



User Manual



Gas Detector

Alpa EcoWent XT

Product code: PW-097-CO



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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 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 Safety System for a protected facility may involve other requirements throughout all stages of the product life.

How to use this manual?

-  Important parts of the text are marked as follows:



Pay special attention to information given in these fields.


-  User Manual consists of main text and appendices. Appendices are independent documents and can exist without User Manual. Appendices have their own page numbering independent of User Manual page numbering. These documents can also have their own tables of contents. All documents included in the User 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 Purpose

Alpa EcoWent XT is a 3-threshold gas detector for detecting the presence of hazardous concentrations of carbon monoxide in the surrounding atmosphere, incl. in such facilities as garages and underground car parks.











The Alpa EcoWent XT Gas Detector is not intended for use in potentially explosive atmospheres.

An electrochemical sensor was used as an element detecting the presence of a hazardous gas. This solution is characterized by a high resistance to the change of environmental conditions, such as temperature, humidity, pressure. The Alpa EcoWent XT Gas Detector is also characterized by high resistance to the presence of disturbing factors (e.g. methane, isobutane, carbon dioxide), which eliminates generation of false alarms.

The CO (carbon monoxide) sensor demonstrates a slight sensitivity to hydrogen and ethanol vapours, however, in typical applications, these gases occur sporadically and in small quantities. More details on electrochemical sensors can be found in Appendix [2].

Basic operational features include:

-  safe, low-voltage installation,
-  ease of installation,
-  possibility to connect the components in a "bus system" or a "star system",
-  possibility to connect the Alpa EcoDet XT detector (we obtain a cooperating pair of CO and LPG detectors),
-  possibility to calibrate the detector by replacing the sensor plate (shortening the calibration time),
-  three alarm threshold,
-  detector failure and loop breaking indication,
-  long term, stable operation.

These features, at an extremely attractive price, make Alpa EcoWent XT Gas Detector an ideal solution for low cost applications, e.g. in public construction.

1.2 Description of operation

The Alpa EcoWent XT Gas Detector is one of the elements of the Gas Safety System. It performs cyclical measurements of gas concentration in the air. Information about exceeding a certain threshold is transmitted using the controls located on the side part of the housing (see Figure 2) and output current signal. In addition, if it works in an alarm loop system (see Section 6.2, 6.3), at its input (via an XT T- connector) a current signal can be passed from the next detector – Alpa EcoWent XT or Alpa EcoDet XT. This signal is compared with the local value and a signal corresponding to a status of a higher priority is transmitted to the output (see Table 1).

The Alpa EcoWent XT Gas Detector can work directly with the Alpa EcoDet XT (connection via X2 terminals). Then we get a couple of sensors that allows for the simultaneous detection of carbon monoxide (CO) and LPG (C_3H_8 , C_4H_{10})¹.

Priorities	State of operation
1 (highest)	Exceeded alarm threshold
2	Exceeded warning threshold 2
3	Exceeded warning threshold 1
4	Damage to the detector, bus, connection with the Alpa EcoDet XT detector or information on an incorrect setting of the configuration switch
5 (lowest)	Correct operation of the detector
	Warm-up

Table 1: Priorities of the Alpa EcoWent XT Gas Detector

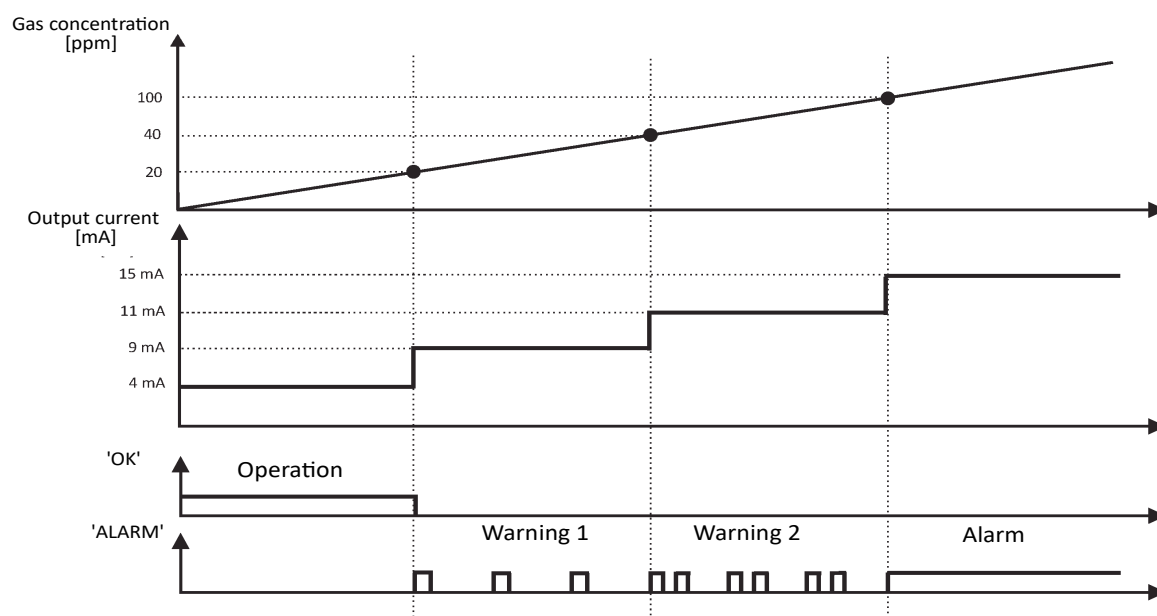


Figure 1: The value of output current and the LED display for the individual operating conditions





The type of gas, the thresholds and the corresponding current value for a specific detector should be checked in the calibration certificate.

In the course of its work, the detector makes continuous measurements of gas concentrations in the environment, and carries out regular tests of the sensor. Depending on the outcome of these actions, it distinguishes between the states described in the following sections.

1.2.1 Operation

It is a condition in which the detector works properly and conducts measurements. The value of the measured concentration of gas is below the thresholds and no irregularities were detected in the operation. The detector does not require special attention of the user, except for:


¹ Calibration with propane C_3H_8 .

-  possibly frequent readout, preferably daily,
-  systematic ordering of inspections (see Subsection 9.4.3).

1.2.2 Warning 1 (threshold 1) / Warning 2 (threshold 2)

It is a condition that occurs when a low gas concentration is detected that requires informing the user.



Actions to be taken:

-  check the cause, which can be e.g.:
 - a leak at the facility,
 - interruption of the detector operation by other substances (e.g. a high-concentration solvent or fuel vapours) – the substances should be removed from the supervised premises,
 - shift of the detector characteristics. Over time, the detectors tend to zero drift. Therefore, if they are not calibrated periodically, it may happen that the warning threshold will move to the level of clean air. The cause of this should be suspected in a situation when competent services checked the lack of gas leakage in the facility with a special device, and no presence of interfering substances was found.

1.2.3 Alarm (threshold 3)

This state occurs when the gas concentration exceeds the alarm threshold (3rd threshold).

Actions to be taken:





-  remove bystanders from the danger zone,
-  as far as possible, allow the airing of the endangered rooms – by opening windows and doors (if the control unit does not automatically switch on the ventilation).

1.2.4 Failure

Simultaneously with the process of gas concentration measurement, the detector performs a number of diagnostic measurements in order to validate its own work and the system operation.

The internal failures signalled by the detector concern problems with the sensor.

The system failures signalled by the detector may concern:

-  breakage of the bus,
-  abnormal values of currents flowing into the detector,
-  incorrect settings of the configuration switch,
-  breakage of the connection with the Alpa EcoDet XT detector.

1.2.5 Warm-up

After powering the detector, the parameters of the sensor stabilize for some time. In this state, the detector does not conduct measurements. This state takes about 1 minute, after which the sensor starts to operate normally.

2 Safety



Do not allow cutting or damaging the insulation of the wires connecting the system.



Do not install a gas detector in places exposed to direct sunlight and water.



In the case of damage, shut down the detector, secure the connection cables, and conduct the service.



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



Although switching power supply of the Gas Safety System off, there is a possibility that a dangerous voltage can exist on the terminals of the Control Unit. It can originate from another system like for an example ventilation system that uses one of the output pins of Control Unit.



When performing repair, building and maintenance works, secure the device in a proper way.



Before painting the walls, make sure the device is secured.



Before painting the floors, make sure the device is secured.



Before using silicons or silicon-containing materials (paints, glues, sealing etc.), make sure the device is secured.

3 Description of the construction

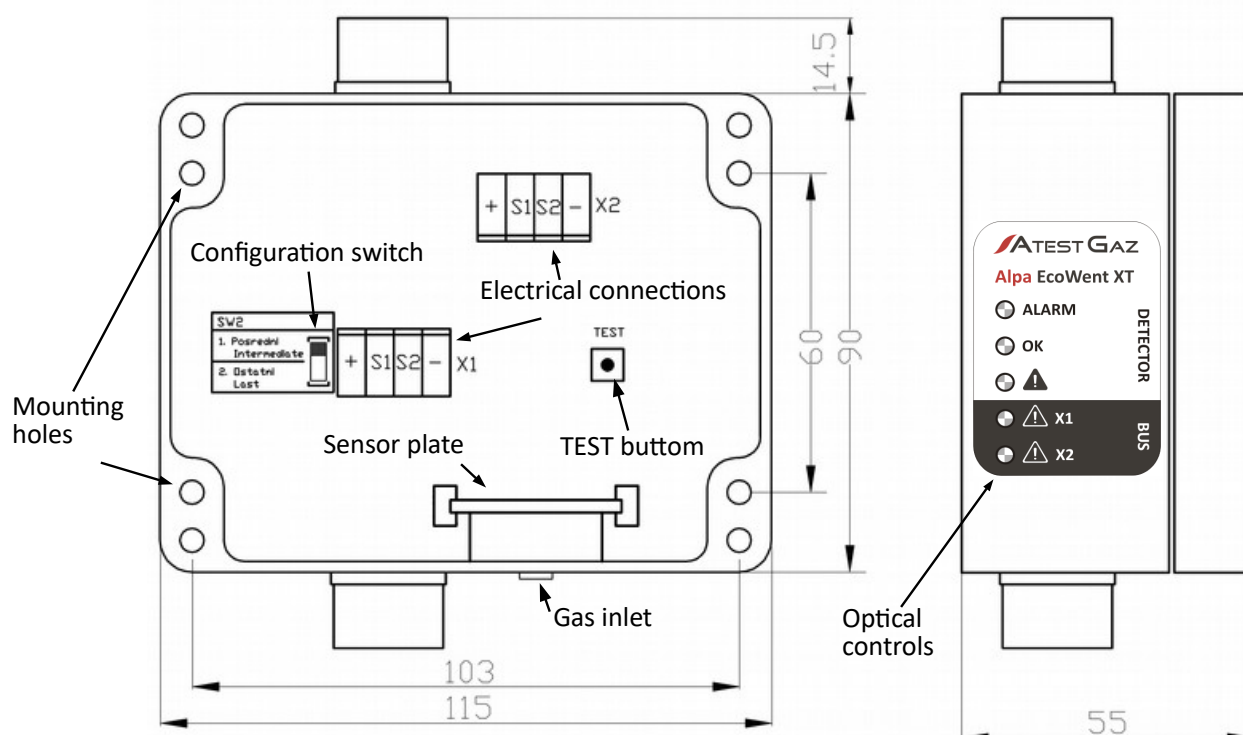


Figure 2: The construction of the device and its dimensions

4 Input-output interfaces

4.1 Electric interfaces

The appearance of the terminal strip is shown in Figure 2.

Name	Terminal	Description
X1		Port of the detector bus / T-connector XT / control unit. Parameters – see Section 10
	+	Positive supply pole
	S1	Signal line S1
	S2	Signal line S2
	-	Negative power pole
X2		Alpa EcoDet XT detector port
	+	Positive supply pole
	S1	Signal line S1
	S2	Signal line S2
	-	Negative power pole

Table 2: Electric interface description

5 User interface

The detectors have a function of signalling statuses by means of five LED indicators located on the side of the housing (see Figure 2 and 3).

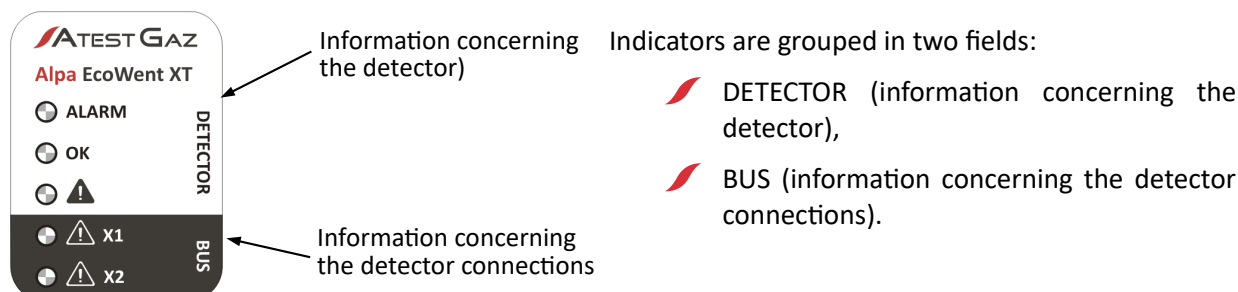


Figure 3: User interface

Table 3 describes the way of signalling the states of the detector operation. Detailed description – see Section 1.2.

