



| Guidebook

Teta Gas

Gas Detection & Safety System



Reliable and Innovative **Gas Detection & Safety Systems**

We design, manufacture, implement and support:

Systems for Monitoring, Detection and Reduction of gas hazards

For more details please visit our website **www.atestgaz.pl**

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Remarks and reservations

-  Read and understand this manual prior to connection and operation of the device. Keep the User Manual with the device for future reference.
-  The manufacturer shall not be held responsible for any errors, damage or defects caused by improper selection of suitable devices or cables, errors in installation of equipment or any misuse due to failure to understand the document content.
-  Engineering of a gas detection&safety system for any specific facilities to be safeguarded may need consideration of other requirements during the entire lifetime of the product.
-  Use of unauthorized spare parts different from the ones listed in project is strictly forbidden.

How to use this manual?

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



Pay extreme attention to information provided in such framed boxes.

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1 General information

Teta Gas system is a modern Gas Detection & Safety System that uses Digital Data Transfer – Teta Bus, which, via a single pair of cables, allows for both supply and addressable communication with the gas detectors. It is intended to provide security of public utility, civil engineering and residential facilities (underground garages, boiler rooms or halls heated with radiators) and protect people staying at such facilities from dangerous gas hazards.

Teta Gas system provides independent alarms and control outputs for each of the gases – this allows splitting signals and selective HVAC control. It is also possible to generate selectively a fire protection signal in the event of LPG leak.

