in the right upper corner of the screen.
The system name is set when the system is initiated and configured for operation (see Section 6.3) and then is displayed in the topmost section of the panel screen together with the system status.

For control unit with the firmware revision number below R32 the section with the system status is not displayed.

For smooth operation of the Visualization Panel we strongly recommend using one of the most recent releases of the web browsers listed in Table 4.

Upon a click on the line with the status of a detector or a control unit, an associated window with supplementary details is displayed.

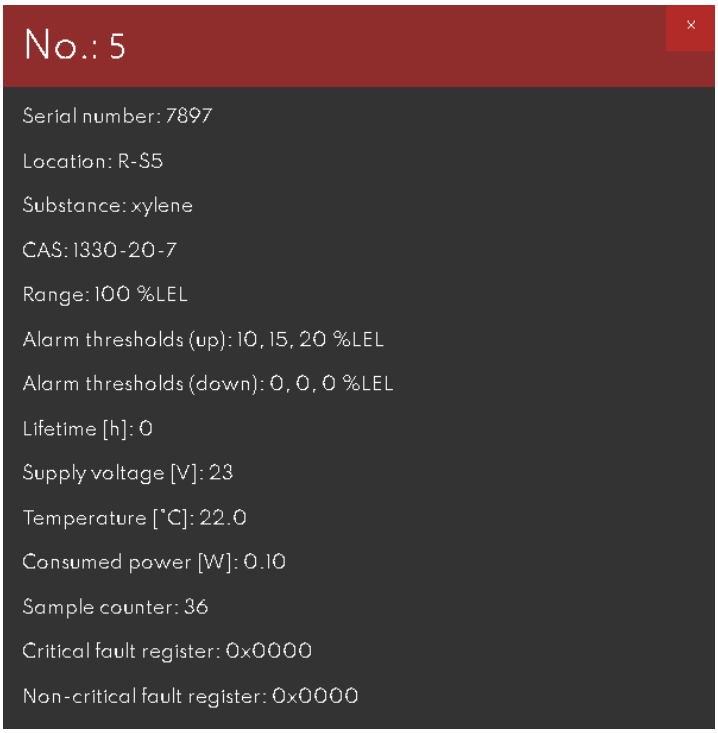


Figure 2: A window with detailed parameters of a gas detector

3 Design

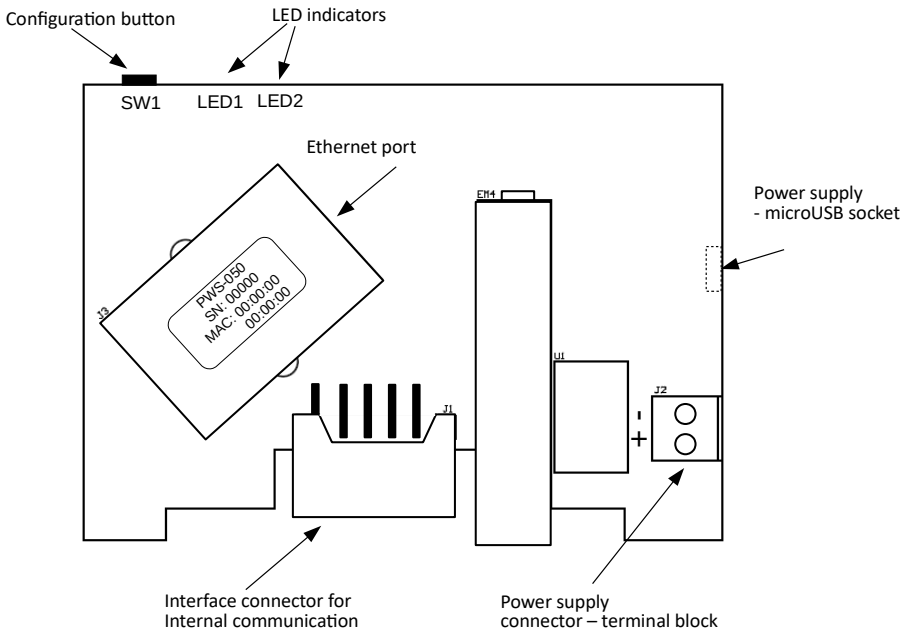


Figure 3: Layout of the module components

4 Input/output interfaces

Designation	Specification	Purpose
J1	Interface connector for internal communication	To be used by the master device for power supply of the module and for data transmission.
J2	Power supply connector - terminal block	To supply power voltage for the module when it is removed from the master device for configuration – see Table 4 for parameters.
J3	Ethernet port	To connect the module to an Ethernet (LAN) network.
-	Power supply – microUSB socket	An alternative socket to supply power voltage for the module when it is removed from the master device for configuration.

Table 1: Specification of connector

5 User interface

The user interface is designed to display status of the module and includes:

- two LED indicators (refer to Section 6.4 for detailed specification of indications)

Indicator	Status / colour	Description
LED1	/ green	OPERATION
LED2	/ yellow	FAULT

Table 2: LED Indicator description

- SW1 pushbutton for configuration of the module – see Figure 3.

6 Life cycle

6.1 Transportation

The module should be conveyed just in the same way as a new one, preferably in its original package. Should the original package, cushioning or other protective parts (e.g. blinding plugs) are unavailable use alternative means to protect the module against vibrations, shocks and moisture. If the Extension Module is embedded into another master device, convey the whole assembly according to the foregoing rules. Obey instructions provided in the User Manual for the master device.

6.2 Installation

Install the Extension Module inside a master device according to instructions provided in the User Manual for the master device.

6.3 Module configuration

Use a web browser to access configuration pages. The most recent ones listed in Table 4 are recommended.

To carry out the configuration procedure follow the steps below.

1 Enter the configuration mode:
  1.1 depress and hold the SW1 pushbutton,
  1.2 supply power voltage to the module – it can be supplied in three ways:
    1.2.1 when the module is embedded into a master device – from that device,