State of the indicators		Communicated information
Green (OK) – lights	DETECTOR	The detector works properly, gas concentration below the determined thresholds
Yellow (⚠) – lights		Detector damage
Red (ALARM) – blinking [diagram]		Exceeded warning threshold 1
Red (ALARM) – blinking [diagram]		Exceeded warning threshold 2
Red (ALARM) – lights		Exceeded alarm threshold
Yellow (⚠ X1) – lights	BUS	Bus failure (interruption), not allowed current values – see also Section 8
Yellow (⚠ X2) – lights		Improper connection of the Alpa EcoDet XT detector – see also Section 8
Cyclic flashing of all indicator lights		Warm-up

Table 3: Indication of operating conditions

6 System architectures

Detectors can be connected in two ways:

- star system (traditional) or,
- into a serial "bus" arrangement (alarm loop) – open or closed.

Systems can be built of single Alpa EcoWent XT detectors or pairs (Alpa EcoWent XT along with the Alpa EcoWent XT detector).

6.1 Star system

In the conventional system each detector is individually connected to the control unit. This solution requires the input of a large number of wires to the control unit, which can be a serious impediment to the assembly – particularly in large buildings, and the increase in wiring costs.

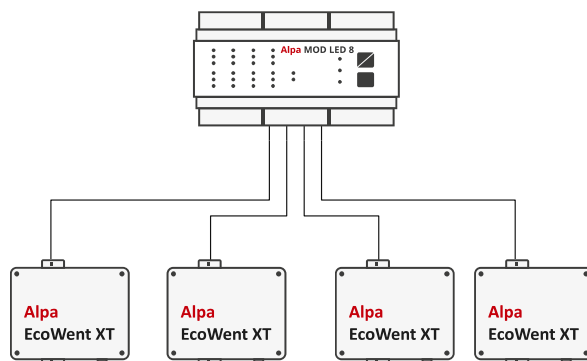


Figure 4: Connection with the Alpa MOD LED8 control unit into a star-shaped system

A detailed diagram is shown in Appendix [3].

6.2 Open alarm loop

In this arrangement, the detector are connected in series to the bus line via the XT T-connector. An advantage of this solution is significant facilitation of the system installation and reducing the wiring costs.

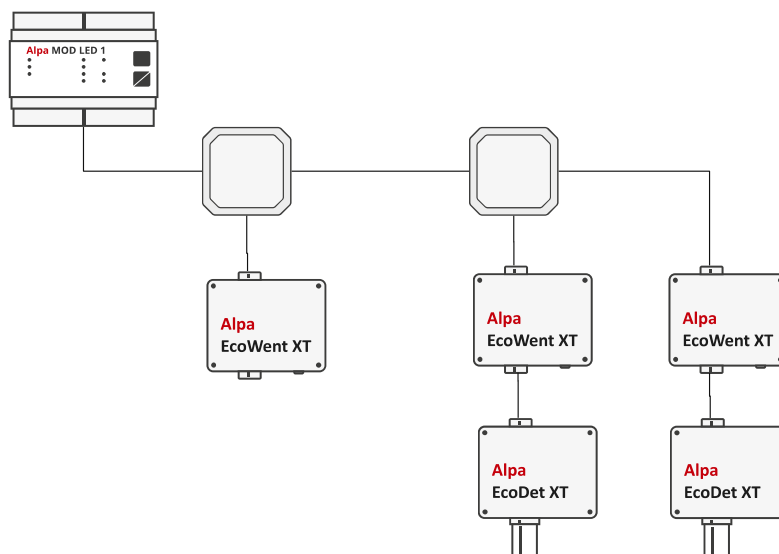


Figure 5: Connection with the Alpa MOD LED1 control unit into an open bus system



In the last Alpa EcoWent XT detector (the most remote one from the control unit) of the open bus system, the configuration switch on the plate must be set to position 2 (see Figure 8). Inappropriate switch setting causes the system to malfunction (indicating failure and lack of response to a signal from the following detectors).

A detailed diagram is shown in Appendix [3].

6.3 Closed alarm loop

This system is different from the previous one in terms of connection of the end of the supply and signal line back to the control unit of the loop equipped with a test output (e.g. Alpa MOD LED1 Control Unit). In this way, it is possible to improve the power supply conditions of the sensor and resistance to damage. In this system it is also possible to check the loop continuity and the regularity of the system operation by enforcing the alarm at the "test output of the loop" in the control unit. This makes it easier to carry out periodic checks of the system.

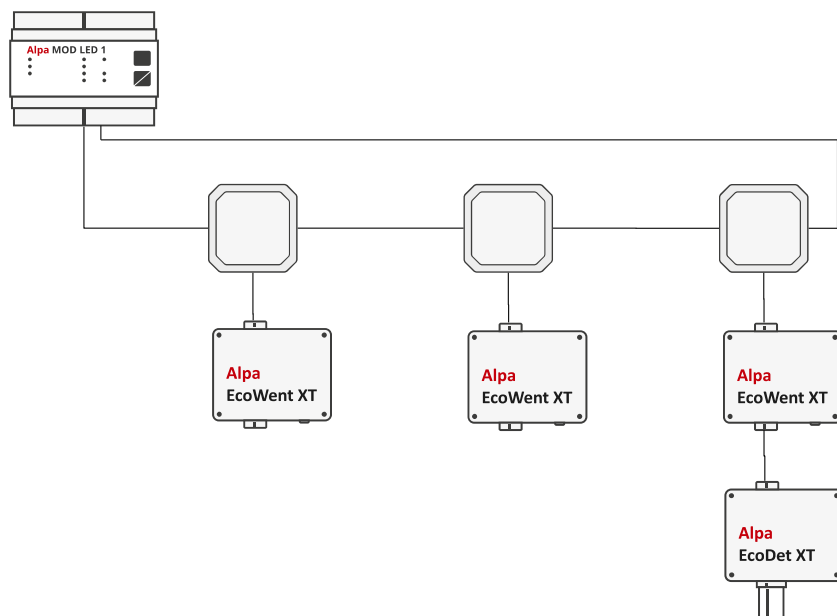


Figure 6: Connection with the Alpa MOD LED1 control unit into a closed bus system

A detailed diagram is shown in Appendix [3].

6.4 Other architectures

It is also possible to use modification of the described architectures. For example, by connecting several bus systems to single inputs of the control unit, it is possible to create a system composed of several independent zones using only one control unit. However, it is necessary to remember that it may be possible to supply the bus systems from additional power sources that will provide adequate current capacity of the system.

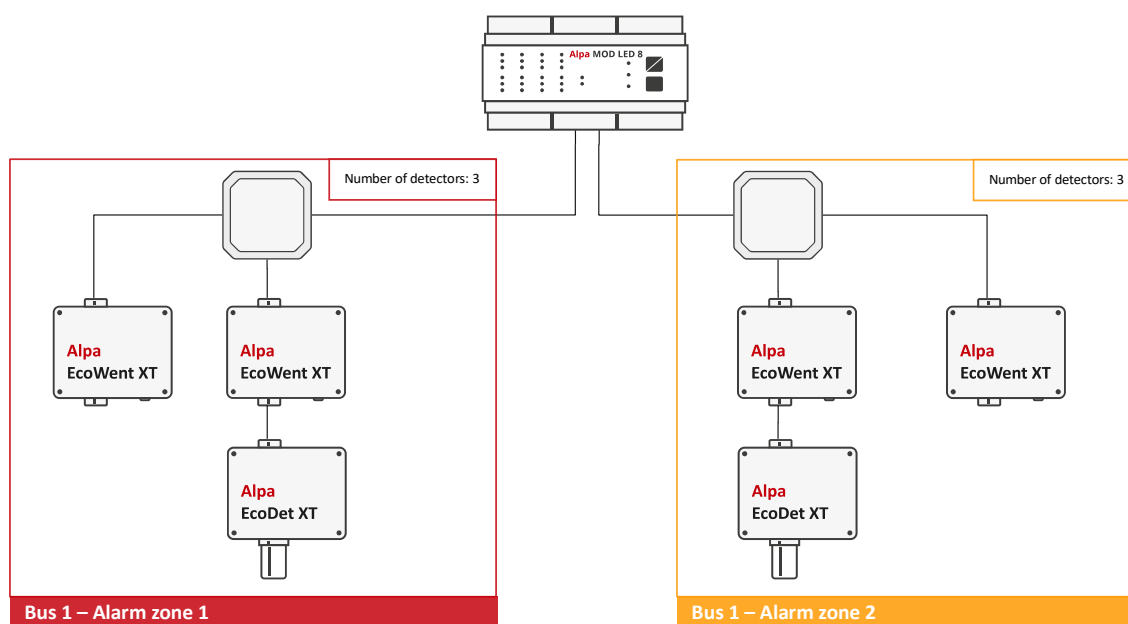


Figure 7: Connecting into two open bus systems servicing two zones

7 Device configuration

7.1 Detector location

For correct operation of the system, it is necessary to configure the detectors by appropriately setting the configuration switch located in the detector (see Figure 2, 8).

Two setting possibilities are distinguished:

- ✍ last detector – switch setting for detectors working in the star-shaped system or the last detector in the connection in the open alarm loop system,
- ✍ intermediate detector – switch setting for detectors working in the system of a closed alarm loop and detectors working in the open alarm loop system except for the last detector.

Architecture	Detector location	Settings of the configuration switch
Open bus system	Last detector	Position 2 (last)
	Intermediate detector	Position 1 (intermediate)
Closed bus system	Any	Position 1 (intermediate)
Star system	Any	Position 2 (last)

Table 4: Device configuration



Inappropriate switch setting causes the system to malfunction (indicating failure and lack of response to a signal from the following detectors).

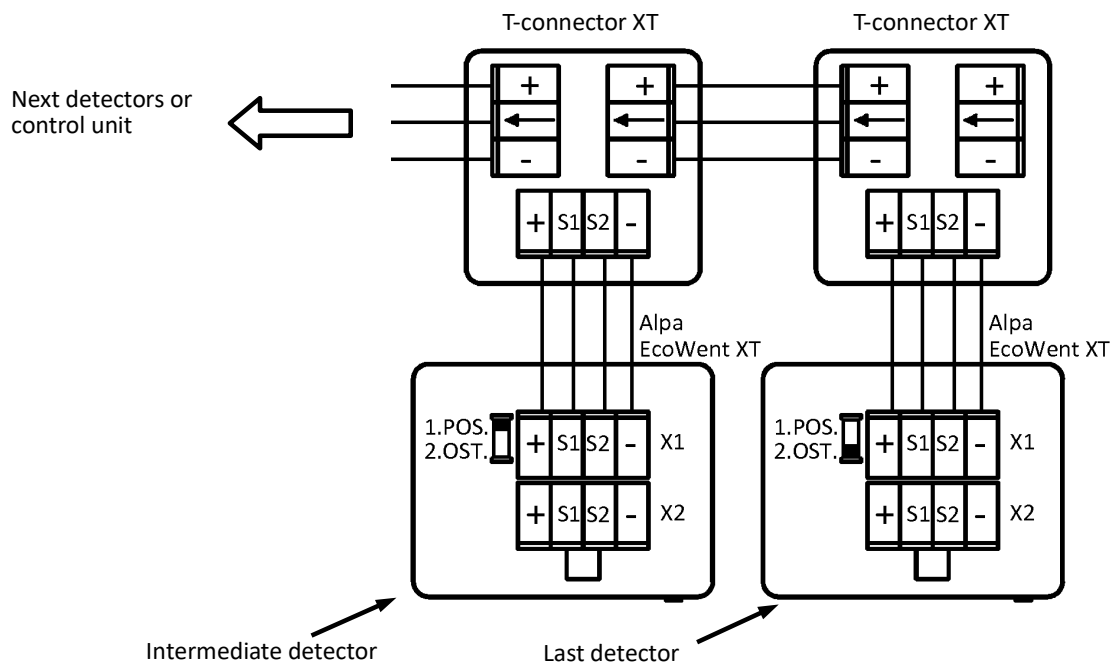


Figure 8: Settings of the configuration switch

7.2 Independent work and cooperation with the Alpa EcoDet XT detector

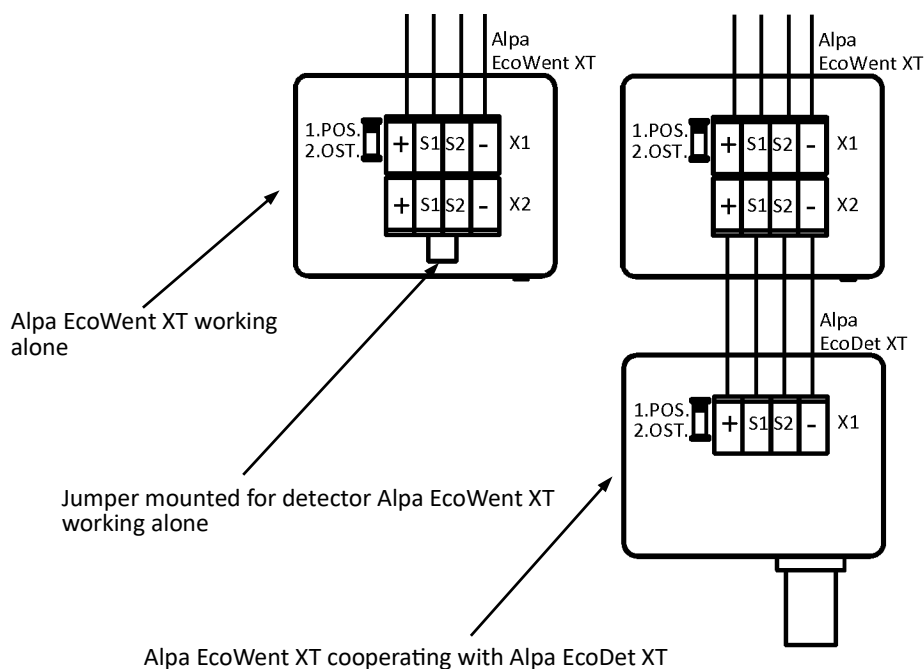


Figure 9: Independent work and cooperation Alpa EcoDet XT



In the case of working alone, it is necessary to pay attention to the need to mount the jumper in the terminal block X2.