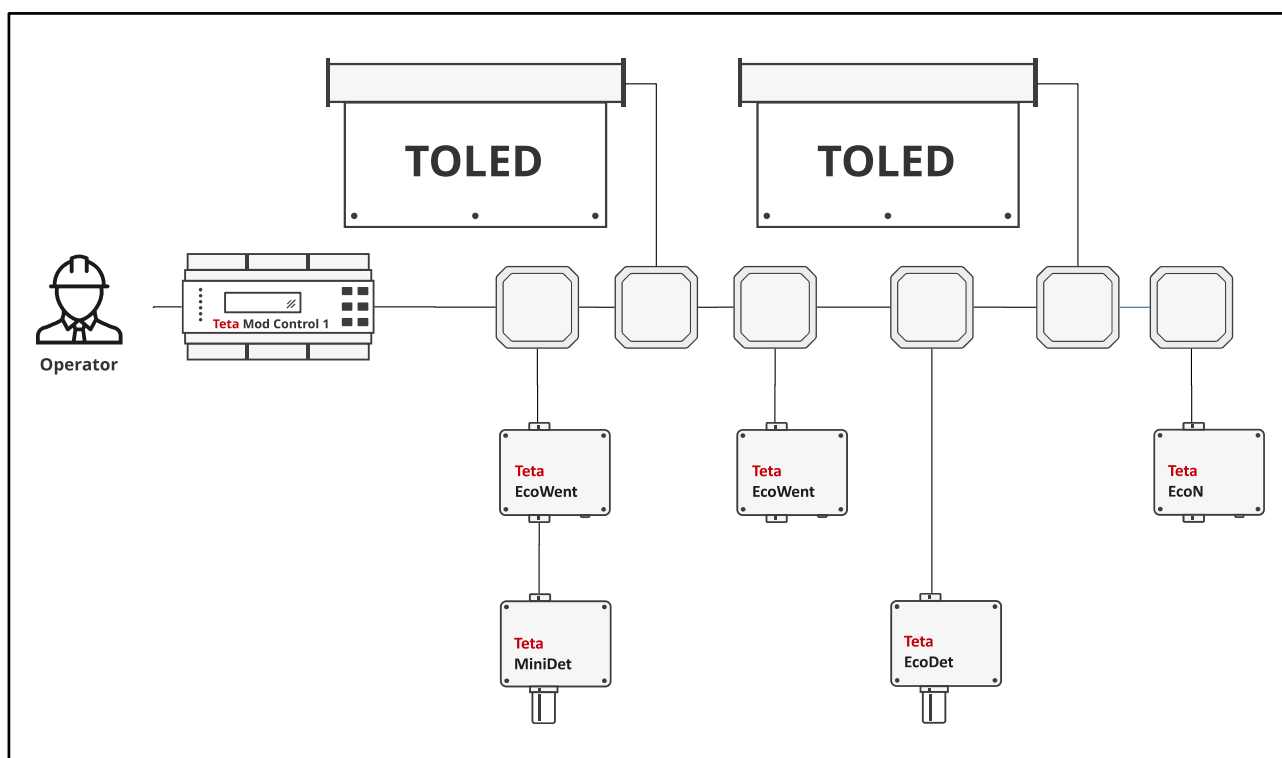


Figure 1: Gas Detection & Safety System for garages and car parks

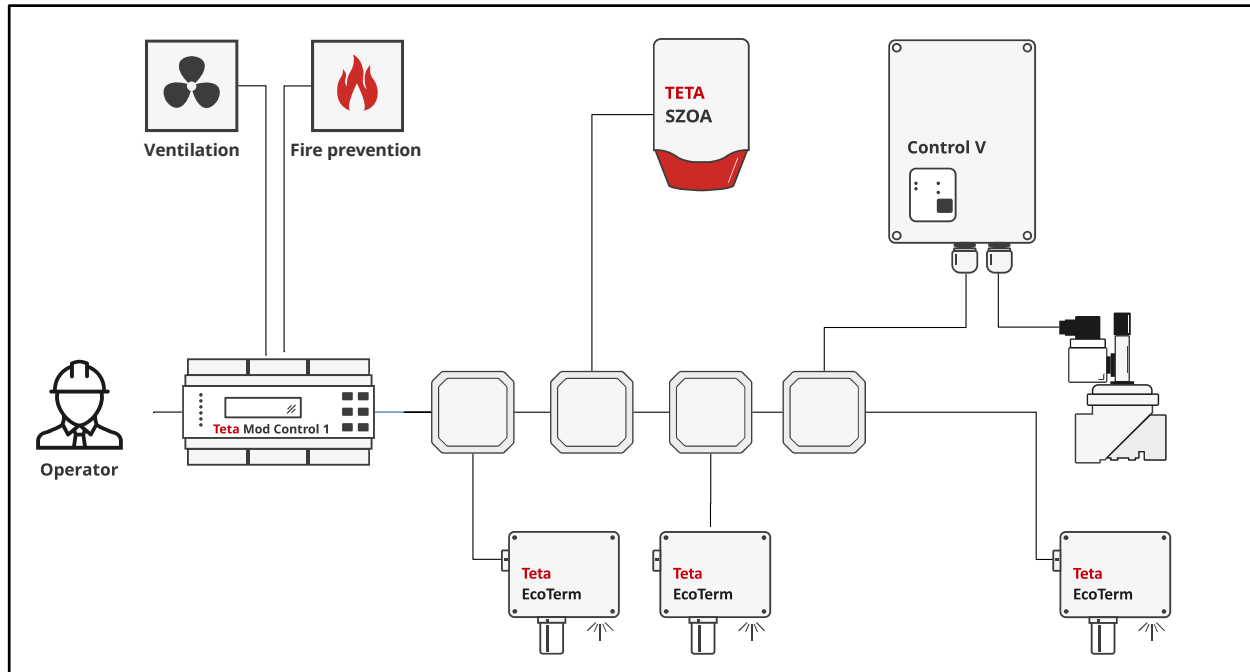


Figure 2: Gas Detection & Safety System for industrial halls heated with radiators

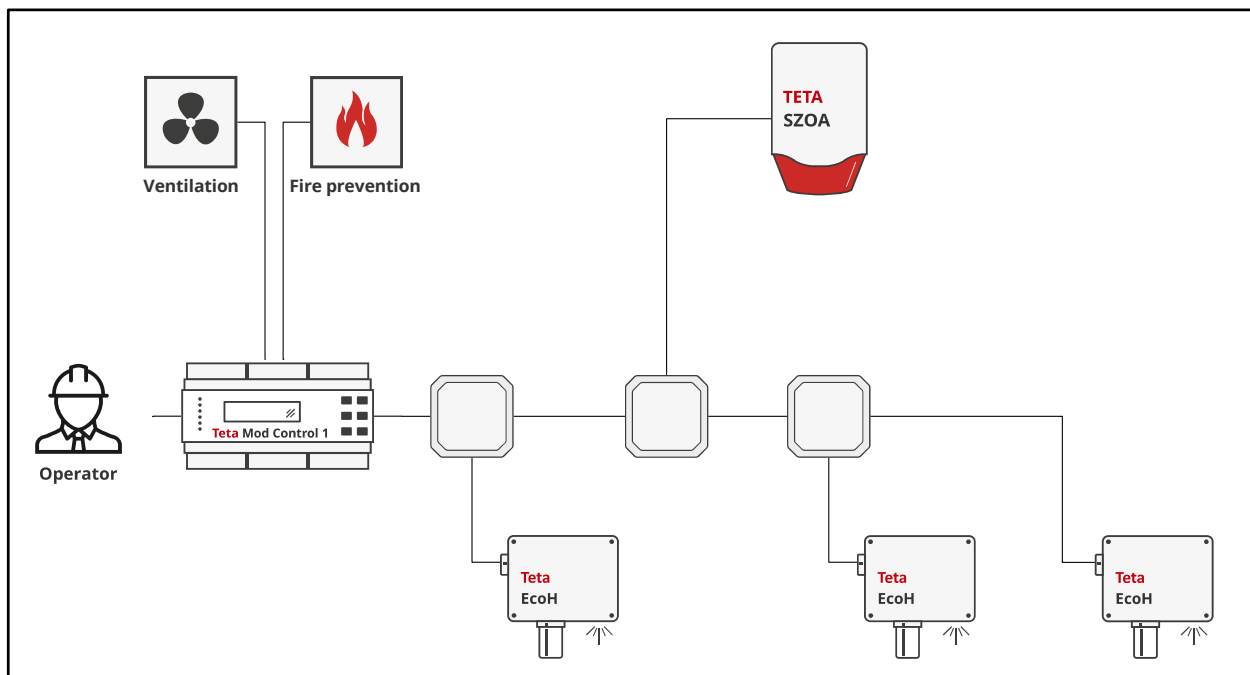









Figure 3: Gas Detection & Safety System for battery room

The Gas Detection & Safety Systems include the following equipment

Product code	Description
PW-108-A	Control unit
-	• Teta MOD Control 1 Unit Module
-	• DC/DC voltage doubler UP-300 24/28 V
-	• Power supplies
PW-117-A	Teta MOD F Control Unit Module (optional) – see details in Section 4.6
PW-105-CO	Teta EcoWent Gas Detector (CO detector)
PW-107-LPG	Teta MiniDet Gas Detector (LPG) for direct co-operation with the Teta EcoWent detector
PW-111-NO2	Teta EcoN Gas Detector (NO ₂ detector)
PW-106-LPG	Teta EcoDet Gas Detector (LPG detector)
PW-113-NG	Teta EcoTerm Gas Detector (CH ₄ detector)
PW-123-H2	Teta EcoH Gas Detector (H ₂ detector)
PW-112-S2	S2 T-connector
PW-127-X	TOLED Warning LED Display
PW-085-24	Alpa SZOAmmini Warning Beacon with Sounder
PW-118-24	Alpa SZOA Warning Beacon with Sounder
PW-118-TETA	Teta SZOA Warning Beacon with Sounder
PW-121-X	Control V Valve Controller
-	Valve

Table 1: Device of Teta Gas System

Key features of gas detectors

-  A two-wire BUS – Power supply and data transmission on one, easily accessible two-wire cable.
-  Handling up to 50 devices connected directly to the Teta Bus port.
-  Arbitrary polarisation – the system is designed as installer-friendly – it is impossible to make an error during installation.
-  Easy integration – Teta Gas system provides independent alarms and control outputs for each of the gases – this allows splitting signals and selective HVAC control. It is also possible to generate selectively a fire protection signal in the event of LPG leak.
-  Simple integration with BMS (e.g. Ethernet, EIB and other Intelligent Building buses).
-  Unique addressing – a simple and clear method of assigning and verifying detector addresses, additionally, it is possible to check the status of the given detector on the control unit.
-  Identification of a hazardous location – in the event of a gas leak at a facility, the Control Unit allows service technicians to inspect the hazardous location, which significantly affects the response time and simultaneously increases the level of protection of people and property.