    1.2.2 when the module is configured externally – via the J2 terminal block (see Table 4 for voltage ranges), or
    1.2.3 via the microUSB socket (any power adapter 5V/1A for mobile phone charging is sufficient)
  1.3 release the SW1 pushbutton after the green LED1 indicator starts blinking – the module is switched over to the configuration mode,
  1.4 wait about 3 minutes,
2 Connect the module to a computer by means of an Ethernet cable. Establish connection with use of the following network parameters: network mask 255.255.255.0, IP address ranging from 192.168.0.1 to 192.168.0.254 (except for 192.168.0.170) and navigate to the website "http://192.168.0.170/config",
3 Assign the system name – it will displayed in the window of the Visualization Panel,
4 Select the mode for the IP address assignment: static /DHCP (DHCP is the default setting),
5 Click the 'Save' button on the website screen,
6 Disconnect the power supply voltage for the module to exit the configuration mode.

To verify the module configuration connect it to the network, power it up and wait about 3 minutes. Then check whether the module is available at the IP address assigned to it. The check is made via the website "http://MODULE_IP_ADDRESS/config" (e.g. „http://192.168.0.121/config"). The website screen with the current configuration of the module should be displayed. Otherwise go to Section 6.4.

If the mode of IP adress assignment is set to DHCP please remember to contact your network administrator to assign a fixed IP address to the module. It will be necessary to advise the MAC address printed on a sticker provided on the module.

Should the module is intended for operation in the DHCP mode and the module has not been configured yet no additional configuration is necessary – DHCP is the default setting.

6.4 Troubleshooting

The two LED indicators (LED1 – OPERATION, LED2 – FAULT) are used for the module troubleshooting.

Indicator	Status/colour	Description	Procedure
LED1	/ green	Module operation in the regular mode	-
	/ green	Module operation in the configuration mode	-
		No power voltage is supplied	-
LED2		No failure	-
	/ yellow	1 or 6 blinks – network interface failure	Turn power supply for the master device off and then on. If the problem persists contact technical support.
	/ yellow	2 blinks – network cable disconnected	Check reliability of cable connections at its both ends.
	/ yellow	3 blinks – no IP address received from the DHCP server	Turn power supply for the master device off and then on. If the problem persists contact the network administrator.
	/ yellow	4 blinks – problem with communication between the module and the master device	Turn power supply for the master device off and then on. If the problem persists contact technical support.
	/ yellow	5 blinks – problem with the module firmware	Turn power supply for the master device off and then on. If the problem persists contact technical support.