8 Diagnostics of electrical connections – searching for connection errors

In the case when the detector signals problems with connections (see Section 5) the reasons of failure should be sought using the guidance contained in the Table 5.

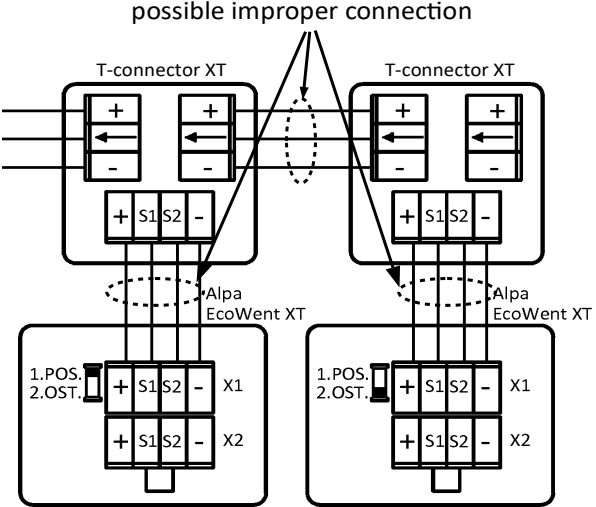
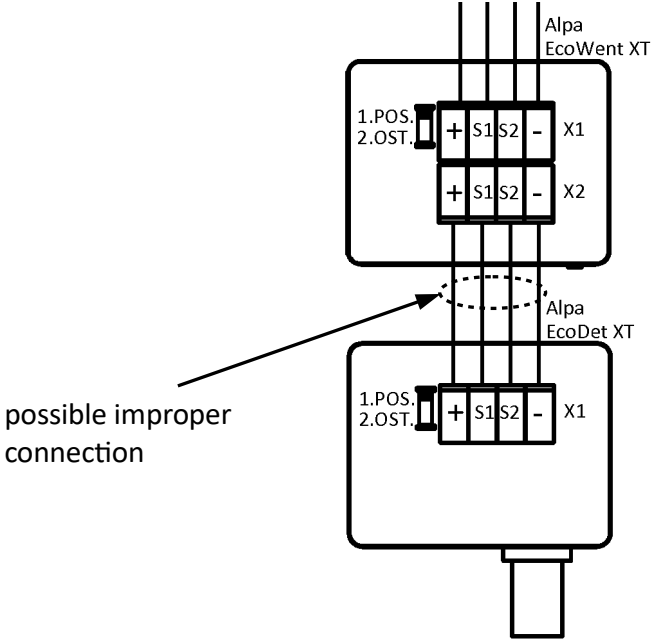
Indicator	Additional conditions	Possible cause of the problem
⚠ X1	The detector works as an intermediate one	<p>Damaged XT T-connector or inappropriate connection in the places indicated in the figure:</p>  <p>possible improper connection</p> <p>T-connector XT</p> <p>Alpa EcoWent XT</p> <p>1.POS. 2.OST.</p> <p>X1</p> <p>X2</p>
		Incorrect setting of the configuration switch (see Section 7.1)
	The detector works as the last one	Incorrect setting of the configuration switch (see Section 7.1)
⚠ X2	The detector works in a pair with the Alpa EcoDet XT detector	<p>Incorrect connection in the places indicated in the drawing:</p>  <p>possible improper connection</p> <p>Alpa EcoWent XT</p> <p>Alpa EcoDet XT</p> <p>1.POS. 2.OST.</p> <p>X1</p> <p>X2</p>
	The detector works alone	No jumper (see section 7.2)

Table 5: Reasons for failure signalling

9 Life cycle

9.1 Transport

The device should be transported in such a manner as new devices of this type. If the original box, extrusion or other protective elements (e.g. plugs) are not available, you must manually protect the device against shock, vibration and moisture using other equivalent methods.

Transport should take place in environmental conditions described in Table 6.

9.2 Set-up

9.2.1 Location of detectors

The location of detectors should be determined by the designer of the system, taking into consideration the following principles:

- ✍ it is recommended to mount the CO detector at the level of the upper respiratory tract, i.e. approx. 1.2 -1.7 m over the ground (typically 1.5 m),
- ✍ for a typical underground parking lot, it may be assumed that one detector is required per every 120-200 m² and it is dependent on the local conditions (ventilation, place of the probable gas accumulation, the structure of the facility),
- ✍ the detectors should not be exposed to the direct impact of water or other chemical substances (e.g. cleaning agents during the facility cleaning), direct impact of sunlight, rain, water,
- ✍ the detector should be protected against damaging mechanical exposures,
- ✍ the detector location should enable conducting checks and the sensor adjustments, as well as its replacement or disconnection.

9.2.2 Installation


Electrical installation of the detectors may only be performed by persons having appropriate qualifications or acting in agreement or under the supervision of the manufacturer. The electrical installation should be performed in accordance with the design.

- ✍ The electrical installation of the detectors should be performed in accordance with the general principles of performing measurement and control systems². Cables should be installed in a way protecting them from damage. Installation in cable ducts is required.



All activities related to the connection of the detectors and other components of the system must be made while the power supply to the control unit is switched off. Although the power supply to the gas detection system is switched off, there is a possibility that the source of dangerous voltage may be another system (e.g. a ventilation system using pin outputs).


- ✍ or making connections, it is possible to use three-wire cables e.g. of the YTKSY, OMY, LiYY type (bus). For connecting the Alpa EcoWent XT detector, it is necessary to apply a four-wire conductor. The selection of a specific cable type depends on the designer and should take into account the conditions in the place in which the gas detection system operates. The maximum lengths of the wires connecting the detector with the control unit for a given cross-section of cable wire are given in Appendix [4].

 When selecting the cable, it is necessary to pay attention to voltage drops on the lines.



The power line should be designed in such a way that, at the lowest expected voltage of the line power supply, the voltage "seen" on the detector terminals does not drop below the permissible value (see Section 10).

 The spring clips of the terminal strip are released by pressing the button with a screwdriver.

 The detector should be mounted with the use of Ø6 rawl bolts or M5 screws using the mounting holes accessible after the housing is open, so that the gas inlet is directed downwards. The housing dimensions, mounting hole spacing and the arrangement of the elements are shown in the Figure 2. To make the holes it is recommended to use drilling template enclosed in the packaging of the unit.

If the connection was made with the use of multi-wire cables (commonly known as a "cord"), the ends of these connectors should be ended with clamp sleeves.

If there is a need to connect two conductors in one terminal of the device, the only allowable option is to connect them in a common clamping sleeve (details are provided in Table 6).



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.

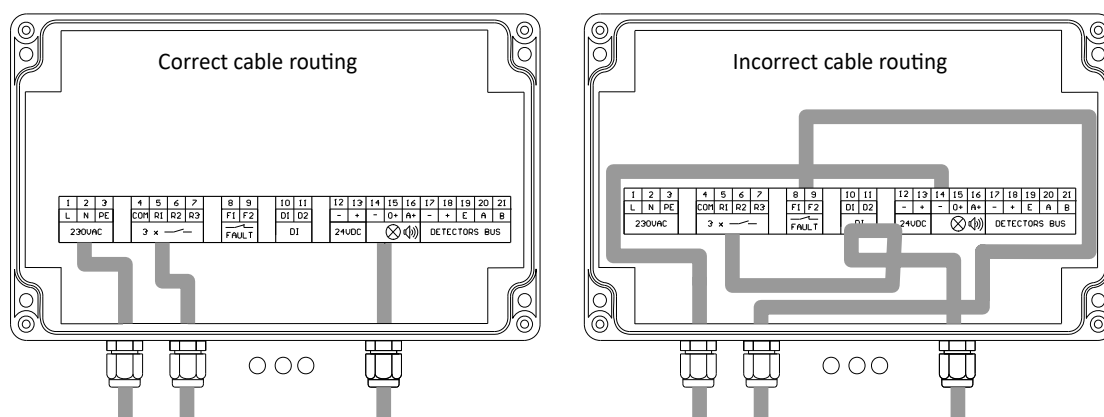


Figure 10: Example connection of cables to the device

9.2.2.1 Star system

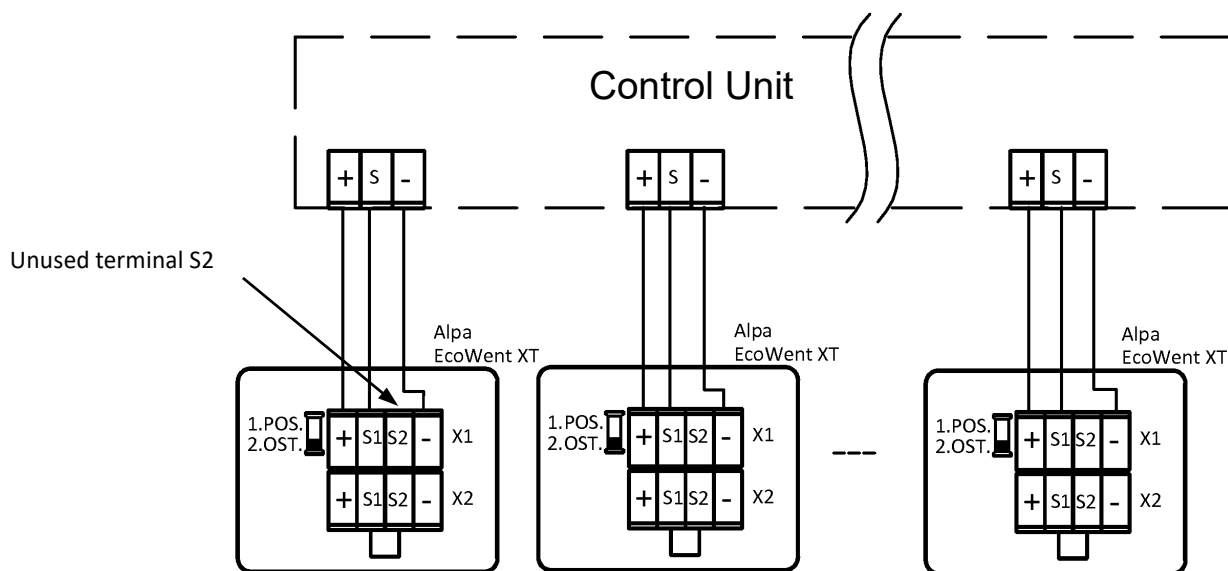



Figure 11: Connection of the Alpa EcoWent XT Gas Detector into the star system












Only the S1 terminal is used.












The configuration switch is always set in position 2 (last detector). For details, see Section 7.

 Distribute connection cables in the facility, leaving appropriate reserve for connecting the detectors.

-  Install and provide power to the control unit. After the power supply is switched on, the state of "FAILURE" should be shown due to the lack of connected detectors. Turn off power to the control unit.
-  Mechanically fastened detectors on the object.
-  Connect the output of the first detector to the cable going into the control unit. The configuration switch in the detector should be in position 2 (last detector) – see Figure 11.
-  The cable from a given sensor should be connected to a corresponding channel of the control unit. After the power supply is switched on, the control unit should show the state of WORK, and the controls on the sensor will blink subsequently for about one minute (stabilization of the sensor). After this time, the OK indicator will light up.
-  If the control unit shows the FAILURE status – check and eliminate the possible connection errors.
-  If the control unit shows the state of WORK – perform the test of the detector operation. For this purpose, force ALARM by pressing the TEST button in the detector. The control unit should indicate ALARM.
-  Turn off the power supply.
-  Repeat the installation steps for further detectors.
-  Turn on the power supply when connecting all the detectors to the control unit. WORK should be indicated on all the channels of the control unit. Measure the power supply voltage on the sensor furthest from the control unit while pressing TEST. It should not be less than 10 V.