Operation principle

The detectors performs cyclical measurements of gas concentration in the air and then the indicator lamps (LEDs) of the detector are used to provide information whether the concentration is safe or any threshold limit is exceeded. At the same time a signal is sent to the control unit to trigger appropriate actions, i.e. to actuate a valve, display a warning message on a board or activate the ventilation system.

2 Safety



All activities related to connecting detectors, signallers or other elements must be carried out while control unit's power supply is off.



Despite the power supply voltage for the Gas Safety System is off, dangerous voltage may persist across terminals of the control unit. Such a voltage may come from another system controlled by the same unit, for instance ventilation, that use one output pin of the control unit.



The devices of gas detection system must be reliably secured during any repair, installation or maintenance works.




3 Input-output interfaces

The Gas Detection & Safety System serve as a source information for both the system operator and for other automation systems deployed within the building.

Gas Detection&Safety System	Fire protection system	Ventilation system	Other systems	User
Control unit module	Yes	Yes	Yes	Yes
Control V Valve Controller	No	No	No	Yes
Detectors	No	No	No	Yes
Gas Warning LED Display	No	No	No	Yes
Signalling devices	No	No	No	Yes

Table 2: Gas Detection & Safety System output interface

Information about current status of detectors deployed on the facility area is disseminated by means of the following methods:

-  detectors and the control unit module – by means of indicator lamps (LEDs) provided on the device enclosure (see details in appropriate User Manual for a specific device),
-  warning LED displays – a relevant message is displayed,
-  signalling devices – optical and acoustic.

The control unit module receives information transmitted by detectors and in response, send signals that are necessary to control other devices or systems for instance valves, alarm systems (warning LED displays, sound and light warning beacons) or yet other automation systems deployed within the building.

3.1 Relay outputs – PK

For details about operation and functionalities of relay outputs offered by the Control Unit Module Teta MOD Control 1 please refer to a user manual for the specific device.

4 Engineering of Gas Detection & Safety Systems

4.1 Equipment layout

4.1.1 Deployment of gas detectors

For installation of the Gas Detection & Safety System in a garage or a car parking facilities the assumption can be made that one detector is necessary for each 120 to 200 m². However, the detailed layout depends also on local conditions, i.e. availability and efficiency of a ventilation system, presence of locations for potential accumulation of gas.

Detailed information with regard to layout of detectors can be found in User Manuals for specific equipment.

4.1.2 Location for a control unit module

Components of the control unit shall be mounted inside a control cabinet on a DIN 35 rail or in a terminal cabinet (Atest Gaz offers a kit of the control unit components enclosed into a dedicated housing).




4.1.3 Locations for a shutoff valve and the Control V controller for the valve

The location for the shutoff valve controller is strictly associated with the place where a shutoff valve is to be mounted pursuant to requirements of the gas supplying system.

Please pay attention to the distance between a valve and a controller. Such a distance depends on the valve type and the diameter of an interconnecting pipe. For more details please refer to the User Manual for the Control V device.

4.1.4 Location for warning LED displays

Designers of a Gas Detection System must take account for the following recommendations with regard to locations of warning LED displays:

-  warning LED display shall be placed at the sufficient height to enable undisturbed and safe traffic of persons and vehicles,
-  depending on a message to be displayed the warning LED display shall be mounted at the following locations:
 - above or next to ingress/egress doors of a garage,
 - in communication roads,
 - above or next to an ingress/egress gate of a garage,
-  installation height shall be properly selected so that to enable easy access to a warning LED display.

4.1.5 Location for sound and light warning beacons

Sound and light warning beacons shall be mounted at such locations that guarantee good visibility of messages.

4.2 Selection of power supply units

When components of the Gas Safety System are to be connected to the system bus of the Teta Bus type, parameters of power supply voltage can be determined by means of the dedicated software Teta System Configurator.

That software tool enables easy and quick configuration of the system with selection of input voltage and power of a power supply unit, cross-sections of all cables and conductors as well as verification of distances between individual components of the system.

The software description and download guidelines can be found on our website

<http://conf.atestgaz.pl/TetaGasConfigurator/index.html?lang=en>



In case of systems where equipment of the Teta series is to be connected directly to a control unit, the power necessary to supply the system shall be calculated as a sum of power consumed by Teta devices (can be calculated by means of the aforementioned software tool) and other components of the system (see Section 4.2.2).

Parameters of a newly designed system can be estimated according to guidelines provided in subsequent items of this section.

4.2.1 Types of power supply units

Firstly the power voltage required for specific detectors must be established according to guidelines provided in Table 3 to select then the necessary type of a power supply unit.

Power voltage for detectors can be found out by means of the dedicated software tool. The selection between 24 V DC or 48 V DC can be made with consideration of a distance between the control unit and the first gas detector, the closest to the controller, and the bus cable cross-section. Although, the rule of thumb says that the voltage of 48 V DC is more beneficial for system with a substantial number of detectors for flammable gases.