Table 3: Indications of the module status by LEDs

7 Memory map

7.1 Memory map for Sigma Control L (system control unit)

The memory map can be viewed at the standard 502 port, ID:1 upon connection of the module to the network with use of the MODBUS TCP protocol.

Range of register addresses	Description
40001 – 40040	Statuses of detectors at channels 1 to 20
40041 – 40064	Unused – always zero
40065 – 40066	Statuses of binary inputs and outputs
40067 – 40067	Status of the control unit
40068 – 40087	Temperatures inside measuring heads of detectors at channels 1 to 20
40088 – 40099	Unused – always zero
43501 – 43503	Interface buffer for execution of operator's commands
44001 – 44002	External DI (digital control inputs)

7.1.1 Detectors statuses

Channel No.	Register address	Name	Description	Type
1	40001	State_A	Detector status	flags
	40002	N	Concentration	U16[1]
2	40003	State_A	Detector status	
	40004	N	Concentration	U16
...	...	...	...	...
20	40039	State_A	Detector status	flags
	40040	N	Concentration	U16

State_A – detector status at a specific channel. For meaning of individual bits see the table below.

Bit No.	Flag	Description
0	Collective_W1	1st warning threshold exceeded
1	Collective_W2	2nd warning threshold exceeded
2	Collective_AL	Alarm threshold exceeded
3	Collective_CrFail	Collective information about a critical failure
4	Collective_NonCrFail	Collective information about a non-critical failure
5	-	Unused – always zero
6	Gas_HiHi_Range	Gas overload
7	Sensor_Lock	Sensor locked (the last measurement result latched)
8	Calibration	Calibration mode
9	Test	Test mode
10	Warm_Up	Preheating
11	Sensor_Inhibit	Inhibit mode
12	Comm_Error	Communication error
13	Calibration_Warning	Calibration time out (non-critical failure)
14	Measure	Measurement in progress
15	System_Stop	System stopped

N – gas concentration, where 0 corresponds to nil concentration and 1000 corresponds to the upper limit of the detector range.

[1] U16 – 16 bit unsigned integer

1 U16 – 16-bit unsigned.

7.1.2 Statuses of binary outputs and DI1 to DI2 inputs (read only)

Register	Name	Description	Type / range
40065	DO_Status	Statuses of the Control Unit digital outputs. Individual bits have the following meaning: bit 0 – open/close status of the R1 relay bit 1 – open/close status of the R2 relay bit 2 – open/close status of the R3 relay bit 3 – output for a visual warning device bit 4 – output for an audio warning device bit 5 – FAULT relay (control unit failure) bits 6 to 15 – unused (don't carry values) 0 (low): the output is inactive 1 (high): the output is active	flags
40066	DI_Status	Statuses of the Control Unit digital inputs. Individual bits have the following meaning: bit 0 – active/inactive status of the DI input bits 1 to 15 – unused (don't carry values) 0 (low): the input is inactive 1 (high): the input is active	flags

7.1.3 Statuses of the control unit (read only)

Register	Name	Description	Type / range
40067	CU_Status	Status of the control unit	flags

CU_Status – Control Unit module status. For specific bits description see the table below.