For details, see Appendix [3].

9.2.2.2 Open alarm loop

-  Route the main cable within the facility.
-  Install and provide power to the control unit. After the power supply is switched on, the state of FAILURE should be shown due to the lack of connected detectors. Turn off power to the control unit.
-  Mechanically fasten the detectors and the T-connectors on the facility. Connect the detectors with T-connectors.
-  Connect the output of the first T-connector to the bus. Set the configuration switch in the detector to 2 (working as the last detector).
-  After the power supply is switched on, the control unit should show the state of WORK, and the controls on the sensor will blink subsequently for about 1 minute (stabilization of the sensor). After this time, the OK indicator will light up.
-  If the control unit shows the FAILURE status – check and eliminate the possible connection errors.
-  If the control unit displays the status of OPERATION – the configuration switch in the detector should be set to position 1 (working as an intermediate detector). The X1 indicator is lit in the detector, and the control unit should signal the failure of the detector (no detector at the end of the loop).
-  Turn off the power supply.
-  Repeat these steps for the next T-connectors and detectors.

- ✍ In the detectors, set the configuration switch in position 1. In the last detector, set the configuration switch in position 2 (see Figure 8). The control unit should show the state of OPERATION for the whole bus.
- ✍ Perform the test of the entire assembled bus. For this purpose, force the alarm on the last detector by pressing the TEST button in the detector. After a period of time dependent on the number of sensors (approx. 5-30 seconds), the control unit should signal ALARM.
- ✍ With the pressed TEST button, measure the power supply voltage on the last detector. It should not be less than 10 V. If it is lower, it is recommended to use a higher power supply voltage or use a connection into a closed alarm loop.

For details, see Appendix [3].

9.2.2.3 Closed alarm loop

This system differed from the one mentioned above only in that:

- ✍ in all the detectors being part of the loop, the configuration switches are set to position 1 (the control unit works as the last detector) – see Figure 8,
- ✍ the input of the last T-connector is plugged to the output of the control unit.

For details, see Appendix [3].


9.3 Start-up

9.3.1 Handover inspection

After performing the power supply and signal installation of the detectors, it is necessary to check and start the installation. Checking is based on further addition of detectors (or their simulator – see below) to the installation and checking the reaction of the control unit.

9.3.2 Checking

The verification of the correctness of operation of the installation is based on:

- ✍ checking whether the control unit shows the status of OPERATION without the activation of the sensors with gas,
- ✍ activating the first detector with gas and checking the reaction of the control unit (it should display WARNING or ALARM – depending on the concentration of the fed gas),
- ✍ activation of the last detector with gas and checking the reaction of the control unit and all the intermediate detectors (they should display  or ALARM – depending on the concentration of the fed gas),
- ✍ random activation of selected intermediate detectors,
- ✍ random disconnection of the detectors and checking the reaction of the control unit – it should display the status of FAILURE.

9.3.3 Start-up of the system

After performing the electrical connection and handing it over to operation, the installation is ready to work. After performing the electrical installation, it is possible to conduct start-up and verification of the system in accordance with the procedure below:

- ✓ check the correctness of the electrical connections and the setting of the configuration switch,
- ✓ turn on the power supply of the system. All detectors should start warm-up, which is indicated by the cyclic flashing of the indicator lights. In this state, the channels of the control unit used by the detectors should indicate work. After about 40 seconds, all the sensors and the control unit should indicate the status of OPERATION (with the assumption that the air is free of an agent that could cause a reaction of the detector),
- ✓ conduct the test of the sensor operation by pressing and holding the TEST button located inside the detector (see Figure 2) until the control unit signals ALARM. Pressing the TEST button should cause the ALARM on the checked detector and control unit,
- ✓ with pressed TEST button (all detectors show the status of ALARM) conduct the measurement of voltage on the most remote detector. The voltage cannot be lower than the minimum voltage of power supply to the detector (see Table 6). A too low value indicates an inappropriate selection of the conductor cross-section or too low voltage of the power supply to the system,
- ✓ it is recommended to conduct the reaction of the detectors with a span gas,
- ✓ the test of operation should be conducted for each detector,
- ✓ if the system does not work properly, it is necessary to check the correctness of connections or contact the manufacturer,
- ✓ the condition for admitting the system to use is conducting all the inspection operations with a positive result.

9.4 Periodical operations

During the operation of the gasometric system, it is necessary to be aware of the fact that the detectors – and most of all the sensors – are components susceptible to aging and environmental impacts. Therefore, the maintenance process must be performed systematically.

These operations may be conducted by trained services only, in accordance with the art, general safety principles and special installation conditions.

The periodic operations include:

- ✓ periodic inspections,
- ✓ calibration of detectors.

9.4.1 Calibration

During the operation of the system with Alpa EcoWent XT gas detectors, it is necessary to conduct periodic, systematic inspections of operation. The gas detector applied in the device is an element vulnerable to aging and environmental impacts, the natural effect of which is the decrease in its sensibility.

Calibration should be carried out once a year by a specialized facility. In order to compensate for this effect, it is necessary to conduct a periodic calibration of the Alpa EcoWent XT gas detector, performed by an authorized service of the manufacturer. The calibration process may be conducted in several ways:

- ✓ disassembly and sending the complete detector to the manufacturer,
- ✓ sending only the sensor plates to the manufacturer – the plate may be removed from the Alpa EcoWent XT gas detector after opening the housing (see Figure 2) – prior to this operation, it is absolutely necessary to turn off the power supply,
- ✓ calling the manufacturer's authorized service provider who will perform the calibration at the customer's.

The costs of calibration and travel should be incurred by the user.



It is prohibited to test the sensor individually by applying a small amount of gas with an unknown composition and concentration on it, e.g. from a lighter. Such an operation leads to the poisoning of the sensor and the detector de-calibration.

9.4.2 Replacement of consumables






Details of the lifetime of consumables can be found in Table 7.

9.4.2.1 Sensor plate replacement

During operation there is a natural loss of metrological parameters of the sensors. A compensation of this phenomenon takes place through a periodical, systematic regulation of the indications – until the replacement of the detector is necessary. It is assumed that the exchange should be carried out after the loss of sensitivity below 50% of the initial sensitivity.



It is impossible to replace the sensor only. The whole component is subject to replacement – the sensor mounted on the plate (sensor plate) – see Table 7.

In order to replace the sensor plate, it is necessary to:

-  turn off the power supply to the detector,
-  open the housing,
-  replace the sensor plate (see Figure 2),
-  close the housing,
-  turn on the power supply to the detector.

9.4.3 Periodical inspections

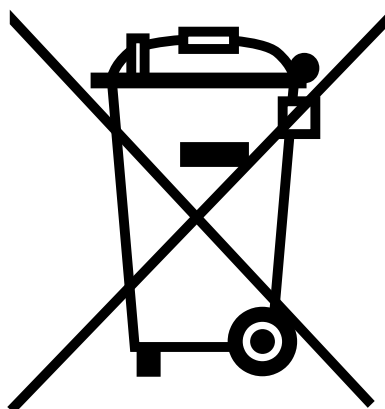
It is recommended to conduct periodical inspections every 3 months. Within the scope of a periodical inspections, it is necessary to conduct the visual inspection of the external installations and system devices, as well as to conduct the detector operation test:

-  activating the first detector with gas and checking the reaction of the control unit (it should display WARNING or ALARM – depending on the concentration of the fed gas),
-  repeat the operation for all detectors.

9.4.4 Maintenance

The only manner of cleaning the device is to wipe it with a damp soft cloth. Agents containing solvents, petrol or alcohols cannot be used to clean the sensor.

9.5 Utilization



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

10 Technical specification

Power supply		
<ul style="list-style-type: none"> V_{CC} I_{CC} 	10 – 42 V $\overline{\square}$ 40 mA ³	
Environment	In-operation	Storage
<ul style="list-style-type: none"> Ambient temperatures Humidity Pressure 	-20 – 50°C 10 – 90% long term 0 – 99% short term 1013 ± 10% hPa	0 – 50°C 30 – 90% long term
Detected substance	Carbon monoxide (CO)	
Measuring range	0 – 300 ppm	
Standard configuration		
<ul style="list-style-type: none"> warning 1 warning 2 alarm 	20 ppm 40 ppm 100 ppm	
IP	IP 43	
Digital input parameters		
<ul style="list-style-type: none"> R_{IN} 	200 Ω	
Analogue output parameters		
<ul style="list-style-type: none"> R_{LOAD_MAX} 	200 Ω	
The output signal according to the operating status of the detector:		
<ul style="list-style-type: none"> failure operation warning 1 warning 2 alarm 	2.4 mA 4 mA 9 mA 11 mA 15 mA	
Integrated signalling equipment (audible)	LED Display	
Protection class	III	
Dimensions	see Figure 2	
Cable glands (cable diameter range)	Cable glands pressed into installation pipes – pipe diameter 16 mm Multi-range cable glands – cable diameter 3.5-12 mm	
Acceptable cables	0.25 – 1.5 mm ² – solid wire 0.25 – 1 mm ² – stranded wire	

3 The given value does not take into consideration the current consumed by the Alpa EcoDet XT detector connected to the X2 terminals.

Enclosure material	ABS
Weight	0.3 kg
Mandatory periodic inspection	Once a year (valid calibration certificate)
Lifetime of consumables	See Table 7, Section 11
Mounting	4 openings for a screw with a diameter of 4 mm, for spacing see Figure 2

Table 6: Technical specification

11 List of consumables

No.	Consumable item	Life time	Manufacturer	Product code
{1}	Sensor plate	5 years	Atest Gaz	PWS-017-CO

Table 7: List of consumable items

12 List of accessories

Product code	Description
PW-049-CB3	CB3 Service Cable
PW-064-WM1	Mounting Adapter WM1 (for wall mounting)
PW-092-A	Calibration kit
-	Standardized reference gas – carbon monoxide CO 150 ppm

Table 8: List of accessories

13 Product marking

Product code	Device
PW-097-CO	Alpa EcoWent XT Gas Detector

Table 9: Method of product's marking

14 Appendices



- [1] DEZG113-ENG – EU Declaration of Conformity – Alpa EcoWent XT
- [2] PU-Z-032-ENG – Parameters of gas detectors with electrochemical sensor
- [3] PU-Z-099-ENG – Connection diagrams of gas detectors XT series
- [4] PU-Z-098-ENG – Maximum quantity of Alpa EcoWent XT and Alpa EcoDet XT detectors by cable type
- [5] PU-Z-039-ENG – Classification of chemicals used at Atest Gaz

EU Declaration of Conformity

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

(Product description)	(Trade name)	(Type identifier or Product code)
Gas Detector	Alpa EcoWent XT	PW-097

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 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, 20.04.2022


(Name and Signature)

Managing Director
Aleksander Pachole

Parameters of gas detectors with electrochemical sensor

1 Detected substances

Detectors equipped with electrochemical sensors are used for measuring and detecting the presence of specific substances in gaseous atmospheres in concentrations generally above single "ppm," but in some cases (e.g. oxygen, hydrogen), the concentration may be tens or hundreds of thousands "ppm".

These gases have characteristic measurement ranges. Most of the detected substances are primarily volatile inorganic compounds. Some organic compounds, such as ethylene, ethylene oxide, may also be detected.

Table 1 presents an example list of substances detected by electrochemical sensors.

Name of the substance	IUPAC name	Molecular formula	CAS
Oxygen	Oxygen	O ₂	7782-44-7
Ozon	Trioxxygen	O ₃	10028-15-6
Hydrogen	Hydrgen	H ₂	1333-74-0
Ammonia	Azane	NH ₃	7664-41-7
Arsine	Arsenic trihydride, Arsane	AsH ₃	7784-42-1
Carbon monoxide	Carbon monoxide	CO	630-08-0
Chlorine	Chlorine	Cl ₂	7782-50-5
Chlorine dioxide	Chlorine dioxide	ClO ₂	10049-04-4
Ethylene oxide, epoxyethane	Oxirane	C ₂ H ₄ O	75-21-8
Formaldehyde	Methanal	HCHO	50-00-0
Hydrazine, diamine, diazane	Hydrazine	N ₂ H ₄	302-01-2
Hydrogen chloride	Hydrogen chloride	HCl	7647-01-0
Hydrogen cyanide, Prussic acid	Formonitrile, Hydridonitridocarbon	HCN	74-90-8
Hydrogen sulfide, Sulfane	Hydrogen sulfide	H ₂ S	7783-06-4
Nitric oxide	Oxidonitrogen	NO	10102-43-9
Nitrogen dioxide	Nitrogen dioxide	NO ₂	10102-44-0
Phosgene	Carbonyl dichloride	COCl ₂	75-44-5
Silane	Silane	SiH ₄	7803-62-5
Sulphur dioxide	Sulphur dioxide	SO ₂	7446-09-5
Ethylene	Ethene	C ₂ H ₄	74-85-1
Tetrahydrotiofene (THT)	Thiolane	C ₄ H ₈ S	110-01-0

Table 1: Substances detected by the electrochemical sensors

2 Principle of operation

Electrochemical sensors are micro fuel cells. Figure 1 shows a simplified structure of an electrochemical sensor.