System options	Power voltage required for detectors	Warning LED displays or sound and light warning beacons for 24 V DC	Power supply unit suitable for the application
No backup voltage facilities	24 V	-	24 V
	48 V	NO	48 V or 24 V with the DC/DC voltage doubler (UP 300 24/48 V)
		YES	24 V with the DC/DC voltage doubler (UP 300 24/48 V)
System with backup voltage	24 V	-	24 V + UPS
	48 V	-	24 V + UPS + the DC/DC voltage doubler (UP 300 24/48 V)

Table 3: Selection of a power supply type

4.2.2 Output power




The power supply unit selected for the system must deliver sufficient power to cover power consumption of all measurement points. The demand for power consumption of specific detectors can be found in relevant user manuals for these devices.

To calculate the overall power necessary to cover the system demand the consumption of all system devices must be added up and then doubled.

4.3 Warning devices connected directly to a relay output of the control unit




4.3.1 Warning LED displays

The control unit of the Teta Gas system can handle the following warning number of warning LED displays:

-  18 units for the power voltage of 24 V,
-  9 units for the power voltage of 48 V,
-  30 units for the power voltage of 230 V.

When the system includes more warning LED displays than the foregoing limits, an additional relay with elevated immunity to voltage surges (appearing at the moment of a warning board activation) must be applied. Current carrying capacity of the relay contacts must be properly selected to match consumption of electric current by all warning LED displays altogether with sufficient safety overhead. The connection diagram with the use of an additional relay is shown in Figure 8.

The manufacturer recommends the RPI-1ZI-U24A relay from Relpol with the output current sufficient to connect:

-  50 warning LED displays for the power voltage of 24 V,
-  100 warning LED displays for the power voltage of 48 V,
-  100 warning LED displays for the power voltage of 230 V.

4.3.2 Alpa SZOAmmini Warning Beacons



Up to 16 warning beacons of the Alpa SZOAmmini type with the power voltage of 24 V can be connected directly to the control unit of the Teta Gas System.

4.4 Connection of warning devices via the Teta Bus interface

Up to 12 warning devices with the Teta interface can be connected to a single control unit of the Teta Gaz system.

4.5 Solenoid valve

The valve can be connected in two manners:

-  directly to the Control Unit Module Teta MOD Control 1 – see Figure 6 – which enables connection of a single valve with the power supply voltage of 230 V or 12 V,
-  by means of the Control V Valve Controller – extends the system capacity to connect up to 8 valves with the power supply voltage of 12 V.

Incorporation of the Control V controller also enhances the system automatic troubleshooting since the controller monitors continuity (resistance) of the valve control line, status of the battery charging and fluctuations of the power supply voltage with indication of the need to check the valve and to run a manual test.

4.6 Teta MOD F

For facilities where the level of interferences exceeds thresholds specified in the Directive 2014/30/EU (on the harmonisation of the laws of the Member States relating to electromagnetic compatibility) application of the Teta MOD F Control Unit Module is strictly recommended.

The connection between Teta MOD F module and the control unit is shown in the schematic diagram below.

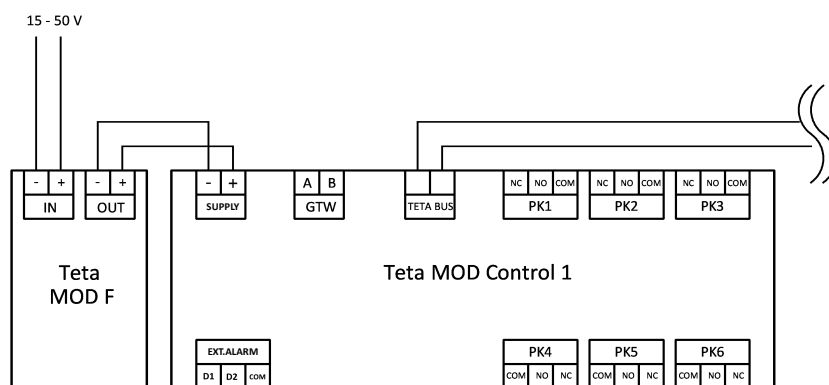


Figure 4: Connection of the Teta MOD F module

4.7 Cables for the system connections

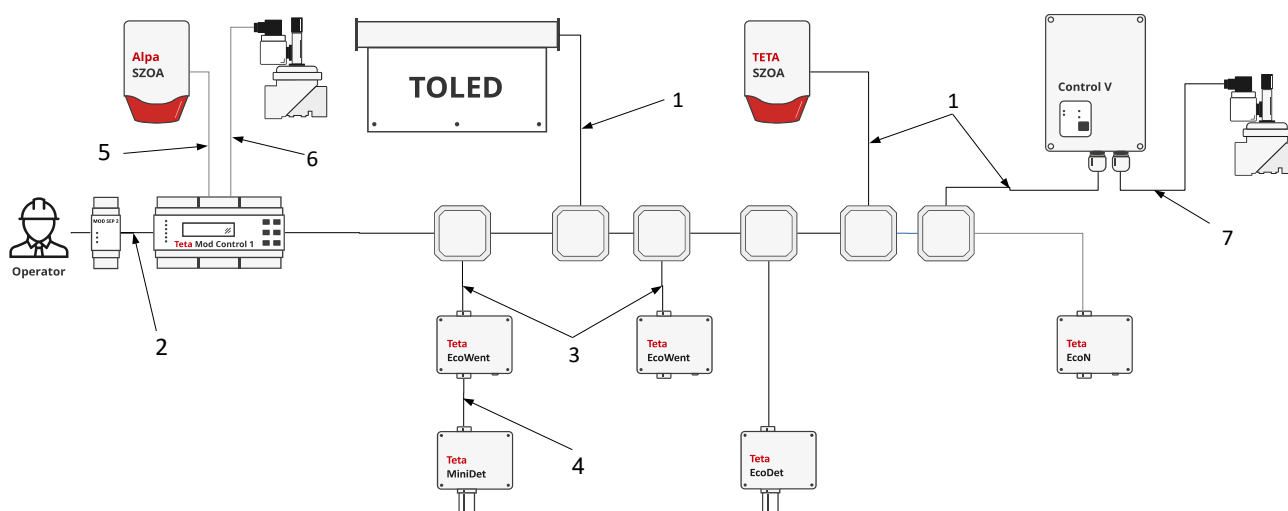


Figure 5: Interconnections within the Teta Gas system

When no information about cable types to be used for interconnections is provided in the engineering documentation please follow the specification in the table below.