Bit	Flag	Description
0	System_fail	Collective signal of the system failure
1	CU_fail	Failure
2..15	-	Unused – always zeros

7.1.4 Temperatures inside measuring heads of detectors (read only)

No.	Register	Name	Description	Type
1	40068	Temp.	Temperature inside the measuring head for the detector No. 1 [°C]	S16[2]
2	40069	Temp.	Temperature inside the measuring head for the detector No. 2 [°C]	S16
...	...	...	...	...
20	40087	Temp.	Temperature inside the measuring head for the detector No. 20 [°C]	S16

2 S16 – 16-bit unsigned.

7.1.5 External DI Digital control inputs (read / write)

Register	Name	Description	Type / range
44001	Static_External_DI	External DI – static Write 1 – the input is being set as active Write 0 – the input is being set as inactive Read – current status of inputs Application – source for the output activation	flags
44002	Pulse_External_DI	External DI – pulse type Write 1 – current level is 0 (low): a one-shot positive pulse is produced at the selected output Write 1 – current level is 1 (high): the selected output remains unchanged Write 0 – the selected output remains unchanged (current level is preserved) Read – always 0 Application: temporary deactivation, backup reset	flags

Static_External_DI, Pulse_External_DI – meanings of individual bits are summarized in the table below

Bit no.	Flag	Description	Default configuration
0	External_DI_0	Input no. 0	Temporary deactivation of the internal buzzer
1	External_DI_1	Input no. 1	Temporary deactivation of an external audio warning device
2	External_DI_2	Input no. 2	Activation of an external audio warning device
3	External_DI_3	Input no. 3	Reset of an alarm signal (latched) for a visual warning device
4	External_DI_4	Input no. 4	Activation of a visual warning device
5	External_DI_5	Input no. 5	Activation of the R1 relay
6	External_DI_6	Input no. 6	Activation of the R2 relay
7	External_DI_7	Input no. 7	Activation of the R3 relay
8	External_DI_8	Input no. 8	Activation of the FAULT relay (failure)
9..15	External_DI_9..15	Input no. 9..15	Unassigned

7.1.6 Interface buffer for execution of operator's commands

Register	Name	Description	Type / range
43501	Command_Status	Status of the current command execution Write – the register content is ignored Read – status • 0: inactive • 1: command execution in progress • 2: command is successfully completed, the content is latched for 5seconds after execution of the past command • 3: command execution is failed – incorrect command or its parameters, the content is latched for 5seconds after execution of the past command	U16

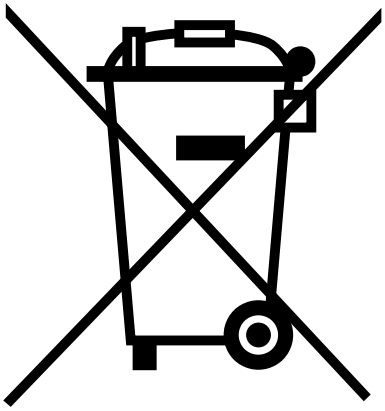
Register	Name	Description	Type / range
43502	Command_Code	Code of the command to be executed	U16

		Write – code of the command to be executed, write operation to that memory register initiates execution of each command Possible content – see the list of commands in the subsequent table	
43503	Command_Param	Command parameter	U16

List of commands:

Command code	Description
1	Reset of a latched detector Execution parameter – number of the channel with a latched detector to be cleared, possible range 1 to 20

8 Utilization



This symbol on the product or its packaging indicates that this product must not be disposed of with other household waste. Instead, it is user's responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your consumer waste equipment for recycling, please contact your local city recycling office, waste collection company or the dealer from whom you originally purchased the product. The product can be also returned to its manufacturer.

9 Technical specification

Rated power supply parameters • V_{cc} • Power consumption	 5 – 30 V ⎓ 0.5 W
Environmental conditions (operation and storage) • Ambient temperature range • Humidity	 0 – +50°C 10 – 90% long term, 0 – 99% short term
Digital communication parameters • Electric standard	 IEEE 802.3 Ethernet 10Base-T
Modbus TCP server parameters • Port • Maximum number of clients	 502 2
Recommended web browsers	Mozilla Firefox (version 90 or later), Chrome (version 90 or later), Opera (version 80 or later), Edge (version 90 or later), Safari (version 13 or later) Use of Internet Explorer may entail problems with correct displaying of the Visualization Panel page and the configuration page for the module.
Cross-section of cables wired to the J2 connector	0.15 – 1 mm^2

Table 4: Technical specifications

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:

www.atestgaz.pl/en