The sensor inlet (1) is protected with anti-condensation membrane (6) which serves also as a protection against dust. The simplest electrochemical sensor consists of two electrodes: sensing (2) and counter (3), separated by a thin layer of electrolyte (4). Depending on the detected gas, the reduction or oxidation reaction occurs on the first electrode, which is balanced by a counter electrode by water oxidation or oxygen reduction respectively. In order to improve the performance of the sensor, a third electrode – the reference electrode – is used (5). It has a constant potential that is not dependent on the concentration of

the measured gas. Owing to electrode reactions, electrons are generated, whose orderly flow – electric current, is proportional to the concentration of the detected gas.

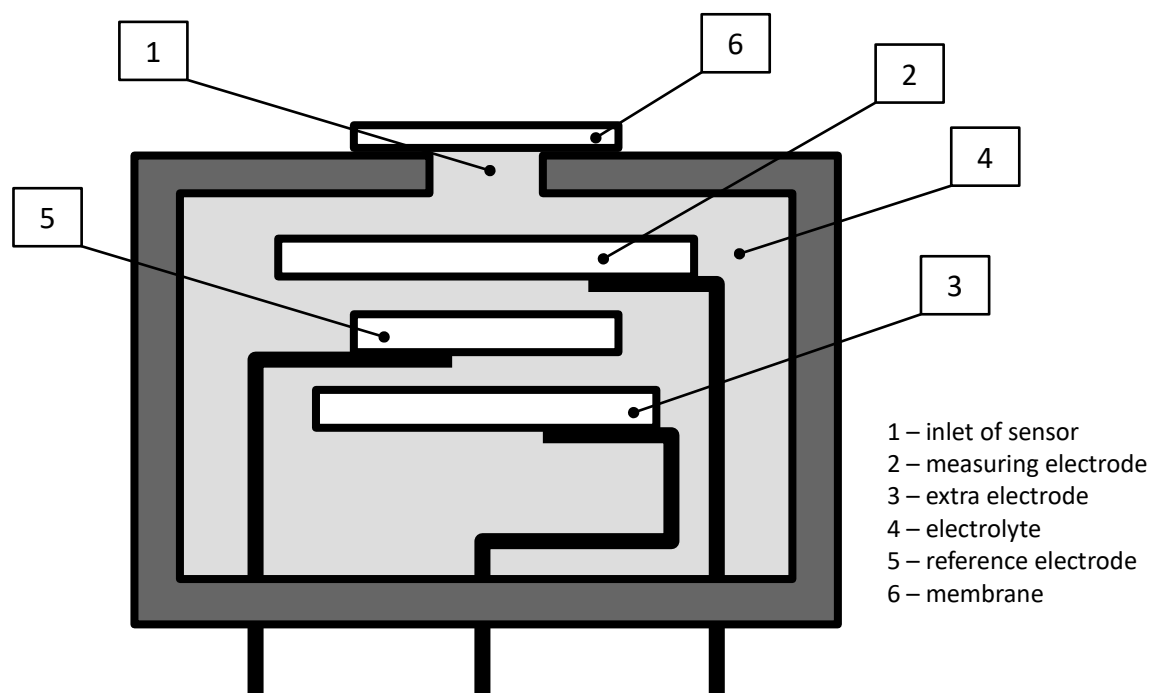


Figure 1: Construction of an electrochemical sensor

Example response to a carbon monoxide sensor:

Sensing electrode: $\text{CO} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + 2\text{H}^+ + 2\text{e}^-$

Counter electrode: $\frac{1}{2}\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2\text{O}$

Overall reaction: $\text{CO} + \frac{1}{2}\text{O}_2 \rightarrow \text{CO}_2$

3 Impact of environmental conditions



Never exceed the rated operating parameters of the detector. These parameters can be found in the "detector calibration certificate".



The detector must be used in accordance with the provisions in the User's Manual.

3.1 Composition of the controlled atmosphere

It is assumed that the standard composition of the atmosphere is a mixture of gases with the proportions indicated in table 2.

Ingredient	C [% vol]	C [ppm]
Nitrogen	78.084	780 840
Oxygen	20.946	209 460
Argon	0.934	9 340
Carbon dioxide	0.0360	360
Neon	0.00181	18.18
Helium	0.00052	5.24
Methane	0.00017	1.70
Krypton	0.00011	1.14
Hydrogen	0.00005	0.50
Xenon	0.000008	0.087

Table 2: Typical composition of atmospheric air

When gas concentrations in the atmosphere differ significantly from those indicated in the table 2, it is necessary to conduct the analysis of the impact of such a situation on the detector operation. This publication assumes that the detector is operated under a standard formulation.

3.1.1 Impact of the presence of a substance in a controlled atmosphere

The electrochemical sensor is relatively selective. This means that in addition to the "working gas," that is the one which the detector responds to, these sensors also respond to a relatively small number of other substances in comparison to other measurement techniques.

Because of the indication, a set of substances exists or can exist:

- ✂ to which the sensor responds *in plus* giving a positive signal proportional to the concentration of a substance (e.g. carbon monoxide on a carbon monoxide sensor, being its "working gas", hydrogen on a carbon monoxide sensor),
- ✂ to which the sensor responds *in minus* giving a negative signal proportional to the concentration of a substance (for example, nitrogen dioxide for a sulphur dioxide sensor),
- ✂ to which sensor does not respond (the output signal does not change – e.g., nitrogen at a carbon monoxide sensor).

A set of substances exists or may exist for every detector:

- ✂ the ones that are inert to the sensor – do not react chemically with the sensor detector element (e.g. nitrogen on a carbon monoxide sensor),
- ✂ the ones that react chemically with the detector element of the sensor and do not cause a supernormal degradation of its properties (e.g. sensor working gas),
- ✂ the ones that affect the sensor elements and cause temporary or permanent degradation of its characteristics or properties.

Due to the physio-chemical phenomena, for each sensor there may be a collection of substances which interact with the working substance leaving no possibility of reaching the detector elements of the sensor by the working gas (e.g. ammonia dissolves in water vapour). In the case of some substances (e.g. chlorine, phosgene, hydrogen chloride, sulphur dioxide) the operating range of the sensor is low enough so that the gas at these concentrations can be absorbed by water vapour from the atmosphere, or condensed on the elements of the sensor. Thus, it will not be the same one, visible for the detector, as long as its concentration does not reach a sufficiently high value and does not saturate water vapour being on the way to the sensor.

3.1.2 Impact of the presence of a working gas or other reaction gas

The reaction of gas from the detector element of the sensor causes its wear, therefore, detectors equipped

with electrochemical sensors are designed to measure and detect the short-term presence of certain gases in the atmosphere. Both the more sustained concentration with values falling within the range of measurement, and even instantaneous concentrations outside the measuring range lead to a rapid wear of the sensor.

3.1.3 Effect of oxygen concentration value

Depending on the sensor, oxygen is required in most cases for the electrochemical reaction. For a short period of time, oxygen dissolved in the electrolyte is sufficient, however, constant operation in an oxygen-free atmospheres is generally impossible.

3.2 Influence of temperature

The temperature of the measured atmosphere affects the characteristics of the sensor. Its influence in the work of the sensor is compensated electronically.

Very rapid changes in air temperature in the rated temperature range of the detector can cause the sensor responses to this phenomenon.

Rapid reduction of temperature can cause a rapid increase in relative humidity, and thus the reaction of the sensor.

3.3 Influence of moisture

- ✦ Depending on the sensor, water is necessary for the electrochemical reaction because the sensors cannot operate in an atmosphere with a low relative humidity. Working in such conditions may lead to the excessive concentration of the electrolyte, which is corrosive and can cause damage to the sensor.
- ✦ When the humidity of the measured atmosphere is within the rated range of the detector operation, it does not affect the reading. However, sudden, abrupt changes of humidity in the measured atmosphere can cause momentary appearance of the signal despite the lack of working gas in the vicinity of the sensor.
- ✦ It is necessary to consider phenomena making the working gas react with moisture in the atmosphere, not allowing it to reach the sensor (vapours of ammonia, chlorine, hydrogen chloride, phosgene, etc.).
- ✦ Condensation may block the flow of working gas to the sensor.

3.4 Influence of pressure

Sudden change of pressure in the presence of working gas can cause an incorrect indication of the detector proportional to the speed and volume change of pressure.

3.5 Influence of vibrations, impacts

It should be ensured that the detector is not exposed to shock and vibration in excess of the amplitude of vibrations amounting to 0.15 mm of the frequencies of over 10 Hz.

4 Factors shortening the lifetime of the sensor

The lifetime of the sensor is limited due to the gradual wear of the electrolyte and electrodes.

This time can be significantly reduced as a result of:

- ✦ long-term persistence of concentrations with the values falling within the range of measurement,
- ✦ the temporary presence of concentrations substantially exceeding the measurement range,
- ✦ impact of extreme humidity (very dry or very humid air),
- ✦ too high ambient temperature,
- ✦ occurrence of abrupt pressure changes.

Connection diagrams of gas detectors XT series

Examples of connection between Alpa EcoWent XT and Alpa EcoDet XT gas detectors with control units are shown in the drawings.

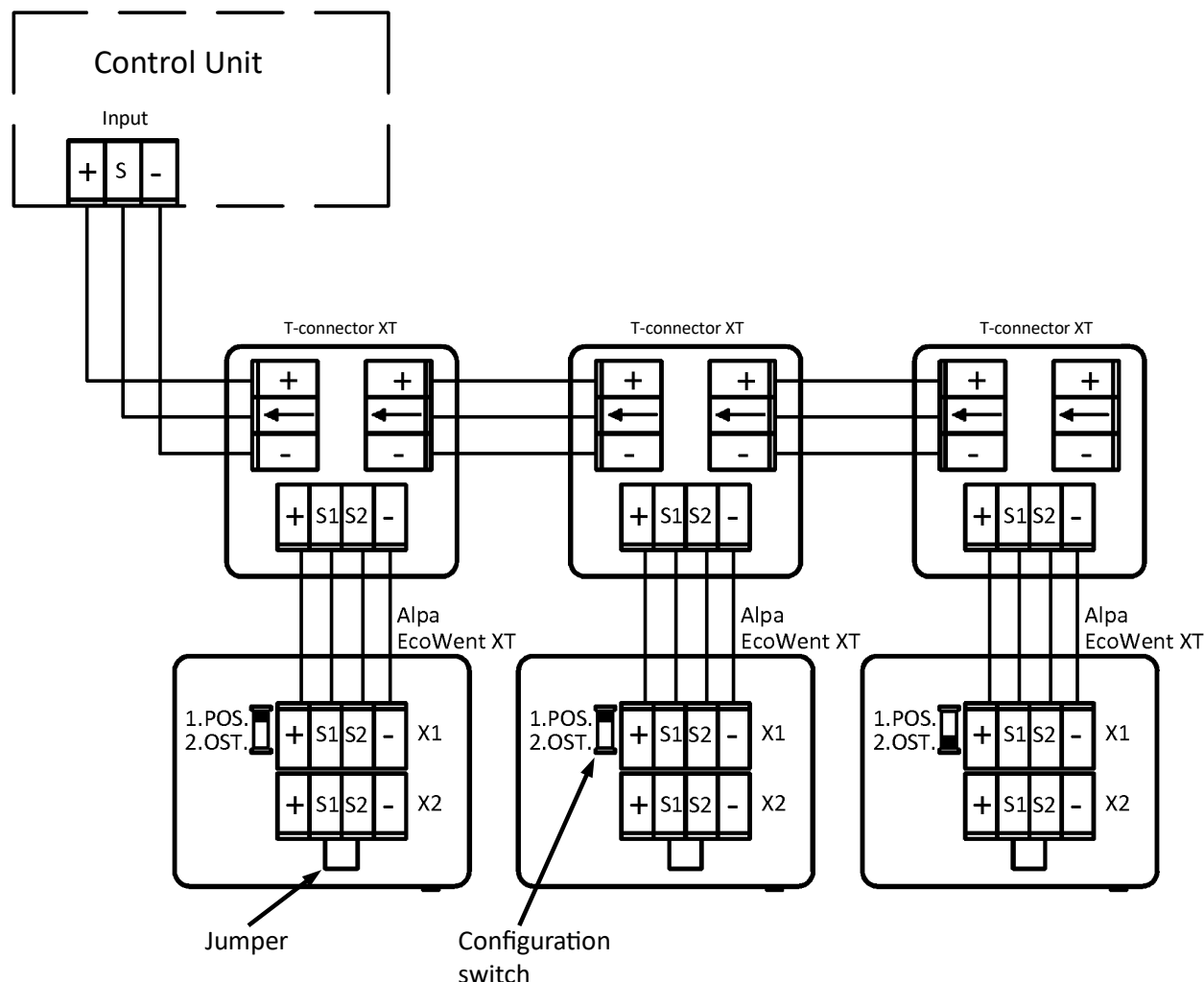


Figure 1: Connection Alpa EcoWent XT Gas Detector with control unit into an open bus system



Please make sure that configuration jumpers are in correct positions. The jumper in the terminal block X2 of the Alpa EcoWent XT must be installed when the detector is not directly coupled with the Alpa EcoDet XT detector). Recheck position of the configuration switch (a transient of a line-end detector).