Cable No. (see Figure 5)	Recommended cable type	Insulation strength	Example of the cable type	Additional remarks
1	Two-core cable	> 100 V	YDY 2x2.5	See details in Section 4.8
2	-	> 100 V		No specific requirements, however consumption of electric current by the device must be taken into account
3	Two-core cable	> 100 V	YDY 2x1	The maximum total length of cable branches must be less than 100 m
4	Three-core cable	> 100 V	YDY 3x1	The maximum distance between neighbouring detectors must be 1.5 m
5	Two-core cable ¹	> 100 V	YDY 2x1.5	The cable cross-section and length must be selected accordingly so that the voltage drop is ≤ 10%
	Three-core cable ²	> 300 V	YDY 3x1.5	

1 For the power voltage of 24 V.

2 For the power voltage of 230 V.

Cable No. (see Figure 5)	Recommended cable type	Insulation strength	Example of the cable type	Additional remarks
6	Three-core cable	> 300 V	YDY 3x1.5	-
7	-	-	-	Details related to cabling between the shutoff valve and the Control V valve controller can be found in the Operation Manual for the controller.

Table 4: Cables applicable for interconnections within the system



The total cable length for the Teta Bus interconnections must not exceed 1 km.

4.8 Selection of a bus cable for gas detectors

Cable length and cross-section for the bus deployment can be established by means of the Teta System Configurator software (see Section 4.2).

5 System architectures

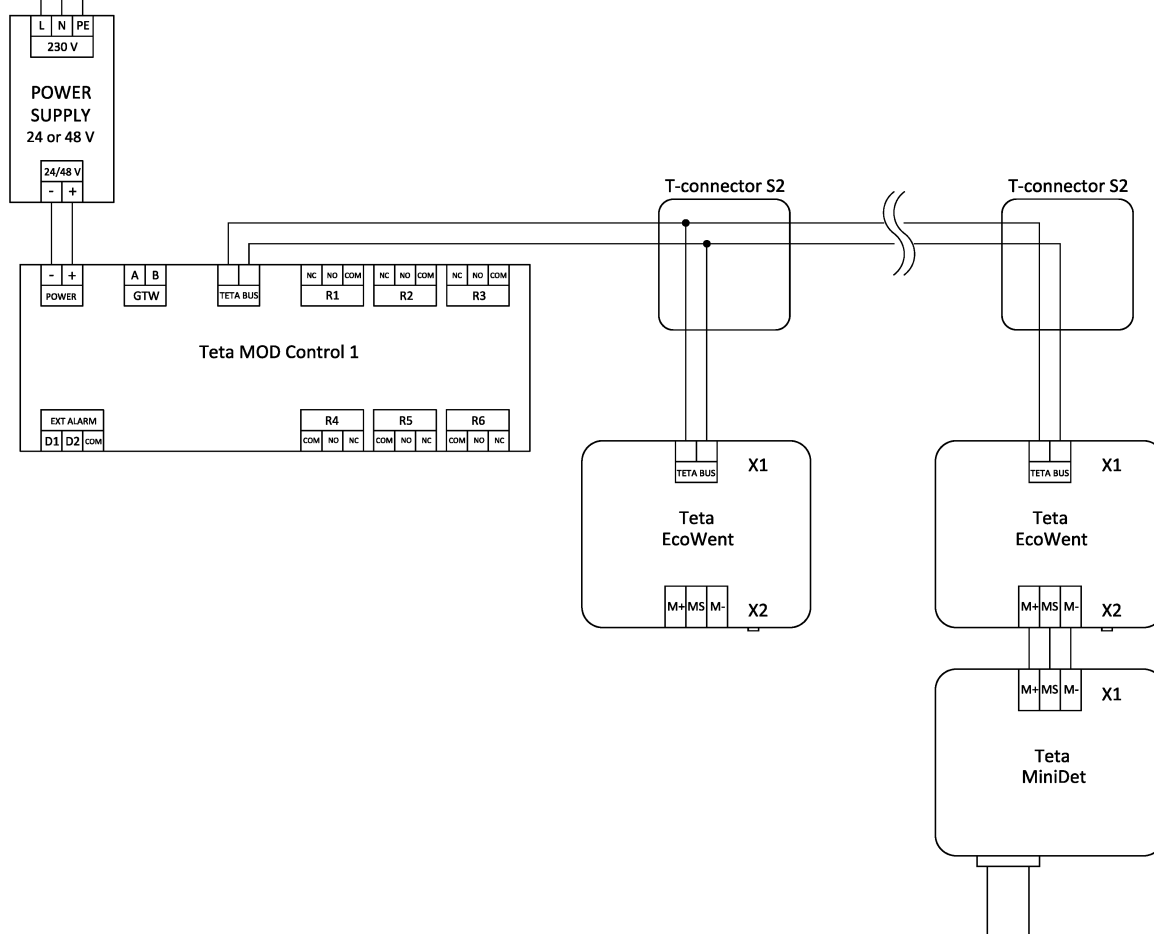
Typical solutions for architectures of a Gas Detection System are shown in Figures 1, 2 and 3.

5.1 Schematic diagrams of interconnections

Examples of schematic diagrams for interconnections within systems are shown in subsequent figures.

Detailed schematic diagrams in an editable format can be found on our website
<http://doc.atestgaz.pl/AG/PROJ/PROJ-LIB-037.dwg>





Program 1 for operation of relays within the Teta MOD Control 1 Unit Module.