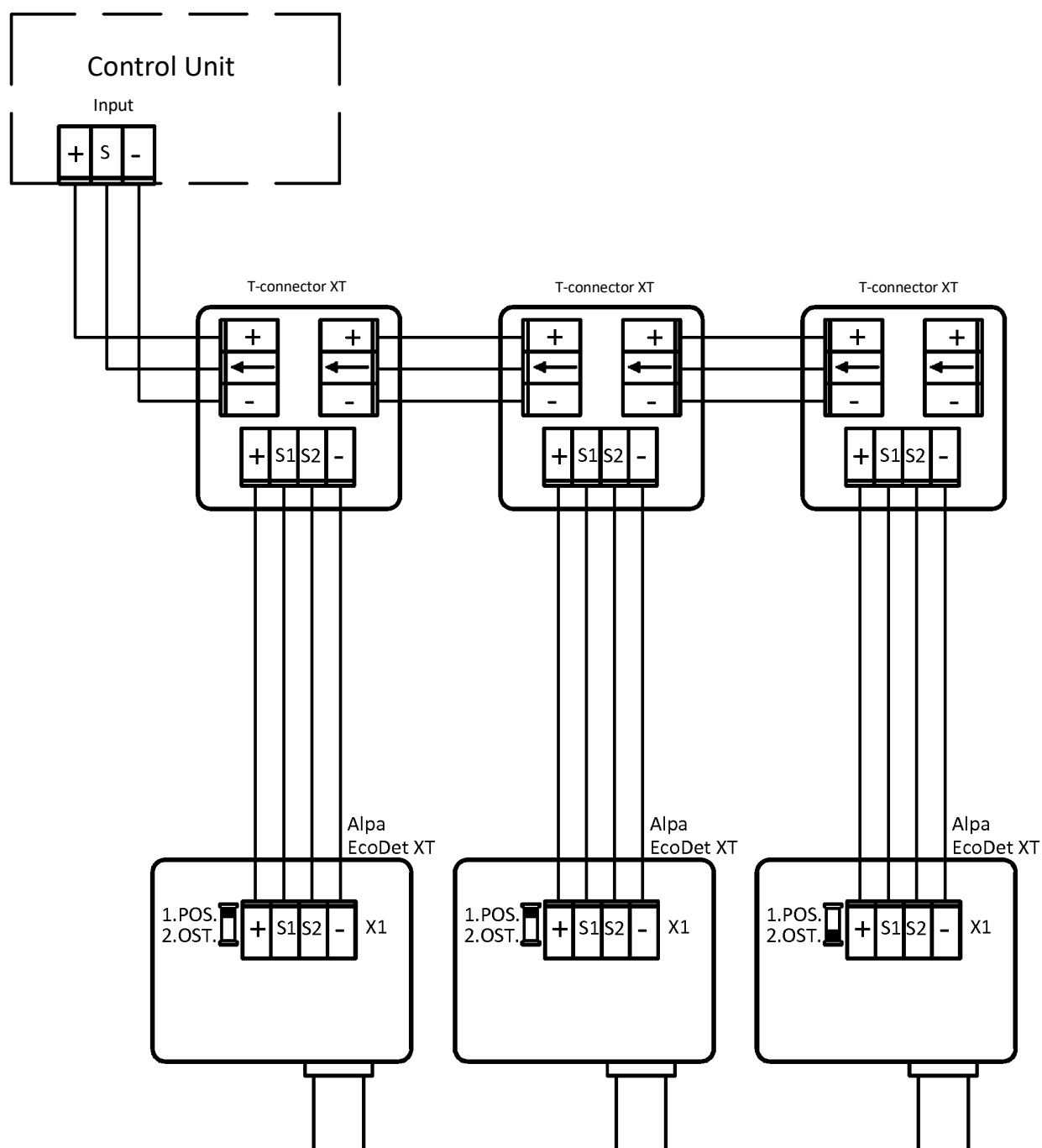


Figure 2: Connection Alpa EcoDet XT Gas Detector with control unit into an open bus system



While connecting detectors to the control loop pay attention to the position of an internal configuration switch (the last detector in the loop or a transient detector).

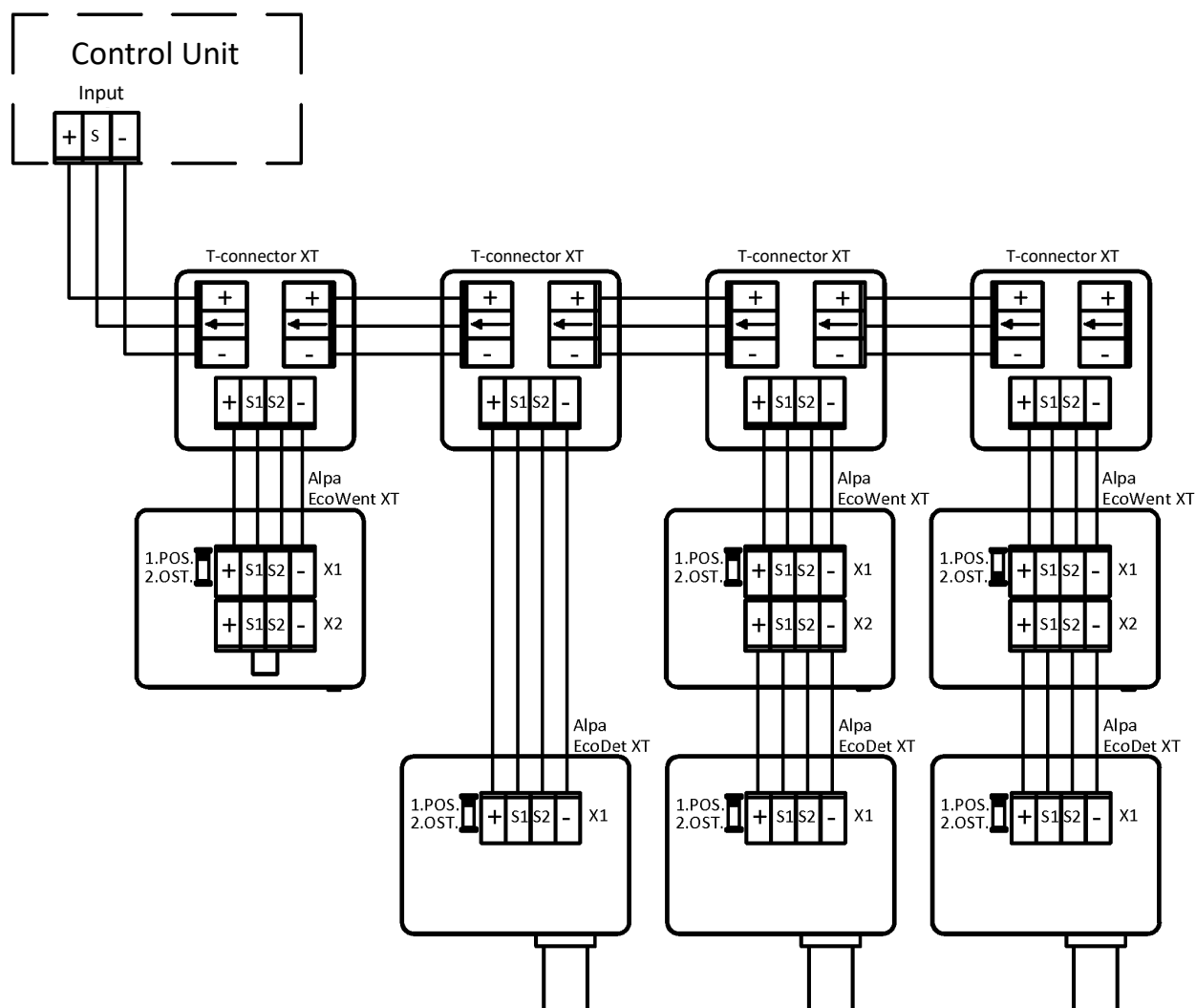


Figure 3: Connection Alpa EcoWent XT and Alpa EcoDet XT Gas Detectors with control unit into an open bus system



Please make sure that configuration jumpers are in correct positions. The jumper in the terminal block X2 of the Alpa EcoWent XT must be installed when the detector is not directly coupled with the Alpa EcoDet XT detector). Recheck position of the configuration switch (a transient of a line-end detector).

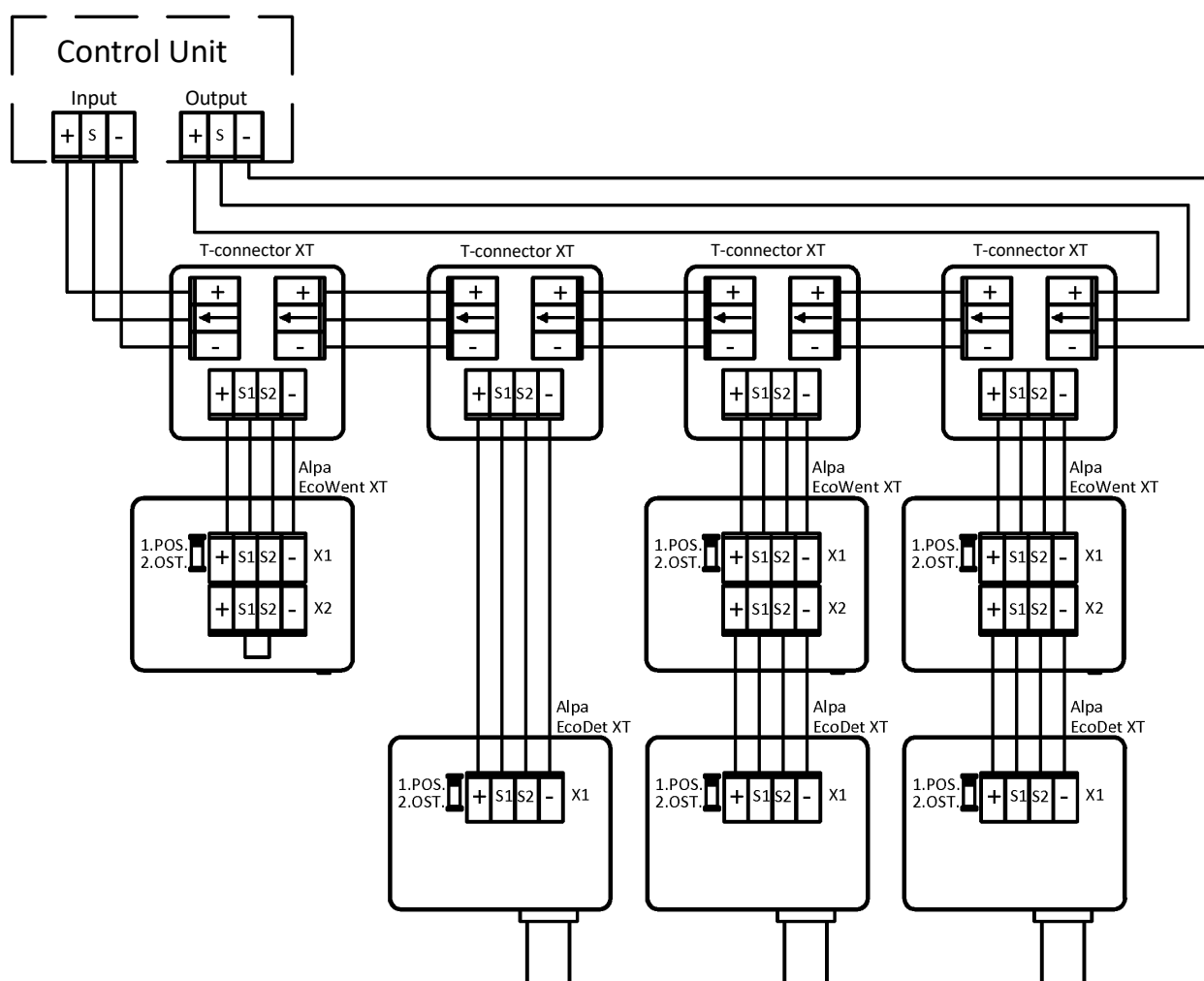


Figure 4: Connection Alpa EcoWent XT and Alpa EcoDet XT Gas Detectors with control unit into an closed bus system



Please make sure that configuration jumpers are in correct positions. The jumper in the terminal block X2 of the Alpa EcoWent XT must be installed when the detector is not directly coupled with the Alpa EcoDet XT detector). Recheck position of the configuration switch (a transient of a line-end detector).

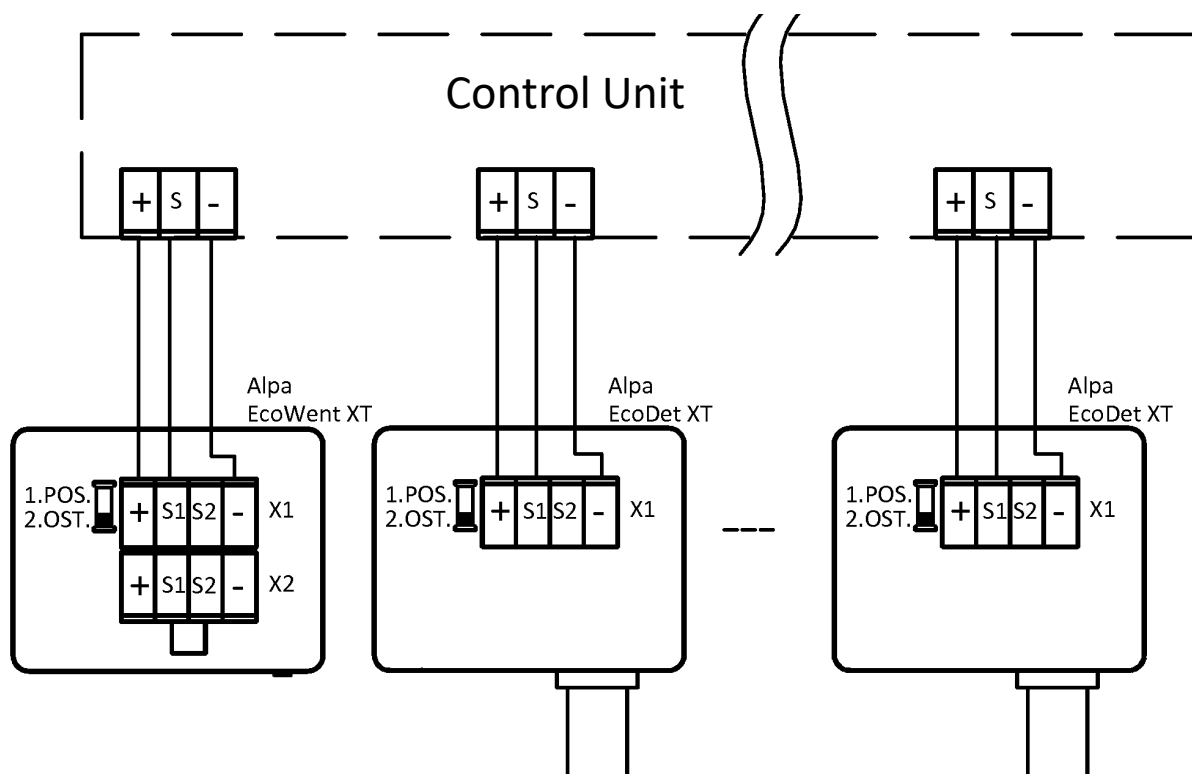


Figure 5: Connection Alpa EcoWent XT and Alpa EcoDet XT Gas Detectors with control unit into a star-shaped system



Please make sure that configuration jumpers are in correct positions. The jumper in the terminal block X2 of the Alpa EcoWent XT must be installed when the detector is not directly coupled with the Alpa EcoDet XT detector). Recheck position of the configuration switch (a transient of a line-end detector).

Maximum quantity Alpa EcoWent XT and Alpa EcoDet XT detectors by cable type

1 Open loop configuration

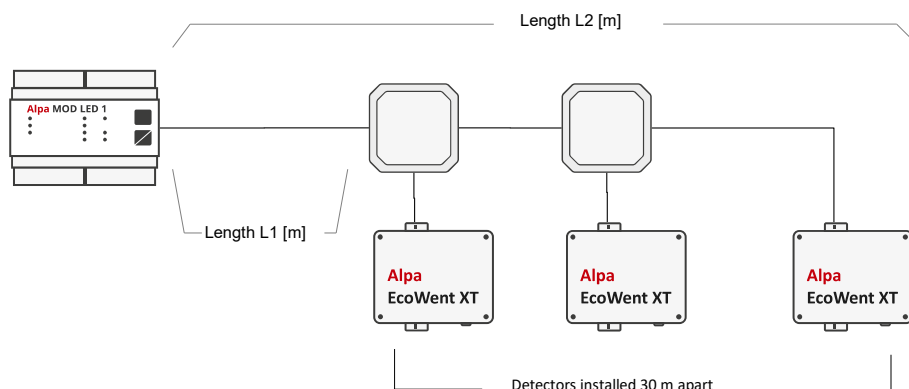


Figure 1: Open loop configuration for Alpa EcoWent XT detectors

Cross-section of a single cable conductor [mm ²]	Alpa EcoWent XT Gas Detector					
	System without backup battery supply (U _{IN} = 24 V)			System with backup battery supply (U _{IN(min)} = 20 V)		
	L1 [m]	L2 [m]	Quantity of detectors	L1 [m]	L2 [m]	Quantity of detectors
0,75	58	628	20	53	533	17
	91	631	19	87	537	16
	127	637	18	123	543	15
	165	645	17	163	553	14
	206	656	16	206	566	13
1	63	723	23	75	615	19
	96	726	22	109	619	18
	131	731	21	146	626	17
	168	738	20	186	636	16
	207	747	19	229	649	15
1,5	62	872	28	81	741	23
	94	874	27	115	745	22
	128	878	26	150	750	21
	163	883	25	188	758	20
	200	890	24	229	769	19
2,5	69	1389	45	53	1193	39
	100	1390	44	84	1194	38
	133	1393	43	116	1196	37
	166	1396	42	150	1200	36
	200	1400	41	184	1204	35

Table 1: Maximum quantity of Alpa EcoWent XT detectors – open loop configuration

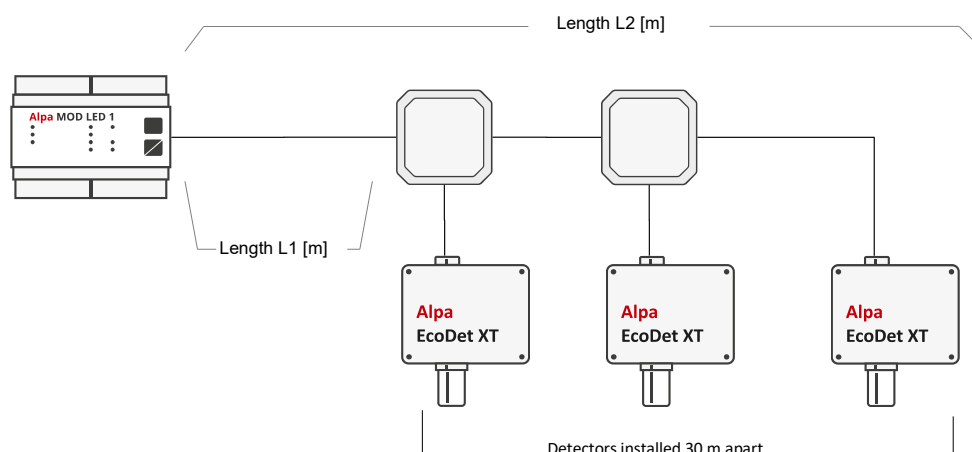


Figure 2: Open loop configuration for Alpa EcoDet XT detectors

Cross-section of a single cable conductor [mm ²]	Alpa EcoDet XT Gas Detector					
	System without backup battery supply (U _{IN} = 24 V)			System with backup battery supply (U _{IN(min)} = 20 V)		
	L1 [m]	L2 [m]	Quantity of detectors	L1 [m]	L2 [m]	Quantity of detectors
0,75	72	402	12	67	337	10
	109	409	11	103	343	9
	147	417	10	145	355	8
	190	430	9	194	374	7
	241	451	8	257	407	6
1	73	461	14	55	385	12
	107	463	13	89	389	11
	144	474	12	126	396	10
	184	484	11	169	409	9
	229	499	10	218	428	8
1,5	45	555	18	42	462	15
	77	557	17	74	464	14
	111	561	16	109	469	13
	146	566	15	146	476	12
	184	574	14	187	487	11
	224	584	13	234	504	10
2,5	35	725	24	28	598	20
	66	726	23	59	599	19
	98	758	22	91	601	18
	132	762	21	125	605	17
	166	766	20	160	610	16

Table 2: Maximum quantity of Alpa EcoDet XT – open loop configuration

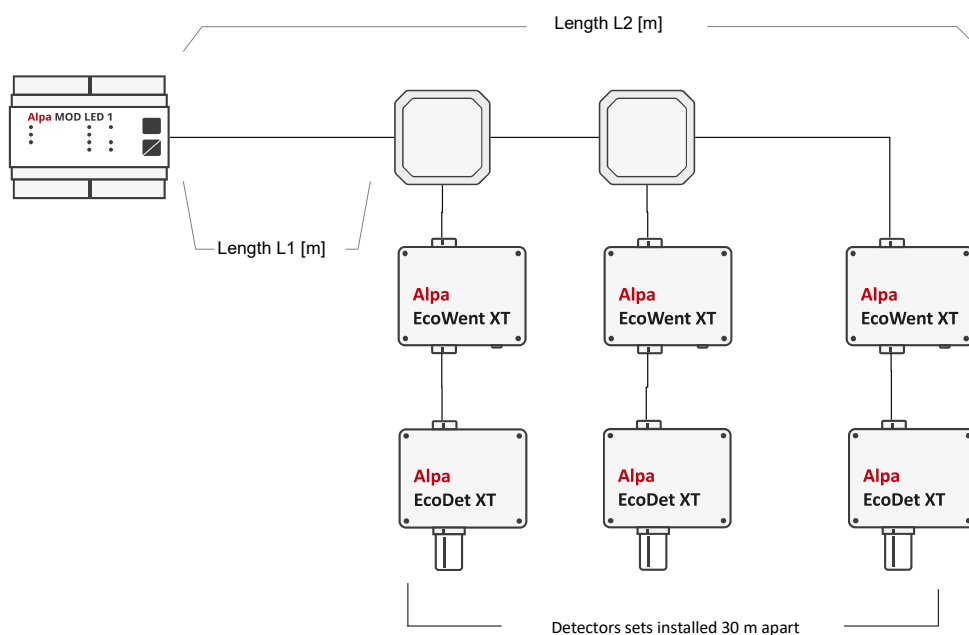


Figure 3: Open loop configuration for sets of Alpa EcoWent XT and Alpa EcoDet XT detectors

Cross-section of a single cable conductor [mm ²]	A set of one Alpa EcoWent XT Gas Detector and one Alpa EcoDet XT Gas Detector					
	System without backup battery supply (U _{IN} = 24 V)			System with backup battery supply (U _{IN(min)} = 20 V)		
	L1 [m]	L2 [m]	Quantity of sets	L1 [m]	L2 [m]	Quantity of sets
0,75	70	319	9	80	267	7
	107	325	8	122	278	6
	152	339	7	173	298	5
	203	359	6	243	337	4
1	58	369	11	56	305	9
	93	373	10	93	311	8
	133	382	9	135	322	7
	177	395	8	185	341	6
	229	416	7	249	374	5
1,5	78	451	13	62	373	11
	114	456	12	98	378	10
	153	464	11	138	387	9
	197	477	10	183	432	8
	245	494	9	237	424	7
2,5	66	636	20	52	532	17
	99	639	19	84	534	16
	133	643	18	118	538	15
	169	649	17	154	544	14

Table 3: Maximum quantity of sets of Alpa EcoWent XT and Alpa EcoDet XT – open loop configuration

2 Closed loop configuration

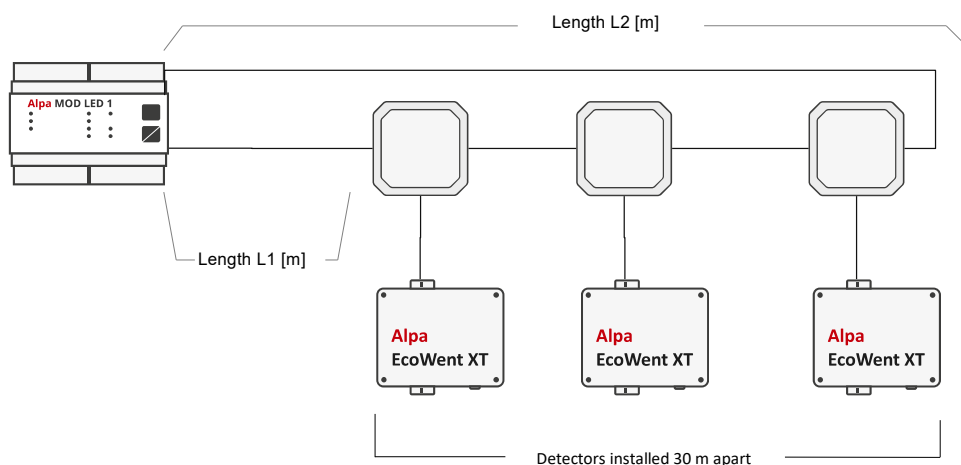


Figure 4: Closed loop configuration for Alpa EcoWent XT detectors

Cross-section of a single cable conductor [mm ²]	Alpa EcoWent XT Gas Detector					
	System without backup battery supply (U _{IN} = 24 V)			System with backup battery supply (U _{IN(min)} = 20 V)		
	L1 [m]	L2 [m]	Quantity of detectors	L1 [m]	L2 [m]	Quantity of detectors
0,75	57	807	26	50	680	22
	89	809	25	83	683	21
	123	813	24	118	688	20
	160	820	23	153	693	19
	198	828	22	194	704	18
	237	837	21	237	717	17
1	63	933	30	67	787	25
	96	936	29	101	791	24
	130	940	28	136	796	23
	164	944	27	172	802	22
	202	952	26	212	812	21
1,5	50	1130	36	55	955	31
	82	1132	35	87	957	30
	115	1135	34	120	960	29
	149	1139	33	155	965	28
	184	1144	32	192	972	27
	220	1150	31	230	980	26
2,5	47	1877	62	56	1616	53
	78	1878	61	87	1617	52
	110	1880	60	119	1619	51
	142	1882	59	152	1622	50
	174	1884	58	185	1625	49