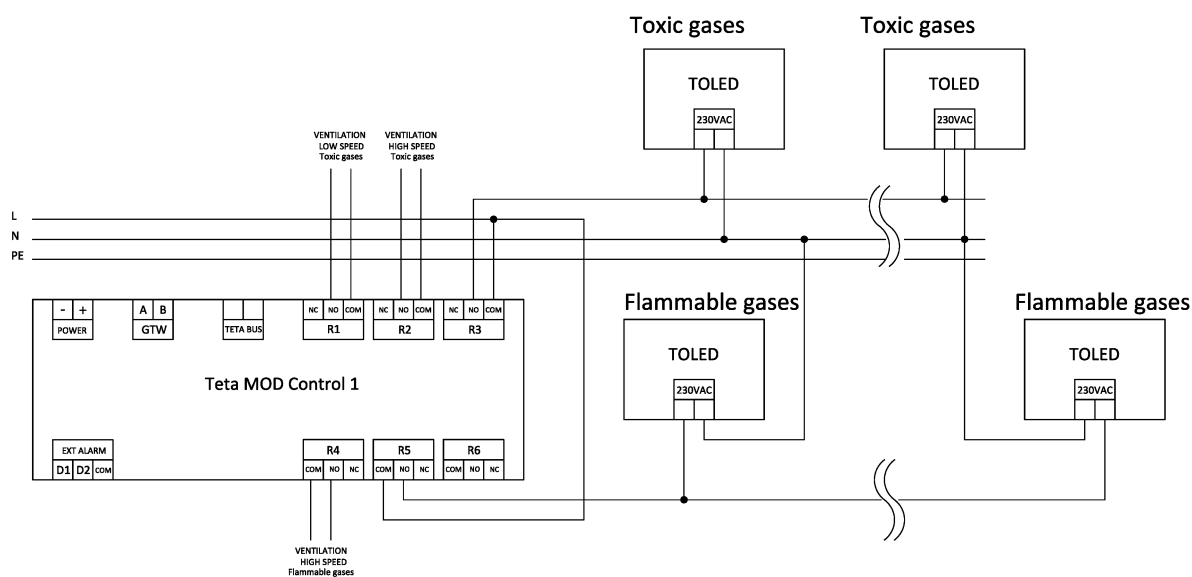


Figure 7: Connection of warning tables and the control system for ventilation

Program 1 for operation of relays within the Teta MOD Control 1 Unit Module.

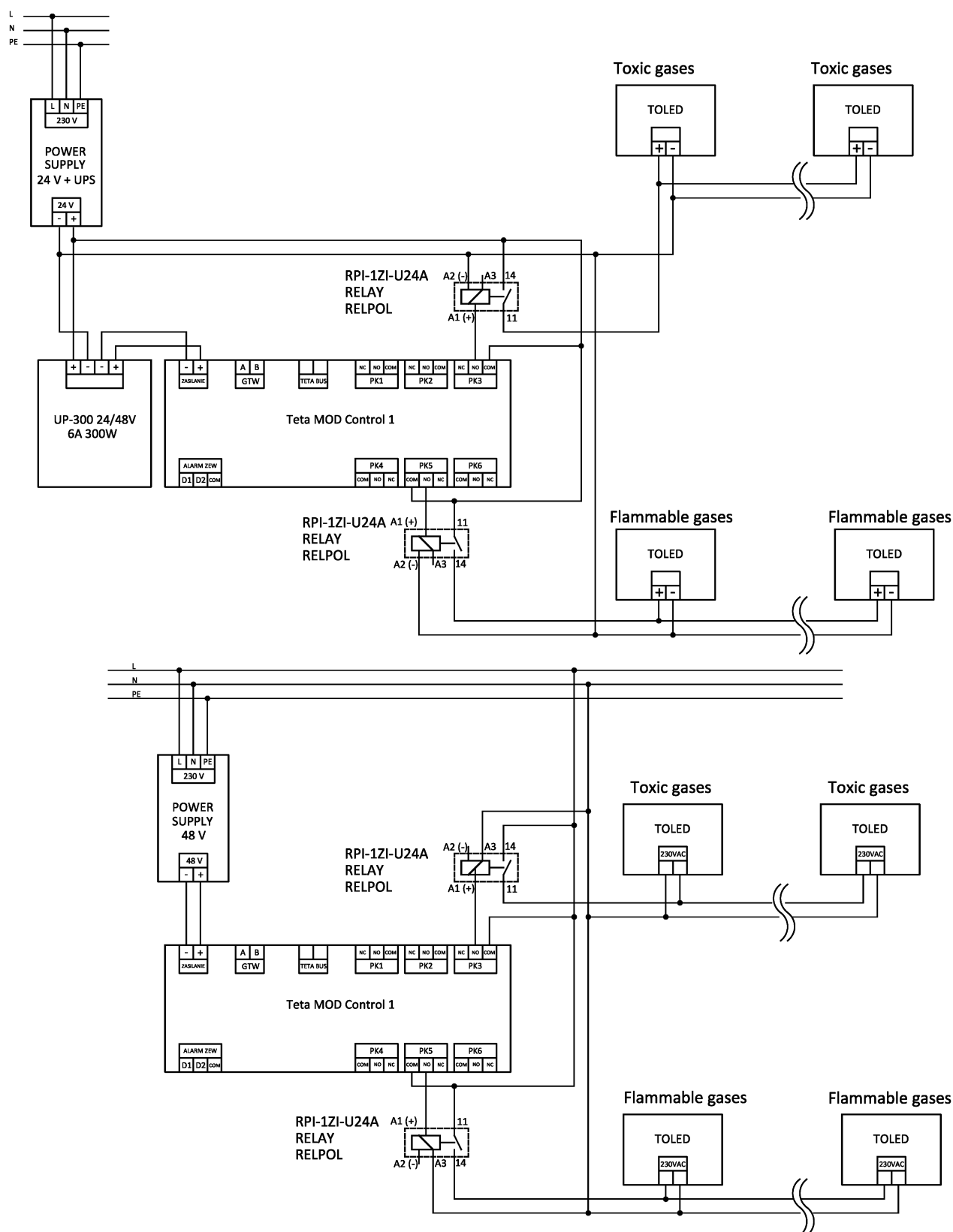


Figure 8: Connection of TOLED via a relay

Program 1 for operation of relays within the Teta MOD Control 1 Unit Module.