Table 4: Maximum quantity Alpa EcoWent XT – closed loop configuration

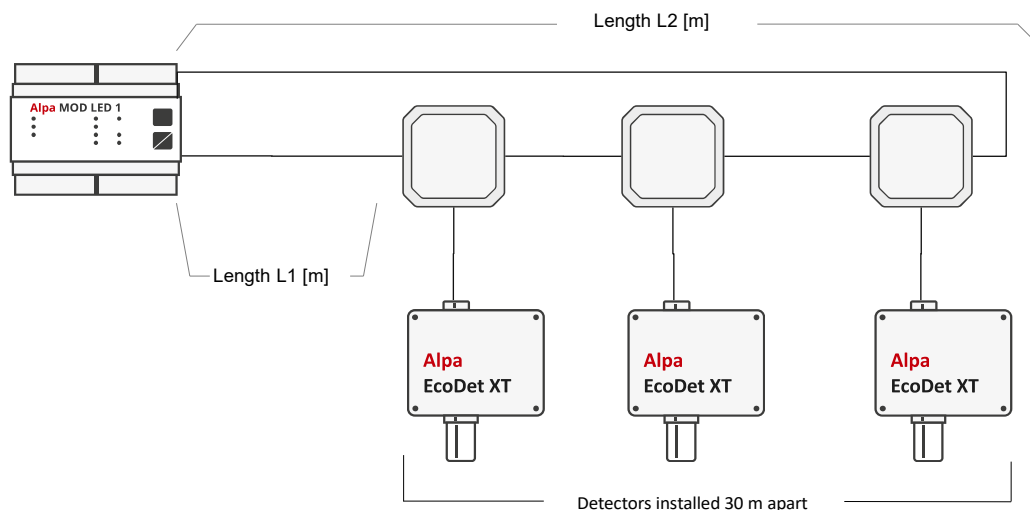


Figure 5: Close loop configuration for Alpa EcoDet XT detectors

Cross-section of a single cable conductor [mm ²]	Alpa EcoDet XT Gas Detector					
	System without backup battery supply (U _{IN} = 24 V)			System with backup battery supply (U _{IN(min)} = 20 V)		
	L1 [m]	L2 [m]	Quantity of detectors	L1 [m]	L2 [m]	Quantity of detectors
0,75	45	495	16	50	410	13
	76	496	15	86	415	12
	112	502	14	120	420	11
	149	509	13	160	430	10
	190	520	12	207	447	9
	235	535	11	-	-	-
1	64	574	18	55	475	15
	97	577	17	89	479	14
	132	582	16	124	484	13
	169	589	15	163	493	12
	209	599	14	207	507	11
1,5	67	697	22	68	578	18
	99	699	21	101	581	17
	133	703	20	137	587	16
	169	709	19	174	594	15
	207	717	18	215	605	14
2,5	51	951	31	65	785	25
	82	952	30	98	788	24
	115	955	29	131	791	23
	148	958	28	166	796	22
	182	962	27	203	803	21

Table 5: Maximum quantity of Alpa EcoDet XT – closed loop configuration

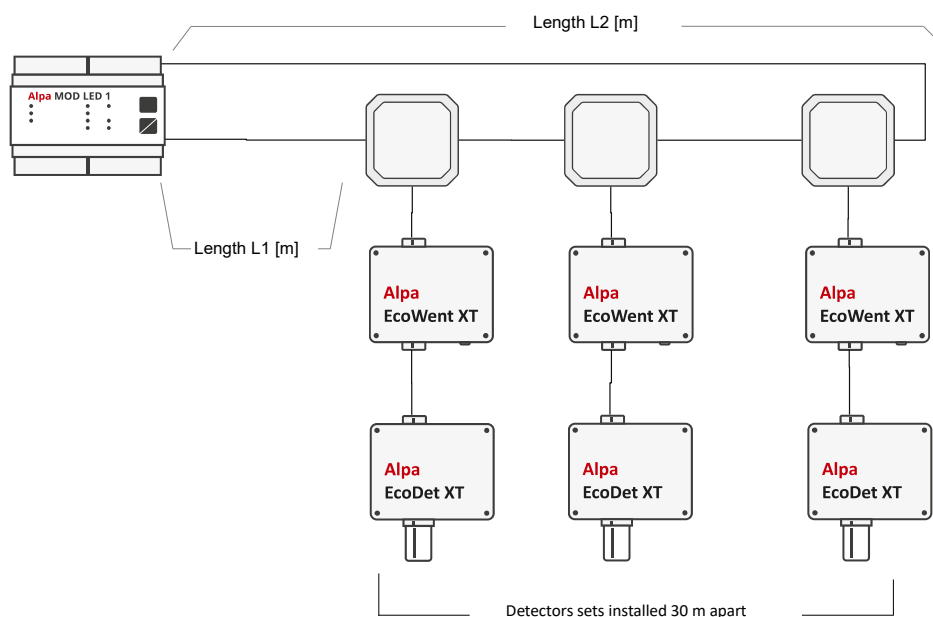


Figure 6: Closed loop configuration for sets of Alpa EcoWent XT and Alpa EcoDet XT detectors

Cross-section of a single cable conductor [mm ²]	A set of one Alpa EcoWent XT Gas Detector and one Alpa EcoDet XT Gas Detector					
	System without backup battery supply (U _{IN} = 24 V)			System with backup battery supply (U _{IN(min)} = 20 V)		
	L1 [m]	L2 [m]	Quantity of sets	L1 [m]	L2 [m]	Quantity of sets
0,75	53	426	13	44	355	11
	88	430	12	78	358	10
	126	437	11	162	411	9
	169	449	10	217	435	8
	218	467	9	-	-	-
1	59	494	15	71	413	12
	94	498	14	108	419	11
	131	504	13	149	429	10
	172	514	12	197	446	9
	217	528	11	252	490	8
1,5	40	599	19	66	501	15
	75	603	18	101	505	14
	108	605	17	139	512	13
	144	610	16	181	523	12
	184	619	15	228	539	11
	227	631	14	-	-	-
2,5	24	834	28	38	698	23
	55	835	27	70	700	22
	87	837	26	103	703	21
	120	840	25	137	707	20
	154	844	24	173	713	19

Table 6: Maximum quantity of sets of Alpa EcoWent XT and Alpa EcoDet XT – closed loop configuration

3 Star configuration

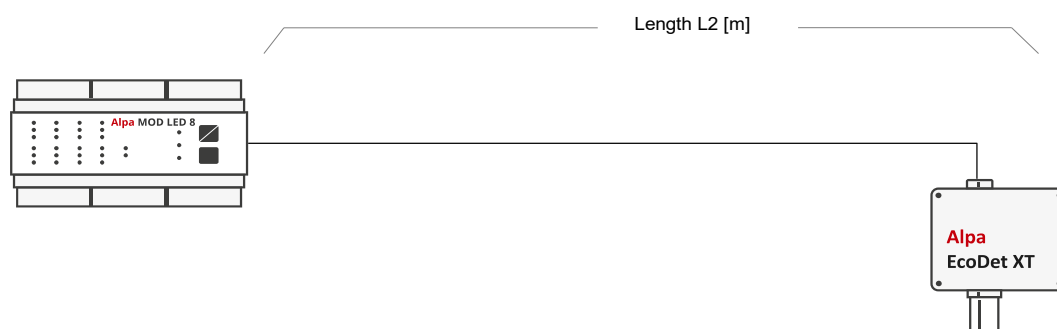


Figure 7: Star configuration

Cross-section of a single cable conductor [mm ²]	System with backup battery supply ($U_{IN(min)} = 20\text{ V}$)	
	One Alpa EcoWent XT Gas Detector at the end of the line	One Alpa EcoDet XT Gas Detector at the end of the line
	L2 [m]	L2 [m]
0,75	1400	1400
1	1400	1400
1,5	1400	1400
2,5	1400	1400

Table 7: Maximum length of cables – star configuration

Classification of chemicals used at Atest-Gaz

Because of the need to present a **consistent and high level of maintenance services**, to ensure **the safety of the calibration process** and to **create a basis for a rational calculation of the costs** of this process, Atest-Gaz developed the "Classification of Chemical Substances" described below.

The classification determines the complexity of the calibration process of a particular detector type, consider two criteria:

- ✍ stability of the calibration mixture (criterion **A**):
 - ease of generate and its stability,
 - ergonomic complexity of operations,
 - required experience and knowledge of the employee performing the calibration,
 - required equipment,
 - environmental requirements for the process (e.g. weather conditions).
- ✍ safety / potential hazard generated by the mixture (criterion **B**).

These both criteria have an impact on the final cost of the calibration services and level of competence required from the employee conducting the calibration.

This classification is applied both by Atest-Gaz and the entities cooperating with it – distributors, authorized service providers and users of the systems.

In the case of calibration with the "crossover" substances, the classification is made in accordance with the substance category that is applied (e.g. for the detector with a PID sensor this substance is isobutylene, i.e. B0 A0).

The detector are classified on the stage of offer.

On the next page we present tables showing the above relationships.

Category	Description	Terms of facility calibration
A0	Cylinder gases, stable environment	No precipitations, and no strong winds, and temperature over -10°C^1 . In other cases, calibration at a location that meets the above conditions (necessary to remove the detectors).
A1	Cylinder gases, unstable environment or absorption by the moisture	No precipitations, and no strong winds, and temperature over $+10^{\circ}\text{C}^1$, and relative humidity under 70%. In other cases, calibration at a location that meets the above conditions (necessary to remove the detectors).
A2	Gases not available in cylinders can be generated at the relevant facilities	like A1 In other cases, calibration at a location that meets the above conditions (necessary to remove the detectors).
A3	Laboratory calibration	Facility calibration impossible, laboratory calibration only, probably at the manufacturer's. This group also includes conditions resulting from other reasons, e.g. the need for temperature compensation, non-linearity of the sensor, the need for calculation, the use of special tools, etc.

Table 1. Classification of chemicals used at Atest-Gaz. Criterion A: mixture stability

Category	Description	Classification criteria
B0	Safe substances	concentration of flammable components $< 60\% \text{ LEL}$, and concentration of toxic components $\leq \text{NDSch}^2$, and oxygen concentration $< 25\% \text{ vol}$, and tank $< 3 \text{ dm}^3$ (water capacity) and $p \leq 70 \text{ atm}$, or specified liquid chemical compounds, e.g.: glycerol, 1,2-propanediol.
B1	Low-risk substances	concentration of flammable components $< 60\% \text{ LEL}$, and concentration of toxic components $\leq \text{NDSch}^2$, and oxygen concentration $< 25\% \text{ vol}$, and tank $> 3 \text{ dm}^3$ (water capacity) or $p > 70 \text{ atm}$, or toxic gases with the concentration of $\text{STEL} \div 15 \times \text{NDSch}$, or specified liquid chemical compounds, e.g.: petrol, acetone, 1-methoxy-2-propanol.
B2	High-risk substances	inert gases having an oxygen concentration $> 25\% \text{ vol}$, or flammable gases with a concentration $> 60\% \text{ LEL}$, or specified liquid chemical compounds, e.g.: styrene, methanol, xylene, toluene, methyl methacrylate.
B3	Extremely dangerous or extremely flammable substances	toxic gases with the concentration of $> 15 \times \text{NDSch}^2$, or specified liquid chemical compounds, e.g.: benzene, formaldehyde, formic acid, epichlorohydrin.

Table 2. Classification of chemicals used at Atest-Gaz. Criterion B: OHS

- 1 Is allowed to perform calibrations at lower temperatures, if they meet the conditions of operation of the detector, e.g. ammonia refrigeration units.
- 2 In the absence of determined NDSch it is necessary to adopt $2 \times \text{NDS}$ as a criterion.



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