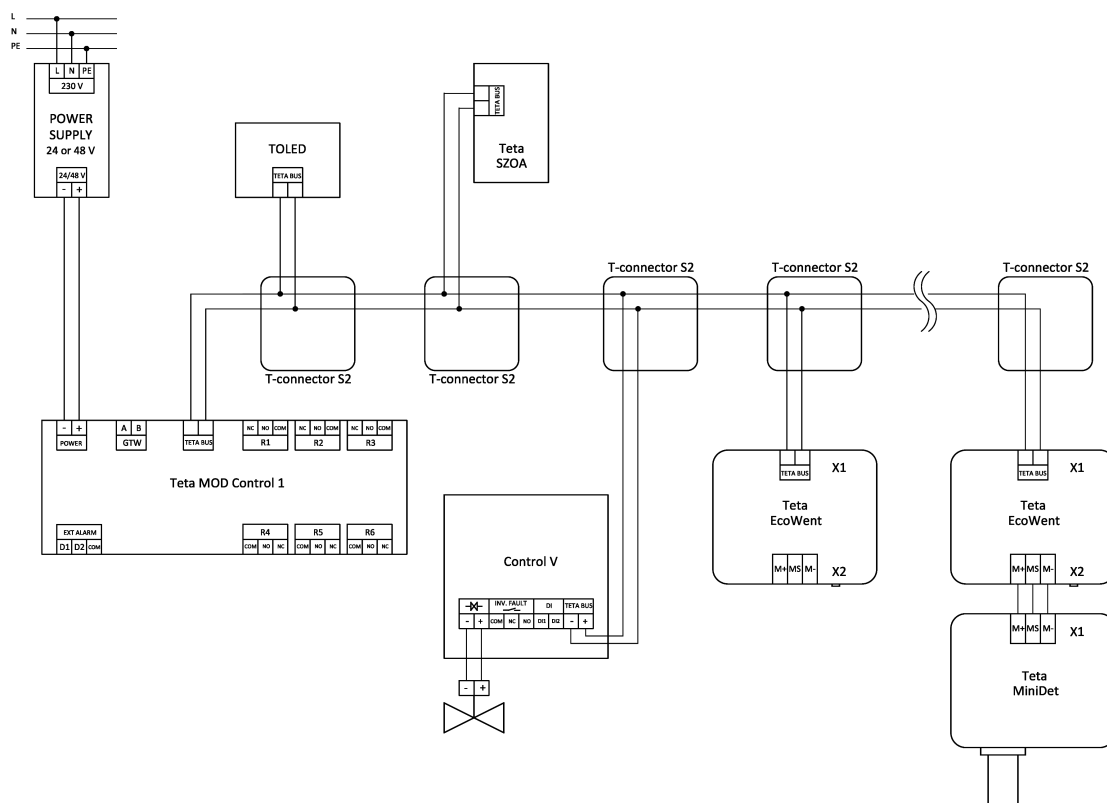


Figure 9: Connection of system components to the Teta Bus lines

Wiring of the Alpa SZOAmini warning beacon to relay outputs of the Control Unit Module Teta MOD Control 1.

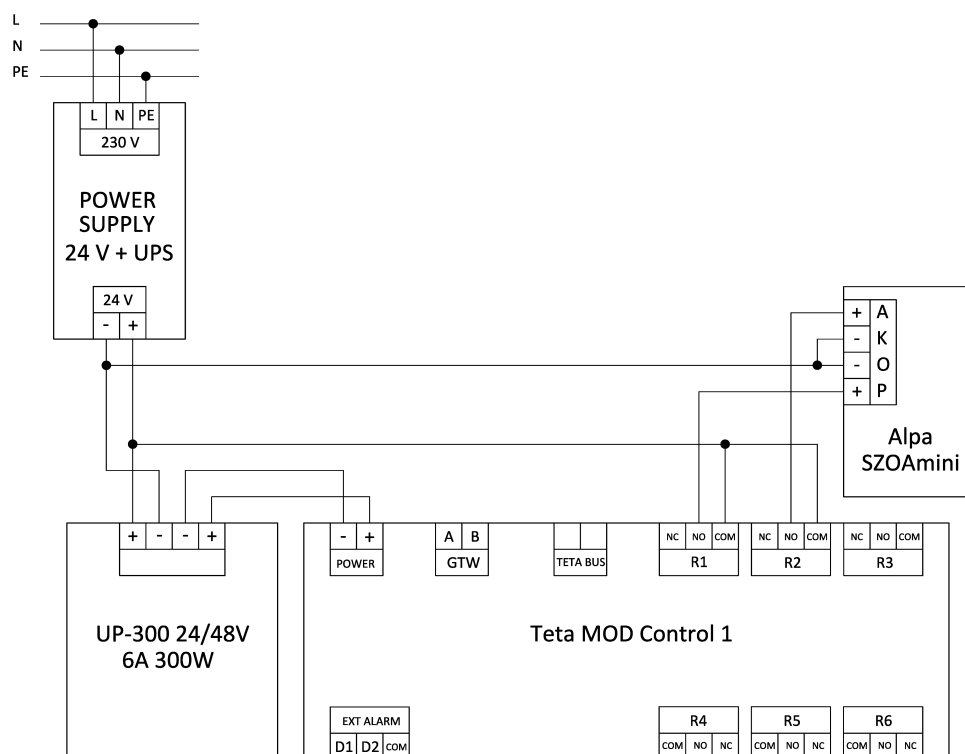
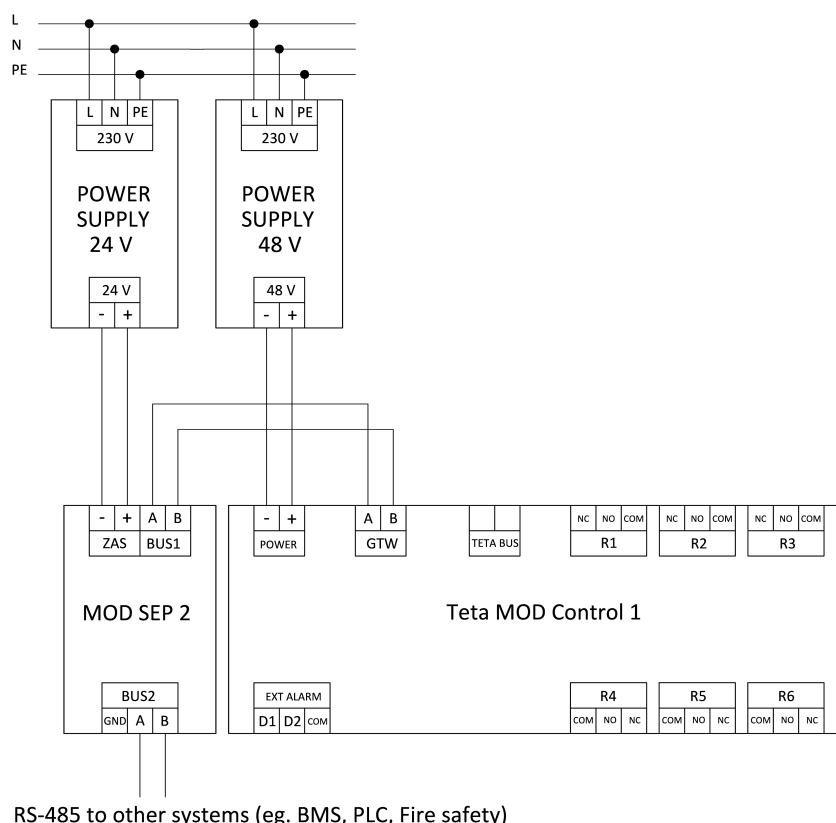


Figure 10: Connection of warning beacon with sounder

Wiring to external systems collaborating with the Teta System equipment.



RS-485 to other systems (eg. BMS, PLC, Fire safety)

Figure 11: Connection to other systems by means of the MODBUS/ASCII /RTU protocol

Program 2 for operation of relays within the Teta MOD Control 1 Unit Module.

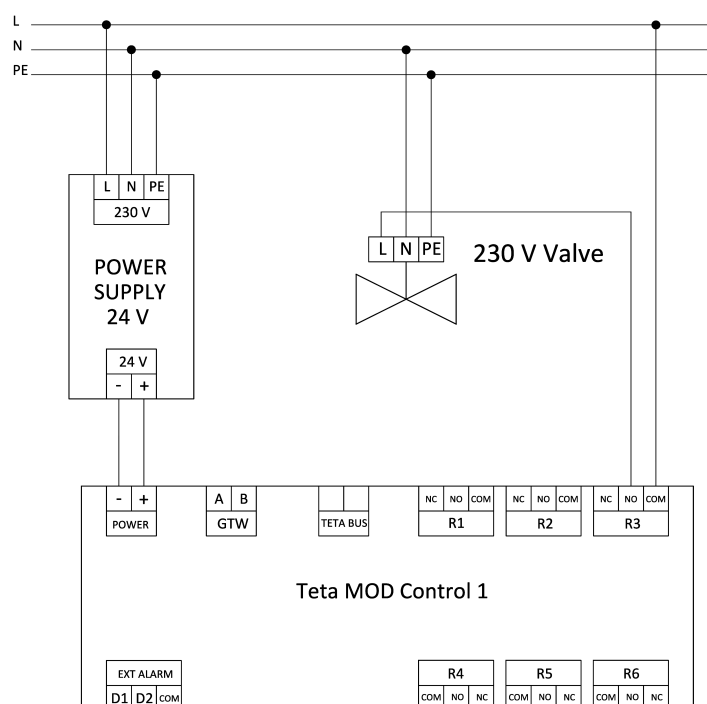


Figure 12: Direct connection of a solenoid valve to the Teta MOD Control 1 Unit



For more details about connection of a solenoid valve to the Control V Valve Controller please refer to the relevant User Manual for the device.

6 Lifetime cycle

6.1 Installation



Mounting of gas detector is allowed only after full completion of all civil engineering works.



The electric network must be deployed according to the engineering documentation.



The electric system must be designed in conformity to general rules for engineering of A&C³ systems.



Electric cables and conductors shall be routed in a safe manner to have then protected against possible damage.






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

For more details about mechanical installation of individual components of the system please refer to relevant user manuals or data sheets.

6.2 Commissioning of the gas detection&safety system

After having the electric network complete and power voltage supplied to all devices carry out the following operations:

-  configure and assign addresses to all detectors (see User Manual of dedicate gas detector),
-  configure the control unit (see User Manual for the Teta MOD Control 1 Unit),
-  make sure that the system works according to the underlying logic flow chart – execute a test of safety functions – see details in section 6.3.3.



Please remember to open the valve after completion of all tests.



If any civil engineering or building (finishing) jobs could have been performed yet after installation of the Gas Detection & Safety System a test of all detectors is mandatory to make sure that detectors correctly respond to presence of hazardous gases.



The gas monitoring system can be approved for operation only after passing results of all aforementioned checks and verifications.

6.3 Maintenance schedule

6.3.1 Calibration

Please refer to relevant User Manuals for specific equipment for detailed information about calibration.

6.3.2 Replacement of fast wearing parts

Please refer to relevant User Manuals for specific equipment for detailed information about replacement of wearing parts and consumables.

6.3.3 Test of safety functions

Execution of the test for safety functions is recommended once a year. Test gas is supplied to one unit of each detector type and response of all components within the Gas Detection&Safety System is checked together with all collaborating systems (e.g. ventilation).



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www.atestgaz.pl/en